AN INVESTIGATION INTO THE FACTORS THAT INFLUENCE THE IMPLEMENTATION OF CLINICAL PHARMACY SERVICES IN HOSPITAL PAEDIATRIC CARE IN HONG KONG

CONOR MING-HO SIN

Doctor of Pharmacy

ASTON UNIVERSITY

March 2023

Thesis Abstract

Aston University

An Investigation into the Factors that Influence the Implementation of Clinical Pharmacy Services in Hospital Paediatric Care in Hong Kong

Conor Ming-Ho Sin

Doctor of Pharmacy 2023

The role of paediatric clinical pharmacists in secondary care has a positive influence on patient care through their contributions and interventions. However, the contextual variation in healthcare settings has affected the uptake and sustainability of clinical pharmacy services, thereby causing them to be inconsistently implemented. In Hong Kong, although paediatric clinical pharmacy service has been delivered for almost a decade in the public sector, little is known about how it has been implemented, and the factors that influenced the implementation of the service.

A systematic review was undertaken to identify factors that influence the implementation of paediatric clinical pharmacy service from service users' perspectives in hospital settings across the literature. The findings of the systematic review helped to deliver a meticulous summary of evidence available in the literature and facilitated the design of interview guides for the qualitative studies.

Three qualitative studies were conducted to identify factors that influenced the implementation of paediatric clinical pharmacy service in Hong Kong with three subgroups using semi-structured interviews. These groups were clinical pharmacists, physicians and nurses, and parents, caregivers, and former patients. The data were then synthesised and analysed using a framework approach.

The main facilitators that enabled paediatric clinical pharmacy service implementation in Hong Kong include the support from physicians, nurses, and parents, direct and coherent communication between healthcare professionals, and clinical pharmacists filling the clinical gap as medicine information providers. Barriers that were identified that hindered service implementation include a lack of a patient-focused approach, limited availability of clinical pharmacists, a culture of medical dominance, and the need for a better understanding of the role of clinical pharmacists.

Improving implementation of paediatric clinical pharmacy service in Hong Kong appeared to be a crucial issue for policy and practice, and the strategies developed through these factors should be evaluated in future studies to assess the uptake and sustainability of the implemented services.

Key words: Clinical Pharmacy Service; Hong Kong; Implementation; Paediatric.

Dedication

I wish to thank my wife, Clementine, and my children, Oliver and Owen, for their support and patience throughout my research.

Acknowledgements

I would like to express my gratitude and appreciation for my main supervisor, Professor Ian Maidment, and associate supervisor, Dr Chi Huynh, whose guidance, support and encouragement have been invaluable throughout the individual study write-ups, publications and final thesis. I would also like to thank all participants who took part in the studies and enabled this research to be possible.

Table of Contents

Abbreviations

AAP	American Academy of Paediatrics
ACCP	American College of Clinical Pharmacy
ASHP	American Society of Hospital Pharmacists
COREQ	Consolidated Criteria for Reporting Qualitative Research
CPS	Clinical Pharmacy Service
ESCP	European Society of Clinical Pharmacy
HA	Hospital Authority
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
NICU	Neonatal Intensive Care Unit
PI	Principal Investigator
PICU	Paediatric Intensive Care Unit
RCT	Randomised Controlled Trial
RPS	Royal Pharmaceutical Society
SR	Systematic Review
SSI	Semi-Structured Interview

Tables

Figures

Chapter 1. INTRODUCTION AND BACKGROUND

1.1 The definition of clinical pharmacy

Onatade et al. (2018) described that the role of pharmacists has evolved and continues to expand. Pharmacists' role is evolving from traditional medicine dispensing to adopting a direct patient-centred care practice, as recommended in the Nuffield Report (Clucas, 1986). Helper and Strand (1990) have refined the definition of pharmaceutical care. They recommended that pharmacists should focus their efforts on improving society by reducing drug-related morbidity and mortality, and they should change their focus of practice to promote the best drug therapy and patient safety. The American Society of Hospital Pharmacists (ASHP) published a statement as a result, which then became the cornerstone of clinical pharmacy services (CPSs) (ASHP, 1993). It stated that:

"The principle elements of pharmaceutical care are that it is medication related; it is care that is directly provided to the patient; it is provided to produce definite outcomes; these outcomes are intended to improve the patient's quality of life… It is a health science specialty that embodies the application by pharmacists of scientific principles of pharmacology, toxicology, pharmacokinetics and therapeutics to the care of patients."

The transition of pharmacists' roles involves an expansion of the scope of their practice, with an increase in responsibility in medicine management. A recent example to illustrate this is the COVID-19 pandemic. The pandemic has accelerated fundamental change within the international healthcare systems, and the scope of practice for pharmacists has rapidly adapted to meet the needs of the public (Visacri et al., 2021).Visacri and colleagues have highlighted clinical pharmacists' responsibilities included advising on an array of health circumstances, medicines management comprising of identification of drug interactions and monitoring adverse drug effects, educating patients on lifestyle choices, and monitoring chronic illness evolution (Visacri et al., 2021).

Focusing on secondary care, Kaboli et al. (2006) conducted a systematic review that evaluates published literature on the roles of clinical pharmacists and the effects of their interventions in hospitalised patients. The list of clinical pharmacy activities that were included in the review were patient interviews, medication profile reviews, medication regimen recommendations, participation in inpatient medical rounds, drug monitoring and recommendation follow-up, drug therapy dosing and management, documentation of clinical interventions, and patient counselling before and after discharge.

Clinical pharmacy is a special branch of pharmacy that continues to expand across institutions and involves a wide range of specialty areas with advances in education and clinical pharmacy research (Carter, 2016). It was found that the role of clinical pharmacists is greatly variable depending on the clinical settings, for example, a critical care pharmacist may contribute more in prospectively evaluating drug therapy, providing pharmacokinetic monitoring and evaluating parenteral nutrition orders (Preslaski et al., 2013), whereas an emergency medicine pharmacist may focus on responsibilities such as accurate medication history taking, identification of medication-related problems, discharge prescription review, and patient counselling (Roman et al., 2018).

1.2 The role of clinical pharmacists in medicines optimisation

Medicines prevent, treat, or manage illnesses and conditions and are the most common intervention in healthcare. According to the National Institute of Clinical Excellence (NICE) in the UK, ‘medicines management’ was the term used which has been defined as a system of processes and practices that governs how medicines are used by healthcare organisations and patients (NICE, 2009). The concept of involving patients in decisions about prescribed medicines and supporting adherence was advocated by NICE in 2009 and has later led to the development of the principle of ‘medicines optimisation’, which ensures the improvement of a patient’s quality of life (NICE, 2015). NICE (2015) has defined medicines optimisation as:

"…a person-centred approach to safe and effective medicines use, to ensure people obtain the best possible outcomes from their medicines… shared decision-making is an essential part of evidence-based medicines, seeking to use the best available evidence to guide decisions about the care of the individual patient, taking into account their needs, preferences and values."

Its guidance has explained that medicines optimisation is a patient-focused approach ensuring the right patients get the right choice of medicine at the right time. Similar ideology on the concept of 'medicines optimisation' has been advocated by the European Society of Clinical Pharmacy (2014) and the United Kingdom Clinical Pharmacy Association (Royal Pharmaceutical Society [RPS], 2013a) prior to the publication of the NICE guidance in 2015. The goal of medicines optimisation is to improve patient outcomes through patient engagement, ensuring that they are taking their medications correctly, avoiding unnecessary medications, and thus improving medication safety. The main difference between this concept, in comparison to conventional medicines management, is that it focuses on outcomes and patients rather than systems and processes (ESCP, 2014). Medicines optimisation requires different healthcare professionals and patients to work in collaboration, by following four principles with a person-centred approach (RPS, 2013a). These are:

i. aim to understand the patient's experience;
ii. to make evidence-based choice of medicine;
iii. to ensure medicines use is as safe as possible;
iv. to make medicines optimisation part of routine practice.

Barnett (2019) explained that the role of clinical pharmacists in medicines optimisation is to identify patients who are at risk of medicines-related problems that are preventable and to perform medication reviews to reduce that risk. This involves clinical pharmacists using their

expert knowledge to practice evidence-based medicine in order to balance the risk and benefits of prescribing and deprescribing medicines to individual patients and at a population level. According to the American College of Clinical Pharmacy (ACCP, 2014), clinical pharmacists' roles involve:

- Assessing the status of the patient's health problems and determine whether the prescribed medications are optimally meeting the patient's needs and goals of care;
- Evaluating the appropriateness and effectiveness of the patient's medications;
- Recognising untreated health problems that could be improved or resolved with appropriate medication therapy;
- Following the patient's progress to determine the effects of the patient's medications on his or her health;
- Consulting with the patient's physicians and other health care providers in selecting the medication therapy that best meets the patient's needs and contributes effectively to the overall therapy goals;
- Advising the patient on how to best take his or her medications;
- Supporting the healthcare team's efforts to educate the patient on other important steps to improve or maintain health; and
- Referring patient to his or her physician or other health professionals to address specific health, wellness, or social services concerns as they arise.

Clinical pharmacists contribute in the delivery of shared-care medicines optimisation, and they have become an integral part of pharmacy profession that helps to improve patient outcomes (Barnett, 2019). This integrated healthcare service model has been advocated for the past few decades (ACCP, 2014). To ensure that medicines help patients to achieve the best possible health outcomes, ACCP emphasised that clinical pharmacists should collaborate and work directly with other healthcare professionals and patients.

Developed in 2008 through The Global Conference on the Future of Hospital Pharmacy and hosted by the International Pharmaceutical Federation Hospital Pharmacy Section, the Basel Statements reached a consensus among hospital pharmacists regarding focusing their activities “to optimise patient outcomes” (Penm, Chaar & Moles, 2016). The paradigm of pharmaceutical care, as defined by the Pharmaceutical Care Network Europe, is “the pharmacist’s contribution to the care of individuals in order to optimise medicines use and improve health outcomes” (Allemann et al., 2013). According to Onatade and colleagues (2018), clinical pharmacists’ role encompasses more than just direct care, with activities such as the production of guidelines and protocols, training and education, and drug utilisation analysis all coming into play. The researchers have illustrated the relationships between clinical pharmacy and medicines optimisation graphically, as shown in Figure 1 below:

Figure 1. The relationship between clinical pharmacy and medicines optimisation.

Recently, the role clinical pharmacist in primary care has been expending in the UK, with the concept of advanced practice pharmacists being advocated (Martin et al., 2022). Advanced practice pharmacists are autonomous clinicians who are qualified with high experience in their specialist area. Different from usual clinical pharmacists in general practice who are recruited to be part of the multidisciplinary team to perform clinical assessment, medicines optimisation and structured medication review, advanced practice pharmacists possess a greater

responsibility in decision-making such as independent prescribing (RPS, 2013). As Martin et al (2022) pointed out, the nature of advanced practice is variable depending on clinical pharmacists' postgraduate education and training, specialist area, prescribing competency and experience.

1.3 Clinical pharmacy in paediatrics

Special attention needs to be paid to optimising medicines in children as they are at high risk of harm as the result of medication errors since such errors are potentially more hazardous to them than to adults (Maaskant et al., 2015; Wong, Wong & Cranswick, 2009). Kaushal et al. (2001) have found that the frequency of potentially harmful medication errors was three times higher in hospitalised children than in adults. There are several factors that contribute to paediatric medication errors. Firstly, since most of the drugs were researched and marketed for adults, the formulations were designed to suit adults' dosage units (Kaushal et al., 2001). This means that when these drugs are needed to be administrated in children, manipulation of the formulation is often required, for example, opening a capsule and dissolving the content or withdrawing a small amount from an ampoule. A study conducted in a teaching and tertiary children's hospital in China has found that more than 20% of tablet or capsule medications needed to be manipulated before administering to children (Zhang et al., 2021). Secondly, the need for calculation on an individual patient basis according to their age, weight and body surface area due to the physiological changes which affect the pharmacokinetics of drugs at different stages of childhood (Farre & Cummins, 2016). Lastly, these medications used are often off-label with no standardised dosing (Kozer, Berkovitch & Koren, 2006). In 2014, the American Academy of Paediatrics (AAP) reported that paediatric medication orders resulted in medication errors with rates as high as 5% to 27% in their systematic review (SR) (Rinke et al., 2014).

There are also potential errors associated with the involvement of family caregivers in paediatrics. Mira et al. (2015) have revealed that the medication error rate, as reported by caregivers, was between 19% and 59%. The researchers have also reported that a higher rate, and a greater risk, of errors were found in the geriatric and paediatric patient groups. In a SR conducted to review studies of how caregivers cause or prevent medication administration errors in home settings, 33 studies were identified that included parents or caregivers caring for children (Parand et al., 2016). The authors found that the most common type of error was dosage errors, followed by dosage omission and wrong medication, and concluded that the contributory factors that occurred frequently across the studies were problems with equipment, poor communication and a lack of understanding of illnesses, instructions or calculations (Parand et al., 2016). For instance, it was found that large dosing errors, which was defined as greater or equal to 40% deviation from the prescribed dose, were made by 25.8% of parents using measuring cups with printed markings (Yin et al., 2010). Khan et al. (2016) have showed that 30% of the adverse events due to medication errors reported by parents at the point of admission to hospitals were actually preventable.

It is believed that clinical pharmacists could optimise patient health outcomes in hospital settings such as cost reduction in length of stay, readmission probability, medicine, medical procedures, and laboratory monitoring (Briggs et al., 2015). There are multiple national and international documents which highlight the importance of CPSs in hospital settings, however, very few were focused on paediatric patients (Bayles, 2015).

Sanghera et al. (2006) conducted a SR examining whether the interventions of hospital pharmacists improve drug therapy in children. The researchers concluded that studies included in the review have demonstrated the significance of hospital pharmacists in the management of medications for paediatric patients, although they expressed that the

comparison between studies was difficult due to the difference in settings, design, duration, size, methodology and definition. More recent studies have demonstrated that the role of paediatric clinical pharmacists played in secondary care is crucial as it highlighted the gaps in parents' and caregivers' understanding of their children's medication regimens, reduced and prevented the number of medication errors and adverse drug reactions (Balakrishnan et al., 2020).

In addressing the causal inference between CPS and patient outcomes, studies have attempted to determine whether CPSs have a cause-and-effect relationship with the economic, clinical and humanistic outcomes. It was found that different clinical pharmacy activities provided different levels of improvement in patient outcomes, from having minor impacts such as drug-cost savings or change in dosage form to serious impacts such as identification of 10-fold overdose or duplication of high-risk therapies (Tripathi et al, 2015). For example, in a SR that reviewed the impact on patient outcomes of pharmacists' participation in multidisciplinary critical care teams, the researchers identified a reduction of life-threatening adverse drug events, thus establishing a causal association between the involvement of pharmacists and lower mortality (Lee et al., 2019). According to the Australian Safety and Quality Goals for Health Care (2014), the role of clinical pharmacists has reduced harm to people from medications through safe and effective medication management, as they have reduced medication errors which were associated with reduced morbidity and hospital mortality rates. However, it is worth to note that evidenced-based innovations in healthcare do not necessarily achieve their desired effects if they are affected by poor implementation quality (Willmeroth, Wesselborg & Kuske, 2019).

Evidence also suggested that there is a causal relationship between patient outcomes and the level of CPS implementation, as the impact of CPSs were often affected by its

implementation effectiveness (Proctor et al., 2011). While some researchers measure implementation success by measuring clinical outcomes or the actual targets of the implementation, Grimshaw and colleagues (2006) argued that the effectiveness of the implementation strategies have been impeded by the lack of detailed information about outcomes, use of widely varying constructs, reliance on dichotomous rather than continuous measures, and unit of analysis errors. In order to address this, Proctor and colleagues (2011) aimed to define implementation outcomes as the effects of deliberate and purposive actions to implement new services and practices. They advanced clarity in the language used to describe outcomes of implementation by organising a working group of implementation researchers to identify concepts for labeling and assessing outcomes of implementation processes using a narrative review approach. A determination of taxonomy of implementation outcomes, which include acceptability, adaptation, appropriateness, costs, feasibility, fidelity, penetration, and sustainability, helped to serve as indicators of the implementation success (Proctor et al., 2011). Implementation researchers used these variables to assess how well implementation has occurred or to provide insights about how these contributes to one's health status or other important health outcomes (Peters et al., 2013).

The issue of variations on the level of CPS implementation was reflected in a scoping review that aimed at describing the extent and range of the professional pharmacy services offered in hospital pharmacies across different countries (Abusheishaa et al., 2020). The authors found that there was a significant inconsistency in pharmaceutical care, clinical pharmacy, and public health services across countries. They contended that it was a result of multiple levels of influence, such as individual, interpersonal, institutional, community, and public policy-related factors. For example, Fernández-Llamazares and colleagues (2013) suggested that with higher level of CPS implementation, clinical pharmacists might intercept many of the errors that occur in the process of medication use, especially in paediatrics.

Professional pharmacy bodies from different countries have advocated the need for CPSs in the paediatric population. In the UK, the initiative of advocating CPS in paediatrics is driven by the Neonatal & Paediatric Pharmacists Group (NPPG, 2017), a professional body that provides consultations and statements on medicines use in children within the nation. In the United States, the Paediatrics Practice and Research Network of ACCP and the Paediatric Pharmacy Advocacy Group have shown their support for paediatric CPS in their joint statement (Bhatt-Mehta et al., 2013). One of their explanation for the need for paediatric CPS was based on the increased prevalence of chronic conditions in children over the past decades, thus leading to earlier and higher exposure to medicines (Bai et al., 2017). Bhatt-Mehta et al. (2013) reported that the median drug exposure was four drugs in infants and five in children between 1 and 18 years of age on the first day of admission, based on the survey data from 52 children's hospitals in the United States.

The role of paediatric clinical pharmacists has been recognised outside the pharmacy profession, including the AAP. The AAP acknowledged the impact that clinical pharmacists have on improving paediatric patient safety, children's quality of life and economic outcome (Bhatt-Mehta et al., 2013). Other national healthcare organisation, such as NICE, has also highlighted the need for paediatric pharmacists in the use of medicines in children. It recommended that the use of medications should be discussed at a multidisciplinary team, which should include a paediatric pharmacist, in its criteria policy for commissioning paediatric services (NICE, 2017).

1.4 Paediatric clinical pharmacy services in Hong Kong

Located on the southeast coast of China, Hong Kong is one of the world's leading financial centres. Officially known as the Hong Kong Special Administrative Region of the People's Republic of China, it has over 7.5 million residents, which is one of the most densely populated

places in the world (The Government of the Hong Kong Special Administrative Region [HKSAR], 2017). The delivery of healthcare services in Hong Kong runs along with a dual-track model, with services being provided by both the government-funded public sector and the private sector (Lee, 2018). The public model service, provided by the Department of Health and the Hospital Authority (HA), is the cornerstone of healthcare service delivery because of its accessibility, efficiency and good financial protection for the public from the consequences of ill health (HKSAR, 2017).

The HA is a statutory body established under the Hospital Authority Ordinance in 1990. It has been responsible for managing Hong Kong's public hospital services since December 1991. The HA is accountable to Hong Kong's Government through the Secretary for Food and Health, who formulates overall health policies for Hong Kong. The HA currently has a workforce of around 79,000 people and manages 43 hospitals and institutions, 49 Specialist Out-patient Clinics, and 73 General Out-patient Clinics. It provides a total of 28,000 beds or about 4 beds for every 1,000 members of the public (Hospital Authority [HA], 2019). In comparison, the average number of beds per 1,000 members of the public in the UK is 2.4, whereas Germany and France are 7.8 and 5.8, respectively (British Medical Association, 2023).

Under the HA, public hospitals and institutions are organised into seven hospital clusters based on their locations. The clusters were designed in a way that a comprehensive and complementary range of services can be delivered to the community (HA, 2018).

Traditionally, hospital pharmacists within the HA have been involved heavily in operational duties such as dispensing. A survey conducted in 2008 found that drug dispensing accounted for up to 55.5% of pharmacist activities in public hospitals (Lau, Pang & Chui, 2011). The HA recognised the potential clinical and economic benefits that CPSs could bring to the healthcare system in Hong Kong and has been seeking to expand the role that hospital pharmacists can offer (Chief Pharmacist's Office (HA), 2015). The path of CPSs in paediatrics in Hong Kong

began in the 1990s when the neonatologists at Princess Margaret Hospital and United Christian Hospital foresaw the benefits that CPS could bring to their patients. It began by running pilot part-time services, inviting pharmacists to Neonatal Intensive Care Units (NICUs) weekly (Lo, C.C.H., personal communication, 27 Mar 2019). The contribution of clinical pharmacists in NICUs had been shown to improve the appropriate use of medicines and prevent potential adverse drug events, such as medication errors and adverse drug events (Chief Pharmacist's Office (HA), 2013). Moreover, the pharmacy-prepared unit dose intravenous dispensing systems had been shown to greatly reduce the rate of medication errors (Chief Pharmacist's Office (HA), 2013). As a result, a full clinical pharmacy service was initiated for both NICUs and Paediatric Intensive Care Units (PICUs) in both Princess Margaret Hospital and United Christian Hospital in 2010.

In 2012, the CPS programme rolled out to all PICU and NICU centres within HA. Given the successful rollout of the CPSs to PICUs and NICUs, pilot CPSs were initiated in different specialist areas within different clusters of HA, and the results showed that the applicability of CPSs could improve therapeutic goals and outcomes in patients with chronic conditions, such as in diabetes and hyperlipidaemic management (Chung et al., 2011, Wong, 2017). In 2014, the general paediatric service has extended to all public hospitals within HA.

The standard of practice for paediatric CPS in HA is constantly being reviewed in order to recognise, develop and deliver the best possible outcomes for children. In its latest version (HA, 2020), the scope of service was divided into activities that involved direct patient care and support collaboration with other healthcare professionals, with details shown below:

1. Direct patient care activities, including reviewing medication orders, assessing medication regimen, monitoring patient outcomes, and providing drug counselling and education talk;

2. Support collaboration with other healthcare professionals, including attending clinical rounds, providing drug information and educational talks, providing drug use evaluations, maintaining proper documentation, performing medication reconciliation, and involving in policy development;

3. Enhance medication management systems and medication safety, including system implementation; formulary management and formulation evaluation, stock management, and paediatric medication safety considerations.

1.5 Statement of problem

In an attempt to clarify the uncertainties around the scope of clinical pharmacy activities, providers, settings, and their relationship to pharmaceutical care, the European Society of Clinical Pharmacy (ESCP) has revised and updated the definition of clinical pharmacy. It defined clinical pharmacy as:

*"**Core definition:** Clinical pharmacy aims to optimise the utilisation of medicines through practice and research in order to achieve person-centred and public health goals.*

***Extension:** Clinical pharmacy practice comprises cognitive, managerial and interpersonal activities by pharmacists regardless of setting, which target the appropriate selection, administration and monitoring of medicines by providers, individual patients and the public. Clinical pharmacy practice encompasses (but is not limited to) care models in which pharmacists assume responsibility for achieving person-centred goals for individual patients as part of a multidisciplinary team. Clinical pharmacy research generates knowledge that informs clinical decision-making, health care organisation or policy in relation to the utilisation of medicines and vice versa."*

Although it is clear that the basic essence of clinical pharmacy is the provision of pharmaceutical care to the patient, which is different and more evolved form of hospital pharmacy services, the term 'clinical pharmacy' is still often open to interpretation. Ahmed and

Hasan (2010) emphasised that there is a strong need to standardise clinical pharmacy service both in terms of practice and education, especially in developing countries that are adopting this concept by providing these roles for their hospitals. The lack of a clear, standardised definition of CPS, which affected the understanding of the service from the healthcare stakeholders' perspectives, was viewed to be one of the more important reasons why CPSs have been implemented differently in various settings (Dreischulte, Bemt & Steurbaut, 2022). The inconsistency in the implementation of clinical pharmacy practice was highlighted in a scoping review that aimed to ascertain professional pharmacy services offered in hospital pharmacies across different countries (Abousheishaa et al., 2020).

ESCP did not list specific services that should be provided in clinical pharmacy practice, as its positional paper explained that the nature of clinical pharmacy is evolving and dynamic in nature. Instead, the society has defined in terms of how its aims are achieved through cognitive, managerial, and interpersonal activities at different stages of the medication use process. The different stages include the selection and design of the medication regimen, the use and implementation of the medication regimen, and monitoring and adjustment of medication regimen by providers, individual patients, and the public. The society postulated that the revised definition supports the wider implementation of CPS and to further position clinical pharmacy as a field of scientific enquiry with a distinct research agenda. As the CPS implementation is still highly heterogeneous across different settings, a holistic approach would therefore be appropriate when evaluating the field of clinical pharmacy.

Critical evaluation of CPS as a single entity is difficult since clinical pharmacy practice entails a wide range of activities provided by clinical pharmacists in an array of clinical settings. As described in Kaboli and colleagues' review (2006), hospital pharmacists perform these clinical activities but not limited to patient interviews, medication profile reviews, medication regimen recommendations, participation in inpatient medical rounds, drug monitoring and

recommendation follow-up, drug therapy dosing and management, documentation of clinical interventions, and patient counselling. It was found that the service provision of CPS was often inconsistent between health organisations, or even between institutions within the same health organisation. For example, within the UK, despite the development of clinical pharmacy beginning a few decades ago with the support from the publication of the government-commissioned 'Noel Hall Report' (1970) and 'Nuffield Report' (1986), there is no agreement within the profession on which components of practice are most important (Onatade et al., 2018).

In Switzerland, although 84% of the surveyed hospitals reported to provide CPSs, researchers found that the service provision was not structured and the services were highly heterogeneous (Abousheishaa et al., 2020). Although both RPS and the European Association of Hospital Pharmacists (EAHP) developed professional standards and statements that articulate objectives for the delivery of hospital pharmacy services that include CPS, their scope did not offer help with prioritising services to be developed.

Most of the studies across the literature focused on the clinical outcomes with activities performed by clinical pharmacists. For example, medicines reconciliation performed by clinical pharmacists has identified a discrepancy rate of 39% between pre-admission and initial admission medication lists in a children's hospital in the UK (Terry et al., 2010). In addition, Gattari et al. (2015) found clinical pharmacists identified that 26% of the transcriptions between medication charts and discharge prescriptions contained at least one discrepant medication in a teaching hospital in Michigan, USA. Furthermore, Tuffana, Abswlhadi and Omar (2012) found that pharmacist-led outpatient paediatric oncology clinics had helped to ensure continuity of care and to optimise therapeutics, with 939 interventions reported during the study period, 53% were safety interventions with 26% related to improving caregivers' medication knowledge.

Results from systematic reviews (SRs) and meta-analyses were also primarily focused on the clinical outcomes with the implementation of CPSs in different specialty areas. On reviewing the SRs on the effectiveness of CPSs, Rotta and colleagues (2015) identified that SRs that assessed CPSs targeting specific conditions were more conclusive given that the intervention was better defined, and the measured outcomes were unequivocal and tangible. For example, Entezari-Maleki et al. (2016) have collated the evidence of primary research on pharmacist-managed warfarin therapy and found there were improvements against usual medical care in the percentage of time in the therapeutic range (72.1% v 56.7%, P=0.013), lower major bleeding events (0.6% v 2.9%, P<0.001), hospitalisation (3% v 10%, P<0.001), and emergency department visits (7.9% v 23.9%, P<0.0001). In a SR that evaluated the impact of pharmacists' interventions on clinical asthma outcomes, the researchers found that nine out of ten RCTs revealed a positive impact after the provision of pharmacists' interventions, which included changes in the percentage of current asthma control, asthma severity, pulmonary function, and asthma symptoms (Garcia-Cardenas et al., 2016). Positive results were also found in a SR that evaluated clinical pharmacists' input in the provision of medicines reconciliation, as Mekonnen at al. (2016) found reductions of 67% in adverse drug event-related hospital revisits (RR 0.33; 95% CI 0.20-0.53), 28% in emergency department visits (RR 0.72; 95% CI 0.57-0.92), and 19% in hospital readmissions (RR 0.81; 95% CI 0.70-0.95) in their meta-analysis.

It is important to note that numerous researchers have highlighted the limitations of the studies that investigated the clinical outcomes of CPSs. The most prominent challenge to researchers was the heterogeneity of studies (Onatade et al., 2018). For example, in a SR that examined the effect of early in-hospital medication review by clinical pharmacists on patients' health outcomes, researchers commented that there was a wide variation in the methods and interventions among studies which made results inconclusive (Hohl et al., 2015).

Another profound factor that affected the generalisability of studies was the quality of the studies. Multiple reviews revealed that many of the included studies that investigated CPSs were low in quality, with reasons such as the absence of controlled groups, small sample size, single site, inconsistent reporting of outcomes, and risk of bias (Kaboli et al, 2006; Thomas et al., 2014).

Potential economic benefits to the healthcare system are also perceived to be an advantage with the implementation of CPSs. According to the EAHP Statement, activities such as coordinating drug formularies and conducting pharmacoeconomic evaluations should be performed by clinical pharmacists which could improve economic outcomes (Maskrey & Underhill, 2014). Economic evaluations of CPS in the USA have found that only several studies can be included for the calculation of incremental cost-effectiveness or benefit-to-cost ratios. The researchers pointed out that although the quality of the studies has improved in their more recent evaluation, significant methodological weaknesses were still identified (Touchette et al, 2014). In the most recent SR of economic evaluations of inpatient clinical pharmacist interventions, only three out of 20 studies were assessed as 'good' quality, and one of which 'good-quality' study found that the in-hospital CPS was probably not cost-effective (Gallagher, McCarthy & Byrne, 2014). The researchers reported the standard of publications has stagnated and called for the utilisation of published guidelines at the initial stages of further studies in order to improve the overall quality.

Although evidence on the benefits of paediatric CPS was shown in literature across a wide array of clinical settings, most studies were conducted in controlled settings, which meant that the service was supported by descriptive or mechanism-oriented studies and intervention studies on highly selective populations (Almomani et al., 2017; Defoe, Jupp & Leslie, 2019; Okumura, da Silva & Comarella, 2016). How these interventions can be translated into the healthcare system was typically not investigated in these studies and thus the research-to-

practice gaps were usually not addressed. This can be reflected by the sparse evidence available in the context of CPSs in qualitative research when comparing with quantitative studies across literature.

Lemay et al. (2018) and Drovandi et al. (2018) pointed out that implementation science has an important role in healthcare practice as it encourages the successful implementation of evidence-based interventions in real-world settings. Drovandi et al. (2018) defined implementation science as “the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice and, hence, to improve the quality and effectiveness of health service”. They also explained that the goal of implementation science is to comprehend the behaviour of stakeholders within healthcare settings in order to adopt and sustainably implement evidence-based interventions. Implementation science is an evolving area of qualitative research; however, studies using implementation theory and investigation of the implementation influences, over the course of implementation during each stage are scarce in pharmacy services (Moullin, Sabater-Hernández & Benrimoj, 2016). Moullin and colleagues reviewed the literature on implementation science and divided the frameworks into categories according to their innovations and comprehensiveness. They identified core components and developed a generic structure that builds on essential core components. The core concepts that the researchers recommended to be considered in all implementation science research include the concepts relating to the process of implementation, the innovation itself, the context, influencing factors, strategies, and evaluations (Moullin, Sabater-Hernández & Benrimoj, 2016).

Li et al. (2014) stated that the degree of implementation of CPSs was inconsistent at the international level. It was found that the degrees of implementation of CPS were higher in

Canada, the USA, Australia, and the UK, whereas these services were scarcely implemented in other countries (Li et al., 2014; Lombardi et al., 2018). In a systematic review that aimed to identify factors that influence the implementation of CPS in hospitals, the most cited influencing factors were distributed across the attitudinal, political, technical, and administrative domains (Onozato et al., 2020). According to a Cochrane Review (Pande et al., 2013) that examined the effect of pharmacist-provided non-dispensing services on patient outcomes, the researchers alleged that pharmacists are underutilised for patient care in more low- and middle-income countries. They highlighted that apart from limited resources, the lack of recognition of pharmacists' role as healthcare professionals, the poor adherence to Good Pharmacy Practice as promoted by the World Health Organisation (WHO), shortage of qualified pharmacists and failure to implement the separation of prescribing and dispensing were some of the reasons that negatively affect the implementation of CPSs.

A recent SR, conducted by Drovandi et al. (2018), has evaluated the benefits of CPSs in paediatrics in comparison with adult patients in hospital settings and concluded that clinical pharmacists in paediatric wards may improve patient outcomes but have also highlighted that there were barriers to the involvement of pharmacists, which may vary considerably between hospitals and health systems between different countries. How these barriers affect the involvement of CPS was beyond the scope of their review; however, the context of implementation plays a critical role because it includes various factors that could affect the process or results of the service (Damschroder et al, 2009). There is an assumption that physicians will implement evidence-based advice provided by clinical pharmacists; however, many interventions that have been proven to be successful in health services studies failed to produce significant patient care outcomes in different contexts. (Montgomery et al., 2007). The implementation theories and frameworks will be examined in detail in Chapter 3 during the discussion of this thesis's research methodologies and data synthesis.

Lee (2018) has highlighted that the development of Hong Kong's CPSs was hindered due to the limitation on human resources and overwhelming workload, as she quoted from Lau, Pang and Chui (2011) that hospital pharmacists in Hong Kong only spent 20.5% of their worktime providing clinical activities, when they spent up to 55.5% of their worktime in dispensing duties. Although it is an interesting area of research to investigate if clinical pharmacists should maintain dispensary knowledge to provide better clinical services, there are currently no evidence in literature to support this, nor did any guidelines from professional bodies that included dispensing as one of clinical pharmacists' role. The intention of Lee (2018) to report the front-line dispensing worktime was a reflection of the lack of time for clinical services provision in Hong Kong. While having pharmacists in the dispensing process can intercept medication errors, especially in prescribing (Cabri et al., 2021), the quality of the clinical service may not be optimal. Due to the frantic workload in Hong Kong's public hospitals, pharmacists were not able to spend ample time to perform thorough medication profile reviews for individual patients. Instead, most pharmacists would often vet and verify the medication orders provided that the prescribed dosing regimens were as recommended in literature or reference books. In contrast, providing CPS on ward could help implementing the service such that direct personal contact supports medicines optimisation. For example, from participating in medical rounds clinical pharmacists were able to understand the clinical intention of prescribing and to provide recommendations on medication regimen based on individual patient's lab results and conditions. In addition, having direct contact with patients or their parents allows clinical pharmacists to make tailored recommendation based on individual needs, thus advocating the principle of medicines optimisation.

To date, the factors that influence CPS implementation have yet to be explored with the use of qualitative methodologies, especially in the area of paediatrics where special attention is needed. Formative evaluations are necessary to determine how well an intervention is being

implemented in a particular setting in order to maximise its advantages and benefits, ensure its sustainability, and promote the dissemination of findings into other contexts (Boaz et al., 2016).

1.6 Purpose of the study

Despite the effort and resources put into the provision of paediatric CPS in Hong Kong, little is known about how well it has been implemented within the healthcare system. The large array of contextual factors that influence implementation, interact with each other and change over time highlights the fact that implementation often occurs as part of complex adaptive systems (Peters et al., 2013). This implementation research seeks to understand and work within real-world conditions, rather than trying to control for these conditions or to remove their influence as causal effects, to identify factors that affect the implementation of paediatric CPS in Hong Kong. Different sources of information, which involve different stakeholders within the healthcare system, are needed to understand an implementation problem in a complex system such as CPS.

The primary purpose of this qualitative study series was to identify both barriers and facilitators that influence the implementation of paediatric CPS in the public secondary sector in Hong Kong from different stakeholders' perspectives. Healthcare stakeholders were selected from three groups, which were: clinical pharmacists; physicians and nurses; and parents, caregivers, and former patients. A second purpose was to deduce evidence-based implementation strategies using the factors explored by these healthcare stakeholders.

As explained previously, clinical pharmacy is a broad term to describe an area of pharmacy concerned with the science and practice of rational medication use. Current evidence of CPSs across the literature typically measure a particular activity that was delivered by clinical pharmacists using a quantitative approach. Rather than

investigate specific activities, the main focus of this research was the stakeholders' perception of CPS as a collective phenomenon per se. How they view paediatric CPS as one entity could help to elicit participants' general concept of CPS, which was crucial when evaluating service implementation as a whole.

1.7 Research Question

The following research question guided this thesis:

- What are the possible factors that affect the implementation of paediatric CPSs within public hospitals in Hong Kong from healthcare stakeholders' perspectives?

The three participant groups were included:

- Clinical pharmacists
- Physicians and nurses
- Parents, caregivers and former patients

1.8 Summary

Children are at higher risk of adverse drug events associated with medication errors in comparison with non-elderly adults, and the consequences of such events could be more severe. Clinical pharmacists are considered an integral part of the multidisciplinary team, which was shown to improve patient outcomes in this highly specialised area. Although there were numerous publications which highlighted the benefits of a CPS in paediatric or neonatal settings, most studies were conducted in controlled settings with the employment of quantitative methodologies.

Implementation research recognises the readiness for change and creating optimal conditions for an intervention, which is crucial to its sustainability and maintenance (Damschroder et al., 2009). The use of qualitative methodologies enables the provision of insights into real-world problems, explaining processes and patterns that can be difficult to

quantify (Moullin et al., 2020). The exploration into the factors that influence the successful implementation of paedicatric CPS in Hong Kong could help to link research and practice to accelerate the development and delivery of an individualised public health approach.

This thesis builds upon the performance of a SR (Chapter 2), consolidating data available in the literature on the factors that influence the implementation of paediatric CPS in hospital settings, thus helping to identify knowledge gaps and major factors that facilitate further research within this programme.

The series of research studies focused on CPSs provided for the paediatric population in Hong Kong within the public hospitals from different stakeholders' perspectives. The methodologies of the qualitative studies are outlined in Chapter 3. Study 1 (Chapter 4) aimed to identify implementation factors from the perspectives of paediatric clinical pharmacists, as their involvement played a key part in service implementation.

Perceptions from other healthcare professionals who have close interactions with clinical pharmacists, such as physicians and nurses, are crucial as their acceptance of the service affects its operation. Al-Arifi et al. (2015) have shown that healthcare professionals' perceptions of CPS influence its implementation. The researchers have identified factors such as the beliefs and confidence in the service, the expectation of the service, the work environment and the collaboration between healthcare professionals, which were found to influence CPS implementation in different ways. The exploration of physicians' and nurses' views and opinions were examined in Study 2 (Chapter 5).

Study 3 (Chapter 6) aimed to identify and categorise factors that enable or hinder the implementation of CPS in Hong Kong by conducting in-depth interviews with parents, caregivers and former patients. Patient engagement was found to play a meaningful role as a partner and co-designers in service improvement and implementation (Stewart et al., 2008).

Stewart et al. (2008) contended that the goals of implementation science with the engagement of patients should be aligned with those of healthcare professionals because the “experience-based co-design” intervention with patient involvement leads to both improvements in healthcare services and in the interpersonal dynamics of care. Researchers have pointed out that patients should take a more direct and ongoing role in identifying, implementing, and evaluating improvements to healthcare services and therefore, views from parents, caregivers and patients could help to identify important factors that influence paediatric CPS implementation in Hong Kong (Robert et al., 2015).

With the findings from the qualitative studies rigorously synthesised and analysed (Chapter 7), purported implementation strategies were developed to address implementation gaps across the data, translating research findings to healthcare practice. The proposed strategies aimed to increase the adoption, implementation, and sustainability of paediatric CPSs in secondary care in Hong Kong.

Chapter 2. LITERATURE REVIEW

Publication information:

Sin, C.M., Huynh, C., Dahmash, D., Maidment, I.D., 2022. Factors influencing the implementation of clinical pharmacy services on paediatric patient care in hospital settings. *European Journal of Hospital Pharmacy.* 29, pp. 180-186. (Published on 23 June 2022)

Systematic review (SR), as known as research synthesis, is a key element of evidence-based healthcare in which a comprehensive, unbiased synthesis of relevant and robust research in a single document (Aromataris & Pearson, 2014). According to the Cochrane Qualitative & Implementation Methods Group, a SR 'uses explicit, systematic methods that are selected with a view to minimising bias, thus providing a more reliable finding from which conclusions can be drawn and decisions made' (Higgins et al., 2021). Khan et al. (2003) described that the process of conducting a SR involves rigorous steps including framing the research question, identifying the relevant publications, assessing the studies' quality, summarising the evidence, and interpreting the findings. According to Munn et al. (2018), the purposes of conducting a SR include but are not limited to the following:

i) Uncover the international evidence;

ii) Confirm current practice/ address any variation/ identify new practices;

iii) Identify and inform areas for future research;

iv) Identify and investigate conflicting results;

v) Produce statements to guide decision-making.

SRs have their advantages because these reviews use explicit and rigorous methods that limit bias. They also draw reliable and accurate conclusions which make the delivery of information to researchers and healthcare providers more straightforward, thus helping to reduce the time delay in the research findings to implementation (Gopalakrishnan &

Ganeshkumar, 2013). According to Gopalakrishnan and Ganeshkumar (2013), SRs also improve the generalisability and consistency of results, generation of new hypotheses about subgroups of the study populations, and overall the increase precision of the results.

However, SRs are without their limitations. According to Yuan and Hunt (2009), biases in SRs or meta-analyses may be induced if there is a flaw in the protocol, a lack of adherence to it, or inappropriate techniques. In addition, the authors explained that the quality and heterogeneity of the primary studies might affect the quality of the SRs, with the risk of being misleading when data are not handled appropriately (Yuan & Hunt, 2009). Therefore, to perform a proper SR, the appropriate research question with the right scientific principles, such as proper protocol that is adhered to, the use of rigorous methodology to perform a literature search and data analysis should be employed.

To the best of the researcher's knowledge, there are only reviews conducted that explore implementation factors in the hospital setting focusing on adult services (Onozato, et al., 2019). Therefore, a SR to explore the implementation factors available across the literature that focuses on paediatric CPSs in secondary care is essential to confirm the availability of existing evidence and to identify any research gaps. The findings of the SR can consequently inform the design of interview guides which facilitates data collection for the series of research studies.

2.1 Aim

The aim of this SR was to identify factors that affect paediatric hospital CPS implementation from service users' perspectives, which include healthcare professionals, patients, parents or caregivers who had received any type of services provided by clinical pharmacists. The objectives of this review were to identify:

- any facilitators that enable; or

- any barriers that hinder a successful implementation of paediatric CPS in hospital setting.

The results of this review will help to inform the development and direction of a future paediatric CPS model, and also the development of the interview guides for subsequent qualitative studies.

2.2 Methods

2.2.1 Search strategy

The identifying and screening process were reported using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram (Moher et al., 2009), which is recommended in the Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ) statement (Tong, et al., 2012). EMBASE, MEDLINE, Web of Science (Core Collection), Cochrane Library, Scopus and Cumulative Index to Nursing and Allied Health Literature (CINAHL) were searched for studies published from inception up until October 2019.

The search strategy consisted of domains of service involved, patient subgroups and attributes. Domains were connected using the Boolean logic in order to combine the search appropriately. “OR” was used to combine MESH terms and relevant keywords with the same domain together according to the individual database where appropriate; “AND” was used to combine different domains together, thus narrowing the search by combining terms. Table 1 outlines the search strategies.

	Service Domain	Patient Subgroup Domain	Attribute Domain
MeSH terms	- Pharmaceutical Services - Pharmacist - Pharmacy Services, Hospital	- Adolescent - Child - Infant - Pediatrics	- Attitude - Attitude of Health Personnel
Text words	- Exp clinical pharmac*/ - Exp hospital pharmac*/	- Exp adolescent*/ - Exp child*/ - Exp infant*/ - Exp p$ediatric*/	- Exp attitude*/ - Exp belief*/ - Exp experience*/ - Exp opinion*/ - Exp satisfaction*/

* is the truncation operator. Words match if they begin with the work preceding the * operator.

Table 1. Search strategies for MEDLINE and other selected databases.

The searched results were exported to EndNote Web (Clarivate Analytics, USA) to facilitate screening with duplications identified and removed.

2.2.2 Study selection

Inclusion criteria were peer-reviewed quantitative and qualitative studies on CPSs with the participants, interventions and outcomes addressed below. Only English-language publications or articles in other languages with full English translations were included in this review. Any studies not meeting the following inclusion criteria were excluded from this review.

I. Participants: Hospitalised children from 0 to 18 years of age in any country where CPSs were implemented. When both adult and child participants were recruited in a study, only data that explicitly referred to the paediatric population were included. Studies will not be included if the data cannot be separated.

II. Interventions: Clinical pharmacists' interventions or activities including but not limited to medicines reconciliation, ward services, outpatient clinics and counselling services.

III. Outcome measures: Direct or indirect findings from qualitative or quantitative data which report factors (barriers and facilitators) that influence the implementation of paediatric CPS.

2.2.3 Data collection

A list was created for all identified studies from all the databases searched. A citation search for included articles, followed by screening of titles and subsequently abstracts of all identified studies against the inclusion criteria were performed. Any discrepancies were resolved through further discussion with reviewers IM and CH. During the title screening process, only definite non-relevant studies were excluded, these include studies that did not include the paediatric population and studies with outcomes which were irrelevant to CPSs. A third reviewer, CH, reviewed the identified full-text articles independently in addition to CS and DD's screening process. IM, the project supervisor, oversaw the data analysis process and acted as an impartial evaluator for making consensus decisions in disagreements that arose. Finally, a video conference meeting was held with all four members of the team and key concepts that emerged from data analysis were discussed.

A standardised form (Microsoft Excel 2010, Microsoft Corporation, USA) (Appendix I) was used to extract data from the included studies for quality assessment and evidence syntheses. Table 2 outlines the categories from the data extracted:

General Information	Methodologies	Study Findings
1. Main author 2. Year published 3. Study location 4. Study objective(s)	5. Study design 6. Nature of study 7. Study population 8. Recruitment method 9. Inclusion/ exclusion criteria 10. Data collection 11. Data analysis	12. Study results or any relevant findings

Table 2. Data extraction categories.

2.2.4 Data analysis and synthesis

The ENTREQ checklist was followed in the reporting of the synthesis of this SR (Tong et al., 2012). An integrated convergent synthesis approach, as adopted by Jennings et al. (2018), was performed in this review. Rather than segregating the qualitative and quantitative synthesis, the studying findings were assimilated into each other, as shown in Figure 2. This approach involved collecting both the quantitative and qualitative data and analysing during the same phase of the process in a parallel or a complementary manner.

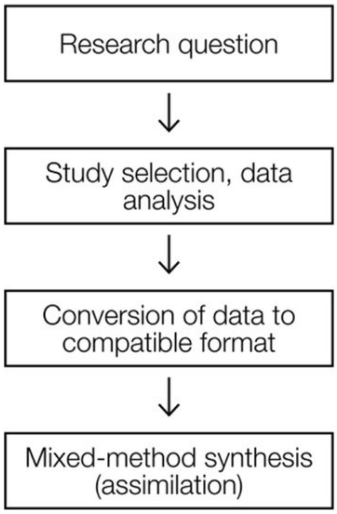


Figure 2. A mixed methods approach for integrating quantitative and qualitative data adopted from Jennings et al.

The integrated approach involved the transformation of quantitative data, which were primarily satisfaction questionnaires, into a qualitative format so that the findings could be merged with data from qualitative studies. Once transformed, all data were subject to thematic synthesis. First-order (views of participants) and second-order interpretations (views of the authors) were identified from included studies for the analysis process. In the qualitative studies, the first-order interpretations focused on the perspectives of the service users. The same interpretations in the quantitative studies were identified from the responses from

questionnaires. These data were derived from healthcare professionals, patients, their parents or caregivers. Second-order interpretations were derived from the discussions and conclusion sections of these studies. As reported by Jennings et al. (2018), this approach has been used effectively in several mixed methods systematic reviews.

Thematic synthesis included three principle stages, which are: free line-by-line coding of the findings of primary studies; the organisation of these 'free codes' into related areas to construct 'descriptive' themes; and the development of 'analytical' themes (Braun & Clarke, 2006).

The data collected from both quantitative and qualitative studies were merged at this stage and were no longer distinguishable, thus enabling the synthesis of all data in qualitative form. The software package QSR NVivo v11 (QSR International, Australia) was used to facilitate data analysis and synthesis. CS coded all the included studies on both orders and a thematic map was created. CH and IM regularly reviewed the coding process to ensure the credibility of the review. Differences in the interpretation were discussed among the three researchers until a consensus was reached.

A framework approach, as described by Willmeroth, Wesselborg and Kuske (2019), was employed with themes derived from studies which have analysed indicators that address implementation quality in healthcare services. These indicators have been successfully adopted into pharmacy settings by Garcia-Cardenas et al. (2017). The researchers have followed a core set of implementation outcomes which was applied within a framework for evaluation. Since these outcomes have been shown to provide consistent and efficient evaluations for implementation studies across the literature, they were adopted as the pre-determined, overarching themes for this review. Table 3 below shows these adopted themes with their definitions for the purpose of results reporting in this SR.

Overarching themes	Operational definition
Acceptability	- The perception among implementation stakeholders that CPS is agreeable, palatable, or satisfactory.
Appropriateness	- The extent to which CPS is suitable, fitting, or proper for the hospital.
Feasibility	- The extent to which CPS can be successfully used or carried out within the hospital.
Fidelity	- The degree to which CPS is implemented and provided as it was described.
Implementation Costs	- Cost impact of CPS implementation effort.
Penetration	- Level of integration of CPS within the hospital and its subsystems.
Service Implementation Efficiency	- The degree to which clinical pharmacist improves his/her skills and abilities to provide it

Table 3. Themes used for the systematic review.

2.2.5 Quality assessment

CS and DD independently assessed the study quality of included studies using the Mixed Methods Appraisal Tool (MMAT) (Hong et al., 2018). The MMAT is a critical appraisal tool designed for the appraisal of mixed methods systematic reviews that include quantitative, qualitative and mixed methods studies. It is designed to allow the quality appraisal of five categories of studies: qualitative research, randomised control trials, non-randomised studies, quantitative descriptive studies and mixed method studies. Using MMAT allows the authors to appraise studies with different methodological designs with one universal tool. The quality rating approach was adopted from Wranik et al. (2019), with studies ranked from 0 to 5 points based on meeting the five-item MMAT criteria. Studies scoring between 0-2 points were rated as low, 3-4 points as moderate and 5 points as high in terms of quality. CS, DD and CH discussed and agreed on the final quality rating for each study.

This SR was registered with PROSPERO database (registration number: CRD4201913-7123, hyperlink: https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=137123).

2.3 Results

2.3.1 Search results and characteristics

A total of 4199 citations were identified from the initial literature search. After the removal of duplications, 2974 citations were left for title screening. After all the screening process, 2643 citations and 299 abstracts were excluded, leaving 32 full-text articles to be assessed for eligibility. At the end of the selection process, during which full texts were reviewed by three reviewers independently, six studies were included. Figure 3 describes the steps involved in the selection process.

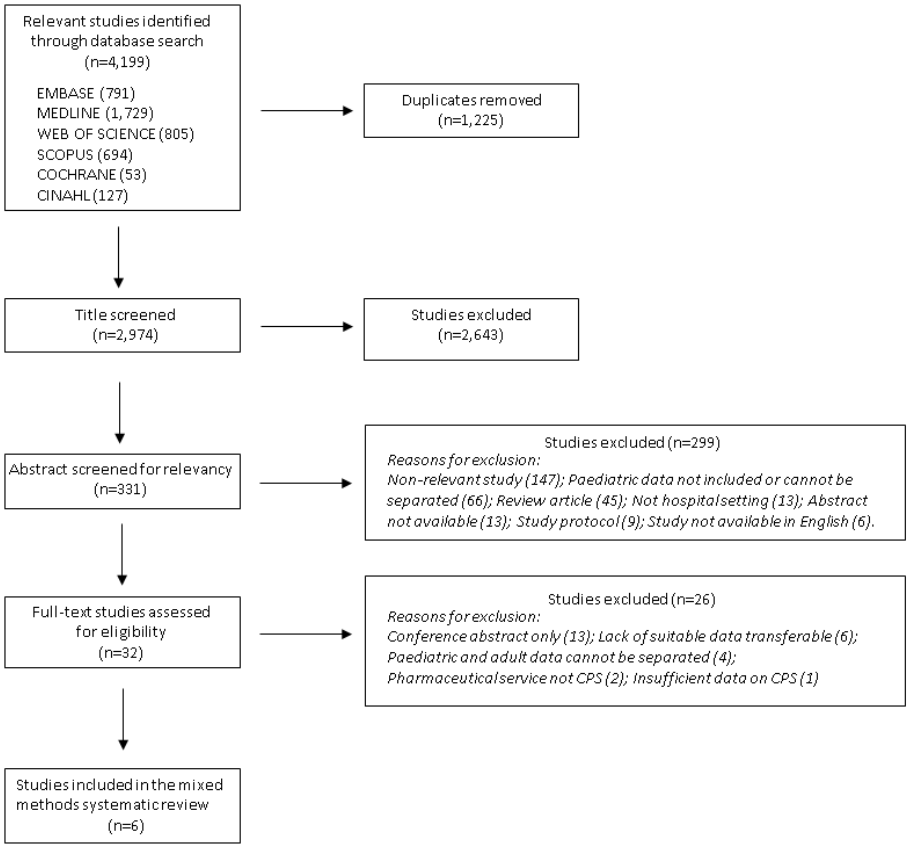


Figure 3. Flowchart of study selection process adapted from PRISMA.

Of the six included studies, two were qualitative, three were quantitative and one was mixed methods. The study characteristics of the included studies are listed in Table 4 (see Appendix I for the original data extraction). The included studies were published between 2013 and 2019 and were conducted in Australia (1), Canada (1), Denmark (1), Singapore (1), the UK (1) and the USA (1).

Main Author	Year of Publication	Country	Site Information	Study Design	Participants	Study Objectives	Data Analysis	CPS implemented	Quality rating
Chen C	2013	Singapore	A 830 bed hospital that provides specialised paediatric and women's healthcare services	Quantitative (survey)	Caregivers who accompanied epileptic patients on neurology follow-up visits	To evaluate the utility of tailored educational pharmacist counselling in improving knowledge and self-reported confidence in patient care by caregivers of children with epilepsy.	Descriptive statistics	Medication counselling	4 (Moderate)
Flannery DD	2014	USA	A 180-bed tertiary care academic paediatric hospital	Quantitative (survey)	Physicians including paediatric fellows and advanced practice nurses	To assess prescribers attitudes about the Antibiotic Stewardship Programme, aimed to identify perceived strengths and weaknesses of the service, with the ultimate goal of maximising its effect on future prescribing behaviours.	Descriptive statistics	Antibiotic Stewardship Programme	4 (Moderate)
Gray NJ	2017	UK	Nationwide	Mixed methods (focus groups, semi-structured interviews and survey)	2 pharmacy policy makers, 3 service commissioners, 2 pharmacy staff, 5 rheumatology professionals	There were 3 phases of the study. The objective of the stakeholder interviews (phase 2) was to share ideas of practicing pharmacists about their current and future roles in the support of young people who take medication for chronic illness with stakeholders	A “middle-ordered” thematic approach	Pharmaceutical care	4 (Moderate)

					and 3 lay advocates	to devise a list of roles for prioritization.			
Moadebi SM	2013	Canada	Lions Gate Hospital, a 335-bed acute care community teaching hospital	Quantitative (survey)	All nurses working in the site's Emergency Department	To measure the impact of the interprofessional collaboration and educational sessions conducted by the clinical pharmacist on ED nurses' level of comfort and satisfaction with intranasal fentanyl for children.	Descriptive statistics	Education sessions	3 (Moderate)
Rishoej RM	2018	Denmark	3 largest tertiary NICUs	Qualitative (focus groups)	Physicians and nurses who practiced at NICUs	To explore current and potential future practices to prevent medication errors experienced by physicians and nurses.	Qualitative content analysis	Clinical pharmacy services	5 (High)
Rosenfeld MPH	2018	Australia	A major Australian paediatric teaching hospital	Qualitative (ethnographic study, focus groups and semi-structured interviews)	Pharmacists, registered nurses and doctors from diverse clinical wards	To examine interdisciplinary medication decision making by pharmacists in paediatric hospital settings.	Thematic analysis according to the 'framework' approach	Ward service, medication decision making	5 (High)

Table 4. Characteristics of the included studies for the systematic review.

2.3.2 Quality appraisal

There were two studies that were graded as 'high' in quality (Rishoej et al., 2018; Rosenfeld et al., 2018), with four graded as 'moderate' (Chen, Lee & Hie, 2013; Flannery et al., 2014; Gray et al., 2017; Moadebi et al., 2013). Both studies with high quality of evidence had qualitative study designs, whereas the moderate quality studies have quantitative designs, primarily by means of survey instruments. Common areas of weakness were the lack of sample representativeness of the target population (Chen, Lee & Hie, 2013), questionnaires were not tested nor piloted for validity or reliability (Flannery et al., 2014), and lack of clarity on minimising biases such as socially desirable and nonresponse bias (Chen, Lee & Hie, 2013; Moadebi et al., 2013). Full quality appraisal was detailed and tabulated in Appendix II.

2.3.3 Factors affecting paediatric CPS implementation

The analysis led to the identification of five themes, which encompassed seven sub-themes reflecting the factors that influence the implementation of paediatric CPS in hospitals (Figure 4). These themes were supported by data from both quantitative and qualitative studies. In this section, the findings supporting first-order interpretations were indicated by italicised quotations and those supporting second-order by non-italicised quotations.

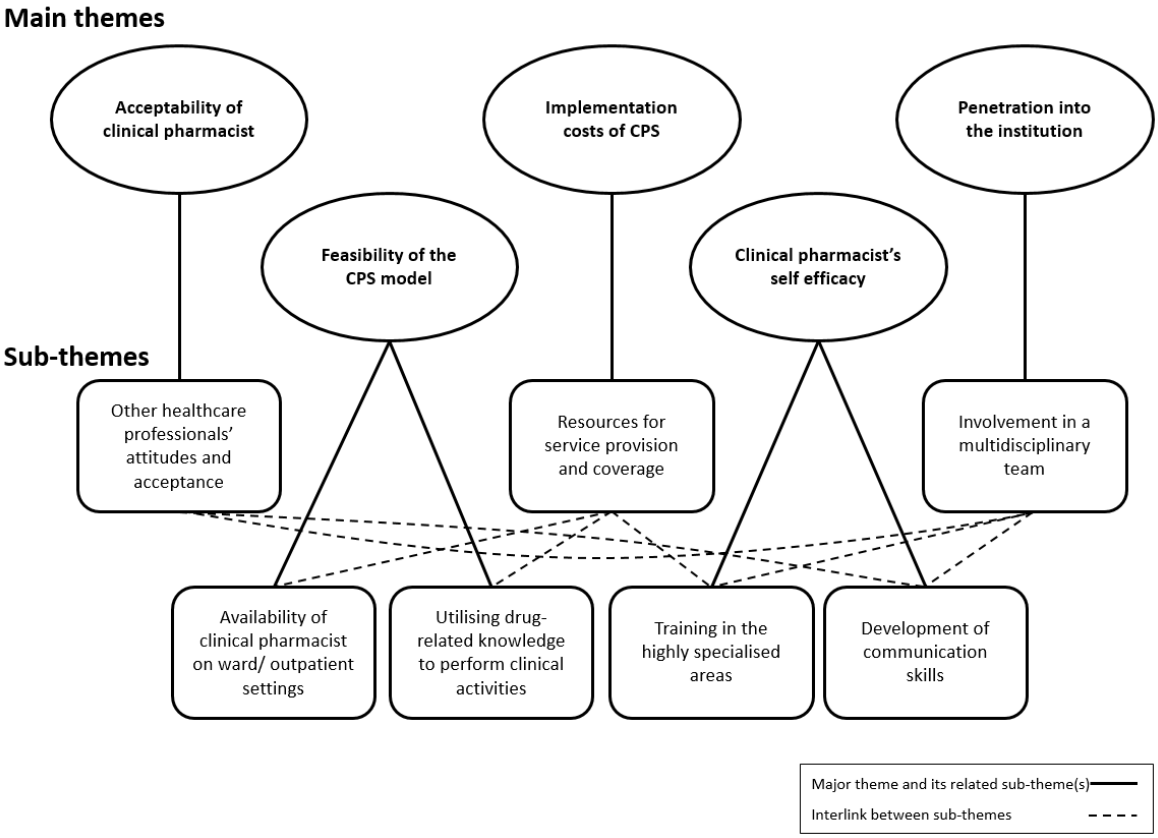


Figure 4. Thematic map illustrating themes and subthemes derived from thematic analysis.

2.3.3.1 Acceptability of clinical pharmacist

2.3.3.1.1 Other healthcare professionals' attitudes and acceptance

The attitude of other healthcare professionals toward CPS was found to be a prominent factor that influences successful implementation. There was generally a positive attitude towards the role of clinical pharmacists from both physicians and nurses, demonstrated by satisfaction shown from surveys, semi-structured interviews and focus groups (Flannery et al., 2014; Gray et al., 2017; Moadebi et al., 2013; Rosenfeld et al., 2018). The quote below shows physician's positive views toward CPS:

"…[doctor] I'm very happy with how the pharmacists here can liaise with us back and forth about drug safety, and what's the best way to prescribe something, different formulations, things for discharge. It's really good." (Rosenfeld et al., 2018)

Data has shown that healthcare professionals' attitudes were found to be interrelated to other implementation factors such as penetration into the institution and clinical pharmacist's self-efficacy (Rishoej et al., 2018; Rosenfeld et al., 2018). The following quotes illustrate how clinical pharmacists affect the attitude of physicians and nurses using their trained skills:

"… junior doctors valued pharmacists' information… the strength of medications, the amounts per bottle or box, their possible adverse effects, and their paediatric application when doctors had mostly prescribed for adults." (Rosenfeld et al., 2018)

"Physician and nurses in our study considered medication preparation by hospital pharmacy staff and involvement of clinical pharmacists at the NICU as potential benefit…" (Rishoej et al., 2018)

However, it is noteworthy that some physicians felt the involvement of clinical pharmacists in making medication decisions might affect their autonomy in prescribing, as highlighted by Flannery et al. (2014).

2.3.3.2 Feasibility of the CPS model in the setting

2.3.3.2.1 Availability of clinical pharmacists on ward/ outpatient settings

The availability of clinical pharmacists enables the extent to which CPS can be successfully used by service users within the hospital, and from the available data this was found to be a strong facilitator which enables CPS implementation (Moadebi et al., 2013; Rishoej et al., 2018; Rosenfeld et al., 2018). Numerous studies described the benefits which physicians and nurses

perceived when clinical pharmacists were readily available to perform their duties, with examples shown below:

"… pharmacists were regularly on ward, share nurses' knowledge of patients' conditions and medications and could resolves queries swiftly." (Rosenfeld et al., 2018)

"The proximity of the pharmacist to the department [Emergency Department] allows for direct consultation and medication review by the pharmacist." (Moadebi et al., 2013)

2.3.3.2.2 Utilising drug-related knowledge to perform clinical activities

Another subtheme that has submerged from the feasibility overarching theme was that clinical pharmacists can exert their expert knowledge in paediatric pharmacotherapy when performing clinical activities which were more relevant to their roles, in comparison to other healthcare professionals (Chen, Lee & Hie, 2013; Moadebi et al., 2013). Moadebi et al. (2013) provided evidence to suggest that with clinical pharmacists performing drug-related activities, other healthcare professionals could redirect their energies into performing other clinical activities. This is a factor perceived to enable the implementation of CPS:

"… the pharmacist's participation in educational in-service two days per week has helped to alleviate the nurse educator workload allowing more time to implement new educational programmes." (Moadebi et al., 2013)

In addition, Rishoej et al. (2018) contended that the substitution of clinical roles by clinical pharmacists increased other healthcare professionals' confidence in improvement in patient outcomes, such as medication safety. The quote below illustrates the perception of a nurse who practiced in NICU, expressing her view on the availability of clinical pharmacists performing medication reviews:

"It is nice that you can just go out and pick it [medication] up without having to worry about looking for someone to perform double check… I also think that it is safer that way." (Rishoej et al., 2018)

2.3.3.3 Implementation costs of CPS

2.3.3.3.1 Resources for service provision and coverage

One of the factors identified from this theme was the scarcity of financial resources, thus affecting the implementation of CPS. Finding from the dataset suggested that this was a barrier to CPS implementation, which has a subsequent negative effect on other factors such as the availability of clinical pharmacists and the training provided for them (Chen, Lee & Hie, 2013; Rishoej et al., 2018; Rosenfeld et al., 2018). The lack of resources was reflected by the constraint in manpower or time that clinical pharmacists face, and the following quotes demonstrate the detrimental effect on service performance due to the limitation in resources:

"… due to manpower constraints, only one pharmacist was rostered to conduct the counselling sessions, which were scheduled for 3 days every week. Caregivers of the next patient may occasionally have longer waiting times because of prolonged counselling session for the previous patient." (Chen, Lee & Hie, 2013)

"Pharmacists' capacity for daily review of case notes was inhibited by the large volume of discharge interviews, admission reconciliation and discharge dispensing." (Rosenfeld et al., 2018)

Despite the limitation in resources, we found that the expectation of CPS remained high, and this has caused enormous pressure on clinical pharmacists who provided these services:

"… paediatric hospital pharmacists are required to maintain high professional standards of medication safety in an era of increasing fiscal restraint." (Rosenfeld et al., 2018)

2.3.3.4 Penetration into the institution

2.3.3.4.1 Involvement in a multidisciplinary team

The integration of CPS into the hospital was identified as a factor which influences the implementation, and the collaboration between clinical pharmacists and other healthcare professionals was found to be a factor (Flannery et al., 2014; Gray et al., 2017; Moadebi et al., 2013; Rosenfeld et al., 2018). Rosenfeld et al. (2018) suggested that the level of collaboration was reflected by the philosophy of teamwork, which plays a key role in influencing successful implementation. Gray et al. (2017) reported that the integration of hospital pharmacists into the multidisciplinary team was highly desirable in their ranking survey with respondents including physicians and specialist nurses.

Chen, Lee & Hie (2013) and Gray et al. (2017) have shown that other healthcare professionals valued clinical pharmacists' contribution to managing chronic illnesses. In addition, the recognition of a multidisciplinary approach has created an opportunity to implement new services depending on the need of different settings within the healthcare system; this is also interrelated to the availability of clinical pharmacists available:

"Many young people with chronic illnesses such as arthritis are seen in hospital outpatient rather than inpatient wards. The pharmacist is not traditionally involved in these clinics beyond the dispensing task, but there was openness to include them." (Gray et al., 2017)

The hospital's culture was also found to play a part in the level of integration of CPS within its subsystem (Rosenfeld et al., 2018). The embedment of a 'no-blame' culture has enabled clinical pharmacists' involvement, as demonstrated in the following quote:

"The quality of pharmacist's relationships with doctors and nurses and the hospital's culture of encouraging open debate and questioning about medication errors, increased pharmacists' interdisciplinary involvement in medication decisions." (Rosenfeld et al., 2018)

2.3.3.5 Clinical pharmacist's self-efficacy

2.3.3.5.1 Training in the highly specialised areas

The skills that clinical pharmacists possess to provide CPS was found to be an influencing factor (Gray et al., 2017, Rishoej et al., 2018). One of the core skills identified which was fundamental to the service was the expert knowledge of paediatric pharmacotherapy that clinical pharmacists possess. This specialised skill was viewed as an important facilitator for the successful implementation of CPS, and examples from Gray et al. (2017) and Rishoej et al. (2018) have shown the need for skill development in areas such as neonatology and managing children with chronic illnesses. Appropriate training was perceived as a necessity from service users' point of view prior to service implementation, which was shown by the following quotes:

"… participants prioritised the development of specialist expertise among pharmacists for chronic illnesses." (Gray et al., 2017)

"However, clinical pharmacists are currently not involved in general in the medication treatment at the Danish NICUs and should receive training before involvement, as these units are highly specialised." (Rishoej et al., 2018)

The attainment of the required knowledge in these specialised areas facilitates the utilisation of CPS, and our data has identified the relationship between specialised skills and the acceptability from other healthcare professionals. The following quote illustrate how these factors were interrelated:

"Pharmacists were viewed by staff as primary authorities about medication issues, particularly in making complex [medication] decisions…" (Rosenfeld et al., 2018)

2.3.3.5.2 Development of communication skills

Another subtheme that emerged from the data in relation to clinical pharmacists' self-efficacy was the development of their communication skills. According to Rosenfeld et al. (2018), good communication between clinical pharmacists and nurses helped to develop a strong relationship, thus enabling the use of the service:

"We work quite closely with the pharmacist and the medical team and they [pharmacists] do a lot of, I guess, communicating for us on our behalf with the medical team…" (Rosenfeld et al., 2018)

Clinical pharmacists were often found to work as a bridge between physicians and nurses for resolving pharmaceutical issues, and this was found to be particularly valuable for nurses and junior doctors, as shown in the quote below:

"Communication informing medication decisions were principally dyadic, that is, between pharmacists and doctors, or nurses and pharmacists, rather than concomitant discussions between the three disciplines… The ease with which nurses communicated with ward pharmacists and junior doctors, however, seemed more a matter of propinquity than hierarchy…" (Rosenfeld et al., 2018)

Strong communication between clinical pharmacists and parents or caregivers was found to support service and facilitate implementation as well (Chen, Lee & Hie, 2013). From the satisfaction survey conducted by Chen, Lee and Hie (2013), not only parents or caregivers felt that confidence in managing their children's epilepsy had increased, but they also found that respect and courtesy were displayed by clinical pharmacists. This experience extended to

adolescents who seek help from pharmacists directly, as Gray et al. (2017) commented that a survey has found adolescents were more likely than other age groups to consider pharmacists a trustworthy source of information, thus showing how communication enables CPS implementation from patients, parents and caregivers' point of view.

2.4 Discussion

With only six studies which were relevant and included in this review, the lack of research in this area seemed apparent. The year of publications for the included studies ranged from 2013 to 2019, thus suggesting the recent growth of interest in this area. This is comparable with a recent SR (Onozato et al., 2020), which focused on identifying factors in the general population setting.

The countries of publication were mainly in developed countries, with studies originating from North America (Flannery et al., 2014; Moadebi et al., 2013), Europe (Gray et al., 2017; Rishoej et al., 2018), Asia (Chen, Lee & Hie, 2013) and Oceania (Rosenfeld et al., 2018). The majority of publications were from countries with relatively high health expenditure (% of GDP), which include Australia (9.21), Canada (10.57), the UK (9.63) and the USA (17.06), reflecting the gap exposed in research in countries with lower health expenditure in this area (World Health Organisation [WHO], 2018).

As described in Table 4, the roles of clinical pharmacists involved in the studies included medication error prevention, patient counselling, Antibiotic Stewardship Programme (ASP), medication decision making and interprofessional education. Although our review has shared some similarities in clinical pharmacist activities as reported in the adult review by Onozato et al. (2020), there were some significant differences between the two populations. For instance, Onozato et al. (2020) have reported medication reconciliation and pharmacist prescribing as services provided by clinical pharmacists in the adult population; however, these activities were

not described in the included paediatric studies. Interestingly, only paediatric studies reported factors which influence the implementation of CPS on medication error prevention. This was an unsurprising finding as previous SR (Ghaleb et al., 2006) have highlighted that medication error in the paediatric population was an area of concern.

Not all themes described by Garcia-Cardenas et al. (2017) were addressed due to the lack of enriched contents allowing for interpretation. For instance, there were insufficient data within the literature to identify any facilitators or barriers relating to 'appropriateness' and 'fidelity' which influence the implementation of paediatric CPS.

Healthcare professionals' attitudes can be a facilitator for the implementation of paediatric CPS, as this was described by interpretations presented in an explanatory descriptive manner across included studies. Its value in CPS implementation was supported by Layland (2018), which advocated that positive attitudes among healthcare professionals nurtured teamwork and trust, which improves the quality and safety of patient care a result. On the contrary, physicians' perception that clinical pharmacists having an inspection role in their prescribing practice was identified from the dataset, which can be a barrier to their acceptability towards the service. This was observed to be a factor that hindered the implementation in different specialised areas or countries; for example, Penm et al. (2014) reported that clinical pharmacists in China felt physicians perceived them as auditors instead of partners in the healthcare team. Unfortunately, factors which demonstrate how patients, parents and caregivers' attitudes affect the implementation of CPS were not found. Effort should be made in exploring how the expectation and interest of patients, parents or caregivers influence the implementation of CPS in hospitals, as evidence were available for the same population but in primary care and community settings (Abraham et al., 2017; Deshpande et al., 2013; Kradjen et al., 1999).

This systematic review has found that the feasibility of clinical pharmacists was a prominent factor. Studies have shown that the hierarchical structure within healthcare discourages interprofessional communication and collaboration (Alsuhebany et al., 2019). Evidence suggested that the availability of clinical pharmacists can effectively mitigate this barrier. Moreover, data from Gray et al. (2017) and Rosenfeld et al. (2018) revealed that synchronous communication between clinical pharmacists and physicians or nurses has a strong influence on service implementation, and this refers to communications happening in real-time such as ward rounds or impromptu conversation. This was confirmed by a qualitative study conducted by Alsuhebany et al. (2019) in adult services, as medical and nursing participants considered that proactive communication and good relationships were essential factors to establish effective teams that enhance patient care.

Patient-centred communication from settings such as outpatient clinics was also found to be important to influence the implementation of CPS (Chen, Lee & Hie, 2013). McCullough et al. (2016) showed that there was promising support of CPS from patients where they can have direct contact with clinical pharmacists in their community-based outpatient anticoagulation clinics. They further elaborated that the benefits of such implementation were that long-term relationships can be developed, and this close rapport leads pharmacists to make individualistic, personalised interventions. Our data suggested that a similar perception was found in paediatric CPS reported by Chen, Lee and Hie (2013), where parents and caregivers felt good relationships were developed as respect and courtesy were shown by the clinical pharmacists.

Another factor which enabled the implementation of CPS was the employment of clinical pharmacists' expertise in performing duties which relieve other healthcare professionals' workload. This was demonstrated in educational sessions provided by clinical pharmacists and

medication reviews in NICU (Gray et al., 2017; Moadebi et al., 2013). Examples showed that this appealing factor could lead to a successful implementation of clinical pharmacists in other healthcare settings such as primary care, as found by Onatade et al. (2018).

Morley and Cashell (2017) pointed out that a multidisciplinary team supports high quality and safe care, patient and staff satisfaction and engagement, and organisational efficiency and innovation. Evidence from this review suggested that the involvement of clinical pharmacists in multidisciplinary team enabled the implementation of CPS, and this was supported by clinical outcome benefits demonstrated by other studies such as Chan and Callahan (2001) and Copley et al. (2013).

The lack of resources was found to be a barrier to implementing paediatric CPS. Chevalier et al. (2018) have found that shortages of clinical pharmacists prevent proper collaboration such that understaffed clinical pharmacists were overloaded with responsibilities to multiple clinical teams, as well as administrative and teaching duties, thus affecting the quality of CPS as a whole. Previous studies have found that the initiation of CPS by healthcare bodies or the government is a facilitator of implementation (Willmeroth, Wesselborg & Kuske, 2019). Although national healthcare organisations such as NICE (2015) have endorsed the importance of interprofessional collaboration so that 'medication optimisation can be achieved, we did not find any evidence of support from organisations or governments that target the paediatric population. The support could perhaps be hindered by the scarce human and technological resources, pressure on cost containment, as well as the lack of a motivational professional and functional career, as underscored by Chisholm-Burns et al. (2010). More research into the impact of clinical pharmacy practice on patient outcomes and health economic data in paediatrics could perhaps help to ascertain its value in the healthcare system.

In terms of self-efficacy, it was found that the training of clinical pharmacists was necessary to facilitate the implementation of paediatric CPS. In an economic evaluation of CPS in the USA (Touchette et al., 2014), training was found to be an important factor in developing an effective and cost-effective pharmacy programme. Apparently, strategies such as clinical training for pharmacists could help to enhance the pharmacists' confidence and motivation to implement CPS in hospitals (Onozato et al., 2020); however, this hindered the fiscal restraint as shown from the included studies.

The development of a good relationship with other healthcare professionals was found to be a factor which enables the implementation of CPS. Although focusing on the relationship between nurses and physicians, Foronda, MacWilliams and McArthur (2016) confirmed that a supportive relationship is a facilitator for interprofessional collaboration. This concept could also be adopted for the working relationship between pharmacists and other healthcare professionals. Additionally, qualitative studies have found that good communication between clinical pharmacists and patients renders the delivery of crucial medication information (Harris et al., 2014). Building a rapport between patients and clinical pharmacists was found to enhance patients' understanding of their medications and their level of engagement as indicators of patients' confidence in self-managing their therapy (Proctor et al., 2011). The findings from this review have helped to affirm a supportive relationship as an essential factor to influence CPS implementation in paediatrics.

2.5 Strengths and limitations

This SR is the first review which aimed to identify factors that enhance or hinder the implementation of CPS in paediatrics in a hospital setting. The SR was reported using a robust checklist to ensure integrity and transparency were sustained throughout the review. It did not only help to identify factors that influenced the implementation of paediatric CPS across the

literature but a knowledge gap within this area was also identified, which warranted further research.

There are certain limitations which could affect the interpretation of the results in this SR. Firstly, there were no study that aimed to address the factors that influenced the implementation of paediatric CPS directly; secondly, some studies included both paediatric and adult patients in their study design and we were not able to separate the data and therefore, these studies had to be excluded. As a result, only a very small number of studies were included and extraction of enriched content from these studies was limited. This emphasises the lack of research in this area, thus highlighting the need for further research which is explicitly the aim of our qualitative studies detailed in Chapters 4 to 6. Moreover, the limited number of studies and the majority of studies being single-site limited their transferability and generalisability to other healthcare institutions or systems. Lastly, since there was no consensus on the literature to exclude studies based on quality assessment, the majority of included studies were classified as moderate in quality; therefore, study designs which produce high quality evidence are warranted.

2.6 Conclusion

This SR has found six studies, with seven factors identified which either facilitate or act as a barrier to the implementation of paediatric CPS in hospitals. These factors were: other health care professional's attitudes and acceptance; the availability of a clinical pharmacist, resources for service provision and coverage, involvement in a multidisciplinary team, utilising drug-related expert knowledge to perform clinical activities, training in the highly specialised areas and the development of communication skills. Evidence was sparse in comparison to a similar SR performed within the general population. An extensive knowledge gap within this area of practice has therefore been identified. Nevertheless, this review has lent insight into some

factors which enable or hinder the implementation of paediatric CPS in hospital settings and helped the development of interview guides for the subsequent qualitative studies in this research programme.

Chapter 3. METHODOLOGY

The general methodology design for the qualitative studies (Chapter 4 to 6) is described in this section. Inclusion and exclusion criteria, and the details of recruitment for each participation group are outlined in individual chapters.

3.1 Constructivist Paradigm

Research philosophy directs researchers to generate research questions, to shed light on the study design and to guide them on what methods should be used and how data should be collected, analysed and interpreted (Khaldi, 2017). The research philosophical paradigm, which is defined as “the beliefs and practices that regulate inquiry within a discipline by providing lenses, frames and processes through which study is carried out (Khaldi, 2017)”, should be clarified so that the appropriate research approach can be chosen.

According to Polit and Beck (2008), research paradigms in healthcare are generally classified as Positivist and Naturalistic (which include Post-positivist and Constructivist). A primary goal of positivist inquiry is to explain the association that ultimately led to prediction and control of the phenomena in question (Park, Konge & Artino Jr, 2020). It relies on the hypothetico-deductive method to confirm hypotheses where relationships can be derived between causal and explanatory factors and outcomes, which are usually quantitative in nature (Park, Konge & Artino Jr, 2020). Positivist researchers create tools to assess the phenomenon of concern and are disengaged from the study to avoid the possibility of personal values influencing the outcomes (Polit & Beck, 2008).

In contrast, the naturalistic paradigm focuses research endeavors on how people behave in natural settings while engaging in life experiences, which are typically qualitative in nature (Park, Konge & Artino Jr, 2020). Qualitative research places importance on subjectivity and its

ontological assumption is that there is no single reality but encompasses multiple realities for any phenomenon, as individuals perceive and experience situations from their own personal views (Polit & Beck, 2008). According to Creswell and Poth (2018), qualitative researchers believe that “truth is both complex and dynamic and can be found only by studying persons as they interact with and within their sociohistorical settings”. Teherani et al (2015) explained the different paradigms in qualitative research: post-positivist researchers agree with the positivist paradigm but believe that environmental and individual differences, while constructivist researchers hold the view that there is no single reality but that the researchers elicit participants’ perceptions of reality.

3.2 Qualitative research approach

Barriers and facilitators have been reported using both quantitative and qualitative methodologies. Studies have measured perceptions and satisfaction of healthcare professionals and patients towards CPSs by means of survey instruments (Mohammed, Moles & Chen, 2016; Smith, 2002). The advantage of qualitative research is that it allows for a rich understanding of complex intervention such as the implementation of CPSs, and can be used to develop and improve interventions in this context (Phellas, Bloch & Seal, 2012). Baumbusch (2010) highlighted that qualitative methodologies have been used in pharmacy practice research in order to provide explanations for and understanding of a broad range of phenomena in this area. Ideally, a mixed methods approach would allow the integration of both qualitative and quantitative research, thus allowing researchers to take advantage of the strengths and counterbalance the weaknesses of both approaches, which can be especially powerful when addressing complex issues such as healthcare service implementations (Tariq & Woodman, 2013). Khaldi (2017) pointed out that the additional advantage of the mixed

methods approach is the possibility it offers the research for the triangulation of the data, which is defined as “the combination of methodologies in the study of the same phenomenon”.

Unfortunately, a mixed methods approach was not practicable with several reasons. First, the use of mixed methods approach would require both quantitative and qualitative expertise to collect and analyse data, and to interpret the results, unfortunately, this was beyond the capacity, resources and scope for the programme and the department. For example, such an approach would require two doctoral researchers based in the same research group, with one student focusing on qualitative and the other on quantitative aspects of the research question. Second, conducting the studies using both research methods, in addition to triangulating both sets of data would be tremendously time consuming and the time frame of the degree completion would make it extremely difficult. Third, since a quantitative approach would mean many participants or respondents have to be reached, therefore this has to be approved on an organisational level locally. The research proposal was raised in the HA’s Pharmacy Paediatric Service Working Group, but was vetoed by the members as the research did not align with the direction of their services at the time of the proposal and that they did not have sufficient resources per study site to conduct the research. In view of the reasons above, the research team has therefore agreed on the use of a constructivist qualitative approach, which involved interviewing for data generation as the research team aims to understand a phenomenon from the perspective of those experiencing it. According to Appleton and King (1997), constructivist researchers seek to understand the experience of research participants in order to discover the participants’ subjective truth or perceptions. The authors pointed out that constructivists’ ontology and epistemology are interwoven as they believe that it is impossible to consider one without the other, which is different from the positivist and post-positivist paradigms (Appleton & King, 1997). This approach allows researchers to access the various realities molded by personal perspectives, context, and meaning throughout the research process, an approach

which has not been used in exploring the CPS in Hong Kong before. The enrichment of the data using qualitative studies and data synthesis will be discussed in more detail in Section 3.6.

3.3 Research Design

3.3.1 Participants and recruitment

Participants were divided into three participant groups, and these included clinical pharmacists (Chapter 4), physicians and nurses (Chapter 5), and parents, caregivers and former patients (Chapter 6). The differentiation of the subgroups is based on their roles within the healthcare system, as population that shared similar trait and demography are exposed under similar influence of the intervention, which aids standardising the interview guide for each group. The eligibility criteria will be described in more details under each specific study's methodology. Recruitment of 10-15 participants for each participant group was intended as this was based on the average number of participants that researchers have recruited in similar studies to reach data saturation (Onatade et al., 2018; Penm et al., 2014). In addition, the proposed number of participants was aligned with the validated approach that Guest, Namey and Chen (2020) used in assessing and reporting on saturation in the context of inductive thematic analyses. They indicated that around 6-7 interviews would be needed to capture 80% of all themes in a homogenous sample, whereas 11-12 interviews would help to yield a higher degree of saturation, which was reported to be around 95th percentile.

Data saturation, as first described by Glaser and Strauss (1967), was defined as:

"Saturation means that no additional data are being found whereby the sociologist can develop properties of the category. As he sees similar instances over and over again, the research becomes empirically confident that a category is saturated."

Saunders et al. (2018), who sought to clarify the nature, purposes and uses of saturation, identified four distinct approaches to data saturation across literature. These are theoretical saturation, inductive thematic saturation, a priori thematic saturation, and data saturation. Inductive thematic saturation was considered to be the most appropriate approach for the presenting studies since we have adopted an inductive coding process with the emergence of new themes. In comparison with inductive thematic saturation, theoretical saturation is reached on a later stage, often when grounded theory categories has been developed, so analysis is much more advanced. The aim of grounded theory is to create or construct an explanatory theory that reveals a process inherent to the main subject of the inquiry (Saunders et al., 2018). Since the anticipated data is not substantive enough to develop a theory and the author has insufficient experience in using the grounded theory method, theoretic saturation was considered not to be the best approach for the presenting studies. As described by Saunders et al. (2018), in contrast to theoretical saturation, inductive thematic saturation focuses on the identification of new themes and is based on the quantity of such themes rather than the completeness of existing theoretical categories. Thematic saturation is said to be achieved when further observations and analysis reveal no new theme can be derived from the dataset (Braun & Clarke, 2006).

Purposeful sampling was used as the method of choice for this series of studies. It is a method that is widely used in qualitative research for selection of participants who are rich in information with the best use of limited resources (Palinkas et al., 2015). The author stressed that the choice of sampling method is fundamental as it helps to maximise efficiency and validity of the research. Palinkas et al. (2015) listed a number of purposeful sampling strategies, which placed emphasis on similarity (e.g. criterion-i, criterion-e, typical case, homogeneity, snowball, extreme or deviant case), on variation (e.g. intensity, maximum

variation, critical case, theory-based, confirming and disconfirming case, stratified purposeful, purposeful random), and nonspecific emphasis (e.g. opportunistic, convenience).

After careful consideration with the available resources, such as manpower and number of study sites, maximum variation sampling was considered the most appropriate sampling method. Maximum variation sampling is constructed by finding cases that differ from each other as much as possible from the key dimensions of variation (Suri, 2011). This method of sampling, according to Suri (2011), enables the researchers to yield "high-quality, detailed descriptions of each case, which are useful for documenting uniqueness, and important shared patterns that cut across cases and derive their significance from having emerged out of heterogeneity".

For healthcare professionals, recruitment of samples from diversified backgrounds was intended, such as from different study sites, ranks, and different subspecialties. A higher proportion of healthcare professionals from the tertiary centre was recruited as they have more staff that practice in the area of paediatrics and the institution has a wider range of paediatric subspecialties. For parents, caregivers and former patients, the recruitment targets were children who have different conditions and were under care across different public hospitals in Hong Kong. The recruitment of parents, caregivers, and former patients from patient support groups was employed as these groups provide a platform in which patients are the experts on their condition. In addition, these groups can help to reach their members using their extensive networks via different medias.

3.3.2 Data collection methods

Interview is one of the qualitative approach used frequently in healthcare services for data collection. Baumbusch (2010) enlightened that interactions between the interviewer and interviewees could trigger responses, follow up new ideas and to investigate emotions and

motives, which a survey instrument could not achieve. Three types of interviews are commonly used in social health: Narrative, structured, and semi-structured interviews (SSIs).

Narrative interviews are stories that are based on the development of events from the perspective of a participant's life experience (Stuckey, 2013). The benefit of narrative interviews is that unpredicted information can be retrieved from participants as they guide the interview rather than the researcher; however, this unstructured approach tends to be more difficult to analyse when compared with other types of interviews (Stuckey, 2013).

During structured interview, researchers follow a specific set of questions in a programmed order with fixed response categories, and the data is elicited by the respondent in a controlled and tight manner (Doody & Noonan, 2013). This type of interview would be appropriate if researchers sought for consistency responses in a standardised and straightforward approach (Stuckey, 2013). Other advantages of structured interview include the limitation of researcher's subjectivity and bias, and that the controlled data is easier to code and analyse in comparison with other types of interview (Doody & Noonan, 2013). However, some researchers contended that the nature of structured interview is similar to a spoken questionnaire that leaves no room for elaboration and thus should only be used to elicit sociodemographic data (Doody & Noonan, 2013).

According to Kallio et al. (2016), SSIs consist of a set of open-ended questions that allow for spontaneous and in-depth responses, and researchers can use SSIs to gather new, exploratory data related to a research topic, triangulate other data sources, or validate findings by member checking. The authors gave details of the five phases in SSI guide development. These include identifying the conditions for using semi-structured interviews; retrieving and using previous knowledge; formulating the preliminary semi-structured interview guide; pilot testing the interview guide; and finalising the complete semi-structured interview guide (Kallio

et al., 2016). According to Doody and Noonan (2013), SSI allows the researcher to explore issues that arise spontaneously, and its flexible nature means that the order of the questions can be changed to guide the direction of the interview, so that the researcher can explore new paths that has emerged. Furthermore, it was found that the open nature of the questions in SSI encouraged the exploration of data in depth and vitality, which helped the identification of new concepts (Stuckey, 2013). SSI has been extensively used as a rigorous data collection method when evaluating the factors that influence clinical pharmacy in variable settings (Bēchet et al., 2016; Auta & Strickland-Hidge, 2016; Vinterflod et al., 2018). In view of the advantages and the suitability on the nature of the data that can be elicited, SSIs were used as the method of data collection throughout the study series.

In this thesis, the questions in the interview guides were derived from the themes and subthemes identified in the SR (Sin et al., 2022). However, the completion of interview guides informed solely from the paediatric data was not possible because the SR has identified that there was insufficient research in this area. In view of this, the interview guides were also informed by a similar SR focusing on the adult services (Onozato et al., 2019). The attitudinal, political, technical and administrative factors from Onozato et al. (2019) were put into consideration when designing the interview guides.

The sections of each interview guide were categorised using the implementation process model developed by Garcia-Cardenas et al. (2017). The author examined across the four phases of implementation process which include exploration and adoption, programme installation, initial implementation, and full operation (Appendix III).

The designed interview guides were piloted to confirm the coverage and relevance of the content of the preliminary guides so that the possible need to reformulate questions can be identified. Pilot testing was performed both internally and externally. Internally, the

development of the interview schedules was developed through the consultation with the thesis supervisors; whereas field-testing was performed with two study participants per participant group. As there were no changes to the interview schedules, these data from field-testing were included for analysis.

Participants were given the choice to choose between telephone and video-conferencing software Zoom® (Zoom Video Communications, Inc., USA), which is the official video-conferencing software of the HA, to conduct the SSIs. Face-to-face interview was not recommended due to social distancing and gathering restrictions as addressed by local government and university policies in view of the COVID-19 pandemic during the data collection period. The interviews were audio recorded using PI's mobile device and the files were deleted from the device once they were transferred to a computer with organisation's secure network.

It was intended to interview 10-15 participants per participant group, and the interviews were stopped once it was deemed that data saturation, as explained above, was reached. The duration of interviews was reported under each individual study below.

3.3.3 Data analysis

The interviews were held in spoken Cantonese, which were then translated into English. It is important to ensure that the transcripts were close to 'verbatim', due to the variations in syntax and clinical terminology during the conversation of spoken Cantonese to English. This was deemed most appropriate, to convert conversational Cantonese directly into written English, rather than, converting spoken Cantonese into written traditional Chinese characters because doing so would change the prose and structure of the sentences, which might affect the translation accuracy or fluency. To minimise transcriptional error, more than one person was involved in translating the transcripts. CH, the associate supervisor of the project fluent in

spoken Cantonese, checked three samples of translated transcripts from each subgroup for accuracy. Once translated and transcribed as Microsoft Word documents, all transcripts were entered into the QSR NVivo (Version 12, QSR International, Australia) for data analysis.

CS and CH were responsible for the coding process. A constant comparison process with previously analysed interviews, using an inductive approach, was carried out to allow themes to emerge. The resulting topics were organised by thematic analysis, as described by Braun and Clarke (2006). Consensus was reached amongst the researchers for the identification of themes that emerged during the interviews. The subthemes were then mapped onto the according main themes in tabulated form and in text description in the subsequent analysis.

COREQ (Tong, Sainsbury & Craig, 2007) is a checklist that covers the necessary components of a qualitative study that needs to be reported, including important aspects of the research team, study methods, context of the study, findings, analysis, and interpretations. It is used to promote comprehensive and explicit reporting of qualitative studies. The checklists for each study can be found in Appendix IV.

3.4 Reflexivity

According to McNair, Taft and Hegarty (2008), reflexivity has been defined as “an effort to reflect on how the researcher is located in a particular social, political, cultural and linguistic context”. Reflexivity can help researchers to recognise how they have changed the research process and as a result, how these changes have affected the research process (Palaganas et al., 2017). Researchers have differentiated the types of reflexivity available (Walsh, 2003) that constitute a broad and comprehensive typology of reflexive practice relevant throughout the study. According to Walsh (2003), there are four overlapping and interacting dimensions of reflexive process, and these are personal, interpersonal, methodological, and contextual. Table

5 listed the questions for each type of reflexivity related to the series of studies and the answers provided by the PI therein.

Personal Reflexivity

Question: How is my unique perspectives influencing the research?

I was the Principal Investigator (PI) in these studies conducted as part of my PharmD degree. All of the participants were aware of this aspect of the study context as it was stated in the Information Sheet. Being an insider researcher, the study aim came from my experience as a clinical pharmacist in Hong Kong. My experience working for the NHS, UK, has enabled me to observe the differences practicing in Hong Kong. I was intrigued by how the sociocultural values between the two places and different interactions between clinical pharmacists, other healthcare professionals, and patients have affected the role of clinical pharmacists. CPS in the UK is well developed which was build up from a strong foundation of research and government policies. The development of CPS in Hong Kong seems to be at a slower pace and there is no apparent research available to provide an explanation on why this is. This has triggered by interest in finding out the factors that affect its implementation. I have observed the process of implementation mainly in the area of paediatrics where I provide clinical work, therefore, I shaped my studies to focus on paediatric CPS.

My personal reflexivity involved reflecting on practicing as a clinical pharmacist in Hong Kong, and comparing with the role in the UK - such as the work involved, interaction with relevant stakeholders, and so on. As I realised that I needed more training in order to conduct qualitative research to achieve my objectives, I attended a qualitative research course programme provided by the University of Bristol, so that I can conduct quality qualitative studies for this thesis.

I understand that my position as a pharmacist who is providing CPS might have affected my views in this context. The advantages of being a clinician qualitative researcher include the understanding of the clinical environment and may share some values, therefore enhancing qualitative health research by being able to provide a depth of understanding to the meanings practitioners bring to the healthcare environment. However, for believing the benefits in CPS I might make more enquiries in exploring barriers perceived by the participants. I would need to constantly remind myself to stay impartial and also to engage the participants in the process of elaboration and collective understanding on the facilitators as well. In addition, my supervisors were aware of the situation and constantly challenged me to be more reflexive. Some qualitative researchers (Olmos-Vega et al., 2022) pointed out that personal reflexivity ought to occur continuously across the duration of the investigation and should be interwoven with all aspects of the research, understanding and made aware that it should be from the conception of the research to research outputs.

Interpersonal Reflexivity

Question: What relationships exist and how are they influencing the research and the people involved? What power dynamics are at play?

I was an insider during the research period as I was actually a clinical pharmacist providing CPS in one of the

study sites. Some participants, which include clinical pharmacists, physicians, and nurses were colleagues that I worked with. As a result, my interactions in the research area were influenced by my experience as a clinical pharmacist who works with the participants. I had to carefully think through and document how these existing relationships and my position in the context impacted my data. I had to mediate any pre-existing differences feelings about the pharmacists that I work with, and the physicians and nurses that I have direct interactions with on the wards. The power relationship between doctors, nurses, and pharmacists has put into consideration as traditionally doctors were viewed at the top of medical hierarchy, with nurses and pharmacists competing with each other for more clinical roles. In addition, I also had to consider how the power dynamics shaped the interactions with the healthcare professionals and parents. They might emphasise on their positive experience and share good side of the service only; or they might not participate in the studies as they had bad experience about the service; furthermore, pharmacist participants might have the idea that they are being evaluated. For parents, caregivers and former patients, they might have the fear that their responses might affect the management of their children. In order to mitigate these, I focused on putting my researcher's lens on and consistently emphasised that the research would not affect the current service in anyway and by no means it is an evaluation of individuals.

Participants were reminded that their data will remain anonymous and their input will help to shape the service in the future. I have reiterated these principles on the Information Sheet and prior to the interviews.

Methodological Reflexivity

Question: How are we making methodological decisions and what are their implications?

We conducted the series of studies from a constructivist paradigm, using thematic analysis for seeking to understand experiences, and thoughts across the data. Themes were actively construct patterns inductively that enabled to answer the research question, rather than categorisation of codes. This approach allowed us to emphasise the social, cultural, and structural contexts that influence individual experiences, thus enabling the development knowledge that is constructed through interactions between the researchers and the participants. However, the use of inductive thematic saturation to determine data saturation arguably limited the emergence of codes or themes at a later stage, in comparison with theoretical saturation. We felt that it is the appropriate analysis method to use as it is relatively simple to learn and apply for a novice researcher who has limited experience in conducting qualitative research but at the same time, it is a powerful method to allow highlighting the key features of, and interpret a wide range of datasets. Inductive thematic analysis was a suitable method to address the research question with the ability to analyse data with an inductive approach. Grounded theory was considered not appropriate as the limitation in resources and experience inhibited us to iterate a large volume of dataset from a wide range of population to generate a social theory. A framework approach for the studies was considered but we did not want the generated themes to be strictly predefined; rather, our research design was developmental in response to the data obtained and ongoing analysis. Being methodological reflexive entailed understanding both the affordances and shortcomings of our study design and making these explicit in the thesis. It also shows the need for constant evaluation of the appropriateness of the approach and the alignment of the paradigm of the research when deciding on how to generate the data and its analysis.

Contextual Reflexivity *Question: How are aspects of context influencing the research and people involved?* Being contextually reflexive in the research entailed the understanding the setting of this programme of research – a resourceful, well-developed, cosmopolitan city where the western culture meets the east. The involvement of clinical pharmacist in paediatric patient care is a recent concept and how this intervention has influenced the health system and the attitudes from different stakeholders remain unknown. It is known that CPSs do not uniformly incorporated into healthcare systems. I held informal conversations with some of my colleagues in other specialties and they often expressed how they wish the role of pharmacists can be extended clinically like other places where they participated in exchange programmes. They support this programme of research, using the paediatric service as an example to examine the barriers that pharmacists face in implementing clinical services. In order to understand the unique situation in Hong Kong in how the paediatric CPS has implemented in secondary care, there is a need to systematically outline and assess the factors in this context. This is the 'check' stage of the 'plan-do-check-act' implementation process model – the factors found can be reviewed and addressed which enable planning can be done to implement the service more successfully.

Table 5. Table to demonstrate how each type of reflexivity (Walsh, 2003) might manifest in studies.

Different techniques were employed at different stages during the research process to encourage the researchers to act in a reflexive manner. Self-description, as described by Hadi and Closs (2016), promotes the credibility and confirmability of research findings. Methods such as making field notes was used in the series of studies to acknowledge and make explicit of any personal views and opinions (Lee et al., 2016). Moreover, self-reflection with items on the COREQ checklist helped to discuss the researchers' positions within the study and how their personal beliefs and past training could influence the results. Lastly, member checking, as recommended by Hadi and Closs (2016), was performed with two participants per group, to ensure the dependability and credibility of this research.

3.5 Ethics approval

Ethics approvals were obtained from the Research Ethics Committees from Hong Kong Children's Hospital (HKCH-REC-2021-031) and Kowloon Central and East Cluster (KC/KE-21-0089) within the HA, and Aston University (#1741).

3.6 Data synthesis

3.6.1 Implementation theories, models and frameworks

3.6.1.1 What is implementation science?

The area of implementation science began to merge as a field of research with the publication of *Diffusion of Innovations* written by Everett Rogers (1962). It is a theory that seeks to explain how and why new concepts and technology spread. Rogers argues that diffusion is the process by which an innovation is communicated among the population over time as a social process. He synthesised his research from over 508 studies across the fields that influenced the theory, which included anthropology, education, and different areas of sociology such as early, medical, and rural. Rogers used his synthesis to produce a theory of the adaptation of innovations among individuals and organisations.

Historically, researchers were aware of the problem of non-adoption of evidence-based practice, but this research-to-practice gap was not in the interest of academic clinical researchers (Bauer et al., 2015). Bauer and colleagues contended that conventional academic research success has predominately supported conducting mechanism-oriented studies focusing on purposefully selected populations, and alleged that whether the findings could be translated into the public has typically not been the concern of these researchers.

Inspired by Rogers' work, other researchers began to seek attention to the contextual aspects of innovation adaptation that address the link of evidence to policy decisions, which have provided a collective foundation upon which the development in the field of

implementation science (Dearing et al., 2018). Implementation science has then expanded as researchers began questioning traditional assumptions as to how scientific innovations could influence real-world clinical practice (Barr et al., 2021). It was assumed that the implementation of best healthcare practices would spontaneously happen if clinicians applied this evidence to routine practice; however, the application of clinical practice guidelines was challenging, as it requires clinicians to interpret, accept, and consistently applying it (Oslwang & Prelock, 2015). Implementation science is considered to be able to help narrow the gap between the finding of new clinical knowledge and its application in different healthcare settings (Barr et al., 2021).

3.6.1.2 Definition of implementation science

According to the definition put forward in the inaugural issue of the *Implementation Science* journal, Eccles and Mittman (2006) described implementation science as:

"*The scientific study of methods to promote the systematic uptake or research findings and other evidence-based practices into routine practice, and, hence, to improve the quality and effectiveness of health services."*

As it is a fair new field of study, there are several published definitions of implementation science which range from narrow to broad. Some definitions emphasise closing the know-do gap, whereas others emphasise producing generalisable knowledge or locally fit solutions. Examples of the range of definitions include:

- Glasgow, Eckstein, and ElZarrad (2013)

"Implementation science is the application and integration of research evidence in to practice and policy"

- Peters et al. (2013)

"Implementation science is the scientific inquiry into questions concerning implementation – the act of carrying an intention into effect, which in health research can be policies, programmes, or individual practices."

- National Institutes of Health (2014)

"*The study of methods to promote the adoption and integration of evidence-based practices, interventions, and policies into routine health care and public health settings to improve the impact on population health."*

- World Health Organisation (WHO, 2017)

"Implementation science is a form of research to address implementation bottlenecks, identifies optimal approaches for a particular setting, and promotes the uptake of research findings: ultimately, it leads to improved healthcare and its delivery."

In essence, implementation science is the scientific study of methods and strategies that facilitate the uptake of evidence-based practice and research into regular use by practitioners and policymakers. The field of implementation science seeks to systemically close the gap between what we *know* and what we *do* by identifying and addressing the barriers that slow or halt the uptake of proven health intervention and evidence-based practice (Westerlund, Nilsen & Sundberg, 2019). It incorporates a scope broader than traditional clinical research, focusing not only on the patient level but also on the healthcare organisation and policy-makers (Bauer et al., 2015). According to Bauer and colleagues, implementation research requires trans-disciplinary research teams, which include members who are not usually part of clinical trials. They gave examples of members such as healthcare service researchers, economists, sociologists, and operational staff such as front-line healthcare professionals, administrators, and even patients. The crux of implementation science is two-fold, which is differentiated from the identification of uptake factors across multiple levels of context and the development of implementation strategies that overcome these factors and enhance the facilitators to increase the uptake of evidence-based practice (Bauer et al., 2015).

The aim of implementation research is to build a base of evidence about the most effective processes and strategies for improving the quality of care, by discovering how to

move the interventions into specific settings, extending their availability, and benefit across the public (Proctor & Bunger, 2020). In implementation research, researchers seek to understand and work within real-world conditions with populations that are affected by the health interventions, and the context plays a critical role on whether an intervention could be successfully implemented (Peters et al., 2013). According to Peters et al. (2013), context can include the cultural, economic, legal, political, physical and social backgrounds, in addition to the intrinsic settings that include different relevant stakeholders, putting into consideration of their demographic and epidemiological conditions.

3.6.1.3 Implementation theories, models and frameworks

With the growing interest in adopting scientific research into clinical practice, implementation research has seen wider recognition recently. The need to establish the theoretical bases of implementation has been advocated so that they can guide implementation intervention developers by outlining phases in the development process, factors to help understand and approaches to evaluate and demonstrate change (Nilsen, 2015).

Healthcare organisations seek to use implementation science to address the effectiveness of service provision, but the relatively new area of research has not fully exploited on the wealth of established theories of healthcare organisation and management (Sarkies et al., 2021). The application of implementation theoretical approaches could lead to a more comprehensive understanding of the explanatory mechanisms for improving healthcare services and could help conceptualise implementation science specifically (Sarkies, et al., 2021).

Implementation theoretical approaches, such as theories, models and frameworks form the foundation for drawing from and developing a cumulative, evidence-informed science (Presseau et al., 2022). Researchers proposed that theories, models and frameworks could help to gain insight into the mechanisms by which implementation is more likely to succeed; however, the many theoretical approaches available in the literature made it difficult for

researchers to choose and apply the most appropriate one for their research (Nilsen, 2015). As Strifler and colleagues (2020) explained, implementation theories, models and frameworks differ in complexity, such as their aim and scope for the interventions. They illustrated examples such as the description of different stages of implementation, identification of factors that influence implementation, or the prediction of implementation success. The authors further elaborated that where some theories, models and frameworks aimed to address the whole implementation process, some might focus on particular aspect such as sustainability.

Five categories of theoretical approaches that can be used in implementation were determined, with aims to either describe the process of translating research into practice, to understand what influences implementation, or to evaluate implementation (Nilsen, 2015). These approaches are illustrated in Figure 5 below:

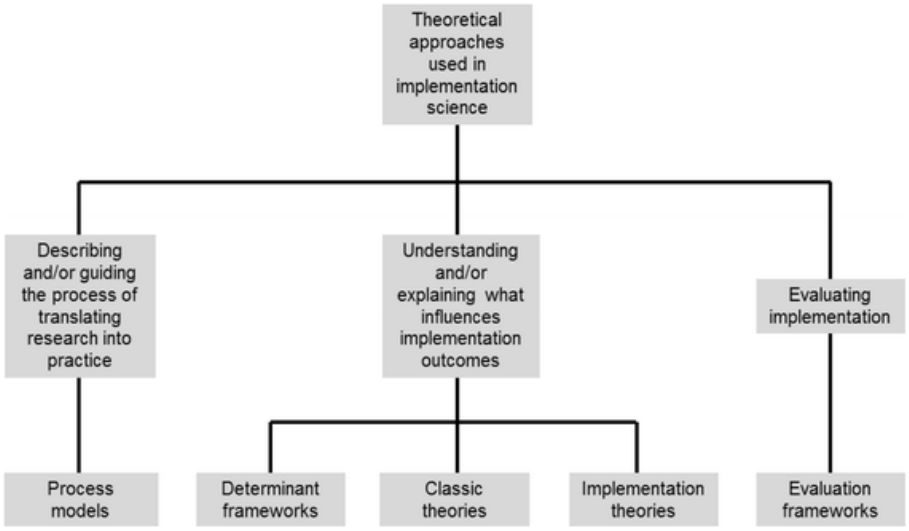


Figure 5. Three aims of the use of theoretical approaches in implementation science and its five categories.

Nilsen (2015) explained the differences between theories, models, and frameworks in implementation science. He described that an implementation theory is a set of analytical principles that is intended to structure observation, understanding and explanation of the context. Theory in implementation science typically implies some predictive capacity and attempts to explain the causal mechanisms of implementation. In contrast, some researchers

pointed out that implementation models and frameworks do not specify the mechanisms of change as they are typically more like checklists of relevant factors to various aspects of implementation (Frankfort-Nachmias & Nachmias, 1996). Implementation models are commonly used to describe and guide the process of translating research into practice rather than predicting what influences the outcome of the implementation of an intervention, which is particularly useful in deliberating a specific aspect of a phenomenon. An implementation framework usually represents a structured overview consisting of descriptive categories, such as constructs or concepts, and the relations between them that are presumed to account for a phenomenon (Moullin, Sabater-Hernández & Benrimoj, 2016).

3.6.2 Justification of implementation framework

Since the primary objective of this research was not to explain and predict how and why the implementation of paediatric CPS was successful in Hong Kong, but rather to describe what influences its implementation, the application of an implementation theory would not be appropriate. Although implementation model and framework are both descriptive in nature, an implementation science model usually specifies steps in the *process* of translating research into practice, rather than describing the factors that are believed to influence an intervention which is typically the purpose of an implementation framework (Alberta Health Services, 2020). Frameworks tend to organise, explain, or describe information and the range and relationships between concepts, in contrasts to models where they are more specific in scope, which are more often perspective (Moullin et al., 2020). In addition, implementation framework is an approach of choice for supporting thematic analysis because it provides a systematic model for managing and mapping of the data (Moullin et al., 2019). Furthermore, researchers pointed out that the framework approach facilitates large data sets as its matric form provides an intuitively structured overview of the summarised data (Nilsen, 2015). Therefore, considering

the nature and the aim of this research, the use of an implementation framework would seem to be the most suitable theoretical approach.

There are many conceptual frameworks developed to analyse implementation, as shown by a recent survey that revealed the existence of about 100 different approaches (Ridde, Perez & Robert, 2020). Different disciplines have developed various frameworks for implementation. This discipline-specific approach in the targeted innovations, settings, and end-users has led to the development of multiple and potentially disparate frameworks. As implementation science advances, researchers have attempted to consolidate nomenclature and develop multidisciplinary frameworks (Moullin et al., 2015). The scientific literature describes a large number of theories and frameworks utilised in implementation science which can be used to examine a wide range of research questions. For example, Meyers et al. (2012) have identified 25 frameworks in their synthesis to provide a conceptual overview of the process of implementation, whereas Tabak et al. (2012) have provided a review of 61 models designed for use in healthcare.

Understanding professional pharmacy services implementation processes combined with the use of a suitable implementation framework could aid its adoption, implementation, sustainability and eventual scale-up of the services (Moullin, Sabater-Hernández & Benrimoj, 2016). Identified factors that influence the implementation of paediactric CPS in Hong Kong from different participant groups would therefore be more appropriately synthesised using a framework methodology. When selecting the suitable framework for a particular implementation intervention, Moullin et al. (2020) suggested the consideration of the following:

i. The purpose of the framework;
ii. The level(s) included within the framework;
iii. The degree of inclusion and depth of analysis or operationalisation of implementation concepts;

iv. The framework's orientation, which includes the setting and type of intervention.

There are several frameworks that can be considered to be appropriate and are widely used in implementation science. An example would be the implementation framework that was developed by Proctor and colleagues (2011). It was designed to evaluate successful implementation and consisted of eight implementation outcomes that are used as indicators of implementation success which include: acceptability, adoption, appropriateness, feasibility, fidelity, implementation cost, penetration, and sustainability. However, this evaluation framework seems to work best at measuring successful implementation using these indicators, rather than determining factors that influence implementation during different phases.

Another implementation framework in implementation research is the Reach, Effectiveness or Efficacy, Adoption, Implementation and Maintenance (RE-AIM) framework (Glasgow, Vogt & Boles, 1999). The RE-AIM framework is one of the most widely used implementation frameworks (Birken et al., 2017). It guides the evaluation of interventions by considering the representativeness of participants, the impact of the intervention, the proportion of settings and staff who adopted the intervention, the extent the intervention is implemented as intended and sustained over time. Although the RE-AIM framework has its benefits such as equal emphasis on both internal and external validity and can be adapted for use across settings, similar to Proctor's framework, it focuses more on evaluating implementation rather than determining factors that influences the intervention (Alberta Health Services, 2020).

Determinant frameworks are frameworks that examine and explain what influences specific implementation outcomes. It can be used to describe the variables that may positively or negatively affect an outcome and will usually address intended context and strategies (Nilsen & Bernhardsson, 2019). Examples of determinant frameworks that are more appropriate in exploring factors influencing implementation are Promoting Action on Research

Implementation in Health Services (PARIHS), Conceptual Model, Theoretical Domains Framework (TDF), and Consolidated Framework for Implementation Research (CFIR) (Damschroder et al., 2009; Francis, O'Connor & Curran, 2012; Greenhalgh et al., 2004; Kitson et al., 1998).

In comparison to other determinant framework such as PARIHS that put emphases on evidence, facilitation and context which is complicated and often partially used, CFIR comprises of five domains that are broader in definition with clearer explanation of its domains and constructs (Bergstrom et al., 2020). The Conceptual Model developed by Greenhalgh and colleagues (2004) is another framework that has be used prospectively by implementation researchers. It is a framework focuses predominantly in healthcare that elicited attributes of innovations, receiving organisations and their surrounding contexts, the complex nature of the implementation process, and positing preliminary links amongst implementation concepts (Moullin et al., 2015). However, the disadvantage of the Conceptual Model is that the characteristics of the end users are not addressed, thus making it not suitable with this research (Nilsen, 2015). The TDF is an integrated framework that was developed to help apply theoretic approaches to interventions aimed at behavioural changes (Phillips et al., 2015). It comprises of 14 domains and 84 constructs that allows synthesis of a multitude of coherent behaviour change theories into a single framework that associates influencing factors and permits the assessment of behavioural problems (Francis, O'Connor & Curran, 2012). Amid the comprehensiveness of the framework, the present research has revealed several challenges in applying the framework including time and resources issues, and steps in operationalisation of the TDF (Phillips et al., 2015).

Damschroder et al. (2009) has developed CFIR as a 'meta-theoretical' framework, which is one of its advantages as it comprises common constructs from published implementation theories that embraces the contribution of existing implementation research in healthcare. One

of the advantages of using of the CFIR is its overarching structure that supports the exploration of essential factors that may be encountered during implementation, and Appendix V summarised the constructs within the framework and provides short description for each construct. The CFIR framework offers a thorough framework to systematically identify factors that may emerge in various, multi-level contexts to influence implementation, making it well suited to guide evaluation of the implementation of complex healthcare service interventions (Kirk et al, 2016). Other advantages of the CFIR are that it can be used to develop data collection and as a guide for analysing, interpreting, and reporting implementation-related findings. In addition, it can be applied at any stages of implementation, and researchers can build testable hypothetical models based on its constructs that emphasise particular constructs and their relationships with one another (Kirk et al., 2016).

The five major domains from CFIR were widely used by implementation science practitioners as it allows identification of implementation facilitators and barriers across settings with clear definition, and rationalised interaction between them (Means et al., 2020). Birken et al (2017) pointed out the key difference between CFIR and TDF is that while the TDF focuses primarily on factors influencing individual healthcare provider behavior at the individual level, the CFIR domains also consider the factors at organisational and broader societal level, which makes it more appropriate for this research.

The CFIR domains include the intervention, inner and outer setting, the individuals involved, and the process by which implementation is accomplished. Damoschroder et al. (2009) gave descriptions of each domain as follow:

- *Intervention: The "thing" being implemented*
- *Outer setting: The setting in which the Inner Setting exist. There may be multiple Outer Setting and/or multiple levels within the Outer Setting, such as community, system, or state*

- *Inner Setting: The setting in which the intervention is implemented. There may be multiple Inner Setting and/or multiple levels within the Inner Setting, e.g. unit, team*
- *Individuals: The roles and characteristics of individuals*
- *Implementation Process: The activities and strategies used to implement the intervention*

Figure 6 below shows the depiction by Damschroder et al. of how these domains interact in rich and complex ways to influence implementation effectiveness.

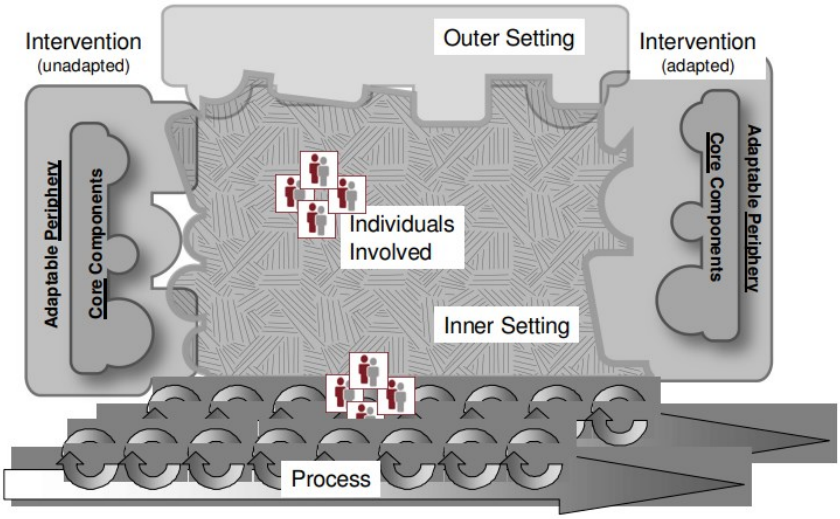


Figure 6. Major domains of the CFIR.

Data synthesis of the findings from the studies (Chapter 7) were informed by CFIR, which provides a pragmatic structure for identifying influences on implementation and organising findings across these studies, thus facilitating drawing descriptive conclusions clustered around the themes identified. The consolidated framework has been employed for implementation research in different pharmaceutical services (Shoemaker et al., 2017; Weir et al., 2019; Fernandes et al., 2022), which helped to guide formative evaluations of interventions in context and offers an organisational framework for synthesising and building knowledge about what works where, across multiple settings.

Chapter 4. STUDY 1 – CLINICAL PHARMACISTS

Publication information:

Sin, C.M., Huynh, C., Maidment, I.D., 2022. Clinical pharmacists' perceptions of the barriers and facilitators to the implementation of paediatric clinical pharmacy services in Hong Kong. *International Journal of Pharmacy Practice.* 30(5), pp. 466-471. (Published on 28 July 2022)

4.1 Aim

This study aimed to identify any facilitators or barriers that influence the successful implementation of paediatric CPS in the hospital setting in Hong Kong from the clinical pharmacists' perspective.

4.2 Methods

The general methods were described in detail in Chapter 3.

4.2.1 Inclusion criteria

Eligibility criteria included clinical pharmacists who have worked or were currently working within the field of paediatrics in the four participating public hospitals across two regional clusters (Kowloon Central and Kowloon East). The participating hospitals were Hong Kong Children's Hospital, Kwong Wah Hospital, Tseung Kwan O Hospital, and United Christian Hospital. Queen Elizabeth Hospital, which is another institution in one of the regional clusters, did not agree to take part and did not state the reason for non-participation. The proposal to invite all seven clusters was considered and proposed at the HA's Paediatric Service Working Group (Clinical Services) meeting in 2019 but was declined on the corporate level on the ground that organisation resources should not be allocated to benefit individual's academic achievement when the intervention is not within the strategic plan. In addition, as nominating a PI for each cluster is required according to local ethics committee regulations, not all clusters

could nominate appropriate personnel to take on this role. As a result, two regional clusters were included in this study and in the following Chapter.

4.2.2 Participant recruitment

Each hospital that provides paediatric CPS are members of the Paediatric Service Working Group under the HA's Pharmaceutical Services Committee, with each hospital nominating a paediatric clinical pharmacist as its representative. Invitations for the interviews were sent to the working group representatives within the participating hospitals and they were asked to disseminate the invitation to relevant clinical pharmacists within their department, with an Information sheet and a consent form provided. These can be found in Appendix VI and VII. Reminder emails were sent to the representatives one month after the initial invitation emails so that more clinical pharmacists could be recruited.

4.3 Results

Of 32 clinical pharmacists across all study sites invited, 14 clinical pharmacists agreed to take part. Twelve participants were interviewed by telephone that allowed for thematic data saturation to be reached. The duration of the interviews ranged from 15 to 30 minutes. Table 6 shows the demographic details of those clinical pharmacists who participated in this study.

Key	Study site	Gender	Age in years	Years of experience in paediatrics
Pharm 1	Hospital A	M	31-40	<5
Pharm 2	Hospital A	F	21-30	5-10
Pharm 3	Hospital B	M	41-50	>10
Pharm 4	Hospital C	F	41-50	>10
Pharm 5	Hospital C	F	31-40	<5
Pharm 6	Hospital C	F	31-40	5-10
Pharm 7	Hospital B	F	31-40	5-10
Pharm 8	Hospital D	M	41-50	>10
Pharm 9	Hospital D	M	31-40	5-10
Pharm 10	Hospital A	F	41-50	5-10
Pharm 11	Hospital A	M	51-60	>10
Pharm 12	Hospital D	M	41-50	>10

Table 6. Characteristics of clinical pharmacist participants in the study.

Five barriers and three facilitators were identified as main themes. The main themes and their according subthemes are outlined in Table 7 on the next page.

Barriers	Facilitators

• Penetration into the healthcare system
  o Understanding of clinical pharmacist's role
  o Culture of medical dominance
  o Time for service to implement
• Practice environment constraints
  o Increased workload
  o Competing priorities
• Affirmation from the administrative stakeholders
  o Acknowledgement of outcome measures
  o Limitation of resources
  o Budget allocation in pharmacy services
• Governance of the profession
  o Lack of standardisation of practice
  o Need of a professional council for practice guidelines and accreditation
• Collaboration with other organisations
  o Liaise to bring local research to evidence-based practice
  o Provision of training for specific needs
	• Healthcare professionals' trust and confidence in CPS
	  o Seeing the benefit
	  o Coherent and direct communication
	• Support from the pharmacy management team
	  o Provision of comprehensive training
	  o Allocating manpower to provide service coverage
	• Clinical pharmacists' self-efficacy
	  o Job satisfaction and self-esteem
	  o Attitude to drive the profession forward

Table 7. Summary of themes and subthemes identified from clinical pharmacist participants.

4.3.1 Barriers

4.3.1.1 Penetration into the healthcare system

During the interviews, a wide range of views from clinical pharmacists were reflected on the acceptance level of healthcare professionals such as physicians and nurses. Some participants felt that their role was not well recognised. A participant expressed that the lack of recognition was not an issue of trust or confidence, but rather a lack of understanding of the clinical pharmacist's role or the awareness of the service, which can be illustrated by the quotes below:

"I don't think that they don't have confidence in us, but rather they do not know that we possess so much knowledge… I'm suggesting that whether the medical chiefs can promote the role of clinical pharmacists to their teams, to facilitate the work collaboration." (Pharm 4)

"I think first of all, may be they [physicians] need to know the existence of CPS, I think a lot of doctors have not heard about the service when they were graduated… and if they are not sure on what we can do then this is hard for them to rely on us…" (Pharm 6)

The culture of medical dominance was also perceived as a barrier that hindered the penetration of the CPS into the paediatric healthcare management model. Some clinical pharmacists observed that sometimes the service was not appreciated by healthcare professionals, which were mainly physicians. They contested that some physicians were reluctant to change their practice, as can be seen in the following quotes:

"Let's say for example, with the adult service, pharmacists would help doctors to prescribe discharge medications and to provide medicines reconciliation… but in paediatrics, we offered the same service… but because they think that they can handle it and therefore they declined our help." (Pharm 5)

"… when you talk about dosage adjustments and TDM [therapeutic drug monitoring] etc… who should do it? Traditionally this is a role of doctors… it is not that they have taken our service away per se, but rather this is set like as the foundation of their job." (Pharm 8)

The reasons for physicians' resistance were a multifaceted one, with the belief in whether clinical pharmacists can provide comparable services, subjective perception of physicians, and the idea of deskilling in medication knowledge within the context. The quotes below showed some examples of the complexity of this issue:

"I think this is perhaps to do with doctors' concept? In Hong Kong, doctors feel that they have greater ability in comparison to other allied-health professionals… it is hard for them to rely on other healthcare professionals…" (Pharm 6)

"… for examples, TDM and prescribing TPN… some of them [doctors] think that this is their part of training and that if they rely on clinical pharmacists to provide these services then they might not know how to do it… it feels like we have crossed the boundaries in a way." (Pharm 8)

Some participants believed that the perception of resistance to change from other healthcare professionals was interlinked with internal factors within the pharmacy profession itself. Participants considered that it was related to the governance of CPS, the training and accreditation of clinical pharmacists, and clinical pharmacists' attitude, which will be described later.

Another subtheme that has emerged from the interviews was related to the relatively short time since the service was first established. When asked about whether the participants think that the level of implementation was similar to that of other countries with more advanced CPS, they concurred that the service has not been implemented as successfully in comparison. Some clinical pharmacists expressed that an adequate period of time was needed for the CPS to be implemented successfully and to exert its optimal efficacy. They held the belief that the service would be implemented more successfully when a longer period of time was given. The following quote showed an example that demonstrated their thoughts:

"…because our service is still developing, some doctors might not feel comfortable for us to deliver the clinical services…" (Pharm 8)

The strategy on the service implementation in Hong Kong when the service was first implemented was to gain support from the organisation internally. Clinical pharmacists' focus was to provide activities that aid other healthcare professionals, such as physicians and nurses, in order for them to understand the value of CPS. As a consequence, this has jeopardised the provision of some direct patient care activities, thus having a negative impact on the overall service implementation. An example of this could be shown with a clinical pharmacist attempted to explain the current situation:

"… let me give you an example, in oncology the clinical pharmacists would provide new drug counselling… so that the direct patient care is there… but I think we can do better because of how the service was set up… the priority is to collaborate with the doctors first so that we can develop some protocols or to give recommendations on medication safety matters… and this is where we are heading first." (Pharm 9)

4.3.1.2 Practice environment constraints

The limitation due to the practice environment was perceived as a major barrier that affected the implementation of paediatric CPS in Hong Kong. There was a wide range of responses from the participants. Most participants felt difficulty performing their services because of their heavy workload. They believed that CPSs were under tremendous pressure and sometimes stretched beyond capacity. For example, a clinical pharmacist expressed her difficulties:

"We can only afford to provide a half-day service due to the limitation of manpower… as a result, we cannot participate in the afternoon medical rounds… and now we have started our discharge counselling service, but if the patients were discharged in the afternoon we cannot provide our service then." (Pharm 5)

Participants explained that with the increasing workload, the room for the development of further services was severely affected as a result. This could be illustrated from the participants' comments below:

"I think that they [the management team] will provide the basic support, as in having pharmacists on paediatric wards… but if there are additional services, for myself, I am not sure if they would like us to do so." (Pharm 2)

"… we would like to continue our care to the outpatient level, but this is complicated and yet a luxury service… we hope that we can provide more care to these patients." (Pharm 3)

The clinical pharmacist-to-patient ratio was also put into question. Some clinical pharmacists expressed that their work has been constrained by how many patients were under their care each day, as a result of limited support and resources:

"… this is not the same as in the USA, where they have 100 pharmacists for 1000 beds… but this is not the same in Hong Kong as we have 3-40 pharmacists in a 1400 bed hospital…" (Pharm 11)

In addition, some clinical pharmacists questioned the structure of pharmacy itself, argued that the lack of differentiation of clinical and traditional dispensing pharmacy might have a detrimental effect on the delivery of the service. According to the participants, the primary focus has always been on the dispensing side of work:

"… I mean clinical pharmacists are still a part of the manpower within the pharmacy operation, which means that they would still have to perform their front-line duties, such as dispensing process, working on odd shifts, etc… and I feel that this is not ideal because, at the moment, we would rather sacrifice the role of providing clinical work rather than that of dispensing work…" (Pharm 12)

"I think at the moment our priority has been put onto the operational side of work. It feels that the clinical work is something in addition… it's great that you can contribute in clinical pharmacy… but the priority still goes to the day-to-day operational work…" (Pharm 4)

The heavy burden with dispensing work in pharmacy was commonly agreed as a major barrier. One participant alleged that the root of the problem on clinical pharmacist availability was not the budget that was allocated to the pharmacy profession, but rather the lack of clear division between primary and secondary care within the healthcare system in Hong Kong. The situation is that majority of the discharged patients return to hospitals for regular medical appointments rather than transferring them to primary care, and the prescriptions are only allowed to be dispensed in HA's hospitals. He indicated how community pharmacy can help in other countries:

"The reason is that the frontline role of the pharmacist, especially like outpatient dispensing, is usually done by community pharmacies… patients go to their community pharmacy to pick up their discharge medications rather than the hospital itself… this burden of workload is relieved by pharmacists in community and therefore hospital pharmacists can the focus their effort to provide clinical services." (Pharm 8)

A better-structured pharmacy framework, with a well-defined division of pharmacy staff being responsible to different sections within the department, could enhance the availability of clinical pharmacists to perform their duties, as one clinical pharmacist pointed out that:

"…sometimes I think we need to spend a lot of time in dealing with drug information… whether it's an issue with manpower… let say, for example, there are drug information centres in some countries… therefore these drug information pharmacists can often help to answer more complicated enquiries, so that we can perform other tasks…" (Pharm 7)

4.3.1.3 Affirmation from administrative stakeholders

The lack of support from the administrative stakeholders was viewed as another barrier that hindered the service implementation. Some clinical pharmacists expressed that it was difficult to gain support from them because they have different views on outcome measures and that the evidence on how the paediatric CPS benefits locally were rather limited. The quote below showed an example:

"It is quality versus quantity. A lot of statistics have shown that the focus is on quantity, no measurements on quality based on my understanding. For example, we may have spent 5-6 hours looking in literature to answer a doctor's inquiry, and there is no evaluation on the pharmacist's output." (Pharm 10)

As a consequence, the administrative stakeholders were not committed to reforming the current healthcare structure by investing in CPSs, hence limiting the resources available. A clinical pharmacist attempted to explain the limitation on the resources in CPS, and he pointed out from the stakeholders' perspective that investing in clinical pharmacists might not seem to be as attractive as investing in other healthcare professions in terms of cost-effectiveness:

"Hong Kong is different as there is just a lump sum of money coming in… do you employ doctors, nurses or pharmacists... they have something to juggle with… so even though they can see the contribution of clinical pharmacists, but the value of money is not as great as employing a doctor or a nurse, then they might not use the resources in our profession…" (Pharm 11)

In addition, participants believed that the administrative stakeholders might have different goals and directions when it came to strategic planning in comparison to the clinical pharmacists' ideology, which can be shown from the following quotes:

"…all levels of management, but mainly CPO [Chief Pharmacist's Office] and down to every hospital's local management, and clinical pharmacists' views on service expansion may not be aligned…" (Pharm 10)

"… they [administrative stakeholders] would ask whether we could show the benefit of having pharmacists on wards… and if we have a clinical pharmacist on each ward that would make us having over a hundred pharmacists… they are worried that whether the resources are put into the right place if they put it in CPS… the stakeholders have not yet seen the contribution that clinical pharmacists can give to the patients."(Pharm 11)

As a result of resource limitation with the reasons above, there was a knock-on effect with the service coverage and pharmacist availability. Many clinical pharmacists have commented on the difficulties that they face, which constrained the implementation of the service. For examples:

"… some cases can be handled more in-depth but considering the workload, I may not be able to spend more time studying a particular case. Expectation from the managers means I must review all patients but in some cases where I'm interested in looking into the disease management, I may not be able to do that…" (Pharm 10)

"… for us to achieve a comprehensive service… we would need to increase the coverage of clinical pharmacists… and the resources required would be immense… let say we have to cover 365 days a year, 24-7… yes, that would be hard." (Pharm 12)

The reason for the struggle came from the management allocation of resources between different clinical pharmacy services, as it was pointed out that the paradigm shift of CPS was toward the services that the stakeholders see fit:

"Paediatric only constitutes a minor part of the population, and the pressure always comes from a wider population like geriatrics… the focus is now on ambulatory care in adults, such as replacing or alternating medical appointments between doctors and clinical pharmacists… paediatric service is not in an expanding position…" (Pharm 12)

A participant explained that the current direction of the organisation was to provide pharmacist-led ambulatory care services, thus relieving physicians' workload and reducing the time needed for medical appointments in adults. He further pointed out that since the paediatric specialty as a whole was not under as much pressure in terms of workload in comparison to adult services, paediatricans would only implement services that could improve the quality of patient outcome, rather than relieving their workload. These services are usually higher in cost and the evidence to prove its efficacy will usually be more difficult to demonstrate.

Some participants mentioned that the resource allocation towards paediatric CPS lacked sustainability. They contended that the pharmacy administrative stakeholders have their own focus on certain pharmacy projects each year, and for the past few years the direction of pharmacy service has changed dramatically. They felt that the current emphasis was not on paediatric services, and therefore the implementation of the service seemed to be affected. The struggle in allocating adequate manpower in paediatric CPS can be shown from the statement below:

"In Hong Kong because of the lack of manpower then you have to allocate clinical pharmacist according to the number of patients… so that you need to work where they need you most… so that when the outcome was not as significant, the resources will be restricted as a result." (Pharm 4)

4.3.1.4 Governance of the profession

There were several issues raised in terms of governance that could potentially affect the implementation. Some participants reflected that the service was difficult to implement on the same level amongst hospitals due to a lack of standardisation in practice. This results in stakeholders not being able to understand the role of clinical pharmacists and the value of having CPSs in place. Many participants felt that having protocols or guidelines for CPS practice were essential with the subsequent reasons explained:

"If there is a protocol to follow this would become more systematic… for example for more advanced service such as TDM… I think there are no rigorous guidelines for the entire HA… especially in the area of paediatrics… if we can have an infrastructure with protocols and guidelines in place… I think we are capable of delivering these services…" (Pharm 12)

"… because you are not the only one providing the service, we provide it as a team, and therefore the level of clinical pharmacists needs to be aligned. There should be a standardisation or alignment with the things that we recommend." (Pharm 8)

The inconsistency of in-house training standards was also revealed. Some of the participants felt that the level of training across hospitals were highly variable, and a rigorous, shared training schedule was proposed to keep the training consistent across all institutions. Below are some comments related to this sub-theme:

"… when you first started, young pharmacists would shadow more experienced pharmacists… but often these experienced pharmacists will only offer to teach what they can think of at the time… but as the service starting to become more mature, this method of teaching may not be appropriate." (Pharm 8)

"… I think training… the competencies… whether the clinical pharmacist process the knowledge to provide such service… for example in my hospital, the resident pharmacists are like interns, where they would shadow us for a few months and then they will go onto the wards themselves… but whether they are competent to provide advice or recommendation in these specialties? I think we need to think about this." (Pharm 9)

When asked on why the protocols and guidelines were not in place for standardisation of paediatric CPS, participants have given different reasons. First, there was no professional body in Hong Kong that governs the practice of paediatric clinical pharmacists. Some participants pointed out that having a professional body in place not only can help to provide practice standard guidelines, but also training requirements so that the skills of clinical pharmacists can be kept to a competent level. For example, a participant commented that:

"… we should have something similar to the PGY [residency programme] system in the USA, where it is clearly defined what competencies have to be fulfilled and what to expect when you deliver the service… also similar to the different bandings in NHS in the UK, and this is very well defined…" (Pharm 12)

Second, some clinical pharmacists believed that the professional body could also act as a credentialing organisation to ensure that all paediatric clinical pharmacists maintain current credentials and skills, thus providing an apparent specialist qualification that stakeholders can trust. Views from participants were shown as below:

"…with the competencies and credentialing of the clinical pharmacists… for example in SickKids [The Hospital for Sick Children, Canada], the clinical pharmacists would need some sort of credentialing… whether we are competent to provide these services, they should all be included in the guidelines…" (Pharm 9)

Nevertheless, some participants expressed that standardisation in paediatrics was difficult because disease management in children is not usually guideline-driven due to the limited evidence available. A clinical pharmacist has used parenteral nutrition as an example. He explained that some experts recommended the use of tailor-made parenteral nutrition but there is also evidence of standardised parenteral nutrition emerging. This showed that the lack of alignment did not only appear at the clinical pharmacy professional level but across an array of disciplines within the area of paediatrics.

Several participants highlighted a lack of information and practice sharing between hospitals. They believed that the paucity in inter-hospital sharing not only has a detrimental effect on clinical pharmacists' individual clinical knowledge, but also has a negative impact on the standardisation of clinical pharmacy practice across all sites. These factors can be identified from a statement like this:

"… I have been working in the paediatric service for a few years now but yet I am not sure what other hospitals do, like their practice, or what they do to help doctors and nurses… maybe there should be some opportunities for local training, where we can learn from other hospitals…" (Pharm 2)

"I think there should be more communications between paediatric clinical pharmacists, with a platform where clinical pharmacists can share cases that he or she has handled… if we can share experiences like this I think it can help." (Pharm 8)

4.3.1.5 Collaboration with other organisations

A stronger collaboration with universities was suggested by the clinical pharmacists to enhance the implementation of paediatric CPS in Hong Kong. The benefits of an improved partnership with universities have been described by some clinical pharmacists. Participants encouraged

a closer partnership between the two organisations, as both parties can gain advantages as a result:

"… frontline healthcare professionals need universities to conduct local research to provide evidence-based practice that is most suitable to our population, as we often only have overseas guidelines to follow… vice versa, local universities need frontline healthcare professionals to work together for research purposes within the local population." (Pharm 4)

As for clinical pharmacy in particular, working in collaboration with local universities helps to provide the much needed local evidence that administrative stakeholders seek for, thus presenting a robust indication for how paediatric CPS can benefit within the paediatric population in Hong Kong. Participants believed that the partnership not only provides evidence for stakeholders' consideration for more resources but also aids clinical pharmacists to deliver evidence-based practice. This was explained by a clinical pharmacist below:

"… I think that the research aspect within the clinical pharmacy in Hong Kong is rather weak… this is because I think that there should be a certain level of evidence from research to back up our practice, and we often need to extrapolate the data towards our own population…personnel from universities can help to consolidate, analyse and to publish papers, I think that is possible." (Pharm 3)

Participants scrutinised the current collaboration between public hospitals and universities and pointed out that teaching practitioners in paediatric clinical pharmacy are rather limited in Hong Kong. They believed that the teaching practitioner's role can help to strengthen the working relationship between the two organisations, thus improving the implementation of the service.

When talking about the centralised training, which was collaborated with local universities, there were mixed views associated with it. The general opinion was that the training was well structured, which helped to enhance their knowledge and facilitated their practice; however, some pharmacists thought that the training was too advanced for someone who has just started practicing within the area. For instance:

"In fact, I was one of the first ones to receive the two-week advanced specialty training… at first, from my point of view that I wasn't the best candidate to receive such training because I had very limited knowledge in paediatrics at the time…" (Pharm 7)

Some clinical pharmacists contended that the course provided by a local university did not fit their practice, with some believed that these university-provided courses should be sustained and provided throughout different stages of their professional development. These can be illustrated from the quotes below:

"… I think in terms of general paediatrics it is fine. But in terms of developing the service in further sub-specialties, I don't think it is sufficient… for example, if the service would extend to paediatric psychiatrics, then I don't think it is enough." (Pharm 4)

"… there is no requirement in paediatric CPD [continuous professional development] in place and I think it'd be better to have… such as short courses… as currently we only attend to a course once and there is no continuity." (Pharm 10)

Another issue that was raised with the training provided by universities was that the course was only available to more experienced clinical pharmacists and the quota per intake was limited. Participants felt that the training should start before the service delivery and that the course should be opened to those who were interested in this area. Some of the participants' comments were shown below:

"… at the moment what HA is providing in paediatric CPS is limited by quota… and that they only offer the training to those who have practiced for a certain period of time… and I don't think this is timely enough. I suppose that you have to train that person before you provide that service." (Pharm 5)

"… perhaps the course is more suitable for those who already have experience providing the clinical service or to spread the course a bit may help… I strongly feel that the course would benefit those who are already on the wards the most…" (Pharm 7)

4.3.2 Facilitators

4.3.2.1 Healthcare professionals' trust and confidence in CPS

Several factors were identified which facilitated the implementation of paediatric CPS in Hong Kong. Despite several participants reflected that the service was unfavourable to some physicians and nurses due to reasons such as unfamiliarity of the service scope or the lack of awareness of it, however, participants felt that it was generally well supported by majority of other healthcare professionals. This could be shown from the quotes below:

"… we have all sorts of requests for service extensions, whether they are big ones or small ones… such as clinical, teaching and logistic aspects of our work. I think they have to feel comfortable and have confidence in us to seek our help." (Pharm 11)

"… the pediatricians from all hospitals really treasure the service that clinical pharmacists provide, therefore, I think the support is adequate." (Pharm 12)

Participants have given many examples of situations on how the service has helped the physicians, such as time-saving, and prevention of medication errors; as a result, confidence and trust between physicians and clinical pharmacists were built therein. This can be shown from the comments below:

"One is being the improvement of the medication regimen. We can provide quality assurance as in the medications were screened by a pharmacist… in terms of the dosage, the route and formulation… this helps to reduce medication errors." (Pharm 1)

"… because of the development of the service we often see them [doctors and nurses] directly, and the exchange of information has improved as we often see face-to-face, and therefore we have become the provider of some important information…" (Pharm 3)

As for the nursing profession, participants believed that nurses have confidence in clinical pharmacists' work, as a high reliance on the drug information on reconstitution and administration, training, and guidelines and protocols provided by clinical pharmacists was observed. In addition, participants believed that trust was built from clinical pharmacist acting as a bridge between the ward and the pharmacy, thereby improving the communication between the two departments. This can be demonstrated with the statement below:

"…there are a lot of policies in place with medications… if nurses have to handle this they have got a lot of work to do... but if the clinical pharmacists are familiar with the policy then we can help them to do it… the clinical pharmacist can actively give advice to the nurses on what should be done…" (Pharm 9)

Clinical pharmacists believed that the service has allowed for more direct and coherent communication with other healthcare professionals and this, in turn, has helped to encourage a good rapport. As a result, trust and confidence in the service were developed accordingly. This can be demonstrated from the subsequent quotes:

"… what I can say is that they do appreciate our work collaboration… we can communicate with them. If we recommend any changes they [physicians] will sincerely accept them. In

terms of nurses, there are no issues. They will often approach us and seek for our advice …" (Pharm 1)

"… they [physicians and nurses] are happy when they see a clinical pharmacist. They would often ask us questions relating to drug straight away… they do seek our help when it comes to clinical issues, but of course, there are always some minor stuff such as the logistics of drugs …" (Pharm 8)

4.3.2.2 Support from the pharmacy management team

Another factor that has positively influenced the service implementation from clinical pharmacists' perspective was the support that they gained from the pharmacy management team. In contrast with the administrative stakeholders, clinical pharmacists thought that the support from the pharmacy management was adequate as a whole, whether it was on the organisational level or individual institutional level:

"… the [pharmacy] management team was very supportive such that they have given me a role for me to execute this service, so that I can be devoted to providing the CPS, thus fulfilling the corporate's requirements…." (Pharm 3)

Interestingly, clinical pharmacists' views on the support from the clinical and administrative stakeholders were rather different. Data suggested that the participants felt the clinical stakeholders were positive towards the CPS, thus facilitating its implementation:

"The consultants are very supportive of our work. I am glad that in a way the medical leader of my institution valued us… he would often seek our participation proactively. This, in turn, has led the doctors and nurses to approach us to work together." (Pharm 3)

Participants acknowledged the pharmacy management team's effort in providing different arrays of training to equip them to provide a seamless service. The statements below outlined the training that the clinical pharmacists received and their appreciation towards it:

"… the CPO [Chief Pharmacist's Office] provides many training opportunities… they also worked hard to provide overseas training and also local training, collaborating with local universities… I think they are very supportive in this aspect." (Pharm 8)

"In terms of training, I think it is pretty good. I am talking before the pandemic here, colleagues had the opportunity to receive overseas training… for local training, apart from inter-cluster training where pharmacists can have a better understanding of how other hospitals provide their service, HA [Hospital Authority] would also collaborate with CUHK [the Chinese University of Hong Kong] to provide advanced specialty training course…" (Pharm 2)

4.3.2.3 Clinical pharmacists' self-efficacy

Clinical pharmacists' high self-efficacy was perceived as another factor that enabled successful implementation of the service. Participants believed that their services have improved children's disease management, and that they felt like being part of the multidisciplinary team working towards the common goal. Bargsted, Ramirez-Vielma and Yeves (2019) contended that self-efficacy has an impact on work activity through its association with practical job success, mainly because people with high self-efficacy beliefs face difficulties more effectively and pursue their efforts, increasing their job satisfaction. The following statement shows a participant's belief in her role in helping children's health and her confidence in delivering CPSs:

"… we can help patients in both inpatient and outpatient services… we provided a well-rounded service on wards… in terms of outpatient… although we currently only have asthma clinic, we have directions in helping many other patients, for example, children with eczema, etc…" (Pharm 2)

Some participants reflected confidence in improving parents' and caregivers' knowledge in their children's medications through the implementation of CPS. They alleged that clinical pharmacists could identify some specific medication-related problems as they can bring a different perspective to patient's medicine management. In addition, several participants believed that the implementation of CPS has enhanced the patient-healthcare professional relationship, and this can be seen from the quotes below:

"According to their feedback, they [parents] do appreciate the opportunity to speak with clinical pharmacists. Their feelings were clear and their responses were satisfactory." (Pharm 1)

"The expansion on the scope of general paediatric service has helped lessen the gap between clinical pharmacists and patient's family, resulted in more interactions with doctors, and increased the presence and importance of clinical pharmacists within the team." (Pharm 10)

As a whole, clinical pharmacists had a positive attitude in the implementation of paediatric CPS. They pointed out that the implementation helped to drive the profession forward, and that their knowledge can be fully utilised when providing CPS.

"When we discuss the cases… see how to handle them… finding the evidence together to support… I think the interesting part of the clinical aspects of CPS is that is to learn new things…. And that's why we should do this." (Pharm 8)

Participants' attitudes were affected by multiple factors, such as manpower, training, work relationship, and support. These interlinked factors consequently affected clinical pharmacists' perception towards the implementation as a result, for example, affecting their confidence in providing the service. This could be reflected from some of the statements below:

"… I think firstly it is a personnel issue whether we feel secure to provide the service… apart from the belief in me with my ability I also think about the consequences, this, in turn, derived to another issue of whether I am willing to accept the risk to make judgments and to give advice…" (Pharm 1)

"I think there can be more training provided… it depends on what kind of sub-specialty we want to implement… I think we are capable in terms of common chronic illnesses… but if it is more specialised… such as paediatric psychiatric services… then I think we do not have enough training for this." (Pharm 6)

Some participants identified that clinical pharmacist's self-initiative was a strong driving force in successful implementation of CPS. They believed that in addition to have more clinical pharmacists, it is equally important to be enthusiastic and passionate about the job, and the outcomes could be demonstrated as a consequence.

"… it is important for individuals to have the passion to drive the service forward… because even though there is adequate training, they can only deliver what is best if they have the passion… we should think about new projects to implement to improve patient care every year…" (Pharm 11)

"For me resources mean manpower… but it doesn't only mean how many pharmacists you can put into the service… we need to have the ambition to provide a better service, and then we can build up from there…" (Pharm 3)

4.4 Discussion

Factors that influenced the implementation of paediatric CPSs in Hong Kong were identified in this study using a qualitative research methodology. These included penetration into the system, practice environment constraints, support from the administrative stakeholders and pharmacy management team, governance of the profession, healthcare professionals' trust and confidence, collaboration with other organisations and clinical pharmacists' self-efficacy. Several themes that were identified in this study corresponded with the themes that were identified in the systematic review (Chapter 2), thus indicating that clinical pharmacists in Hong Kong face similar difficulties with other countries in implementing paediatric CPS.

The availability of clinical pharmacists has a major influence on the implementation of paediatric CPSs in Hong Kong. This barrier was found to be related to institutional and organisational levels, with administrative and political factors being the reasons behind the hindrance. Internally, participants believed that the availability of clinical pharmacists to provide clinical service was limited by the operational demand of dispensing work. Externally, the recruitment of clinical pharmacists was limited by the resources available. The Food and Health Bureau of Hong Kong (2019) has estimated that the total health expenditure in Hong Kong amounted to HKD$189,624million in 2019/2020, with annual per capita spending at HKD$25,258, constituting 6.8% of the Gross Domestic Product (GDP). The percentage was low in comparison with countries with well-established CPSs, such as the USA (16.7%), the UK (10.2%), and Australia (9.9%) during the same period of time (WHO, 2021). This could explain why the administrative stakeholders struggle to fund CPS. To overcome this problem, stakeholders must first recognise the importance of this specialised branch of pharmacy within the healthcare system; however, convincing the administrative stakeholders may be challenging, as Onatade et al. (2018) highlighted the paucity of robust research regarding the

impact of CPSs on organisational and patient outcomes, as well as the lack of information to support the most efficient use of available resources. With the scarce support from the administrative stakeholders, the implementation costs for service provision and coverage were found to be a barrier as a result. Indeed, Schoeb (2016) emphasised that staff shortages, workforce issues, and timeliness of services were important factors that limited patients' access to public healthcare in Hong Kong.

Healthcare professionals' attitude was found to be a major factor that influenced the implementation of paediatric CPS in Hong Kong. In general, clinical pharmacists felt that their roles were well received; however, some participants highlighted that other healthcare professionals were not clear on their actual roles, and where they stand within the healthcare infrastructure. De Leon-Castaneda et al. (2019) likewise identified that there was a lack of knowledge of the pharmacist's clinical roles by nurses and physicians, thus reflecting the lack of interprofessional academic training in this aspect. Moreover, it was articulated that some physicians were reluctant to accept the new shared-care model, and this resistance to change became a challenge to implementing paediatric CPS. This is somewhat expected given that Hong Kong's health policy continues to be dominated by the medical profession, reinforcing the traditional notion of professional hierarchy. Schoeb (2016) has underlined that the medical profession in Hong Kong not only acted as a gatekeeper for the allied healthcare professionals but also holds the power over the registration board of other professions. Freidson (1986) contented that physicians exert medicine's control over other healthcare professionals through the hierarchical skills structure; and by occupying the chairmanship of the Pharmacy and Poisons Board of Hong Kong, which is the regulatory body responsible for the registration of pharmacists, clearly establishes the medical authority in Hong Kong's healthcare system. Given the growing interest in a collaborative model of healthcare delivered by the multidisciplinary team, it is crucial to consider how coordinated action is required to foster true

collaboration across influential institutional bodies on the professional, managerial, and governmental levels, influencing the regulatory and economic factors facilitating the phenomenon of multidisciplinary healthcare framework (Bourgeault & Mulvale, 2006).

Clinical pharmacists' self-efficacy was also found to be a factor that affects the implementation of paediatric CPS. Psychological factors, including lack of confidence and fear of risk-taking, were frequently identified as barriers when implementing clinical services, even in countries with more established CPSs, such as Australia, Canada, and the UK (Frankel & Austin, 2013; Zhou et al., 2019). Training was found to be a contributing factor that affects clinical pharmacists' attitude. Participants revealed that the perceptions on the training provided were from both ends of the spectrum – some felt that the centralised training was good; whilst other thought that it was rather unilateral and was unsuitable for pharmacists with lesser experience in this area of practice.

Hong Kong has a statutory body responsible for pharmacist registration, namely, the Pharmacy and Poison Board, but it lacks a professional council, unlike the case for the medical and nursing professions. Nevertheless, a call to enact government policies establishing a pharmacy council dedicated to the continuous quality enhancement of professional practice, with consistent standards as an agenda, is currently in motion. The definition of clinical practice competence and the creation of an infrastructure and frameworks to allow for the development of competence skills across the spectrum of different career stages are important in equipping clinical pharmacists in their delivery of paediatric CPSs in Hong Kong (Forsyth & Rushworth, 2021).

4.5 Strengths and limitations

This is the first qualitative study in Hong Kong that enabled the factors which influenced the implementation of paediatric CPS to be identified, thus providing insightful evidence to promote

the systematic uptake of research findings into routine practice from clinical pharmacists' perspectives. Moreover, a robust methodology was used by reporting using the COREQ checklist so that the credibility and conformability of this research could be ensured.

This study has some limitations. First, recruiting participant from all hospitals with paediatric or neonatal units would be more desirable; however, with limited resources and the difficulty in nominating PIs for each study site, this study involved only four hospitals across all fourteen institutions with paediatric services within HA. Nevertheless, the studied sites covered a wide range of services, including general paediatric and intensive care units, in addition to a tertiary centre, thus enriched data could still be collected from the diverse experience from the clinical pharmacist participants. Second, with all the participants chosen to be interviewed via telephone, the possibility of a loss of nonverbal or contextual data cannot be excluded. In addition, socially desirable responses are possible as the interviews were related to their own services. Interpersonal reflexivity was ensured by paying close attention to any issues that may arise in order to overcome this (Chapter 3.5). Lastly, this study focused on the public services, the implementation of paediatric CPS in the private sector is not known.

4.6 Conclusion

The clinical pharmacists interviewed in this study reported that the successful implementation of paediatric CPSs in public hospitals in Hong Kong in an area of continued development with several key barriers. The major implementation barriers identified included the availability and coverage of clinical pharmacists for service provision. Nevertheless, clinical pharmacists and other healthcare professionals were found to have not only positive attitudes towards CPSs but also support from clinical and pharmacy management teams. An enhanced internal and external governance infrastructure within the pharmacy profession would allow for the

standardisation of practice and training, which would ultimately help drive the implementation of paediatric CPSs forward as a whole.

As explained in the introduction and background (Chapter 1), in addition to clinical pharmacists' views, healthcare professionals' perceptions toward CPS could influence its implementation (Al-Arifi et al., 2015). The focus of the next Chapter was on physicians' and nurses' perceptions of the implementation of paediatric CPSs, given that they are the frontline healthcare providers who have close interactions with clinical pharmacists, and their acceptance of the service therefore critically affects its operation.

Chapter 5. STUDY 2 – PHYSICIANS AND NURSES

5.1 Aim

This study aimed to identify the facilitators and barriers that have influenced the implementation of hospital paediatric CPSs in Hong Kong from the perspectives of physicians and nurses who practiced in this area.

5.2 Methods

The general methods were described in detail in Chapter 3.

5.2.1 Participants and recruitment

As described in the general methods section, we aimed to recruit 10-15 physicians and nurses. Potential participants included over 200 medical and nursing staff who were working within the field of paediatrics, and based in the four (out of five) participating public hospitals situated in the east and central areas of Kowloon in Hong Kong. These included the Hong Kong Children's Hospital, Kwong Wah Hospital, Tseung Kwan O Hospital, and United Christian Hospital. The heads of Paediatric and Adolescent Medicine at Queen Elizabeth Hospital did not specify the reason for non-participation.

Once the approvals from the heads of department were received, invitation emails were sent to each group of healthcare professionals within the group directory via the internal emailing system with an information sheet and a consent form (Appendix VI and VII). A reminder email was sent to the same groups one month after the initial invitation emails were delivered. Signed consent forms were received either electronically or in hard copies prior to the interviews.

As explained in Chapter 3, maximum variation sampling was used for participant selection. In order to capture the widest range of perspectives possible, participants were selected based on variations in hospital, profession, and years of work experience in paediatrics. We aimed to recruit similar number of participants between the two professions, with selection of participants from different sites as the priority. Selecting participants from as many different subspecialties and wide range of years of experience in paediatrics for as far as possible were also considered in order to maximise the variation between participants.

5.2.2 Inclusion criteria

Eligibility criteria included physicians and nurses who were currently working within the field of paediatrics in the four participating public hospitals. They must be able to give consent to participate before the interviews.

5.3 Results

A total of 25 paediatric physicians and nurses across four study sites agreed to participate in the study and 17 were interviewed by telephone which allowed reaching thematic data saturation. This included seven physicians and ten nurses. The eight invitees who were not interviewed include one physician and seven nurses. The reason for not interviewing them was because thematic data saturation was reached before selecting participants who shared similar demographic details as those who have already been interviewed, such as working at the same study site within the same specialty with similar years of experience. The durations of the interviews were between 11 to 29 minutes. Table 8 shows the demographic details of the medical and nursing participants.

Key	Study site	Gender	Age in years	Years of experience in paediatrics	Subspecialty
Physician 1	Hospital C	M	40-50	>10	Oncology and haematology
Physician 2	Hospital C	M	>50	>10	PICU
Physician 3	Hospital B	M	40-50	>10	Oncology and haematology
Physician 4	Hospital C	M	30-40	5-10	Gastroenterology
Physician 5	Hospital A	M	40-50	>10	General paediatrics
Physician 6	Hospital A	M	30-40	5-10	General paediatrics
Physician 7	Hospital A	F	30-40	5-10	NICU
Nurse 1	Hospital A	F	30-40	5-10	General paediatrics
Nurse 2	Hospital C	F	40-50	>10	Oncology and haematology
Nurse 3	Hospital D	F	20-30	<5	General paediatrics
Nurse 4	Hospital D	F	30-40	5-10	General paediatrics
Nurse 5	Hospital B	F	20-30	<5	General paediatrics
Nurse 6	Hospital A	F	40-50	>10	General paediatrics
Nurse 7	Hospital D	F	30-40	5-10	General paediatrics
Nurse 8	Hospital A	F	>50	>10	PICU
Nurse 9	Hospital A	F	20-30	5-10	NICU
Nurse 10	Hospital A	F	40-50	>10	NICU

Table 8. Characteristics of medical and nursing participants in the study.

There were seven barriers and six facilitators that were identified and categorised as subthemes, and the quotes linked to each category were attributed to the relevant anonymised interview participant. These themes and subthemes are outlined in Table 9.

Barriers	Facilitators

• Related to external bodies including the public and government
  ○ Public understanding and recognition of clinical pharmacists
  ○ A culture of medical dominance
• Related to the organisation and institutions
  ○ Lack of resources and heavy workload including clinical and dispensing duties
  ○ The need for a more transparent and defined role of clinical pharmacists at institutional level
• Related to clinical pharmacists
  ○ The need to have a more proactive approach
  ○ Lack of involvement in direct patient care activities
	• Related to the patients
	  ○ Improvement of patient outcomes
	  ○ Improvement of the overall pharmaceutical service efficiency
	• Related to the healthcare team
	  ○ Trust and confidence in the CPS
	  ○ Filling the clinical gap as a medicine information provider
	  ○ Direct and coherent communication as a multidisciplinary team member

Table 9. Summary of themes and subthemes identified from medical and nursing participants.

5.3.1 Barriers

5.3.1.1 Public understanding and recognition of clinical pharmacists

A lack of understanding of the role of a clinical pharmacist from the public was perceived as a barrier that hindered service implementation. Some participants commented that the general population in Hong Kong was not clear on what clinical pharmacists do, and where they stand within the healthcare system, as mostly portrayed pharmacists with medicine supply role only:

"I think for the general population, clinical pharmacist's role isn't clear… they might not aware how many things that clinical pharmacists can do… they only know that they know about medicines very well… I cannot deny that some citizens might think what pharmacists do is dispensing…" (Nurse 6)

A nurse participant felt that as the result of not understanding clinical pharmacist's role, trust between public and clinical pharmacists was not well developed, and therefore this negatively moderate the effects of CPS implementation:

"For a civilian who doesn't have any medical background… they can trust themselves by going to the pharmacy to pick up some drugs… but when they are told that a clinical pharmacist can prescribe you with medications, they somehow hesitate…" (Nurse 2)

Some participants identified a causality dilemma between the recognition of clinical pharmacist and professional autonomy. They contended that the status of clinical pharmacists as a healthcare professional was negatively affected due to lack of legislations to support their clinical practice, such as prescribing rights. However, some participants suggested that the public has to know and understand the importance of clinical pharmacists before the enactment of related legislations. This can be reflected in one of the medical participant's comments below:

"I think the public or the community needs to be aware of this [CPS] and to accept this. They need to know that the benefits would bring with clinical pharmacists' involvement… and from that, we can perhaps explore the opportunity on the legislation level." (Physician 4)

5.3.1.2 A culture of medical dominance

Medical dominance was perceived to be a barrier that hindered the implementation of CPS. Many participants have alleged that the reasons for medical dominance were due to the culture, where traditional values were embedded:

"First, this is to do with how the public sees clinical pharmacists… this is what has history left us with… because traditionally, doctors were responsible for all the patient care…" (Nurse 2)

"… another reason was perhaps to do with the traditional perception… it isn't a pharmacist's job to make dosage adjustments… to have the autonomy to make such a decision… so that's why this has not been executed." (Physician 6)

Interestingly, medical and nursing participants gave different reasons for their opinions on the resistance to change in this medical dominance culture. Some physicians believed that the barrier was underpinned by cultural aspects that disfavours the enactment of supportive legislation to give greater autonomy to pharmacists in medicines management:

"Regulatory-wise I don't think clinical pharmacists are authorised to prescribe drugs… but I think so far this is how the culture is…" (Physician 3)

Apart from the culture, participants further annotated that this resistance was also related to the public viewpoint, which was interlinked with the public's understanding of the role of the clinical pharmacist:

"… because of the culture in Hong Kong and how we practice medicine… it might take time to have parents' acceptance [to CPS]…" (Physician 5)

"I am not sure if it is to do with the culture here? But I think legal-wise this [CPS] is not supported. I feel that in Hong Kong, people believed that everything has to be decided or confirmed by the doctors…" (Physician 4)

Some nursing participants concurred with physicians that the difficulty of the implementation lied on the autonomy within the healthcare system:

"I think this is because clinical pharmacists do not have the authority to do so… no one has granted clinical pharmacists the power to do these things… I feel that they have the professional knowledge to do so." (Nurse 2)

Different from the medical participants, some nurses have revealed that physicians might have some resistance toward CPSs, explaining that they might have a perception that the medical profession has a leading role within the healthcare team. Others have highlighted that some physicians might be threatened by the increasing power of clinical pharmacists. The following quotes could illustrate this thought:

"… some doctors might want to stay the current way… they would only want clinical pharmacists to check their orders because it is their prescription and their patients, as they might think that other healthcare professionals only execute their orders…" (Nurse 10)

"I think there is some resistance from the doctors as well… it's like that you have taken their jobs… I feel that as a whole picture doctors would think that patient management is their job, and they should be managing the whole care… why should clinical pharmacists take parts of their clinical roles away?" (Nurse 2)

One nursing participant observed that locally trained physicians seemed to be more resistant to the change of the healthcare model with the implementation of CPS, as the lack of exposure to advanced CPSs and the relatively short time to develop working relationship often made them uncomfortable with the change and hence became more reluctant as a consequence:

"This is because the current system in Hong Kong doesn't work like that… if the doctor received this training aboard, then I think the service will be more acceptable. But when the doctor was raised and educated in Hong Kong, they might not be used to the new model… they might need time to understand and to adapt…" (Nurse 6)

5.3.1.3 Lack of resources and heavy workload including clinical and dispensing duties

In general, both physicians and nurses were satisfied with the services which clinical pharmacists have provided; however, they believed that the current manpower of CPSs has already stretched to its limit. This could be shown from the quote below:

"I think clinical pharmacists' workload is heavy… from what I can see is that their availabilities are just adequate… I feel that if resources allow if they can increase their availabilities by 20-30%... I think that would be better." (Physician 4)

One of the reasons was that the patient-to-clinical pharmacist ratio was high, as expressed by some of the medical participants:

"… at the moment we are serving a large population… so this made it difficult to execute any services because of the time constrain." (Physician 6)

"I feel that they [clinical pharmacists] are busy and we have a huge patient load… I believe the problem lies with the workload as we really have many patients…" (Physician 7)

As a result of limited manpower, clinical pharmacists often had to cover more than one ward, thus limiting implementation of clinical activities:

"Clinical pharmacists have different wards to visit… and therefore they physically cannot join the multidisciplinary rounds… because the rounds were in the morning, during the busy period I would say." (Nurse 8)

Some nurses observed that the time which clinical pharmacists spent on their clinical duties on ward were constrained by other pharmaceutical roles, such as dispensing duties:

"… I only see them during the morning sessions; they would only participate in the morning medical rounds… if they can participate in the afternoon medical rounds that would be great." (Nurse 4)

"I think that they have more duties to do… as after medical rounds they would need to head back to the pharmacy to perform their operational duties… I'm not entirely sure what they do, but I know for a fact that they don't just provide the clinical service on ward…" (Nurse 2)

One participant suggested that there should be protected time for clinical pharmacists, separating the clinical and dispensing roles, so that they can focus on their clinical activities:

"…whether to separate the roles or to have protected time? So that they can have more time to perform their clinical tasks and administrative work." (Physician 1)

As a consequence of limited resources, some participants were unsure on whether clinical pharmacists can deliver more advanced services, as they were concerned about whether there are sufficient pharmacists available for the implementation:

"Whether we can do the same [advanced CPS]… if we were to follow other countries, they would spend 10-15 minutes per patient, I think it is very difficult." (Nurse 6)

"I once went to training in Cambridge… they have a very experienced clinical pharmacist responsible to all premmies' [preterm neonates] TPNs… I was very impressed with that. I think it is achievable in Hong Kong, but the main issue is manpower…" (Physician 7)

5.3.1.4 The need for a more transparent and defined role of clinical pharmacists at institutional level

Both medical and nursing participants could outline the roles of clinical pharmacists as described in HA's standard of practice, which included direct patient care activities, support collaboration with other healthcare professionals, enhance medication management systems and medication safety. However, the participants found it difficult to elaborate further to describe what clinical pharmacists do in practice to serve the aforementioned functions. There were some comments which showed that some participants were not clear on the responsibilities that clinical pharmacists held:

"I do not understand their [clinical pharmacists] roles that much…" (Nurse 2)

"…it's often that they provide the routine work like reviewing the medication charts… but I don't think there are a lot of problems… and the pharmacists can verify the order in the pharmacy on their screen… therefore what are they doing on the ward?" (Nurse 3)

Some participants expressed that before practicing in paediatrics they were unware of clinical pharmacists because CPSs were not implemented on all wards across hospitals. They pointed out that they started to understand more about the service from the build-up of work relationship with clinical pharmacists:

"I wasn't sure actually [on the role of clinical pharmacist]… because before this [paediatric service] I was working on adult's surgical ward, and they didn't have this service [CPS]…" (Nurse 9)

"… I think what I didn't notice before was that they [clinical pharmacists] have a lot of input at the back to help with patient care…" (Nurse 7)

The lack of a transparent role of clinical pharmacists at institution level has made some healthcare professionals uncertain about CPSs, thus affecting the penetration of CPSs into Hong Kong's public healthcare system. For instance, a physician pinpointed his concern on how the implementation of advanced services in CPS could affect paediatric patients, even though other pharmacist-led clinical services have demonstrated positive results:

"I am aware that there are other [pharmacist-led] clinics that handle drug-related problems as such... I know it is showing an effect but how this can be implemented in paediatrics… how these can be set up… we need to understand more to make this happen." (Physician 5)

Participants expressed that the HA and its hospitals should take a leading role in informing physicians and nurses on the role of clinical pharmacists in order for the service to be implemented successfully. Some participants suggested that the promulgation should be initiated by public hospitals or healthcare professional bodies:

"I think a good point of the introduction would be at public hospitals… I am not sure if there are any societies that can help, such as pharmaceutical society and so on…" (Physician 4)

"… if there is a clearer role of clinical pharmacists… perhaps if there is a pharmacist party… I think this is what they should do in the future." (Nurse 8)

5.3.1.5 The need to have a more proactive approach

When asked participants about whether clinical pharmacists' attitudes could influence the implementation of CPS in paediatrics, a range of feedback was received. In general, participants stated that clinical pharmacists were willing to deliver the clinical services assigned to them, but were faced with limitation in resources. This can be reflected by one of the physicians' comments below:

"… if we have to always ask clinical pharmacists to do these tasks as extra work I don't think this is ideal…" (Physician 1)

Although the implementation of paediatric CPSs was supported by the recognition of clinical pharmacists' work from both medical and participants, however, some participants felt that the implementation can be more successful if clinical pharmacists are more proactive:

"I do feel that they should have more authority in the medications used… to have more decision making, letting us know how to use drugs properly… rather than a more passive role as currently, they would need to approach use on dosage adjustments…" (Physician 4)

Physicians and nurses also wish clinical pharmacist to take up a more proactive role in other areas of their clinical services, which include participation of multidisciplinary meetings and provision of teaching sessions for staff:

"… I do feel that clinical pharmacists do possess a high level of drug knowledge… I hope that they can participate more in some joint meetings, educational teachings or talks… yes, these are what I hope to see clinical pharmacists to deliver" (Physician 4)

"We do invite clinical pharmacists to provide educational talks to nurses but a session that only last for an hour and a half wasn't enough, as the nurses might not be able to take the information in." (Nurse 2)

Drug counselling service was viewed as one of the most important clinical services that clinical pharmacists provide, but it was found that clinical pharmacists would only counsel the patients and their parents when medical or nursing staff referred the cases to them. Many participants expressed that the ideal situation would be the service being initiated by the clinical pharmacists:

"…perhaps they [clinical pharmacists] can approach them [patients and parents] directly to see if they have any problems with any medicines… so that we don't necessarily need us to refer to them… this is because we can be quite busy sometimes and we might not aware that some parents might have questions to ask…" (Nurse 5)

"We would request them… yes, we would ask them when we feel that there's a need… I think it would be better if they can speak with the parents more… if they can provide this they can really relieve our workload and also improve the service…" (Nurse 3)

5.3.1.6 Lack of involvement in direct patient care activities

Participants reflected that direct patient care activities, such as providing drug counselling, were an important aspect of the CPS. Physicians believed that through drug counselling by clinical pharmacists, parents have got a better understanding of the medicines used for their children as a result. This can be reflected in the comments below:

"I think the first thing is that for the patients they would understand more on what drugs they are using… and from the counselling they understood more on how to use the drugs and any special things that they need to be aware of…" (Physician 6)

"… we would speak with the parents before the initiation of drug treatment… however, given our limited time and knowledge, the counselling provided by clinical pharmacists can help to provide the much-needed information… it's an added value." (Physician 7)

Some participants believed that the implementation of paediatric CPS was influenced by the observation that clinical pharmacist's input has improved medication compliance:

"…let's say we talk about a special drug that has distinctive adverse effects, for examples, antineoleptic agents, target therapy, and so on… we strongly feel that with the help of clinical pharmacists, the choice of therapy, and the compliance of the drugs, etc… have been improved." (Physician 5)

However, many participants expressed that the involvement of clinical pharmacists in direct patient care activities was not as much as they anticipated, and they believed that clinical pharmacists can contribute more in this area:

"…I thought that clinical pharmacists would involve more in direct patient care… to provide education, etc… but somehow the responsibility has shifted to nurses…" (Nurse 2)

"I have had some cases where they [clinical pharmacists] would provide drug education to the parents… but it's not often… but they would do it sometimes… it's good because they are the expert on drugs…I would think it is better if they can speak with the parents more." (Nurse 3)

The general perception was that clinical pharmacists are in a better position to provide drug information to the parents, as they were viewed as expertise in medicines:

"… with patient education… if they can provide this they can really relieve our workload and also improve the service due to their expertise…" (Nurse 3)

"… we refer them to parents to provide explanations on drugs… in particular providing answers to more in-depth questions… they provide more detailed information to the family members… so that the family members are more confident this way…" (Nurse 10)

Some participants expressed that the implementation of direct patient care services should not be provided only during hospitalisation, but should extend to after patients' hospital discharge so that there is a continuity of care by clinical pharmacist. They believed that CPS can be implemented more successfully should clinical pharmacists' involvement be enhanced in this area:

"I feel it is important to monitor them [the patients] once they are discharged… for examples, checking on their compliance or specific medication those who need regular injections… whether they have any questions to ask…" (Physician 6)

A nurse participant suggested some follow-up appointments should be initiated by clinical pharmacists to review patients' drug use. In addition, she stressed the importance to have a point-of-contact whom parents can refer to should they have any questions to ask once their children are discharged. This is because expertise in this area is lacking at the moment:

'When they are discharged, clinical pharmacists would go through the use of drugs to the parents… I think it would be ideal if they can follow-up on how they are taking the medications after their discharge, to see how they are getting on with the medicines, and to

see if they have any questions… or in the future, there might be a follow-up in outpatient settings when they can come back to discuss issues concerning their medications? Just like that, they will come back to see a physiotherapist… a service like that." (Nurse 8)

5.3.2 Facilitators

5.3.2.1 Improvement of patient outcomes

Participants reflected that the involvement of clinical pharmacists performing their duties has improved patient outcomes and that the successful experience in the implementation of current CPS has become a facilitator for further service implementation:

"… during the process we work together to identify if there are any things that we need to look out for in terms of drugs for particular patients…they would identify drug-related issues and this has improved the clinical service for the patients as a result... from medication counselling they [the parents] understood more on how to use the drugs and things that they need to be aware of… I think there are benefits [to patients] in terms of taking drugs and the education towards the drug." (Physician 6)

Participants believed that clinical pharmacists have provided benefits to patients by making recommendations on the appropriateness of medications prescribed, and suggesting dosage adjustments when clinically indicated. In addition, the expectation of CPS to help patients and their parents to understand more about their medications, which in turn improving their adherence or concordance, was also perceived to facilitate implementation:

"… they [parents] might ask the side effects or storage conditions of these medicines… or how to take them… clinical pharmacists have a role to help these parents in managing their children's medications…" (Nurse 5)

Medication safety was also viewed as an important aspect of clinical pharmacists' activity that helped to improve patient outcomes. It has been commented by participants that clinical pharmacists have helped to improve the safety on the use of medicines in children, which was perceived to pose a high risk of error:

"… there's always involvement in calculations when prescribing drugs for children… there is more variation in dosages… and therefore they [clinical pharmacists] are very important." (Nurse 5)

"I think the medication safety aspect has changed a lot. The counter checking and to provide advice on drugs… I think these are very valuable." (Physician 7)

An array of activities to enhance medication safety that were performed by clinical pharmacists was described by the participants. These included reviewing medication orders, designing electronic chemotherapy forms, and providing supervision on medicine storage and transportation.

5.3.2.2 Improvement of the overall pharmaceutical service efficiency

Another factor that influenced the service implementation was the perception that clinical pharmacists could improve not only the clinical service, but also the efficiency of other pharmaceutical activities. Both medical and nursing participants believed that clinical pharmacists have helped to facilitate the service as a whole, making the overall pharmaceutical service more efficient, because they can interact directly with a representative of the pharmacy department:

"… because we focus on different aspects of things, and so if I can obtain an answer directly from the clinical pharmacists, it can be delivered to the patients straight away…" (Physician 4)

Participants have remarked that one of the roles of clinical pharmacists was to act as a liaison to communicate with the pharmacy department, thus facilitating the dispensing and supply process and also saving their time and effort:

"They [clinical pharmacists] would help to liaise with inpatient to ensure that the logistics of some drugs that require special care would arrive on the ward on time and in appropriate storage condition…" (Nurse 7)

Furthermore, with the clinical pharmacists being based on the wards, they possess a more direct and thorough picture of patient's clinical needs, which supported prompt implementation of any queries or drug-related issues:

"They [clinical pharmacists] are also more familiar with our patients, this, in turn, helps them to answer our drug enquiries more quickly… and also when they have identified any drug-related issues, we can discuss it straight away…" (Nurse 7)

5.3.2.3 Trust and confidence in the CPS

In contrast to clinical pharmacist participants in Chapter 4, the trust and confidence in CPS as showed by physicians and nurses were more apparent than clinical pharmacists' perceived, with extensive comments approving clinical pharmacists' work. This can be shown by comment such as this:

"I do have trust in clinical pharmacists, they have great knowledge in paediatrics… and therefore I feel good because they are familiar with the cases and can answer queries that we have." (Nurse 4)

Physicians and nurses entrusted clinical pharmacists as they believed that clinical pharmacists possessed highly specialised skills and knowledge, which helped them to provide optimal patient-care management:

"I think they use their expert knowledge as pharmacist… I think that the knowledge that clinical pharmacists possess is quite different to that of doctors." (Physician 4)

"For the past three years after we have been working with the clinical pharmacists, we are convinced that it is necessary to have this service in place… I think we feel more confident in the improvement in medication safety…" (Physician 2)

With healthcare professionals trusting clinical pharmacists, their confidence in the CPS was demonstrated as a result. It was revealed that some participants were confident that clinical pharmacists in Hong Kong could provide advanced services similar to that of other countries with more developed CPSs such as the USA or the UK. Advanced service examples that were discussed include parenteral nutrition prescribing, dosage adjustments, laboratory test ordering, and so on. The confidence can be shown from a physician's quote below:

"I feel comfortable for them to do that [advanced CPS]… I think it would improve the service as a whole as well… from my experience with the clinical pharmacists whom I work with, their knowledge in medicines is greater than some of our doctors, like residents [junior doctors]…" (Physician 7)

However, not all participants showed the same level of confidence. Some participants contended that there is a need for evidence of the benefits, and that trials of pilot projects of advanced services should be conducted to confirm the benefits of CPS before the implementation:

"I think the HA [Hospital Authority] is a large organisation… I think if we start with some pilot projects… and if they are successful with positive outcomes… then we can promulgate this." (Physician 2)

Furthermore, some participants pointed out that spending time with parents and supplying detailed information enable the build-up of trust between the two parties and this supports implementation:

"… when parents know that it is the clinical pharmacist who provides the counselling, they will often pay more attention to it and the information is more in-depth." (Nurse 4)

5.3.2.4 Filling the clinical gap as a medicine information provider

In general, both physicians and nurses have showed appreciation to have clinical pharmacists providing them with medicines information that facilitated their clinical practice. Filling of the service needed was perceived to be a facilitator:

"I think that clinical pharmacists are a very professional group who offered their expert service in allied health… I think that they have helped to fulfil the gap in the clinical needs that the doctors were lacking..." (Physician 5)

"…there would be some reminder to us on some drugs that require special care…for example, clinical pharmacists would check on IV compatibilities, to see if some drugs can be

given together… they would provide us with drug information whenever we have any questions, and they are always willing to answer." (Nurse 5)

Information provided that was reported frequently by the medical participants to support CPS implementation was the review of medicine regimens appropriateness, which include the choice, the dosage, and the duration of the treatment. Other activities such as education in the pharmacology of drugs, performing literature search, procurement and logistics of drugs, and drug counselling to parents were also highlighted as important services that received support.

The implementation of CPS was further enabled by the appreciation showed by most of the nursing participants, as some believed that the provision of practical information such as drug formulation and administration methods has enhanced the safety of their nursing practice. In addition, some nurses also supported CPS implementation because they felt that the medication counselling service provided by clinical pharmacists was much better in terms of quality:

" As we are not the expert in medicines, they [clinical pharmacists] helped us to ensure that what we are administering is correct." (Nurse 2)

"What we provide in drug counselling is very limited because we can only tell them what we know which is quite basic… I think clinical pharmacist's expert knowledge is way better than nurses…" (Nurse 3)

Providing drug counselling to patients and their parents was viewed to be the main activity that has helped both disciplines to relieve their workload, which is another factor to enable service implementation:

"… with patient education… if they can provide this they can really relieve our workload and also improve the service due to their expertise." (Nurse 3)

Medicines reconciliation was another service provided by clinical pharmacists that participants believed could relieve their tasks in hand, in particular, the nursing staff:

"Sometimes we can be very busy. When we have new cases admitted they might be on some medications already… we might not have time to go through their medication history against what the doctors have prescribed… clinical pharmacists could help to identify these problems…" (Nurse 5)

5.3.2.5 Direct and coherent communication as a multidisciplinary team member

Another factor that facilitated the implementation, as reported by the healthcare professionals was the direct (e.g. face-to-face) and coherent (e.g. logical and consistent) communication with clinical pharmacists facilitated by the physical presence of clinical pharmacists on the ward. Physicians valued the participation of clinical pharmacists in medical rounds, where they can have ad hoc discussions on medicine management with clinical pharmacists:

"… we work closely with clinical pharmacists… they would participate in the medical rounds together… this, in turn, would make the interactions more direct… whether they are communicating with us, or speaking with the parents… we can solve the problems immediately." (Physician 5)

According to the participants, good communication between physicians and clinical pharmacists with well-established and defined guidelines and protocols was essential to implement more extensive CPSs with greater autonomy. For examples, some participants expressed that:

"…what is important is that we have the adequate communication… that they will inform us on what has been amended [on dosage adjustment]… I think that is the most important thing." (Physician 3)

"I think we can definitely talk about this [advanced CPS]… but prior to this we would need to have consensus… if there is a protocol, with close communication with clinicians… I feel that our clinical pharmacists can provide these services…" (Physician 6)

Physicians believed that direct communication has formed a good working relationship between healthcare professionals in which they can learn and support each other. This has in turn improved the care of patients as a consequence:

"… previously we would need to contact the pharmacy department, which we can get an answer, but we do not know who's on duty and whom we were speaking to… but now we know which clinical pharmacist is following the cases, and this has increased the level of communication… this is more direct." (Physician 1)

"… now it's great that clinical pharmacists would join us in the meetings so that we can learn on the use of new drugs and developing our skills together… we give motivation to each other." (Physician 1)

The value of having direct communication with the clinical pharmacists was recognised by the nursing staff as well, as some pointed out that this has made the process more efficient, thus benefiting the patients:

"Before having clinical pharmacists, we would need to call the pharmacy if we have any questions, but the pharmacists might not be able to answer so directly… but now, we can just contact whoever is on duty, and they could help me straight away." (Nurse 6)

The direct and coherent communication has led participants to believe that clinical pharmacists became part of their clinical team, thus facilitating the service implementation. They believed that the collaboration between healthcare professionals has built up with time:

"I am saying this because maybe ten years ago? We do not have a direct source of communication, and the involvement of clinical pharmacists was not as much… for the past few years, whether it was to do with problems on the ward, or in terms of helping doctors and nurses in terms of the clinical aspects of drugs… they would also deliver talks in respect to some drugs… I feel that our work relations are very close." (Physician 6)

"… the working relationship has been improving gradually, with working together as a common goal… so I can say that we are working as a team." (Physician 2)

The close working relationship was demonstrated by both the medical and nursing professions, as it could be shown by the following quotes:

"I think there are more multidisciplinary discussions. For example, if there is a drug regimen that I am not familiar with, I feel that there is a source of support…this has given me more confidence when it comes to regimens or drugs that I don't come across often…" (Physician 7)

"… now it feels that they [clinical pharmacists] are part of the clinical team, as now they are more involved in medicine management where they will give suggestions to the use of drugs, the dosages and the indications… the role of clinical pharmacists has extended from pharmacy to the wards…" (Nurse 8)

It was also highlighted that the collaboration between clinical pharmacists and other healthcare professionals has also given them support psychologically:

"… now it's great that clinical pharmacists would join us in the meetings so that we can learn on the use of new drugs and developing our skills together… we give motivation to each other." (Physician 1)

5.4 Discussion

The themes that were identified on the implementation of paediatric CPS in Hong Kong from physicians' and nurses' perspectives were coherent with the main themes that were identified from Chapter 2 (Sin et al., 2022).

The perception of how clinical pharmacists can help to improve patient outcomes was viewed as a strong factor that facilitated the implementation of CPS. As a whole, both medical and nursing professionals concurred that clinical pharmacists have improved patient outcomes by providing an array of activities in medicines management, such as answering medicine information enquiries, providing medication counselling, and giving advice on the appropriateness of medications. Indeed, optimising medication therapy has always been at the heart of clinical pharmacy, as this was endorsed and set within clinical pharmacy practice guidelines as one of the core elements, such as the guidelines published by the American Society of Health-system Pharmacists (2013). The participants' views were concordant with evidence across the literature to show the improvement of patient outcomes with the involvement of clinical pharmacists in medicines management, whether it is quantitative (Scullin et al., 2011; Umar, Apikoglu-Rabus & Yumuk, 2020) or qualitative (Vinterflod et al., 2018). However, it is worth to note that reviews found published studies to measure outcomes of CPSs in hospitals suffer from poor research design and inconsistencies in interventions, measurements and outcomes, and therefore careful interpretation of these results is needed (Onatade et al., 2018).

Improving medication safety was viewed by participants as another CPS activity that helped to improve patient outcomes. The UK Department of Health has recognised that the paediatric population is a challenging group of patients as regards to medication safety (Wong, Wong & Cranswick, 2009). Studies have shown that children are particularly susceptible to medication-related errors due to the lack of appropriate formulations for children, communication problems between healthcare professionals, errors in dosage calculations, and inadequate clinical practice (Wong, Wong & Cranswick, 2009; Kahn & Abramson, 2018). Although the dataset has revealed that participants recognised how the CPS has enhanced medication safety in children through activities as reported by Schepel et al. (2019), which included developing instructions for medication use, creating and updating medication safety plans, using medication error reports in development the process of medication use safer, and participation in continuation education; however, conducting medication reconciliations, which was an important activity as reported by Schepel et al., was rarely mentioned by participants. In addition, some participants expressed their desire for clinical pharmacists to hold more structured, regular educational programmes to enhance medication safety awareness.

The improvement on the efficiency of the overall pharmaceutical service has been identified as a facilitator from the participants' perspectives as well. As pointed out by Rattanachotphanit et al. (2008), the efficiency of pharmacy services could be measured in terms of technical efficiency with parameters including the drug dispensing process, drug purchasing and inventory control, and patient-oriented services. According to the participants, all three aspects of pharmacy services have been improved as a result of CPS implementation. Participants explained that the drug procurement and dispensing process were much smoother and faster as clinical pharmacists served as a point-of-contact, which means more direct communication could be made. Furthermore, the avoidance of making telephone conversations, in conjunction with clinical pharmacists acting as a bridge communicating

between departments, has helped to mitigate any conflicts or errors that arose before the implementation of CPS. Physicians and nurses, especially in highly specialised areas, such as haematology and oncology, have expressed the importance of clinical pharmacists in the procurement process for off-label drugs that were not readily available in Hong Kong, thus facilitating the treatment process of children.

If the wider healthcare team had trust and confidence in the CPS this supported implementation of paediatric CPSs. As a whole, participants have showed trust in clinical pharmacists, as they believed that the expert knowledge that clinical pharmacists possess has helped to facilitate the health service. Certainly, a high degree of trust from physicians and nurses in CPS enables its successful implementation, as demonstrated by international studies (Omar et al., 2020; Shanika et al., 2017). Researchers have found that cultural and procedural factors may have an impact on the trust interprofessionally, thus affecting the collaboration between healthcare professionals and the outcome of medication management as a consequence (Chen & Neto, 2007). Our results have demonstrated that both the medical and nursing professions displayed a certain degree of trust in clinical pharmacists' work, and this was a result of the experience that they had with the paediatric CPS. In addition, some participants showed their confidence in the service and supported the implementation of more advanced services, such as collaborative practice agreements, parenteral nutrition prescribing, and drug therapeutic monitoring; however, the views were variable. The resistance in the implementation of services with more responsibility in decision-making was found to be interlinked with barriers that related to the public and the government, as well as within the organisation itself, which will be discussed in Chapter 6 related to parents', caregivers', and former patients' viewpoint. Nevertheless, our data has found that most physician and nurse participants were satisfied with the current CPS in place, especially in providing medicines information to healthcare professionals. During the interviews, it was clear that both disciplines

supported the implementation of CPSs in that they showed appreciation towards clinical pharmacists' role in providing medicines information. Indeed, studies have shown that clinical recommendations made to healthcare professionals by medicines information services had a significant impact on patient care, outcomes, or medication safety (Innes, Bramley & Wills, 2014). Since there are no established medicines information centres in Hong Kong, the gap has been filled by paediatric clinical pharmacists as a result.

A predominant factor that has enabled a successful implementation was clinical pharmacists' provision of direct and coherent communication with other healthcare professionals and their involvement in the multidisciplinary team. It is widely acknowledged that clinical pharmacist involvement enhances interprofessional communication and is essential for collaborative practice (Luetsch & Rowett, 2016; Rigby, 2010). According to Rahayu et al. (2021), clinical pharmacists have a significant impact on multidisciplinary teams and foster a sense of belonging among other members. This results in better collaboration, coordination, decision-making, and therapeutic outcomes. Despite the fact that pharmacists and other healthcare professionals exhibit positive attitudes toward collaboration that support their intention to form a professional partnership, some qualitative studies found that perceived behavioural control, such as a lack of interpersonal skills, may obstruct the process (Zielinska-Omczak et al., 2021). However, the findings of this study did not show this was the case, as participants perceived good interprofessional relationships between clinical pharmacists and other healthcare professionals, and that no criticisms related to clinical pharmacist's interpersonal skills were revealed during the interviews. This indicates that the working relationships facilitated the implementation of paediatric CPS in Hong Kong.

Relieving physicians' and nurses' workload was also identified as a facilitator for implementing CPS. Both disciplines believed that the provision of CPS, in particular medication counselling service, has helped to provide relief in this aspect of clinical work, therefore

allowing them to focus on other clinical activities. Moreover, participants believed that clinical pharmacists are the most appropriate healthcare professionals to provide medication counselling to patients, parents or caregivers because of their expertise in medicine knowledge. This is concordant with some studies which showed that medication consultation performed by clinical pharmacists improved patient outcomes and safety and results in better adherence to medications in comparison with nurses' consultation (Carollo et al., 2013; Chandrasekhar et al., 2020). The dataset has revealed that whilst most physicians considered medication counselling provided by clinical pharmacists to have saved their time, the nursing professionals felt positive as they believed that clinical pharmacists could provide a higher quality medication counselling service.

This study has also identified a number of barriers that negatively influenced CPS implementation from physicians' and nurses' perspectives. The factors that hindered the successful implementation of paediatric CPS were related to external bodies such as the public and the government, the organisation and institution, the healthcare team, and clinical pharmacists.

Several participants pointed out that the public in Hong Kong does not understand the role of clinical pharmacists or are even unaware of their existence. Other countries have reported similar findings as well (Majchrowska et al., 2019; Auta, Strickland-Hodge & Maz, 2016). Patients' attitudes, trust, and expectations as healthcare professionals were a reflection of the public's perception of pharmacists' professional roles, and these often influence policymakes' decisions on healthcare legislation that governed the functionality of the professional's services (Trein, Fuino & Wagner, 2021). The understanding and recognition of pharmacists' role, therefore, is one of the driving factors in how successful a healthcare service can be implemented within a healthcare system. In this study, participants have reflected that there is a lack of understanding of the clinical pharmacists' role, as some of the participants explained

that the public only knows the supply role of pharmacists in Hong Kong. Studies have revealed that people in Hong Kong have a low acceptance rate of pharmacist-led self-care management in the community due to the unfamiliarity with their role. As a result, Hong Kong citizens believed that pharmacists should not take the leading role in patient self-care of chronic diseases (You JH, Wong FY, Chan FW, et al., 2011).

Another associated factor that affected the implementation of paediatric CPS related to the public was a culture of medical dominance. This barrier was consistent with our findings from the clinical pharmacists' interviews, as highlighted by Schoeb (2016). Participants from both healthcare professionals, physicians and nurses, have confirmed medical dominance, as both professionals explained that the traditional and cultural values of the medical profession are at the top of the professional hierarchy. The lack of autonomy was not only raised by the pharmacy profession, but also by other healthcare professionals, such as nurses. In the Asian Conference on Aging and Gerontology 2017, Lam (2017) expressed her concern that many key policy-makers, hospital chiefs, and other powerful personnel were all from the medical profession. Medical dominance can be seen from the unfair allocation of resources and power and even legislation, such as Chapter 359 of the Supplementary Medical Profession Ordinance, which stipulated that the chairman of the Supplementary Medical Profession Council must be a registered medical profession. Indeed, the current chairman of the Pharmacy & Poisons Board of Hong Kong, a regulatory body responsible for the registration of pharmacists in Hong Kong, is a medical professional. Lam (2017) argued that professional bodies responsible for regulating professionals' conduct tend to protect their reputation and that the managerial positions of the healthcare entities were taken by the medical professionals, thus causing exacerbation of medical dominance and over-protection of the medical professionals.

In their study, Andres et al. (2019) found that hierarchical culture predominated noticeably in Hong Kong's public hospitals. Although hierarchy is a cultural norm that is expected in public institutions, the authors argued that this culture in Hong Kong predominated other studies from other countries by a significant margin. They further gave reasons for their findings, as they indicated the Chinese culture's pervasive influence in Hong Kong, which places a strong emphasis on adhering to strict social hierarchy and roles. Interestingly, very few medical participants agreed that medical dominance in Hong Kong is related to the medical professional itself, as most participants argued that this was the 'traditional' healthcare infrastructure that was embedded within society. However, on the contrary, several nurses gave more explanations on the negative impact related to physicians' behavioural and psychological aspects on medical dominance possibly due to a more partial observation as a third party.

It is interesting to note that although the medical dominance culture was acknowledged by the healthcare professionals, they displayed a certain level of trust and confidence in paediatric CPS at the same time. The uncertainty on how the implementation of CPS might affect the medical profession was found to be a barrier in literature, as it was found that physicians might be threatened by the policing role of clinical pharmacists and that they could undertake some roles of the physicians, thus deskilling the medical profession as a consequence (Alsuhebany, Alfehaid & Almodaimegh, 2019). Although some nursing participants have revealed that this might be the case, the resistance from physicians did not come out strongly as a barrier from the data; rather, many participants reflected that the role of clinical pharmacists was not clear within the organisation, albeit there is a guideline on standards of practice for paediatric CPSs in place within HA, providing an unabridged definition of clinical pharmacists' role.

The availability of clinical pharmacists was also highlighted as an important element that affects clinical pharmacy practice according to Rose et al. (2021), and the shortage of clinical pharmacists due to resource limitation was perceived as one of the major barriers that hindered the service implementation in Hong Kong. One of Hong Kong's prevailing problems is the shortage of healthcare professionals, in particular in medical and nursing professions, with reasons such as lack of registered physicians, and the loss of staff to the private sector due to the pressure from overloaded public hospitals and fiscal reasons (Chan et al., 2013, Our Hong Kong Foundation, 2019). The immense pressure could be reflected by the low practicing healthcare professionals per population ratio, as a 2015 study reported that there were only 1.9 doctors and 6.9 nurses per 1000 population in Hong Kong, which were much lower than the Organisation for Economic Co-operation Development (OECD) average during the same period (3.3 and 9.1, respectively) (Lam, 2018).

Although the availability of clinical pharmacists was limited with the number of pharmacists recruited, their engagement in operational duties in medication supply was another factor that affected their availability to provide clinical services. Lee (2018) has highlighted that hospital pharmacists in Hong Kong have always been profoundly involved in their supply role and quoted a survey conducted in 2008, which found that dispensing constituted around 55.5% of pharmacist activities in the public hospitals. Although the survey was conducted a while ago, the lack of separation between the two roles was still identified in our data, thus showing the need for improvement in this area.

The healthcare system in Hong Kong suffers from underinvestment as a result of deficiencies in medical resources, as reflected by a lower percentage of GDP in health spending compared with other developed countries. As stated in Chapter 4, the total health expenditure in Hong Kong constituted 6.8% of the GDP in 2019, in comparison with 16.7% from the USA, 10.2% from the UK, and 9.9% from Australia during the same year (WHO,

2021). With most hospital pharmacists needing to perform their dispensing duties as explained above, the resource left to deliver CPSs is scarce. Certainly, the increase of funding to recruit paediatric clinical pharmacists would be ideal but with the shortcomings of the current healthcare system, clinical pharmacists must determine the most cost-effective way to deliver their services.

5.5 Strengths and weaknesses

This is the first qualitative study with an aim to identify factors that influenced the implementation of paediatric CPS in Hong Kong by exploring physicians' and nurses' perceptions with the use of a pragmatic and robust methodology. Their views are valuable in the context of CPS implementation as they are one of the service users that could strongly influence key stakeholders. In addition, combining with clinical pharmacists' data (Chapter 4) and parents', caregivers' and former patients' data (Chapter 6) enables researchers to obtain a thorough picture of Hong Kong's situation, thus evidence-based strategies can be devised to ensure the sustainability of paediatric CPSs in this city.

The results of this study needed to be interpreted with caution in light of some limitations. Although thematic data saturation was considered to be reached as there were no new themes emerged after interviewing the participants, there were fewer participants from some study sites due to non-participation (i.e. there were no physicians from hospital D who participated), thus the achievement of maximum variation sampling was in question. Whilst thematic saturation focuses on the breadth of collected data, theoretical saturation focuses on the depth of research data. The recruitment of more participants until theoretical data saturation is reached could perhaps elicit more constructs that yields more insights about the emerging grounded theory; however, with the limitation such as time, number of interviewers and inexperienced researcher in the field of qualitative research, this approach could not be used.

There was an observation that more physicians and nurses who showed general support on the implementation of paediatric CPSs, in comparison to clinical pharmacists' perception on how supportive of physicians' and nurses' attitudes toward the service. This could be explained for two reasons. The first reason is that physicians and nurses could have showed a higher level of social desirability response bias. Multiple interviewers can be used to circumvent the potential for bias affecting the interview process. The second reason is that voluntary participation is particularly vulnerable to sampling bias (Cheung et al., 2017). A different sampling method, such as snowball sampling, can perhaps help to recruit these hidden non-responders who might hold different views.

Lastly, as with Chapter 4, the difficulty in recruiting additional participants across more study sites due to resource limitation and the difficulty in nominating PIs from other cluster as per local research ethics committee protocol might affect the validity of this study.

5.6 Conclusion

The physicians and nurses interviewed in this study reported that the successful implementation of paediatric CPSs in public hospitals in Hong Kong is an area for continued development with several key barriers. The major implementation barriers identified include the understanding of clinical pharmacists' roles both externally and internally, the culture of medical dominance, the dearth of resources such as funding, and the lack of direct patient care activities. Nevertheless, healthcare professionals in general appear to have positive attitudes toward the service, as trust in clinical pharmacists was established with their roles as medicine information providers and as part of multidisciplinary teams helping to facilitate the implementation of the CPS, and the result was thought to be an overall improvement in patient outcomes.

Chapter 6. STUDY 3 – PARENTS, CAREGIVERS AND FORMER PATIENTS

6.1 Aim

This study aimed to identify any facilitators or barriers that influence the successful implementation of paediatric CPS in the hospital setting in Hong Kong from parents', caregivers', and former patients' perspectives.

6.2 Methods

SSIs were used as the method of data collection. The interview guide was developed based on the themes and subthemes that were identified in Chapter 2 (Sin et al., 2022) and was pilot tested both internally by all team members and externally by two study participants. Since no changes were suggested after being pilot tested, the original interview guide was used and the data from the two participants were included in the analysis. All participants agreed to take part to the interviews by means of telephone discussion. The interviews were held in spoken Cantonese, which were then translated into English. CH has checked three transcripts for translation accuracy and discrepancies were resolved through discussion. The data were then coded and analysed using an inductive approach and the resulting topics were organised by thematic analysis. More details of the general methods were described in Chapter 3.

6.2.1 Inclusion criteria

Participants must be over 18 years of age with the following criteria:

- EITHER a parent or caregiver of the child, or the patient him/herself; AND
- The child is/was a patient of the outpatient or inpatient service in any of the public hospitals in Hong Kong.

The NHS (2023) has defined caregiver or carer as anyone who provides unpaid care to a family member, partner or friend who needs help because of their illness, frailty, disability, a mental health problem or an addiction and cannot cope without their support.

6.2.2 Participant recruitment

Patient support groups and organisations were identified through HA's Community involvement and Volunteering Services Department and HA's official website under 'Smart Patient Website' (https://www21.ha.org.hk/smartpatient/SPW/en-us/Useful-Resource/Patient-Group/Category-List/). The following patient support groups were selected for recruitment in alphabetical order:

- Cardiac Patient Support Group
- Hong Kong Asthma Society
- Hong Kong Epilepsy Association
- Hong Kong Lupus Association
- Hong Kong Paediatric Rheumatism Association
- Little Life Warrior Society
- Paediatric Asthma Group
- Parent Support Group of Children with Chronic Eczema
- Preemie's Parents Support Group

These groups were invited on the ground that they are all registered charities or organisations that work closely with the HA. In addition, the selection was based on the rationale that these patient support groups comprised of members that include paediatric patients (or their parents or caregivers) as members, as the selection has covered some of the most prevalent conditions or ailments within the area of paediatrics in Hong Kong.

Invitation emails were sent to these organisations with details of this study (Appendix VIII), with an information sheet attached therein. We asked each representative to cascade the invitation to the members of their patient support groups. Once agreed to participate, we asked the group's representatives to forward an information sheet and a consent form. They were asked to sign the consent form and to send it back to the PI either electronically or via mail.

6.3 Results

Initially four organisations responded with three agreed to take part and one asked for more information. The organisation that asked for more information has later explained that they have no suitable participants in their group. Attempts were made to reach the rest of the organisations via telephone. Three correspondents replied that there were no suitable participants to take part, whilst the other two organisation representatives did not respond. The three participating patient support groups were the Paediatric Asthma Group, Parent Support Group of Children with Chronic Eczema, and Premmie's Parents Support Group.

During the four-month recruitment period, six parents agreed to take part from three different patient support groups. Given the low participation rate, the recruitment period was extended to a total of six months with the amendment of the research protocol approved by the relevant research ethics committees. Reminder emails were sent to the patient support groups once more to the organisation correspondents. By the end of the extended recruitment period, three more parents agreed to take part, totalling of nine participants. However, upon contacting the parents for further arrangements for the interviews, only seven parents can be reached. The other two parents did not respond from emails or telephone calls. The duration of the interviews was between 12 to 23 minutes. Table 10 below shows the characteristics of the parents who participated in this study:

Key	Relationship with child	Child's condition	Patient support group
Parent 1	Mother	Asthma	Paediatric Asthma Group
Parent 2	Mother	Eczema	Parent Support Group of Children with Chronic Eczema
Parent 3	Father	Asthma	Paediatric Asthma Group
Parent 4	Mother	Eczema	Parent Support Group of Children with Chronic Eczema
Parent 5	Mother	Asthma	Paediatric Asthma Group
Parent 6	Father	Eczema	Parent Support Group of Children with Chronic Eczema
Parent 7	Mother	Short bowel syndrome	Premmie's Parents Support Group

Table 10. Characteristics of parent, caregiver and former patient participants in the study.

Using thematic analysis, two facilitators and two barriers with six subthemes were identified. Table 11 outlined the main themes and subthemes identified from interviewing the parents:

Barriers	Facilitators

• Lack of patient-focused approach
  ○ Need to communicate more with patients
• Lack of clear identity
  ○ Need to have a clearer role within the institution/ organisation
• Lack of professional identity as a clinician
	• Building up trust through clinical pharmacist interaction
	  ○ Provision of detailed medicines information and practical advice
	  ○ Perception of clinical pharmacists being medicine experts
	• Belief in healthcare service quality improvement
	  ○ Support of integrated care as a multidisciplinary team

Table 11. Themes and subthemes identified from parent, caregiver and former patient participants.

6.3.1 Barriers

6.3.1.1 Lack of patient-focused approach

6.3.1.1.1 Need to communicate more with patients

Communication with patients is one of the broad areas of intervention in patient-focused care, and the lack of communication was identified as one of the key barriers that hinders the implementation of paediatric CPS. Parents have expressed their limited opportunity to seek detailed advice from clinical pharmacists. Some parents felt unsure on how and where they can seek advice from clinical pharmacists. This means that the implementation of drug counselling services is either ineffective or showing that there is a gap in the service implementation. The following quotes have highlighted the deficit in clinical pharmacist's exposure:

"… they [physicians] just asked me to give it a couple of times a day and didn't tell me more about it… and I don't think it helped that much… he just went 'the steroid is very mild… but I want to know more… if he [the child] uses it regularly, would his body get used to it? And if we stop it how would his body react? No one has explained these to us in detail… whom can we ask then?" (Parent 1)

"… perhaps it'd be better if there is a way to ask something about drugs immediately, for example, to ask if it is a side effect of a drug or it has something to do with my child's condition… on something quite worrying to us, they [clinical pharmacists] can perhaps help to answer these…" (Parent 5)

By explaining their children's medications in detail and having the opportunity to ask drug-related questions, parents believed that clinical pharmacists could empower parents and caregivers in a way that they have a better understanding of their children's health management. Due to the lack of engagement between parents and clinical pharmacists, some

parents believed that they were unable to gain greater control over decisions affecting their children's health and thus called for service implementation to enable this:

"… we can have more pharmacists in Hong Kong, be more systematic and provide more education so that the public can have less concern about taking medications…" (Parent 3)

"… to understand the treatment options available… to know the pros and cons of the treatments available for my child, I feel that that's what I would like clinical pharmacists to do." (Parent 6)

Parents perceived that more face-to-face interactions between clinical pharmacists and parents and their time available can influence the implementation of CPS in paediatrics, as parents pointed out the importance of direct communication and the lack of it in the current situation:

"I think they need to spend more time with us face-to-face… I think the communication has to be improved by speaking with us more… going into more details on how the drug works, its pros and cons…" (Parent 6)

"… although we obtained the general information from the pharmacists, we may not have the opportunity to ask more in-depth questions, because when we were told the condition of my child it was very sudden and everything was so unexpected… so it takes time to digest and to raise questions about drugs on a later stage." (Parent 4)

It was identified that the implementation of some direct patient care services in various hospital clinical settings are missing, for example, some parents wished clinical pharmacists to be involved during their children's outpatient follow-up appointments:

"I think if they [clinical pharmacists] can be there at the follow-up appointments alongside doctors, that would be ideal." (Parent 2)

Others explained the importance of clinical pharmacists in providing direct patient care activities during hospital stay:

"… if they [clinical pharmacists] can really come with the doctors to see us when I know that there is an expertise in medicines who is present, I would understand more about the management and feel more comfortable… to have a way that I can find them when needed, just like how the doctors participate in medical rounds every day… I think this gives us, the parents, to have an opportunity to ask some follow-up questions, which I think it's good."

(Parent 3)

Parents believed that the improvement in direct communication between parents and clinical pharmacists would in turn increase public awareness and recognition of their roles, which can facilitate CPS implementation. For example:

"I guess they [clinical pharmacists] have to talk more to the parents… I think it is rather hard to explain on their roles to the public, but they have to interact more with the parents, and as a result, they will understand more on clinical pharmacist's role." (Parent 6)

6.3.1.2 Lack of clear identity

6.3.1.2.1 Need to have a clearer role within the institution/organisation

Another barrier that was identified from the interviews which hindered the implementation of paediatric CPS in Hong Kong is parents' lack of understanding of the role of clinical pharmacists, and what CPS provides. Participants stated that there is a lack of clarity on the role of clinical pharmacists within public hospitals. The lack of a clear role for clinical pharmacists has an impact on the public's perception of them. Some parents felt that clinical pharmacists were partly responsible to make them aware of the services by their actions or by providing service provision at some point. This can be demonstrated by the quotes below:

"… I was not aware of it, that's because I don't really know what they [clinical pharmacists] do and they didn't tell me what they did… if I know what they do beforehand, then I did not need to search on the internet myself, or after searching I could ask them for advice…"

(Parent 3)

"… what's lacking now is the public understanding of what they [clinical pharmacists] do, at the moment I don't think it's enough. Perhaps they can explain their roles when the children are first admitted to the hospital? So that parents will understand and to know what to expect from them?" (Parent 6)

In addition, a participant suggested that the health organisation should also be responsible to educate the public on what CPS provides:

"In my mind I know there are pharmacists… but whenever I head to the hospital, I always have the idea that I am there to see the doctor… therefore I think it is to do with education, letting people know that HA has such service… so that patients are aware of pharmacy services, or having the awareness to seek help from pharmacists proactively." (Parent 3)

Another parent has pinpointed the effect of the public not being aware of paediatric CPS due to the lack of implementation of general CPSs in Hong Kong. She pointed out that:

"They [the public] would not interact with clinical pharmacists because most of them do not have chronic conditions… they would just use whatever doctors have prescribed… they do not have any direct interactions with clinical pharmacists… they do not understand what they actually do…" (Parent 7)

As a result of lack of clarity of clinical pharmacist's identity, some parents reflected that they do not see the difference between healthcare professionals when it comes to drug-related counselling:

"To be honest it doesn't matter who it is, as long as there is someone who can teach me how to manage my child's eczema…" (Parent 1)

"… if someone came to us and tell us how to use the medications, then we would just listen… to be honest, I am not exactly sure what they do… as doctors and nurses would teach us on how to use them as well…"(Parent 3)

6.3.1.2.2 The lack of professional identity as a clinician

There were only very few participants who can describe the clinical role of hospital pharmacists, as most could only identify the supplying role of pharmacists from their experience with no awareness of CPS in practice. This was perceived as the general perception of the public in Hong Kong:

"… don't they [pharmacist] just look at the prescription to see what the doctor has prescribed and to dispense the medications?" (Parent 1)

"… I think they [pharmacists] mostly to do with dispensing the medications… checking the dosages and appropriateness of the drugs…" (Parent 5)

There were mixed views on the professional image of pharmacists as clinicians that affects the level of support for CPS implementation. Although most parents who had interactions with clinical pharmacists held the view that they are an integral part of the healthcare team, however, parents do not usually associate seeing clinical pharmacist as part of their hospital visits:

"… some people think that only doctors are healthcare professionals, but pharmacists are professionals as well.. as their job title implied that already… in terms of the nature of the drugs etc, they know it best…" (Parent 4)

"… as a parent in Hong Kong, we expect to see doctors whenever we go to the hospital… we normally see a doctor that includes receiving treatments with medications… we normally ask the nurse to see if he/she can help us.. and that's the reality. In my mind, I know there are pharmacists, but whenever I head to the hospital, I always have the idea that I am there to see the doctors or nurses…" (Parent 3)

Overlooking the role of pharmacists providing clinical work shows the limited interactions between the parties, thus highlights the limited availability of clinical pharmacists interlinking with the lack of face-to-face communication and resources available. This problem can be identified from the following quotes:

"I really haven't talk to them [clinical pharmacists] really… apart from obtaining the medications… and as soon as we collected the prescription we will just go straight away, since the waiting time is so long…" (Parent 1)

"…it may be to do with the lack of resources from the government and therefore pharmacists cannot be there all the time…" (Parent 2)

Interestingly, when discussing the professional image of pharmacists as clinicians, it was found that some parents' perceptions on hospital pharmacists' professionalism were influenced by their views on community pharmacists. One of the parents has illustrated her opinion on this point:

" To me, I think pharmacists are like those people that I see in a drugstore, where they would just recommend some remedies for cold and flu, and would answer questions and make suggestions on over-the-counter medicines…" (Parent 2)

In addition, due to the lack of separation of prescribing and dispensing in Hong Kong, physicians usually supply the medications that they prescribe in the private healthcare sector without the involvement of pharmacists. The lack of exposure with the profession was found to have a detrimental effect in parents being able to comprehend the clinical involvement within the public hospitals in Hong Kong. The following quote illustrates this:

"It's like when you see a doctor in the private clinic, they will do everything on their own… it's only the nurse who will give us the medications… so to be frank I am not used to having another healthcare professional to help us this way…" (Parent 3)

6.3.2 Facilitators

6.3.2.1 Building up trust through clinical pharmacist interaction

6.3.2.1.1 Provision of detailed medicines information and practical advice

Parents appreciated the advice that clinical pharmacists gave on the use of medicines and found their advice very practical. The implementation of CPS was enabled by parents'

perceptions that clinical pharmacist is the most suitable healthcare professional to provide advice in medicines and their interventions can improve the management of their children's conditions. These can be shown from the quotes below:

"I think the information provided [by clinical pharmacist] was very clear… that's because the doctor said that he could not explain the new medicine in as many details as the clinical pharmacist…" (Parent 2)

"… like last time after speaking with the pharmacist… we found out that whether we were giving the medicines correctly or not… whether the drug was working for my child… and he/she has kept a record and discussed with the doctors… so after the adjustment of the medicine it has really helped to control the condition… that's true." (Parent 5)

The perceived value of clinical pharmacists' work was viewed as a facilitator to CPS implementation as parents expressed that CPS has given them an opportunity not only to understand their children's medicines for a particular condition, but a thorough discussion of all the drug-related problems. The following quote from a parent outlined the CPS that she has received that demonstrated this:

" … and also we have asked a lot of questions… such as side effects… because we were a bit concerned… and how to take them… what do we do if we missed a dose… and the pharmacist has explained very clearly… this is because my child does not only suffer from eczema and she is on other medications as well… the pharmacist has told me on whether it is okay to take the new medicine alongside, and whether there are any drug interactions… whether there is any food that needs to be avoided… the pharmacist has explained in detail and has even checked the computer again to make sure everything is okay…. So I think it's good." (Parent 2)

One of the reasons for parents to support the implementation of CPS is that clinical pharmacists can help to replace physicians so that they can find out more about their children's

medications, as it was revealed that physicians spend very little time in explaining about the medications:

"… when I was at the doctors I cannot ask that many questions and they would often send us away very quickly…" (Parent 1)

Parents believed that they suffer from a deficit of knowledge in their children's medications as a result of the limited time available to interact with physicians. In addition, participants have expressed that patient involvement, which is a key to medication optimisation, is lacking within the Hong Kong public healthcare system, as some stressed that physicians usually do not discuss with them on treatments available for their children:

"… usually we get told what to give to our children by the doctors… there aren't any options available. Whether there are other drugs that could provide the same effects… their good and bad… we do not have explanations as such." (Parent 6)

Some parents have identified the clinical gap within Hong Kong's healthcare system and contended clinical pharmacists can help to fill the gap. They believed that the implementation of CPS enables a supportive teamwork environment between physicians and clinical pharmacists; as a result, parents can spend longer time with the clinical pharmacist in order to understand more about their children's medications. The following quotes are some examples of how the parents felt in the current situation:

"Yes, a great help [the CPS]… a great help because there is someone to answer your queries… doctors may not have time… if time is allowed for pharmacists they can help the doctors to do this, I think both are winners here." (Parent 4)

"I don't think there is a particular person who can help, like the doctors. They would just tell me how many times to give the medications to my child, which is not too much in detail… that's why I think they [clinical pharmacists] are quite important." (Parent 5)

6.3.2.1.2 Perception of clinical pharmacists being medicine experts

Another factor that has enabled CPS implementation from parents' perspectives is the belief that clinical pharmacists are specialised in medicines. In general, parents believed that clinical pharmacists could provide in-depth information on medications that their children are taking. Some participants had positive experience with CPS and even went further, contending that clinical pharmacists are in a better position to provide advice on medicines because of their expertise and the time they have to provide counselling:

"I think I trust pharmacist's advice more because they are the experts in this area… I think that doctors might not know drugs as much as pharmacists in terms of the depth of knowledge…" (Parent 4)

"From my understanding of public hospital is that pharmacists are the last person that I see when they give me the medications. But after last time I have changed my impression as they will take time to discuss with me on the characteristics of the drugs, and to answer my questions… and it is even more detailed than the doctors…" (Parent 2)

A mother gave a specific example of how a clinical pharmacist has helped in providing long-term care to her child's chronic condition:

"… they [clinical pharmacists] have helped, of course they have. For example, when my child has a lot of stoma output they have made some suggestions as to what medications to use, that's right… if there are other symptoms they would recommend using other medications." (Parent 7)

The implementation of paediatric CPS is facilitated by the positive experience that parents had at times when clinical pharmacists have made interventions using their knowledge in medicines, so that their children could use the most appropriate medications. For example:

"… sometimes you see that doctors might prescribe the wrong drugs, such as one drug that might interact with another, or when you should not take this drug under some conditions…

sometimes doctors are not clear themselves, and pharmacists are certainly the experts in this area…" (Parent 3)

The implementation of CPS has also helped parents to debug some of the information that they have searched on the internet, thus providing a sense of trustworthiness from a reliable source. This can be shown from several participant's quote:

"… he/she [the clinical pharmacist] talked about the nature of the drug, what it can treat… in fact, that drug can also help to treat cancer as well… that's what I remembered most clearly… the pharmacist also explained that this drug can help to treat eczema… it saved me from a search for more information on the internet that I might be shocked about." (Parent 4)

Some parents have gone further in supporting clinical pharmacists in taking more responsibility in their children's medications, as they contended that clinical pharmacists might be in a better position to provide more using their expertise and could potentially make the healthcare service more efficient. For example, a few participants were talking about pharmacist prescribing:

"… you only see the doctor for a very short time only… waiting for a long time and seeing them for a very short period of time… if we see a pharmacist to get the meds, which are almost the same every time, we can also seek advice to see if the meds are appropriate… they can give me an answer to my question as well as providing it into more detail… for this, I support the change…" (Parent 3)

"I think clinical pharmacists in Hong Kong can do the same [prescribing]… and I am sure of it… I am confident that they can do this because if there are some [drug-related] issues that I encountered I can raise it out to them and we can communicate directly and improve." (Parent 7)

Although support was shown from most parents on implementing more CPSs, there are some parents who are not ready for clinical pharmacists to take on a higher level of

responsibility in medicine management. For example, when asked whether parents felt comfortable with clinical pharmacists adjusting the dosages of their children's medications, feedbacks like the following were received:

"I feel that I have listened to opinions from both professionals… because doctors are the ones who prescribe the medications… and therefore we should not just listen to clinical pharmacists…" (Parent 1)

"… I will need to seek advice from the paediatrician first… or the surgeon… they need to work together… I do not believe advice from one party only." (Parent 7)

6.3.2.2 Belief in healthcare service quality improvement

6.3.2.2.1 Support of integrated care as a multidisciplinary team

Although some parents were conservative with clinical pharmacists taking on a greater role in medicines management by providing more advanced services, such as dosage adjustments, participants nevertheless showed support in the implementation of shared care between clinicians and pharmacists. Participants believed that the involvement of clinical pharmacists could help to safeguard their children's health. This could be shown from the parent's comment:

"… so that I don't need to place my child's health onto one person's hands… to be honest, I am quite concerned about this… if we also have clinical pharmacist's help that would be better." (Parent 3)

"I think it is a good thing… there will be a balance of powers… as now all decisions are made by the doctors and there aren't much check and balance in place. If there is a third party to get involved with my child's condition I think it'd be better." (Parent 6)

Some parents have shared their experience on the involvement of clinical pharmacists in their children's care, which were examples of integrated care by a multidisciplinary team:

"… my son used a drug and it gave him diarrhoea, I raised it out to the doctors and I knew that they asked clinical pharmacists… and even for TPN prescriptions they would seek their help as well." (Parent 7)

In general, parents welcomed the idea of clinical pharmacists taking on some medicine management role for their children instead of physicians, as they believe that clinical pharmacist can make the hospital visit more efficient. For example, they have showed support for pharmacist-led medication refill service as it saves time:

"… if I know the doctor's appointment is only to collect my child's medication prescriptions, I think it [pharmacist clinics] is okay." (Parent 5)

"… if we are only there to get medications from the doctors, to be honest, we can see the pharmacists instead." (Parent 4)

However, our data suggested that there is a need for the health organisation, in particular pharmacy stakeholders, to assert confidence to parents on collaborative practice agreements, as this is a relatively new concept in Hong Kong. There were concerns raised by parents on possible drawbacks with integrated care, such as challenges of teamwork and hierarchy of healthcare:

"I feel that there won't be much problem but first they need to align the practice with the doctors first… this is because the doctors may not be aware of the change, or if they disagree with the change." (Parent 2)

Another example of parent's concern was how to ensure clinical pharmacists working within their competency. The following quote has also suggested there may be a lack of understanding of skills that clinical pharmacists possess:

"… my main concern is that if there are any changes to the medical condition, whether they can provide further management or having a mechanism to refer back to the doctors… I have no issue if it is just to do with medications, but what if the drug didn't help my child? Is it

to do with the worsening condition? Whether the doctors should be involved in situations like this… it is my major concern." (Parent 6)

Therefore, specific strategies for addressing parent perceptions are vital to facilitate the implementation of CPS.

6.4 Discussion

6.4.1 Key results

Although thematic data saturation has not been reached in this study due to the low participation rate, the results have nevertheless helped to elucidate an area that was identified to have a research gap. The major barrier that has been identified that hinders paediatric CPS implementation in Hong Kong is the lack of a patient-focused approach. A fundamental element for healthcare professionals is the application of a consistent approach of direct patient care (Harris et al., 2014). A study has found that increased patient contact between hospital pharmacists and patients resulted in greater patient awareness and satisfaction with their hospital stay and particularly with pharmaceutical services (Erstad et al., 1994). Although there is a high demand for parents to seek for advice on medication, clinical pharmacists are not always available to provide the services. The general perception of the lack of a patient-focused approach could be explained by the limitation in resources and the lack of service penetration within the healthcare system, with clinical pharmacists' self-efficacy also coming into play. Although these were not discovered in this dataset, they were identified in clinical pharmacists' and other healthcare professionals' data which were discussed in previous chapters.

Patients reported higher quality of life, more positive health behaviours, and greater treatment satisfaction across a variety of clinical settings when they had greater trust in the healthcare professionals who manage their health (Birkhauer et al., 2017). Here, within the public healthcare service in Hong Kong, a barrier that was identified was clinical pharmacists'

lack of clear identity as clinicians. Participants reported a lack of understanding of the role of clinical pharmacists within Hong Kong's public hospitals, as some of them could only recognise the supplying role of hospital pharmacists. This is concordant with other studies that reported similar findings, as it was found that patients' concept of pharmacists providing clinical work is generally weak in countries that with less developed CPSs, such as China (Penm et al., 2014) and Saudi Arabia (Al-Arifi, 2012). Similar findings were also observed in countries with well-developed CPSs in some particular health settings, such as general practice in the primary sector in the UK (Thompson, Al-Attbi & Patel, 2022).

A more proactive role in providing clinical services was found to be a factor that could increase the recognition of clinical pharmacists, which was perceived to be an enabler to CPS implementation. The build-up of trust in clinical pharmacists from patients' perspectives was most notably related to their work related to the COVID-19 pandemic. Visacri, Figueiredo and Lima (2021) described the comprehensive clinical role of pharmacists within the hospital, and concluded that they played an important role during the pandemic by providing patient care and support for healthcare professionals.

The data have indicated that the professional image of pharmacists as clinicians was affected by other pharmacy sectors. For example, due to a lack of legislation to separate prescribing and dispensing in Hong Kong, physicians in private health clinics often dispense the medications that they prescribed often without supervision by pharmacist (Lee, 2018). The role of pharmacists in separating prescribing and dispensing is to reduce drug expenditure and to inspect prescribing behaviour (Chou et al., 2003). However, as parents often visit private health clinics for their children's common ailments in Hong Kong, there are no opportunities for pharmacists to provide face-to-face services with the parents as clinicians. The lack of exposure to pharmacists in the private sector, therefore, seems to have affected parents' views on the need for this profession and their functionality within Hong Kong's public hospitals.

Furthermore, although evidence is not as strong, some parents correlated the image of pharmacists being community pharmacists, and associated them as “medication supplier” rather than a clinician that provides patient-centred care. Indeed, in countries where CPSs are less developed, researchers have found that there is a psychosocial association between pharmacists and the business context of pharmacy practice (Gregory & Austin, 2021). In addition, community pharmacies selling counterfeit or illicit medications, and selling prescription-only medications without prescriptions are reported frequently in Hong Kong’s media, and this severely affected pharmacists’ integrity and image as healthcare professionals (Ge, 2013; Fernandes, 2017).

Although some major barriers were found, this study has nevertheless identified several facilitators which enable the implementation of paediatric CPS in Hong Kong. Medicines information and practical advice on the use medicines provided by clinical pharmacists were notably found to be one of the facilitators. This is concurrent with studies across the literature, providing evidence to support pharmacist consultations in paediatric medicine use from parents in different settings, such as in community or hospitals, whether it is on the general use of medicines or specific conditions (Abraham et al., 2017; Zhang et al., 2020; Macedo et al., 2021). This factor facilitates service implementation as the role of clinical pharmacists explicitly filled a clinical gap in Hong Kong, which is the desire from parents to discuss with healthcare professionals on their children’s medications, especially drug interactions and their adverse effects. Clinical pharmacists were perceived to have a supplementary and reinforcement role in the information they received from the physicians, and this is concordant with the findings of Abraham et al. (2017). In general, parents and caregivers in Hong Kong have displayed a certain level of trust in clinical pharmacists in hospitals, as participants concurred that they are the medicine experts, with some even perceiving that clinical pharmacists possess better drug knowledge than physicians. Nevertheless, parents’ sense of

trust in clinical pharmacists was not as high as other clinicians, especially physicians, was observed. It is believed that parents' trust directly and positively affects their commitment to treatment, and the establishment of a trustful relationship between the pharmacist and patient positively influence patient satisfaction, which indirectly improves service implementation and its quality (Esmalipour, Salary & Shojaei, 2021).

Parents who participated in this study perceived that the involvement of clinical pharmacists in the multidisciplinary team could improve their children's health. Indeed, the integration of clinical pharmacists into the multidisciplinary team was found to facilitate sustainable improvements in medication access and adherence, and clinical and quality measures in paediatric settings (Lynton, Mersch & Ferguson, 2020). In addition, some parents indicated that there is a deficit of parent involvement in their children's health decision-making in Hong Kong, and they believed that the integrated care with implementation of CPSs could facilitate this. Patient empowerment, defined as 'a process through which people gain greater control over decision and actions affecting their health' by WHO, is a key theme within global health and social care strategies. Parent empowerment, which is a term built on from WHO's definition, enhances parent involvement in daily care and care decisions, improve child symptoms, enhance informational needs and skills, and increase advocacy and altruistic behaviours (Ashcraft et al., 2019). Tobiano et al. (2015) found the implementation of a patient-centred care service with patients' participation was successful as patients believed that their knowledge was built and shared with healthcare professionals. Parents in Hong Kong believed that clinical pharmacists could provide them with an opportunity to explore their children's treatment options and a better understanding about their medicines. Emerging evidence have shown the importance of patient engagement within the healthcare service implementation and therefore parents support in paediatric CPS in Hong Kong could enable its implementation (Boaz et al., 2016). Boaz et al. (2016) have pointed out that through patients' involvement and

contributions, they can act as catalysts for broader change in the attitudes of healthcare staff by providing a motivation for wider organisational and attitudinal changes.

6.4.2 Recruitment challenges

This study attempts to investigate the factors that influenced the CPS implementation in paediatrics in Hong Kong from parents', caregivers' and former patients' perspectives. However, there were some challenges in recruiting patient groups and participants despite amending the method by extending the recruitment period and resending the invitations to selected patient groups. As a result of difficulty in recruiting participants in this subgroup, thematic data saturation has not been reached in this study. Studies have pointed out that the quality of research suffers and its content validity is impeded when data saturation is not achieved (Fusch & Ness, 2015).

According to Price et al. (2020), challenges to patient recruitment and participation in research can appear at any time during the process. These include identifying and inviting eligible patients, gaining consent, and engaging them in data collection. In this study, the identification and invitation of eligible patients posed the greatest challenge. These challenges were discussed and solutions to facilitate further research were purposed in this section.

The recruitment of patients (or their representatives) in collaboration with advocacy groups or charitable organisations is supported by the literature (Vat, Ryan & Etchegary, 2017; Gallagher et al., 2012). However, in the present study, the number of parents recruited was low and no former patients can be recruited using this method. There are several reasons behind this. Recruiting parents through patient support groups was reliant on the groups' commitment supporting the study. With only three out of nine organisations approached agreeing to take part, the low response rate has a knock-on effect on the number of parents, caregivers or former patients who could be reached out to. The lack of patient groups' responses in this study, therefore, has reflected the underestimation on the difficulties in

recruiting participants in Hong Kong and the importance of having alternative solutions planned in the study design is underpinned.

One way to increase the level of organisational commitment is having personnel who work closely with these group representatives, which facilitates the process of participant recruitment. This is because personal contact between the research team and the recruitment site has been shown to enhance the site's level of commitment (Macfarlane & Maidment, 2020). The involvement of institutions' personnel who have close relationship with these patient support groups, such as staff from the medical social services, might result in a higher level of organisational engagement in future studies. Another way to ensure organisational commitment is through direct interaction. Face-to-face communication, as highlighted by Price et al. (2020), could contribute to an increase in patient support groups' engagement as it allows a rapport to be built in an open and trustful manner. Unfortunately, due to the COVID-19 pandemic, face-to-face communication was limited and this might be one of the reasons which affected parent support groups' commitment.

Recruiting participants directly from the study sites in both inpatient and outpatient settings in public hospitals could have been another option to identify and recruit parents and caregivers. This recruitment method was used in inviting patients evaluating pharmaceutical services across literature (Morecroft et al., 2013). However, such recruitment method would involve a high number of healthcare workers in identifying and approaching potential participants on the researchers' behalf and the constraint in resources has limited the adaptation of this method. In addition, the involvement of more study sites was not possible as we were faced with the difficulty in nominating a PI at each study site in accordance with the local Research Ethics Committee guidelines.

Whilst patient support group's assistance was vital to the recruitment process, patients', caregivers' and former patients' willingness to participate has also posed as another challenge

in this study. Our challenge has been exacerbated by the difficulties in recruiting Hong Kong citizens to participate in qualitative research, as reported by researchers in some studies. For example, despite the recruitment process being conducted by a survey agency with the invitation sent out by email or telephone, Chu et al. (2017) reported a participation rate of 1.4% (49/3443) in their focus group exploring individual's perception of online health information in Hong Kong. Although it was some time ago, an international study has reported that Hong Kong has one of the lowest response rates in surveys among the 22 studied countries (Harzing, 1997). The author alleged that the frantic lifestyles in Hong Kong is one of the main reasons of why citizens are less likely to participate in studies in comparison with countries with slower pace of life. This finding is supported by another study, which reported that larger cities are associated with poorer recruitment (Menon et al., 2008). Newington and Metcalfe (2014) held the view that some ethnic populations are traditionally more difficult to engage in medical research. Park and Sha (2015) emphasised the challenges in recruiting the Asian community, which includes Chinese and Korean, due to culture differences, mistrust, and a general lack of experience participating in social science research. In a study that analysed the barriers to the recruitment of Chinese-American family caregivers for dementia research, researchers highlighted that the concepts of health, age, and illness that have roots in Chinese culture and traditional Chinese medicine influenced their understanding of Alzheimer's disease in part (Hinton et al., 2000). Hinton et al. (2000) gave an example that some Chinese families believed that taking part in research may cause the elderly adult to worry excessively, hastening the process of cognitive decline and possibly having other negative health impacts. In addition, Newington and Metcalfe (2014) believed in large cities, high population mobility with individual potentially missing invitations and more university hospitals that created 'research fatigue', may also be the reasons why it is difficult to recruit participants in Hong Kong. Our experience has demonstrated that the provision of an information leaflet may not

be sufficient to elicit participants' interest and response, thus a more critical approach in participant recruitment as discussed below is warranted in order to increase the participation rate in future research.

The recruitment of a diverse sample of participants has to be balanced against practical considerations such as resources, which is one of the biggest limitations of this study. However, providing sufficient resources are available for the future studies, the following strategies may optimise participant recruitment.

Price et al. (2020) found that limited contact with or availability of research supporting staff, and a lack of face-to-face communication between researchers and patients are interacting factors that contributed to low patient recruitment. Unfortunately, this study was conducted during the COVID-19 pandemic, which restricted the opportunity of any face-to-face communication with parents or caregivers. However, practicable strategies that may increase future successful recruitment, as some studies recommended, include a prolonged engagement with participants and long-term engagement in a setting before attempting recruitment (Archibald & Munce, 2015).

The appointment of gatekeepers on each study site is another strategy that could help to enable successful recruitment as gatekeeping fosters meaningful and authentic collaboration with participants might cultivate trust and aid in recruitment (Newington & Metcalfe, 2014). Gatekeepers are essential mediators whom have a key role to ensure researchers gain access to potential participants and sites for research, which can be turned in a research "champion" within the organisation (Robinson, 2014).

A third strategy is to increase public awareness of clinical research. Newington and Metcalfe (2014) have found that advocating for the study among patients, which including approaching them individually, and emphasising the value of clinical research for improvements in healthcare could help to increase recruitment. Online advertising, such as

through social media, is becoming an increasingly popular method to disseminate the message of research study to the potential participants (Robinson, 2014). A large audience can be reached using social media platforms at a minimal cost, and there is an additional benefit on the possibility of bidirectional communication (Arigo et al., 2018), which could be particularly attractive method if resources are limited.

The last strategy that can be employed to increase participation in future studies is through incentives. Researchers pointed out that the perceived benefit of qualitative research could be enhanced through incentives, and these include material, financial, moral, or natural (Newington & Metcalfe, 2014). However, nonmonetary incentive may not result in a higher participation rate compared with no incentive (Kelly et al., 2017). The same research team has found that a financial incentive can play an important role in achieving high participation rates. However, potential ethical issues that may arise from using this approach, such as undue inducement, exploitation, and biased enrolments have to be scrutinised with caution by the research team (Kelly et al., 2017).

6.5 Strengths and limitations

To the best of the author's knowledge, this is the first study to investigate parents', caregivers' and former patients' views and opinions on the implementation of CPS in paediatrics. A robust methodology was used and reported this qualitative study using a validated checklist to promote explicit and comprehensive reporting of interviews. The strength of this study was the participation of parents with different backgrounds who had perspectives about the CPS implementation process. These characteristics were essential as there are emerging evidence suggesting patients' involvement during the implementation process leads a more successful healthcare service implementation.

This study has several limitations. The thematic nature of data saturation has not been met as a result of low recruitment rate which may hamper content validity. An innovational and

well-thought strategy for the recruitment process is necessary in order to recruit the public in Hong Kong, which has its distinctive characteristics due to reasons such as sociocultural differences. Suggestions on the recruitment method have been made in the discussion section but more resources would be necessary. In addition, the factors identified were explicitly related to the current healthcare system in Hong Kong, therefore, the generalisability of the findings has to be interpreted with care when considering the application elsewhere. Nevertheless, this study could lend insight into the facilitators and barriers identified from parents' perspectives, thus helping to analyse paediatric CPS implementation alongside with clinical pharmacists' and other healthcare professionals' datasets in Hong Kong.

6.6 Conclusion

This study has identified some facilitators and strategies involved in paediatric CPS implementation process revealed by parents in Hong Kong. The major barrier that was identified is the lack of patient-focused approach. Clinical pharmacists should communicate more directly with parents and caregivers in different hospital settings to support successful implementation of CPS. Other barriers identified include the need to have a clear role for clinical pharmacists within the institution and organisation, and their lack of professional identity as a clinician. However, parents interviewed in this study have showed a degree of trust for clinical pharmacists through their interactions and a clear need for the service was identified. The CPS in paediatrics is supported by the parents as they valued the medicines information and practical advice on medicines provided by clinical pharmacists, which they perceived as medicine experts. The involvement of clinical pharmacists in the multidisciplinary team was perceived to improve children's health and parent empowerment which facilitated CPS implementation. In addition, this study highlights the challenges in recruiting parents, caregivers and former patients as research participants through patient support groups in Hong

Kong. The reasons for the difficulty in recruiting participants and refined recruitment strategies were discussed in order to improve the participation rate for future research.

Chapter 7. SYNTHESIS OF FINDINGS

7.1 Data synthesis using the CFIR framework

This programme of research focused on consolidating and synthesising the factors that were identified from three groups of stakeholders, which were clinical pharmacists, physicians and nurses, and parents, caregivers and former patients, with an aim to identify factors that influence the implementation of paediatric CPS in Hong Kong. A framework approach was adapted as secondary analysis to provide a structured output of synthesised data.

This programme of research found that a wide range of barriers and facilitators were identified from the synthesised data, presenting in five CFIR domains which are intervention characteristics, outer setting, inner setting, characteristics of individuals, and process, with the relevant constructs fitted within each domain (Damschroder et al, 2009). The factors will be discussed by following these domains in descriptive text and tables to illustrate which participant group has reported barriers and facilitators within the respective domain. The summary of barriers and facilitators, indicated as (-) and (+), respectively, are presented in each table of the domain.

7.1.1 Intervention characteristics

CFIR Construct	Description of Observed CFIR Construct	Clinical Pharmacists	Physicians and Nurses	Parents and Caregivers
Evidence Strength and Quality	A lack of local research to support CPS	(-)		
Relative Advantage	Relieving physicians' and nurses' workload	(+)		
Adaptability	Doubtful on the transferability of overseas studies locally	(-)		
	The provision of CPS is affected by heavy dispensing duties	(-)		
Trialability	Local pilots projects can be performed for advanced services	(+)		
Complexity	A lack of public understanding and recognition of clinical pharmacists' role	(-)	(-)	(-)
	The duration of CPS implementation was relatively short	(-)		
	The scope of CPS is well-defined by the organisation	(+)		
	Standardisation of practice is lacking, the scope of service is variable between different institutions in practice	(-)		
Design Quality and Packaging	Insufficient face-to-face interactions with parents and caregivers		(-)	(-)
Cost	The availability of clinical pharmacists was affected by the limitation of resources	(-)	(-)	

Table 12. Summary of constructs found in the “intervention characteristics” domain.

Intervention characteristics are the key attributes of interventions that influence the success of their implementation. The evidence suggests that constructs including strength and quality, relative advantage, adaptability, trialability, complexity, design quality and packaging, and cost are particularly relevant to the implementation of paediatric CPS in Hong Kong.

As defined by Damschroder and colleagues (2009), ‘evidence strength and quality’ refers to stakeholders’ perceptions of the reliability and quality of the evidence supporting the belief

that CPSs will produce the desired outcomes. ‘Relative advantage’ is their perception of the benefits of CPS implementation in comparison with other available solutions. ‘Adaptability’ is the degree to which paediatric CPSs can be tailored to the needs of Hong Kong and reinvented to meet these needs, whereas ‘trialability’ is the ability to pilot test services provided by clinical pharmacists and the corresponding ability for this freedom to be rescinded. ‘Complexity’ refers to the perceived difficulty of implementation as reflected by the duration scope, with disruptiveness, radicalness, centrality and intricacy all coming into play. ‘Design quality and packaging’ refers to the perceived quality of how paediatric CPSs are presented, and ‘cost’ refers to the money associated with the implementation of CPSs, which includes investment, supply and opportunity costs.

The findings of this research suggest that there are more barriers that hinder service implementation than facilitators that enable it within this domain. Several prerequisite factors affected the complexity of the service implementation but were not addressed before the implementation. For example, although an organisational guideline on the standard of practice was developed, discrepancies were reported in the degree of service engagement at different hospitals. It is reasonable to have variances in terms of CPS provision, as services must be tailored to meet the service users’ needs (Calvert, 1999). However, significant inconsistency is undesirable, as clinical pharmacists should endeavour to offer uniform, continually improving clinical services to provide patients with equal healthcare opportunities (Abousheishaa et al., 2020). A lack of standardisation of practices was identified and may have had detrimental effects on service implementation.

Practice standardisation is desirable for two reasons. First, it allows the practices of paediatric clinical pharmacists to be shared and peer-reviewed across the HA, which improves clinical pharmacists’ confidence when providing these services. Second, standardising

practices on an organisational level could help stakeholders understand clinical pharmacists' role better, thus cultivating the understanding and recognition of their role within the HA.

It takes time for a service to penetrate the healthcare system, and the initial strategy of facilitating implementation by focusing activities around support for healthcare professionals has, as reported by the clinical pharmacist participants, led to insufficient face-to-face interactions with parents and caregivers, impeding public recognition of clinical pharmacists. Limitations in resources, including funding, have restricted the recruitment of clinical pharmacists, which has affected their availability to administer services. It was observed that the availability of pharmacists to perform their clinical role was further hindered by their dispensing duties, since hospital pharmacies are under tremendous pressure to reduce medication collection times but also face a heavy patient load due to the lack of a well-developed public primary care sector.

An adaptability barrier that affected this issue was the difficulty in transferring an evidence-based practice of CPS from foreign research to Hong Kong due to variability in the inner setting, outer setting and individual characteristics (which will be discussed later). It was also reported by some participants that a lack of local research has had a detrimental effect on the construct 'evidence strength and quality', which has affected service implementation as a result.

Nevertheless, the perception that implementing CPS provides a 'relative advantage' by lightening physicians' and nurses' workloads, especially by providing medicine information and parental counselling, was perceived to be a characteristic of CPS that facilitated its implementation. This facilitator was found to be consistent with other studies (Mysak, 2010). Additionally, the organisation delimiting a well-defined service scope was also viewed as a facilitator, which is consistent with the ACCP's (2014) recommendation.

7.1.2 The outer setting

CFIR Construct	Description of Observed CFIR Construct	Clinical Pharmacists	Physicians and Nurses	Parents and Caregivers
Patient Needs & Resources	The need to have clinical pharmacists to provide practical advice and information to parents		(+)	(+)
	The improvement of children's health with clinical pharmacists' involvement	(+)	(+)	(+)
Cosmopolitanism	The need to have professional bodies to govern the profession	(-)		
	A closer collaboration with local universities is warranted to provide adequate training and research in paediatric CPS	(-)		
External Policies & Incentives	A lack of separation of prescribing and dispensing diminishes clinical pharmacists' role in the private sector, thus affecting the transparency of their clinical work involved			(-)
	The lack of governmental/organisational promotion of the role of clinical pharmacists		(-)	(-)

Table 13. Summary of constructs found in the “outer setting” domain.

According to Damschroder et al. (2009), as healthcare systems are hierarchically organised and often interrelated, factors from the outer setting have a significant influence on implementation. The economic, political and social contexts in which an organisation functions are typically included in the outer setting domain. The researchers further highlight that changes in the outer setting are often mediated through changes in the inner setting, and our data have unequivocally supported this.

The definition of ‘patient needs and resources’ is the extent to which patient needs, as well as the factors required to meet those needs, are known and prioritised by the HA. The construct ‘cosmopolitanism’ describes the degree to which the HA is networked with other

external organisations. ‘External policy and incentives’ is a broad construct that includes external strategies intended to spread CPSs, including policies, guidelines and regulations.

A major factor that enabled successful service implementation, according to the physicians, nurses and parents, is captured within the construct of ‘patient needs’, as the involvement of clinical pharmacists was perceived to improve children’s health, which is consistent with evidence across the literature (Tripathi et al., 2015; Fernandez-Llamazares et al., 2015). Both participant groups believed that clinical pharmacists helped by acting as medicine experts, providing detailed drug-related information to other healthcare professionals and parents, participating in multidisciplinary meetings and resolving drug-related issues in medicine management.

The degree to which the HA is externally networked with other external organisations was observed to be a factor that negatively influenced implementation, with the lack of professional bodies to govern clinical pharmacists provided as an example. To support implementation, the clinical pharmacists called for a pharmacy council to set the professional standards required for pharmacists training in paediatric clinical pharmacy and their accreditation. Some researchers strongly advocated that professional organisations should work to support paediatric clinical pharmacists in achieving excellence in practice, research and education (Iqbal et al., 2021). Furthermore, close collaboration with local universities was found to facilitate paediatric CPS implementation, as it can ensure a high-calibre workforce that delivers services based on specialised training and the application of local research in practice (Rowley et al., 2012). Collaboration could help consolidate the evidence on the impact of paediatric CPSs on clinical, humanistic and economic outcomes, thus motivating administrative stakeholders to support the service.

Implementing government policy by addressing its organisational, professional and social contexts encourages changes in healthcare practice (Watt, Sword & Krueger, 2005).

Multiple participant groups reported that governments and other organisations should enact regulations or initiate campaigns to valourise the role of clinical pharmacists. They anticipated that, due to these actions, parents would be likelier to use CPSs and become more aware of their features and advantages. Moreover, the lack of a policy that separates prescribing and dispensing activities in the private healthcare sector has affected parents' perceptions because the clinical role of medication education provision has not been fulfilled by clinical pharmacists.

7.1.3 The inner setting

CFIR Construct	Description of Observed CFIR Construct	Clinical Pharmacists	Physicians and Nurses	Parents and Caregivers
Structural Characteristics	The competing priorities and heavy workload affected the degree of service implementation	(-)	(-)	
	The support of clinical pharmacists as a part of the multidisciplinary team		(+)	(+)
Networks and Communications	High confidence in CPS as a result of direct and coherent communication	(+)	(+)	(+)
Culture	Administrative stakeholders focus on quantity rather than quality as an outcome measure	(-)		
	A culture of medical dominance affecting CPS provision, such as a lack of collaborative practice agreements	(-)	(-)	(-)
Compatibility (implementation climate)	The healthcare team's perception of clinical pharmacists filling the clinical gap as a medicine information provider		(+)	(+)
	Enhancement of the overall pharmaceutical service efficiency was observed		(+)	
Leadership Engagement (readiness for implementation)	The support from the pharmacy management team by allocating manpower to provide service coverage	(+)		

Available Resources (readiness for implementation)	The provision of comprehensive training by the pharmacy department	(+)		
	Lack of support from administrative stakeholders results in restrained investment in resources	(-)		
	The time and workload of clinical pharmacists affected the implementation of CPS	(-)	(-)	(-)
Access to information and knowledge (readiness for implementation)	The need for a more transparent and defined role of clinical pharmacists		(-)	
	The lack of higher training from educational institutions for specific needs	(-)		

Table 14. Summary of constructs found in the “inner setting” domain.

Compared with other domains, notably more factors related to the inner setting were identified. The inner setting refers to the features of the structural, political and cultural contexts in which the implementation process proceeds.

While ‘networks and communications’ refers to the type and quality of social network webs and any other form of communication inside the HA, the construct ‘structural characteristics’ describes the social architecture, age, maturity and scale of the organisation. The ‘culture’ construct refers to the values of the HA. One of the constructs adopted under the implementation climate is ‘compatibility’, which outlines the degree of alignment between the values that concerned individuals attach to paediatric CPSs and how these values connect with their own norms and perceived risks and needs. In terms of readiness for implementation, ‘leadership engagement’ depicts leaders’ and managers’ commitment to, involvement with and

accountability for implementation, while 'available resources' includes money, training, education, physical space and time.

Important structural characteristics of implementation that enable direct communication among and involvement in the multidisciplinary team, such as clinical pharmacists' presence on wards and participation in medical rounds, were favourably mentioned by all three subgroups (Alsuhebany et al., 2019). However, the competing priorities of clinical pharmacists – in addition to the high patient-to-pharmacist ratio on the wards, they are also responsible for dispensing medicine and fulfilling unsocial-hour or night shifts – were reported to hinder service implementation. One of the key barriers identified across the studies was the lack of face-to-face interactions with parents and caregivers, which is an important element of direct patient care (Harris et al., 2014). This barrier is intertwined with other outer and inner factors, leading to insufficient public exposure to parents' and the public's understanding of CPS provision. The availability of clinical pharmacists was observed to hamper direct patient care activities, partially due to the limited resources available.

The culture within organisations was reported to be a barrier to CPS implementation. There is a belief that administrative stakeholders tend to look at service outcomes quantitatively rather than qualitatively. In addition, as reported by participants, there is a general perception of medical dominance within the healthcare system in Hong Kong, which impacts the development and implementation of other healthcare professionals' services (Schoeb, 2016).

In terms of readiness for implementation, leader engagement can be seen in the support shown by the pharmacy management team. Their actions included the preparation of clinical pharmacists to deliver services as far as possible and the provision of comprehensive training at the institutional level, such as journal clubs, local peer-review groups and shadowing of more experienced pharmacists. However, the implementation was limited by the restrained

investment of resources, which has a knock-on effect on the time available for clinical pharmacists to deliver their services appropriately.

As for the implementation climate, compatibility was crucial, as it was perceived that clinical pharmacists filled the clinical gap as medicine information providers and helped to make the overall pharmaceutical service delivery more efficient. This demonstrates how paediatric CPS becomes integrated with an existing healthcare system and its workflow.

7.1.4 Characteristics of individuals

CFIR Construct	Description of Observed CFIR Construct	Clinical Pharmacists	Physicians and Nurses	Parents and Caregivers
Knowledge and Beliefs	Unclear identity of clinical pharmacists as a clinician			(-)
	Parents' belief in clinical pharmacists as medicines experts			(+/-)
	Trust and confidence in the CPS were observed by physicians and nurses		(+)	
	Clinical pharmacists' can see the benefit that CPS has brought to patients	(+)		
Self-efficacy	A high degree of job satisfaction and self-esteem shown by pharmacists	(+)		
	The need to have a positive attitude from clinical pharmacists to drive the profession forward	(-)		
	The need to have a more proactive approach to patients and their parents	(-)	(-)	
Individual Stage of Change	Uncertainty about how CPS affects the dynamic of the healthcare team		(-)	

Table 15. Summary of constructs found in the “characteristics of individuals” domain.

The foundation of setting and intervention constructs lies in the actions and behaviours of people. According to Damschroder et al. (2009), implementation may be impacted by how people interact with one another and how that ‘ripple effect’ spreads through their teams, networks and organisations. ‘Knowledge and beliefs about the intervention’ refers to people’s

perspectives on the importance of paediatric CPS as well as their acquaintance with its guiding principles. Participants' confidence in their ability to carry out plans of action and achieve implementation goals is described as 'self-efficacy'. The 'individual stage of change' refers to the stage an individual is in as they move towards proficient, enthusiastic and sustained usage of CPSs.

The most frequent construct identified in this domain was knowledge and beliefs about paediatric CPS. Although it was observed that the clinical pharmacist's identity as a clinician is adversely influenced by both inner and outer setting factors, as described above, there are several factors within this construct that facilitate implementation. These include the belief, common to most parents, that clinical pharmacists are medicine experts; the trust and confidence in CPS shown by physicians and nurses; and clinical pharmacists' observance of how CPS benefited patients and their parents.

Self-efficacy was viewed as an important construct that affected implementation (Davies & Hodnett, 2006), with clinical pharmacists' high degree of job satisfaction and self-esteem aiding successful implementation. Nevertheless, some individuals showed an insufficiently positive attitude towards driving this special branch of pharmacy forward due to a lack of confidence in offering adequate service. A proactive approach from clinical pharmacists, in which they engaged in more face-to-face interactions with parents and caregivers, was also viewed as a factor that impacted CPS (Khaira et al., 2020). The data suggest that clinical pharmacists' input during the past few years of service has included a certain level of trust and support from physicians and nurses through engagement and participation as multidisciplinary team members. To gain more support from parents and caregivers as well, the attention should be turned to them. Given the increasing demand for CPSs and the increasing workload of clinical pharmacists, successful implementation is dependent on their ability to manage their

clinical tasks – in particular, a balance between dispensing and clinical roles in Hong Kong (Hohmeier et al., 2020).

Additionally, the clinical pharmacist's attitude was found to be a prevailing factor that influences service implementation. Whether a clinical pharmacist is confident in providing clinical services depends on the knowledge and skills they possess. Our data showed that there is a call for more structured, higher-level training to fulfil the need for practicing in some highly specialised areas of paediatrics.

The construct of an individual stage of change was also observed within this domain. It was found that some physicians were not ready to adopt more advanced CPSs in paediatrics, such as collaborative practice agreements or pharmacist prescriptions, as they felt uncertain about how CPS affects the dynamic of the healthcare team, which includes roles and responsibilities, communication and parents' perceptions of the change.

7.1.5 Process

CFIR Construct	Description of Observed CFIR Construct	Clinical Pharmacists	Physicians and Nurses	Parents and Caregivers
Planning	Pilots or trials of advanced services before organisational implementation	(+)	(+)	
Reflecting and Evaluating	Formation of paediatric clinical pharmacy services working group to exchange ideas and report progress	(+)		

Table 16. Summary of constructs found in the "process" domain.

Relatively few factors were identified within this domain. Some reported extended services, such as dermatology and allergy clinics, were carried out in pilot projects within individual hospitals in advance before execution on an organisational level. Another construct identified was related to reflection and evaluation. The implementation of paediatric CPS was facilitated by the setup of a paediatric CPS working group, which provided a platform for paediatric clinical pharmacists to share experiences, exchange ideas and report progress and development

among CPSs on a quarterly basis. The goals of the working group are (HA Chief Pharmacist's Office, 2023) as follows:

- to identify service enhancement opportunities and potential areas for paediatric CPS development;
- to propose service models, operational procedures and guidelines for paediatric CPS;
- to establish professional and quality assurance as well as performance indicators and monitor the implementation and its quality; and
- to lead and promote paediatric pharmacy practice research while encouraging experience sharing between group members.

7.2 Evidence-based strategies

Implementation strategies are defined as 'approaches or techniques used to enhance the adoption, implementation, sustainment, and scale-up of an innovation' (Proctor et al., 2013). According to Kirchner and colleagues (2020), the ability to integrate barriers to and facilitators of an innovation's uptake, as well as the application of implementation strategies to address or leverage these factors, can increase the likelihood of the implementation's success.

The use of the CFIR has helped guide the systematic assessment of multilevel implementation contexts in Hong Kong by identifying factors that have influenced the implementation of paediatric CPS. The barriers identified in the qualitative studies have contributed to the development of evidence-based implementation strategies for improving service implementation, specifically in relation to paediatric services in Hong Kong.

A Cochrane Review concluded that the use of implementation strategies designed to address determinants was found to be more effective than no strategies or strategies not tailored to determinants (Baker et al., 2015). The reviewers also noted that the methods used to identify and prioritise determinants and select implementation strategies were often not well described. To address the need for a common nomenclature for implementation strategies, the

Expert Recommendations for Implementing Change (ERIC) project applied a rigorous consensus-development process and developed 73 discrete implementation strategies and their definitions (Waltz et al., 2015). The advantages of using ERIC as a guide are that it helps provide consistency in terminology to avoid homonymy, synonymy and instability in implementation strategy terms, in addition to providing sufficient details to enable either scientific or real-world replication of implementation strategies (Powell et al., 2015).

Among the 73 implementation strategies, nine thematic clusters were identified, which were developed with the goal of organising related strategies across studies. Waltz and colleagues (2015) conducted purposive sampling to recruit an expert panel of implementation science and clinical experts to participate in concept mapping and task rating; they summarised the possible implementation strategies, organised by cluster with mean importance and feasibility ratings. The panel members were asked to rate each strategy's importance and feasibility, ranging from one, which was defined as relatively unimportant or not at all feasible, to five, which was defined as extremely important or extremely feasible. The clusters, strategies (with their respective importance levels) and feasibility ratings are detailed in Appendix IX.

The proposed implementation strategies were organised and applied in concert with the ERIC compilation, facilitating the selection of the strategies best suited for implementation efforts in this particular setting, with the ratings of importance and feasibility entering into the considerations. Waltz and colleagues (2015) performed scaling and hierarchical cluster analyses to produce visual representations of the relationships between the strategies, with each strategy's importance and feasibility score illustrated on a scatterplot graph. The proposed strategies from this research were numbered and represented using this graph, as shown in Figure 7. Descriptions of each strategy are provided below.

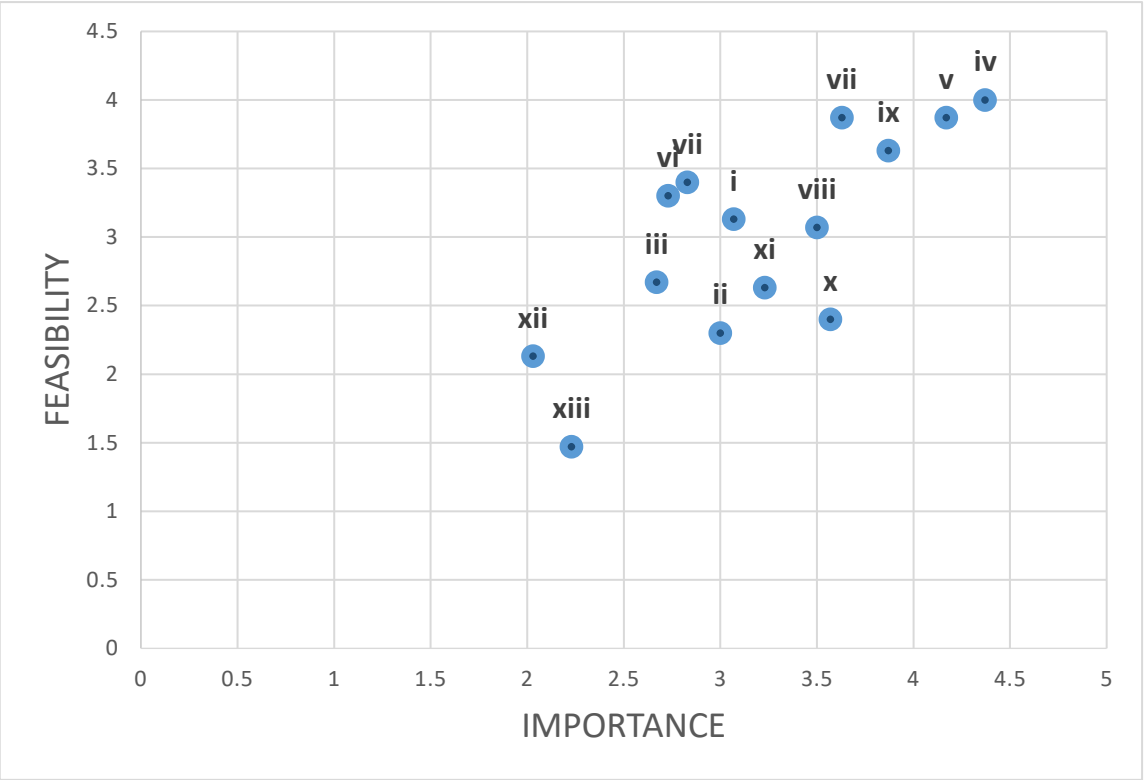


Figure 7. Scatterplot for recommended implementation strategies with feasibility and importance ratings

7.2.1 Support clinicians

i) Develop resource-sharing agreements (Importance: 3.07; Feasibility: 3.13)

'Develop resource-sharing agreements' means developing partnerships with organisations that have resources needed to implement the innovation. A well-defined pharmacy service agreement, which includes protected time for clinical pharmacists on the ward to engage in personal contact with patients, parents and other healthcare professionals while vetting their patient's orders, could improve the level of patient-centred care, since clinical pharmacists could have a better clinical picture and understanding of patients' needs, thus helping to optimise medication provision. Having pharmacists designated to specific roles, such as training or drug information, could help enable clinical pharmacists to provide clinical services as described; however, this may lead to staff issues, which are interwoven with other implementation strategies, such as gaining access to new funding.

ii) Revise professional roles (Importance: 3.00; Feasibility: 2.30)

Clarification of the role of the clinical pharmacist within the multidisciplinary team enhances the effectiveness of patient care (Alsuhebany, Alfehaid & Almodaimegh, 2019; Makowsky et al., 2009). This indicates that a better understanding of the CPS among physicians and nurses warrants the use of the service, which enhances its implementation. The revision of professional roles can be initiated by the healthcare organisation, as implementation strategies that consist of 'top-down' processes have been found to increase the practicability and acceptability of healthcare interventions (Klaic et al., 2022).

iii) Create new clinical teams (Importance: 2.67; Feasibility: 2.67)

'Create new clinical teams' is a strategy that changes who serves on the clinical team, adding different disciplines and different skills to make it more likely that the clinical innovation is delivered. Mixing the skills of pharmacy technicians and dispensers may alleviate the time constraints that clinical pharmacists face. 'Skill mix' refers to the quantity and educational preparation of healthcare staff working in a clinical setting (Boughen & Fenn, 2020). For example, the functions of hospital pharmacy technicians in the UK have evolved from traditional duties, such as dispensation, to medicine optimisation and pharmacy management activities. This allows pharmacists to take more time to focus on their clinical activities. Boughen and Fenn (2020) reported some of the medicine optimisation activities undertaken by pharmacy technicians in the UK, which include providing advice about medicines to patients, providing patients with compliance aids, assessing the appropriateness of medicine forms, analysing quantities of medicines to reduce waste, taking medication histories and reconciling patients' medicines between one setting and another. Although the available literature is scarce, a systematic review has nevertheless found evidence to suggest that pharmacy technicians assuming advanced roles results in either improved patient outcomes

or opportunities for clinical pharmacists to perform more advanced clinical services (Mattingly & Mattingly, 2018).

7.2.2 Adapt and tailor to context

iv) Tailor strategies (Importance: 4.37; Feasibility 4.00)

The idea behind this strategy is to tailor the implementation strategies to address barriers and leverage facilitators that were identified through earlier data collection. The dataset revealed that with the limited resources available – which affect the availability of the clinical pharmacists to perform their clinical duties – prioritising tasks would help clinical pharmacists deliver CPSs. This indicates that more work could be done to reduce medication errors, as the result of enhanced medication safety is to allow other healthcare professionals to understand the value of CPS in paediatrics, thus facilitating its implementation (Wong, 2017).

Hohmeier et al. (2020) pointed out that clinical pharmacists' ability to balance their clinical tasks with competing workload priorities is crucial, given the increasing demand for CPSs. The authors postulated that a paradigm shift may be needed in clinical service research and pharmacy education to place the focus not on 'what' to do but on 'how' to do it. Further research would help identify the skills necessary to design CPS studies and how a combination of training and technology might help overcome skill gaps. In addition, appropriate assessment tools can be used by clinical pharmacists to assess patient priority and complexity to prompt early detection and management of high-risk patients. These tools can be used to stratify paediatric patients into diverse risk levels, as described by Fernandex-Llamazares et al. (2015) and Mott, Kafka and Sutherland (2016) in different settings, thus helping to prioritise those patients who would benefit more from clinical pharmacists' interventions.

7.2.3 Training and educate stakeholders

v) Conduct ongoing training (Importance: 4.17; Feasibility: 3.87)

According to Rose et al. (2021), several factors can facilitate clinical pharmacy practice. First, advanced degrees appropriate for the practice of clinical pharmacy can serve as signs to other healthcare professionals of the skills and knowledge that paediatric clinical pharmacists possess, indicating their competence to successfully perform their clinical duties. Currently, the Chinese University of Hong Kong (CUHK) provides a two-week advanced course in speciality paediatric training in clinical pharmacy skills (School of Pharmacy, CUHK, 2016). However, it is uncertain whether a short, certified course is sufficient to persuade stakeholders of clinical pharmacists' competencies. A more structured training programme, such as the residency and fellowship programme in the USA, is warranted so that different levels of curriculum can be provided at different stages of clinical pharmacists' careers, as the integration of continuing professional development could transform continuing education into a vehicle that advances both the professional's practice and the greater healthcare system (Wheeler & Chisholm-Burns, 2018).

vi) Work with educational institutions (Importance: 2.73; Feasibility: 3.30)

In a report on improving patient and healthcare systems through pharmacy practice, higher education, such as postgraduate training – which includes master's- and doctoral-level training and clinical speciality certifications – was described as essential to the implementation and delivery of advanced pharmacy services in the USA (Giberson, Yoder & Lee, 2011). A stronger collaboration with local universities in providing specialised training, such as the clinical pharmacy training provided by the Centre for Pharmacy Postgraduate Education (CPPE) in the UK, was highly recommended. Pharmacists' clinical aptitude for the safe and effective use of medications could be promoted by a higher educational programme with significant experiential and clinical education components at the introductory and advanced levels, which could help other healthcare professionals or the general public understand how clinical pharmacists contribute to the healthcare system (Ryan et al., 2008).

7.2.4 Develop stakeholder interrelationships

vii) Develop academic partnerships (Importance: 2.83; Feasibility: 3.40) & Capture and share local knowledge (Importance: 3.63; Feasibility: 3.87)

To develop academic partnerships is to 'partner with a university or academic unit for the purposes of shared training and bringing research skills to an implementation project'. Clinical pharmacists should educate administrative stakeholders on the importance of paediatric CPS within the healthcare system; one strategy to encourage their support is to conduct robust research (Rowley et al., 2012). However, the present enquiry discovered a lack of robust evidence in the current literature, where studies are highly heterogeneous and mostly low quality due to the absence of controlled groups, small sample sizes, single sites, inconsistent reporting of outcomes and bias risk. A high level of collaboration between hospitals and local universities could help to consolidate the evidence on the impact of paediatric CPS on clinical, humanistic and economic outcomes. Systematic and pragmatic approaches could subsequently be enacted, providing robust and localised evidence to stakeholders. There is emerging evidence that cultivating university research positions within the healthcare system, such as those of clinical teaching practitioners, could influence the research skills and participation of allied healthcare professionals, facilitating the provision of high-quality, robust evidence in this area of research (Wenke & Mickan, 2016).

7.2.5 Engage consumers

viii) Intervene with patients to enhance uptake and adherence (Importance: 3.50; Feasibility: 3.07)

Pharmacists should make an effort to empower the public through medication education, and this task can be initiated by professional bodies or societies as a starting point. For example, the establishment of the Drug Education Resource Centre under the Society of Hospital Pharmacists of Hong Kong, which provides medication information and education to patients

and the public (Chin, Leung & Xue, 2020), has helped to increase the awareness of pharmacists' role.

The lack of patient and public awareness of the pharmacist's role in the community in the UK was identified in a systematic review (Hindi et al., 2017). The researchers found that while there was a shortage of studies discussing strategies that could effectively promote pharmacy service provision to the public, focus group discussions have revealed various approaches that could enhance service utilisation, such as posters or media and physician support.

More effort is required from clinical pharmacists in Hong Kong to spread awareness and understanding of this special branch of pharmacy service. They could take as an example the Royal Pharmaceutical Society (RPS), which has, following one of its guiding principles, set out to increase recognition of the profession by promoting pharmacy in the media and government (RPS, 2019). The society has published blog posts and podcast episodes and held events and campaigns to achieve this. Nevertheless, the fact that '*seeing is believing*' plays an important role in this implementation strategy, and clinical pharmacists must routinely take advantage of opportunities to interact with patients or parents. As Kelly and colleagues (2014) point out, every patient interaction is an opportunity to educate the public on the knowledge, skills and unique professional skills of pharmacists. Public understanding will foster support for expanded pharmacy services, which, in turn, will help ensure that children achieve optimal health outcomes.

ix) Involve patients and family members (Importance: 3.87; Feasibility: 3.63)

With challenges such as limitations in funding and staff shortages, innovative approaches to service delivery, such as prioritisation of services, have been identified as one of the solutions for achieving cost effectiveness and increased productivity (Alshakrah, Steinke & Lewis, 2019). As suggested by some participants, one way to improve the implementation of CPSs in Hong Kong would be to engage in more direct patient-care activities.

Like Alsuhebany et al. (2019), we found that medical and nursing participants considered proactive communication between pharmacists and patients essential to enhancing patient care. In a qualitative study, Chevalier et al. (2017) noted that themes that can promote effective communication between clinical pharmacists and patients include the provision of clear and easy-to-understand information, patient engagement and empowerment, and the establishment of a rapport with the pharmacist. The need to adopt a consistent procedure for direct patient care was reiterated by the ACCP (2014). In this white paper, the ACCP described four essential elements that serve as the cornerstones of the clinical pharmacist's direct patient care process, regardless of the type of practice, the clinical setting or the medication conditions involved. These include assessing the patient and their medications, developing a plan of care, implementing the plan and evaluating the outcomes. The implementation of a successful direct patient care service not only helps to achieve better patient-related outcomes but could also improve the public's and other healthcare professionals' recognition of clinical pharmacists as healthcare providers, thus solidifying their unique role within the healthcare system (White, 2014).

To develop a strong and appropriate interpersonal relationship with patients and their parents, providing more direct patient care is crucial. This enhances clinical pharmacists' professionalism and facilitates the implementation of CPS as a result (Llardo & Speciale, 2020). The degree to which parental expectations are fulfilled and the confidence that parents have in CPS are attitudinal factors that help positively influence service implementation (Onozato et al., 2019). In view of this, stakeholders and pharmacy management should focus their paediatric clinical pharmacy resources on the provision of direct patient care in order to promote service implementation. A paradigm shift in how clinical pharmacists' energy is directed towards providing services such as parent counselling or the extension of CPSs to

ambulatory care settings are examples of strategies that could enhance paediatric service implementation in Hong Kong.

7.2.6 Utilise financial strategies

x) Access new funding (Importance: 3.57; Feasibility: 2.40)

One of the most persistent barriers identified in the data was the lack of resources – most notably, the funding needed to recruit clinical pharmacists. As reported in previous chapters, the percentage of total health expenditures in Hong Kong is low compared with countries with well-established CPSs, which could explain why administrative stakeholders struggle to fund CPS. Accessing extra funding in healthcare is challenging, and the difficulty in Hong Kong is related to implementation factors such as stakeholder attitudes, lack of recognition of and a definitive role for clinical pharmacists, lack of direct patient-care activities and a culture of medical dominance. Experts have suggested that clinical pharmacists' involvement in patient care activities and recognition of how their functions within local healthcare systems promote improvement in economic, clinical and humanistic outcomes could coincide with unique funding opportunities that seek to guarantee improved patient care in an expanded population (Moore et al., 2018). This is a key reason to call for high-quality studies in this field of research.

7.2.7 Change infrastructure

xi) Mandate change (Importance: 3.23; Feasibility: 2.63)

'Mandate change' captures the call to have leadership declare the priority of the innovation and their determination to have the innovation implemented. This research found that the medical profession consolidates medicine's control over other healthcare professions through the hierarchical skills structure; occupying the chairmanship of the Pharmacy and Poisons Board of Hong Kong, which is the regulatory body responsible for the registration of pharmacists, clearly establishes their medical authority in Hong Kong's healthcare system. Diminishing the dominance of medical culture is challenging and complicated. Nevertheless,

efforts should be made to ensure that the key stakeholders atop the healthcare hierarchy support CPS. For example, the support of key stakeholders led to the stipulation of guidance in the NHS on the responsibility for prescribing and supplying medicines between primary and secondary or tertiary care, thus advocating the provision of medicine optimisation (NHS, 2018). Such organisational initiatives could make the best use of clinical time and resources in different healthcare disciplines, including clinical pharmacy.

Research suggests that there must be a balance between the supply of and demand for healthcare to achieve effective health gains. One way to achieve this is to allocate more resources to community care to support chronic disease management using the least expensive treatment strategy (Lam, 2018). Although prima facie it may seem that fewer resources would be available to secondary care, transferring discharged patients to primary care would largely relieve pharmacists of their dispensing duties, thus facilitating CPS implementation. However, transfers between care settings pose a great challenge in Hong Kong due to the limited number of general practitioners in the public sector. In addition, the attitudes and skills necessary to manage more complex patients might also be barriers to change, as this has been reported as a challenge in some other countries as well (Osborn et al., 2015).

Another example of leaders declaring the priority of CPS can be found in the NHS's Long Term Plan. This is a strategy based on proposing a new model of care, committing to increasing the number of clinical pharmacists through the 'NHS England Clinical Pharmacists in General Practice' initiative and providing clear explanations to the public of how the profession improves the quality of care and ensures patient safety (NHS, 2019).

xii) Start a dissemination organisation (Importance: 2.03; Feasibility: 2.13)

To 'start a dissemination organisation' means to identify or start a separate organisation that is responsible for disseminating the clinical innovation. Government-appointed professional

associations or societies should provide adequate credentialing and advanced degrees to ensure that service is maintained and sustained, define the multiple domains of practice necessary for advanced practice and provide clarity on which differentiations of skills are a prerequisite to progress along the practice spectrum (Hickey et al., 2014). Hong Kong has a statutory body responsible for pharmacist registration, namely, the Pharmacy and Poison Board, but it lacks a professional council, which is not the case for the medical and nursing professions. Nevertheless, a call is currently active to enact government policies establishing a pharmacy council dedicated to the continuous enhancement of professional practice quality, with the establishment of consistent standards providing an agenda. The definition of clinical practice competence and creation of an infrastructure and framework to allow for the development of competence skills across the spectrum of different career stages are key in equipping clinical pharmacists for the delivery of paediatric CPSs in Hong Kong (Forsyth & Rushworth, 2021).

xiii) Create or change credentialling and/or licensure standards (Importance: 2.23; Feasibility: 1.47)

One factor described by Rose et al. (2021) that could enhance clinical pharmacy practice is credentialing, which refers to a recognition of clinical pharmacy as a speciality within the pharmacy profession. The significance of certification lies in assessing the candidacy of clinical pharmacists based on their training and skills, which determine their competence to perform their roles. The certification board helps to maintain their skills through written, oral, practical or simulator-based testing. Credentialling is thought to improve the standardisation of practice and quality of care by holding clinical practice to the credential's standards (Hickey et al., 2014). Training and standardisation of practice were at the core of the values of clinical pharmacists that facilitate the implementation of CPS, and governance of the profession could enable the skills of paediatric clinical pharmacists to be maintained and sustained at a high

level. An example of this is the Advanced Practice Framework proposed by the UK's RPS. The RPS (2013b) has defined the multiple domains of practice necessary for advanced practice and provided clarity on which differentiation of skills, at various levels, is a prerequisite to progress along the practice spectrum; it is also responsible for the credentialing process.

Although there are currently no certification boards for clinical pharmacists in Hong Kong, there is an initiative to form such a professional body. The College of Pharmacy Practice (2023), founded in 2010, aims to establish independent accreditation and recognisable professional titles granting authority to the pharmacy profession in Hong Kong. They are currently working with local universities and pharmacy societies with the aim of becoming an accrediting and educational institution recognised by governmental legislation.

xiv) Change liability laws (Importance: 1.87; Feasibility: 1.33)

The implementation strategy of changing liability laws means participating in liability reform efforts that make clinicians more willing to deliver clinical innovations. There have been reports of growing social and policy interest in studying the potential criminal liabilities of the medicine management decisions that pharmacists are exposed to with the expansion of pharmacist roles in Hong Kong (Tang, 2021). Shifts towards criminal liability from the legislative perspective and more widespread professional liability insurance provision to cover civil liability are some examples that could facilitate CPS implementation from clinical pharmacists' perspectives. In addition, the evolving role of clinical pharmacists, as seen in collaborative practice agreements, should be accompanied by legislation to eliminate the possibility of patient care being minimised alongside specific allocations of liability so that all medical professionals involved are aware of their legal responsibilities, which may facilitate the implementation of such agreements (Van Beek, 2015).

In a paper that discusses liability for dispensation errors in Hong Kong, the author highlights that there is no separation between prescribing and dispensing in Hong Kong, and

the liabilities for dispensing errors are therefore applicable to all healthcare professionals who dispense medication (Tang, 2021). Some legal experts support this separation and contend that the exclusive dispensing role is best left to pharmacists since pharmacists have more extensive experience and knowledge in this area than physicians (Cheung, 2015). Loo and colleagues (2019) go further, arguing that passing government policies to separate prescription and dispensation could have a positive effect on the status of pharmacists as healthcare professionals because it enables pharmacists to engage with the public more and improve patient care. Another governmental directive that could help involves more successfully combating the illegal sale of prescription-only, counterfeit and illicit medicines in the community pharmacy sector, thereby improving the reputation of pharmacists as a whole. An example of the Hong Kong government's efforts was the establishment of a high-level, multi-sectoral steering committee on antimicrobial resistance in 2016 by the Centre of Health Protection, wherein combating the illegal sale of antibiotics in community pharmacies was one of the strategies implemented.

7.3 Further research

Three factors need to be considered to warrant a successful implementation of a health service. These are: firstly, the factors that are influencing implementation; secondly, which strategies may assist; and thirdly, what evaluations should be conducted (Moullin, Sabater-Hernández & Benrimoj, 2016). This programme of research has identified barriers and facilitators that influenced implementation, and strategies were recommended following a framework analysis. However, there was a paucity of factors identified regarding evaluations, which is one of the fundamental elements throughout each stage of the implementation process. As Damschroder et al. (2009) pointed out, "process" is the most difficult domain to define, measure, or evaluate in implementation research. This is because the majority of studies in implementation research described various perspectives on implementation, but not

from direct experiences with implementing these services, and therefore the extent to which the constructs in the “process” domain can be observed is constrained (Shoemaker et al., 2017).

The four components: plan, do, study, and act, are often done in an incremental or spiral approach to implementation, which means each activity will be revisited, expanded, refined, and re-evaluated throughout implementation (Institute for Healthcare Improvement, 2003). Further research would involve iterative and continuous formative evaluations of the new implementation strategies determined from using a pragmatic mixed methods approach, as it enables researchers to simultaneously ask confirmatory and exploratory questions, thus verifying and generating theories within the same research (Whitley et al., 2020). The following recommendations aim to produce enriched evidence by which to ensure the effective implementation of paediatric CPS in Hong Kong in the future:

- To include governmental and organisational decision or policy makers as interview participants, as they have a strong influence in the intervention characteristics domain, such as cost, which has a cascade effect on the outer and inner settings of the intervention. These key stakeholders are also fundamental to the planning and engaging constructs of the implementation process.
- The recruitment of healthcare professional participants from all public and private hospitals in Hong Kong with paediatric services would increase the representativeness of the findings, since paediatric CPSs were implemented on an organisational level. Reaching out to participants from a wider part of a population (e.g. from different hospitals) could potentially trigger responses that could elicit the emergence of new themes.
- A revised recruitment method for parents and caregivers, as recommended in the discussion section of Study 3, should be employed to ensure thematic saturation can be reached. Strategies to increase participation rate include face-to-face communication with

patient support groups or parents, direct recruitment at study sites, availability of research supporting staff and gatekeepers, increase public awareness, and incentives.

Three broad types of study designs for implementation science can be considered for future research. These include experimental/quasi-experimental, observational, and simulation studies (Hwang et al., 2020). Both experimental or quasi-experimental studies can be used to measure the impact of implemented paediatric services. For example, in order to find out what implementation strategies should be used, in what order, and to achieve the best outcomes in a given context, the sequential, multiple-assignment randomised trial (SMART) should be conducted. SMARTs can inform optimal sequences of implementation strategies to maximise downstream clinical outcomes (Miller, Smith & Pugatch, 2020). If randomisation is not desirable, some quasi-experimental study designs, such as interrupted time series (ITS), allow researchers to conduct rigorous studies in these contexts. Researchers explained that ITS designs rely on repeated data collections from intervention sites to determine whether a particular intervention is associated with improvement on a given metric relative to the pre-intervention secular trend (Miller, Smith & Pugatch, 2020). Hwang et al. (2020) explained ITS has a higher power and internal validity than other quasi-experimental designs in implementation research, but defining the interruption and the time needed for the implementation to shown an effect may make it challenging.

Observational studies, such as naturalistic observation, may offer additional value to observe how the implementation of CPSs changes individuals' behaviors, which is essential in identifying the gap between reported and actual practice (Hamilton & Finley, 2019). The context of interpersonal interactions that were unseen by participants or not seen as socially acceptable to discuss, may also be revealed through observation (Hamilton & Finley, 2019).

Chapter 8. PROGRAMME OF RESEARCH CONCLUSIONS

This programme of qualitative research enabled the identification of factors that influence the implementation of paediatric CPS in public hospitals in Hong Kong by performing a systematic review and conducting three studies which involved three participant groups (clinical pharmacists, physicians and nurses, parents, caregivers and former patients). Both facilitators and barriers were identified which relate to the intervention characteristics, outer and inner settings, characteristics of individuals, and implementation process. The following are the main facilitators that enable service implementation:

- Support from the pharmacy management team, physicians, nurses and parents, with the belief that clinical pharmacists are medicines experts;
- Direct and coherent communication between healthcare professionals that brings better patient care and service efficiency;
- Clinical pharmacists filling the clinical gaps as medicine information providers to other healthcare professionals and parents.

There are some major barriers that hindered the implementation of paediatric CPS in Hong Kong. These include:

- A lack of patient-focused approach, especially face-to-face interactions, which affects the public understanding and recognition of clinical pharmacists' role;
- A culture of medical dominance and a lack of support from administrative stakeholders affecting budget allocation towards CPS, thereby limiting opportunities for services such as collaborative practice agreements;
- Limited resources which affected the availability of clinical pharmacists and their workload;
- The need to have a stronger collaboration with educational organisations to provide higher-level training and to conduct local research that brings evidence to practice;

- The need to enact a professional council and formation of specialised professional associations to provide guidance on practice standards, training, and accreditation.

These implementation factors provided a context-specific and evidence-informed decision-making groundwork which is crucial to making what is possible in theory to reality in practice (Peters, Tran & Adam, 2013). Improving implementation appeared to be a fundamental issue for policy and practice for paediatric CPS in Hong Kong and the recommended strategies should be evaluated empirically in future implementation research studies.

Chapter 9. SUMMARY OF PUBLICATIONS

9.1 Systematic review publications

9.1.1 Published paper

Sin, C.M.H., Huynh, C., Dahmash, D., Maidment, I.D., 2022. Factors influencing the implementation of clinical pharmacy services on paediatric patient care in hospital settings. *European Journal of Hospital Pharmacy.* 29, pp.180-186. (Appendix IX)

9.1.2 Conference poster presentation

Sin, C.M.H., Huynh, C., Dahmash, D., Maidment, I.D., 2022. P08 Factors influencing the implementation of clinical pharmacy services on paediatric patient care in hospital settings. *Archives of Disease in Childhood.* 107, e25. (Appendix X)

9.2 Study 1 publications

9.2.1 Published paper

Sin, C.M.H., Huynh, C., Maidment, I.D., 2022. Clinical pharmacists' perceptions of the barriers and facilitators to the implementation of paediatric clinical pharmacy services in Hong Kong. *International Journal of Pharmacy Practice.* 30(5), pp.466-471. (Appendix XI)

9.2.2 Conference abstract

Sin, C., Huynh, C., Maidment, I., 2023. P04 Clinical pharmacists' perceptions of the barriers and facilitators to the implementation of paediatric clinical pharmacy services in Hong Kong. *Archives of Disease in Childhood.* 108, pp. 2-3. (Appendix XII)

9.3 Study 2 publications

9.3.1 Published paper

Sin, C.M., Huynh, C., Maidment, I.D., 2023. Physicians' and nurses' perceptions of the factors influencing the implementation of paediatric clinical pharmacy services in Hong Kong: a qualitative study. *European Journal of Hospital Pharmacy.* Published Online First: 04 August 2023. (Appendix XIII)

9.3.2 Conference poster presentation

Sin, C.M.H., Huynh, C., Maidment, I.D., 7th – 9th October, 2022. Physicians' and nurses' perceptions on the implementation of paediatric clinical pharmacy services. Poster presented at: the 28th Annual professional conference & exhibition of the Neonatal and Paediatric Pharmacists Group. Harrogate, United Kingdom. (Appendix XIV)

References

Abousheishaa, A.A., Sulaiman, A.H., Huri, H.Z., Zaini, S., Othman, N.A., bin Aladinn, Z., Guan, N.C., 2020. Global scope of hospital pharmacy practice: a scoping review. *Healthcare (Basel).* 8(2), pp.143.

Abraham, O., Brothers, A., Alexander, D.S. and Carpenter, D.M., 2017. Pediatric medication use experiences and patient counselling in community pharmacy: perspectives of children and parents. *Journal of the American Pharmacists Association*. 57(1), pp.38-46.

Abusheishaa, A.A., Sulaiman, A.H., Huri, H.Z., Zaini, S., Othman, N.A., bin Aladdin, Z., Guan, N.C., 2020. Global scope of hospital pharmacy practice: a scoping review. *Healthcare.* 8(2), Art no: 143.

Ahmed, S.I., Hasan, S.S., 2010. Clinical pharmacy and pharmaceutical care: a need to homogenize the concepts. *American Journal of Pharmaceutical Education.* 74(10): Art no: 193g.

Al-Arifi, M.N., Alghamdi, B., Al-Saadi, M., Idris, A.E., Wajid, S., Said, R., Babelghaith, S.D., 2015. Attitudes and perceptions of healthcare providers towards clinical pharmacy services at a tertiary care hospital in Riyadh, Saudi Arabia. *Tropical Journal of Pharmaceutical Research.* 14(5), pp.913-918.

Alberta Health Services, 2020. *Implementation science theories, models and frameworks.* Edmonton, Batra-Garga, N. Available from: https://www.albertahealthservices.ca/assets/info/amh/if-amh-ke-implementation-science-theories-models-frameworks.pdf [Accessed on 28 Mar 2023]

Allemann, S.S., Foppe van Mil, J.W., Botermann, L., Berger, K., Griese, N. and Hersberger, K.E., 2014. Pharmaceutical care: the PCNE definition 2013. *International Journal of Clinical Pharmacy*, 36, pp.544-555.

Almomani, B.A., Mayyas, R.K., Ekteish, F.A., Ayoub, A.M., Ababneh, M.A. and Alzoubi, S.A., 2017. The effectiveness of clinical pharmacist's intervention in improving asthma care in children and adolescents: randomized controlled study in Jordan. *Patient Education and Counselling.* 100(4), pp.728-735.

Alshakrah, M.A., Steinke, D.T., Lewis, P.J., 2019. Patient prioritization for pharmaceutical care in hospital: A systematic review of assessment tools. *Research in Social and Administrative Pharmacy.* 15(6), pp.767-779.

Alsuhebany, N., Alfehaid, L., Almodaimegh, H., 2019. Attitude and perception of physicians and nurses toward the role of clinical pharmacists in Riyadh, Saudi Arabia: a qualitative study. *SAGE Open Nursing.* 5, pp.1-8.

American College of Clinical Pharmacy, 2014. *Standards of Practice for Clinical Pharmacists.* [online] Available from: https://www.accp.com/docs/positions/guidelines/standardsofpractice.pdf [Accessed on 25 Nov 2021]

American Society of Hospital Pharmacists, 1993. ASHP statement on pharmaceutical care. *American Journal of Hospital Pharmacy.* 50, pp.1720-1723.

American Society of Health-System Pharmacists, 2013. ASHP guidelines: minimum standard for pharmacies in hospitals. *American Journal of Health-System Pharmacy*. 70, pp.1619–1630.

Andres, E.B., Song, W., Schooling, C.M. and Johnston, J.M., 2019. The influence of hospital accreditation: a longitudinal assessment of organisational culture. *BMC Health Services Research.* 19, pp.467.

Appleton, J.V., King, L., 1997. Constructivism: a naturalistic methodology for nursing inquiry. *Advances in Nursing Science.* 20(2), pp.13-22.

Archiblad, M.M., Munce, S.E.P., 2015. Challenges and strategies in the recruitment of participants for qualitative research. *University of Alberta Health Sciences Journal.* 11(1), pp.34-37.

Arigo, D., Pagoto, S., Carter-Harris, L., Lillie, S.E., Nebeker, C., 2018. Using social media for health research: methodological and ethical considerations for recruitment and intervention delivery. *Digital Health.* 4, pp.1-15.

Aromataris, E., Pearson, A., 2014. The systematic review: an overview. *American Journal of Nursing.* 3, pp.53-58.

Ashcraft, L.E., Asato, M., Houtrow, A.J., Kavalieratos, D., Miller, E., Ray, K.N., 2019. Parent empowerment in pediatric health care settings: a systematic review of observational studies. *Patient.* 12(2), pp.199-212.

Auta, A., Strickland-Hodge, B., Maz, J., 2016. Challenges to clinical pharmacy practice in Nigerian hospitals: a qualitative exploration of stakeholders' views. *Journal of Evaluation in Clinical Practice*. 22(5), pp.699-706.

Bai, G., Houben-van Herten, M., Landgraf, J.M., Korfage, I.J. and Raat, H., 2017. Childhood chronic conditions and health-related quality of life: findings from a large population-based study. *PLoS One.* 12(6), e0178539.

Baker, R., Comosso-Stefinovic, J., Gillies, C., Shaw, E.J., Cheater, F., Flottorp, S., Robertson, N., Wensing, M., Fiander, M., Eccles, M.P., Godycki-Cwirko, M., van Lieshout, J., Jäger, C., 2015. Tailored interventions to address determinants of practice. *The Cochrane Database of Systematic Reviews.* 4:CD005470.

Balakrishnan, R.P., Ravichandran, R., Dillibatcha, J.S., Ravi, A.L., Sam, N.C., Nuthalapati, R., 2020. Clinical pharmacists' role in paediatric patients' medical care. *International Journal of Contemporary Pediatrics.* 7(12), pp.2416-2420.

Bargsted, M., Ramirez-Vielma, R., Yeves, J., 2019. Professional self-efficacy and job satisfaction: the mediator role of work design. *Journal of Work and Organizational Psychology.* 35(3), pp.157-163.

Barnett, N.L., 2019. Opportunities for collaboration between pharmacists and clinical pharmacologists to support medicines optimisation in the UK. *British Journal of Clinical Pharmacology*. 85(8), pp.1666-1669.

Barr, J., Paulson, S.S., Kamdar, B., Ervin, J.N., Lane-Fall, M., Liu, V., Kleinpell, R., 2021. The coming of age of implementation science and research in critical care medicine. *Critical Care Medicine.* 49(8), pp. 1254-1275.

Bauer, M.S., Damschroder, L., Hagedorn, H., Smith, J., Kilbourne, A.M., 2015. An introduction to implementation science for the non-specialist. *BMC Psychology Research.* 3(1), Art no: 32.

Baumbusch, J., 2010. Semi-structured interviewing in practice-close research. *Journal for Specialists in Pediatric Nursing.* 15(3), pp.255-258.

Bayles, E., 2015. Clinical pharmacy in paediatrics – a pilot to design and develop an effective service. *Archives of Disease in Childhood.* 100: e1.

Bēchet, C., Pichon, R., Giordan, A. and Bonnabry, P., 2016. Hospital pharmacists seen through the eyes of physicians: qualitative semi-structured interviews. *International Journal of Clinical Pharmacy.* 38, pp.1483-1496.

Bergstrom, A., Ehrenberg, A., Eldh, A.C., Graham, I.D., Gustafsson, K., Harvey, G., Hunter, S., Kitson, A., Rycroft-Malone, J., Wallin, L., 2020. The use of the PARIHS framework in

implementation research and practice – a citation analysis of the literature. *Implementation Science.* 15, Art no: 68.

Bhatt-Mehta, V., Buck, M.L., Chung, A.M., Farrington, E.A., Hagemann, T.M., Hoff, D.S., LaRochelle, J.M., Pettit, R.S., Phan, H., Potts, A.L., Smith, K.P. and Parrish, R.H., 2013. Recommendations for meeting the pediatric patient's need for a clinical pharmacist: a joint opinion of the paediatrics practice and research network of the American College of Clinical Pharmacy and the Pediatric Pharmacy Advocacy Group. *Pharmacotherapy.* 33(2), pp.243-251.

Birken, S.A., Powell, B.J., Presseau, J., Kirk, M.A., Lorencatto, F., Gould, N.J., Shea, C.M., Weiner, B.J., Francis, J.J., Yu, Y., Haines, E, Damschroder, L.J., 2017. Combined use of the Consolidated Framework for Implementation Research and the Theoretical Domains Framework: a systematic review. *Implementation Science.* 12, Art no: 2.

Birkhäuer, J., Gaab, J., Kossowsky, J., Hasler, S., Krummenacher, P., Werner, C., Gerger, H., 2017. Trust in the health care professional and health outcome: a meta-analysis. *PLoS One.* 12(2), e0170988.

Boaz, A., Robert, G., Locock, L., Sturmey, G., Gager, M., Vougioukalou, S., Ziebland, S. and Fielden, J., 2016. What patients do and their impact on implementation. *Journal of Health Organization and Management.* 30(2), pp.258-278.

Boughen, M., Fenn, T., 2020. Practice, skill mix, and education: the evolving role of pharmacy technicians in Great Britain. *Pharmacy*. 8(2), Art no. 50.

Bourgeault, I.L. and Mulvale, G., 2006. Collaborative health care teams in Canada and the USA: confronting the structural embeddedness of medical dominance. *Health Sociology Review.* 15, pp.481-495.

Braun, V. and Clarke, V., 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology.* 3, pp.77-101.

Briggs, S., Pearce, R., Dilworth, S., Higgins, I., Hullick, C. and Attia, J., 2015. Clinical pharmacist review: a randomised controlled trial. *Emergency Medicine Australia.* 27(5), pp.419-426.

British Medical Association. *NHS hospital beds data analysis.* [online] Available from: https://www.bma.org.uk/advice-and-support/nhs-delivery-and-workforce/pressures/nhs-hospital-beds-data-analysis [Accessed on 30 Jan 2023]

Calvert, R.T., 1999. Clinical pharmacy – a hospital perspective. *British Journal of Clinical Pharmacology.* 47(3), pp.231-238.

Carollo, A., Adamo, A., Giorgio, C.D. and Polidori, P., 2013. DGI-069 The importance of clinical pharmacists counselling in improving patient medication adherence. *European Journal of Hospital Pharmacy: Science and Practice.* 20, pp. 121.

Carter, B.L., 2016. Evolution of clinical pharmacy in the US and future directions for patient care. *Drugs Aging.* 33(3), pp. 169-177.

Chan, D.S., Callahan, C.W., 2001. Multidisciplinary education and management program for children with asthma. *American Journal of Health-System Pharmacy.* 58(15), pp.1413-1417.

Chan, Z.C.Y., Tam, W.S., Lung, M.K.Y., Wong, W.Y., Chau, C.W, 2013. On nurses moving from public to private hospitals in Hong Kong. *Journal of Clinical Nursing.* 22(9-10), pp. 1382-1390.

Chandrasekhar, D., Mohanlal, S.P., Matthew, A.C., Hashik, P.K.M., 2020. Impact of clinical pharmacist managed patient counselling on the knowledge and adherence to antiepileptic drug therapy. *Clinical Epidemiology and Global Health.* 8(4), pp.1242-1247.

Chen, C., Lee, D.S.H., Hie, S.L., 2013. The impact of pharmacist's counselling on pediatric patients' caregiver's knowledge on epilepsy and its treatment in a tertiary hospital. *International Journal of Clinical Pharmacy.* 35, pp.829-834.

Chen, T.F., Neto, A.C.D.A., 2007. Exploring elements of interprofessional collaboration between pharmacists and physicians in medication review. *Pharmacy World & Science.* 29, pp.574-576.

Cheung, E., 2015. Drug blunders by overworked doctors on rise in Hong Kong's public hospitals. *South China Morning Post.* Available from https://www.scmp.com/news/ hong-kong/health-environment/article/1824696/drug-blunders-overworked-doctors-rise-hong-kongs [Accessed on 21 Jul 2023].

Cheung, K.L., ten Klooster, P.M., Smit, C., de Vries, H., Pieterse, M.E., 2017. The impact of non-response bias due to sampling in public health studies: a comparison of voluntary versus mandatory recruitment in a Dutch national survey on adolescent health. *BMC Public Health.* 17, Art no. 276.

Chevalier, B.A.M., Watson, B.M., Barras, M.A., Cattrell, W.N., 2018. Hospital pharmacists' and patients' views about what constitutes effective communication between pharmacists and patients. *International Journal of Pharmacy Practice*. 26(5), pp.450-457.

Chief Pharmacist's Office (Hospital Authority), 2013. *Service management meeting (Pharmaceutical services)* [Presentation]. Available from: http://cpo.home/Doc/PD_PM/Presentations/SMM/SMM%20Presentation%202013.pdf [Accessed on 7 Apr 2021]

Chief Pharmacist's Office (Hospital Authority), 2015. *Strategic planning workshop for pharmaceutical services (2017-22)* [Presentation]. Available from: http://cpo.home/Doc/PD_PM/Presentations/Strategic%20Planning/Strategic%20Planning%202017-22.pdf [Accessed on 10 Mar 2021]

Chin, G., Leung, J., Xue, W., 2020. Visionary in the field of pharmacy: an interview with Mr William Chun-ming Chiu. *Hong Kong Medical Journal.* 26(6), pp.553-555.

Chisholm-Burns, M.A., Lee, J.K., Spivey, C.A., Slack, M., Herrier, R.N., Hall-Lipsy, E., Zivin, G.J., Abraham, I., Palmer, J., Martin, J.R., Kramer, S.S., Wunz, T., 2010. US pharmacists' effect as team members on patient care: systematic review and meta-analyses. *Medical Care.* 28(10), pp.923-933.

Chou, Y.J., Yip, W.C., Lee, C.H., Huang, N., Sun, Y.P., Chang, H.J., 2003. Impact of separating drug prescribing and dispensing on provider behaviour: Taiwan's experience. *Health Policy and Planning.* 18(3), pp.316-329.

Chu, J.T.W., Wang, M.P., Shen, C., Viswanath, K., Lam, T.H., Chan, S.S.C., 2017. How, when and why people seek health information online: qualitative study in Hong Kong. *Interactive Journal of Medical Research.* 6(2), e24.

Chung, J.S., Lee, K.K.C., Tomlinson, B., Lee, V.W.Y., 2011. Clinical and economic impact of clinical pharmacy service on hyperlipidemic management in Hong Kong. *Journal of Cardiovascular Pharmacology and Therapeutics.* 16(1), pp.43-52.

Clucas, K., 1986. *The pharmacy report of a committee of inquiry appointed by the Nuffield Foundation.* Nuffield Foundation, London. ISBN: 0904956245.

College of Pharmacy Practice. *Background* [online]. Available from: https://www.cpp.org.hk/background/ [Accessed on 20 June 2023]

Committee of Inquiry,1986. *Pharmacy. A report to the Nuffield Foundation.* London: Nuffield Foundation.

Copley, L.A.B., Kinsler, M.A., Gheen, T., Shar, A., Sun, D., Browne, R., 2013. The impact of evidence-based clinical practice guidelines applied by a multidisciplinary team for the care of children with osteomyelitis. *The Journal of Bone & Joint Surgery*. 95(8), pp.686-693.

Creswell, J.W., Poth, C.N., 2018. 'Chapter 2. Philosophical assumptions and interpretive frameworks' in *Qualitative inquiry and research design: choosing among five approaches.* 4th ed., California: SAGE Publications.

Damschroder, L.J., Aron, D.C., Keith, R.E., Kirsh, S.R., Alexander, J.A., Lowery, J.C., 2009. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science*. Implementation Science*. 4, pp.50.

Davies, B.L., Hodnett, E., 2006. Labor support: nurses' self-efficacy and views about factors influencing implementation. *Journal of Obstetric, Gynecologic & Neonatal Nursing.* 31(1), pp.48-56.

Dearing, J.W., Kee, K.F., Peng, T.Q., 2018. *Historical roots of dissemination and implementation science.* In: Brownson, R.C., Colditz, G.A., Proctor, E.K. (Editors), Dissemination and implementation research in health, 2nd Edition. Oxford University Press, Oxford, pp. 47-61.

Defoe, K.D., Jupp, J., Leslie, T., 2019. Integration of clinical pharmacists into an ambulatory, pediatric hematology/oncology/transplant clinic. *Journal of Oncology Pharmacy Practice*. 25(3), pp.607-612.

de Leon-Castaneda, C.D., Gutierrez-Godinez, J., Colado-Velazquez, J., Toledano-Jaimes, C., 2019. Healthcare professionals' perceptions related to the provision of clinical pharmacy services in the public health sector: a case study. *Research in Social and Administrative Pharmacy.* 15(3), pp.321-329.

Deshpande, M., Schauer, J., Mott, D.A., Young, H.N., Cory, P., 2013. Parents' perceptions of pharmacists as providers of influenza vaccine to children. *Journal of the American Pharmacists Association.* 53(5), pp.488-495.

Doody, O., Noonan, M., 2013. Preparing and conducting interviews to collect data. *Nurse Researcher.* 20(5), pp.28.

Dreischulte, T., van den Bemt, B., Steurbaut, S., 2022. European Society of Clinical Pharmacy definition of the term clinical pharmacy and its relationship to pharmaceutical care: a position paper. *International Journal of Clinical Pharmacy.* 44, pp. 837-842.

Drovandi, A., Robertson, K., Tucker, M., Robinson, N., Perks, S., Kairuz, T., 2018. A systematic review of clinical pharmacist interventions in paediatric hospital patients. *European Journal of Pediatrics*. 177, pp.1139-1148.

Eccles, M.P., Mittman, B.S., 2006. Welcome to implementation science. *Implementation Science.* 1, Art no: 1.

Entezari-Maleki, T., Dousti, S., Hamishehkar, H., Gholami, K., 2016. A systematic review on comparing 2 common models for management of warfarin therapy: pharmacist-led service versus usual medical care. *The Journal of Clinical Pharmacology.* 56(1), pp.24-38.

Erstad, B.L., Draugalis, J.R., Waldrop, S.M., 1994. Patients' perceptions of increased pharmacy contact. *Pharmacotherapy.* 14(6), pp.724-728.

Esmalipoir, R., Salary, P., Shojaei, A., 2021. Trust-building in the pharmacist-patient relationship: a qualitative study. *Iranian Journal of Pharmaceutical Research.* 20(3), pp.20-30.

European Society of Clinical Pharmacy, 2014. *European Statements of Hospital Pharmacy. Section 4: Clinical Pharmacy Services.* [online] Available from: http://www.statements.eahp.eu/statements/final-statements [Accessed on 28 Apr 2019]

Farre, A., Cummins, C., 2016. Understanding and evaluating the effects of implementing an electronic paediatric prescribing system on care provision and hospital work in paediatric hospital ward settings: a qualitatively driven mix-method study protocol. *BMJ Open*. 6: e010444.

Fernandes, B.D., Foppa, A.A., Ayres, L.R., Chemello, C., 2022. Implementation of medication reconciliation conducted by hospital pharmacists: a case study guided by the consolidated framework for implementation research. *Research in Social and Administrative Pharmacy.* 18(9), pp.3631-3637.

Fernandes, N., 2017. Illegal sale of antibiotics still common in Hong Kong. *HKUJournalism* [online]. Available from: https://jmsc.hku.hk/2017/03/illegal-sale-of-antibiotics-still-common-in-hong-kong/ [Accessed on 13 Nov 22].

Fernandez-Llamazares, C.M., Perez, L.A., Poy, M.C., Rosa, F.R, Garrido, B., Gallego, V., Hernandez-Gago, Y., Manrique-Rodriguez, S., Perez, I., Pozas del Rio, M.T., 2015. Pharmaceutical care system for chronic paediatric patients. *European Journal of Hospital Pharmacy*. 22, Art no. 23.

Fernandez-Llamazares, C.M., Pozas, M., Feal, B., Cabanas, M.J., Villaronga, M., 2013. Profile of prescribing errors detected by clinical pharmacists in paediatric hospitals in Spain. *International Journal of Clinical Pharmacy.* 35(4), pp. 638 – 646.

Flannery, D.D., Swami, S., Chan, S., Eppes, S., 2014. Prescriber perceptions of a pediatric antimicrobial stewardship program. *Clinical Pediatrics.* 53(8), pp.747-750.

Food and Health Bureau (The Government of the Hong Kong Special Administrative Region), 2019. *Statistics: Domestic Health Accounts – Estimates of Health Expenditure: 1989/90 – 2019/20* [online]. Available from: https://www.fhb.gov.hk/statistics/en/dha/dha_summary_report.htm [Accessed on 24 Dec 2021]

Foronda, C., MacWilliams, B., McArthur, E., 2016. Interprofessional communication in healthcare: an integrative review. *Nurse Education in Practice*. 19, pp.36-40.

Forsyth, P., Rushworth, G.F., 2021. Advanced pharmacist practice: where is the United Kingdom in pursuit of this 'Brave New World'? *International Journal of Clinical Pharmacy.* 43, pp.1426-1430.

Francis, J.J., O'Connor, D., Curran, J. Theories of behaviour change synthesised into a set of theoretical groupings: introducing a thematic series on the theoretical domains framework. *Implementation Science.* 24(7), Art no: 35.

Frankel, G.E.C., Austin, Z., 2013. Responsibility and confidence: identifying barriers to advanced pharmacy practice. *Canadian Pharmacists Journal.* 36, pp.1031-1038.

Frankfort-Nachmias, C., Nachmias, D., 1996. *Research Methods in the social sciences.* London: Arnold.

Freidson, E., 1986. *Professional powers: a study of the institutionalization of formal knowledge.* Chicago, University of Chicago Press.

Fusch, P.I., Ness, L.R., 2015. Are we there yet? Data saturation in qualitative research. *The Qualitative Report.* 20(9), pp.1408-1416.

Gallagher, J., McCarthy, S., Byrne, S., 2014. Economic evaluations of clinical pharmacist interventions on hospital inpatients: a systematic review of recent literature. *International Journal of Clinical Pharmacy.* 36(6), pp. 1101-1114.

Gallagher, M., Worth, A., Cunningham-Burley, S., Sheikh, A., 2012. Strategies for living with the risk of anaphylaxis in adolescence: qualitative study of young people and their parents. *Primary Care Respiratory Journal.* 21, pp.392-397.

Garia-Cardenas, V., Armour, C., Benrimoj, S.I., Martinez-Martinez, F., Rotta, I., Fernandex-Llimos, F., 2016. Pharmacists' interventions on clinical asthma outcomes: a systematic review. *European Respiratory Journal.* 47, pp.1134-1143.

Garcia-Cardenas, V., Benrimoj, S.I., Ocampo, C.C., Goyenechea, E., Martinez-Martinez, F., Gastelurrutia, M.A., 2017. Evaluation of the implementation process and outcomes of a professional pharmacy service in a community pharmacy setting: a case report. *Research in Social & Administrative Pharmacy*. 13, pp.614-627.

Ge, C., 2013. Hong Kong's illegal cancer drug trade driven by mainland buyers. *Medicalxpress* [online]. Available from: https://medicalxpress.com/news/2013-12-hong-kong-illegal-cancer-drug.html [Accessed on 13 Nov 22].

Ghaleb, M.A., Barber, N., Franklin, B.D., Yeung, V.W.S., Khaki, Z.F., Wong, I.C.K., 2006. Systematic review of medication errors in pediatric patients. *The Annals of Pharmacotherapy*. 40, pp.1766-1776.

Giberson, S., Yoder, S., Lee, M.P., 2011. *Improving patient and health system outcomes through advanced pharmacy practice. A report to the U.S. Surgeon General.* Office of the Chief Pharmacist. U.S. Public Health Service. Available from: https://jcpp.net/wp-content/uploads/2015/09/Improving-Patient-and-Health-System-Outcomes-through-Advanced-Pharmacy-Practice.pdf [Accessed on 10 Jan 2023].

Glaser, B.G., Strauss, A.L., 1967. *The discovery of grounded theory: Strategies for qualitative research.* Chicago: Aldine.

Glasgow, R.E., Eckstein, E.T., ElZarrad, M.K., 2013. Implementation science perspectives and opportunities for HIV/AIDS research. *Journal of Acquired Immune Deficiency Syndrome.* 63, pp. S26-S31.

Glasgow, R.E., Vogt, T.M., Boles, S.M., 1999. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. *American Journal of Public Health*. 89(9), pp.1322-1327.

Gopalakrishnan, S., Ganeshkumar, P., 2013. Systematic reviews and meta-analysis: understanding the best evidence in primary healthcare. *Journal of Family Medicine and Primary Care.* 2(1), pp.9-14.

Gray, N.J., Shaw, K.L., Smith, F.J., Burton, J., Prescott, J., Roberts. R., Terry, D., McDonagh, J.E., 2017. The role of pharmacists in caring for young people with chronic illness. *Journal of Adolescent Health.* 60, pp.219-225.

Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., Kyriakidou, O., 2004. Diffusion of innovations in service organizations: systematic review and recommendations. *The Milbank Quarterly.* 82(4), pp. 581-629.

Guest, G., Namey, E., Chen, M., 2020. A simple method to assess and report thematic saturation in qualitative research. *PLoS One.* 15(5), e0232076.

Hadi, M.A. and Closs, J.S., 2016. Ensuring rigour and trustworthiness of qualitative research in clinical pharmacy. *International Journal of Clinical Pharmacy.* 38, pp.641-646.

Harris, I.M., Phillips, B., Boyce, E., Griesbach, S., Hope, C., Sanoski, C., Sokos, D., Wargo, K., 2014. Clinical pharmacy should adopt a consistent process of direct patient care. *Pharmacotherapy.* 34(8), pp.e133-148.

Harzing, AW., 1997. Response rates in international mail surverys: results of a 22-country study. *International Business Review.* 6(6), pp.641-665.

Helper, C.D., Strand, L.M., 1990. Opportunities and responsibilities in pharmaceutical care. *American Journal of Hospital Pharmacy.* 47(3), pp.533-543.

Hickey, J.V., Unruh, L.Y., Newhouse, R.P., Koithan, M., Johantgen, M., Hughes, R.G., Haller, K.B., Lundmark, V.A., 2014. Credentialing: the need for a national research agenda. *Nursing Outlook.* 62, pp.119-127.

Higgins, J.P.T., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M.J., Welch, V.A. (editors). 2021. *Cochrane handbook for systematic reviews of interventions.* Version 6.2 (updated Feb 2021). [online] Available from: http://www.training.cochrane.org/handbook. [Accessed on 5 Jun 2021]

Hindi, A.M.K., Schafheutle, E.I., Jacobs, S., 2017. Patient and public perspectives of community pharmacies in the United Kingdom: a systematic review. *Health Expectations.* 21(2), pp. 409-428.

Hinton, L., Guo, Z., Hillygus, J., Levkoff, S., 2000. Working with culture: a qualitative analysis of barriers to the recruitment of Chinese-American family caregivers for dementia research. *Journal of Cross-Cultural Gerontology.* 15, pp.119-137.

Hohl, C.M., Wickham, M.E., Sobolev, B., Perry, J.J., Sivilotti, M.L.A., Garrison, S., Lang, E., Brasher, P., Doyle-Waters, M.M., Brar, B., Rowe, B.H., Lexchin, J., Holland, R., 2015. The effect of early in-hospital medication review on health outcomes: a systematic review. *British Journal of Clinical Pharmacology.* 80(1), pp. 51-61.

Hohmeier, K.C., Shelton, C., Havrda, D., Gatwood, J., 2020. The need to prioritize "priotitization" in clinical pharmacy service practice and implementation. *Research in Social and Administrative Pharmacy.* 16(12), pp.1785-1788.

Hong, Q.N., Pluye, P., Fabregues, S., Bartlett, G., Boardman, F., Gargo, M., Dagenais, P., Gagnon, M.P., Griffiths, F., Nicolau, B, O'Cathain, A., Rousseau, M.C., Vedel, I., 2018. *Mixed methods appraisal tool (MMAT)* [online]. Available from: http://mixedmethodsappraisaltoolpublic.pbworks.com/w/file/fetch/127425851/MMAT_2018_criteria-manual_2018-04-04.pdf [Accessed on 5 May 2019]

Hospital Authority, 2018. *About us: clusters, hospitals & institutions.* [online] Available from: https://www.ha.org.hk/visitor/ha_visitor_index.asp?Content_ID=10036&Lang=ENG&Dimension=100&Parent_ID=10004 [Accessed on 23 Nov 2020]

Hospital Authority, 2019. *Introduction: caring for our community's health.* [online] Available from: https://www.ha.org.hk/visitor/ha_visitor_index.asp?Content_ID=10008&Lang=ENG&Dimension=100&Parent_ID=10004 [Accessed on 23 Nov 2020]

Hospital Authority, 2020. *Hospital Authority Head Office: guideline on standards of practice for paediatric clinical pharmacy services.* Document no: HAHO-COC-GL-PHA-014-v04. Issue date: 12 June 2020. [Accessed on 23 Mar 2021]

Hospital Authority Chief Pharmacist's Office, 2023. *Paediatric service working group: terms of reference* [online]. Available from: http://cpo.home/en/Page/11254 [Accessed on 9 Mar 2023]

Helper, C.D., 2004. Clinical pharmacy, pharmaceutical care, and the quality of drug therapy. *Pharmacotherapy.* 24(11), pp.1491-1498.

Hwang, S., Birken, S.A., Melvin, C.L., Rohweder, C.L., Smith, J.D., 2020. Designs and methods for implementation research: advancing the mission of the CTSA program. *Journal of Clinical and Translational Science.* 4(3), pp.159-167.

Iqbal, A., Rutter, V., Gűlpinar, G., Halai, M., Awele, B., Elshenawy, R.A., Anderson, C., Hussain, R., Chan, A.H.Y., 2021. National pharmacy associations in the commonwealth: current scenario and future needs to maximise effective contributions of the pharmacy profession towards universal health coverage. *Journal of Pharmaceutical Policy and Practice.* 14, Art no. 112.

Innes, A.J., Bramley, D.M., Wills, S., 2014. The impact of UK medicines information services on patient care, clinical outcomes and medicines safety: an evaluation of healthcare professionals' opinions. *European Journal of Hospital Pharmacy.* 21, pp.222-228.

Institute for Healthcare Improvement, 2003. The breakthrough series: IHI's collaborative model for achieving breakthrough improvement. In *Innvation Series*. Cambridge, MA, pp.20.

Jennings, A.A., Foley, T., Walsh, K.A., Coffey, A., Browne, J.P., Bradley, C.P., 2018. General practitioners' knowledge, attitudes and experiences of managing behavioural and psychological symptoms of dementia: protocol of a mixed methods systematic review and meta-ethnography. *Systematic Reviews*. 7, pp.62.

Kaboli, P.J., Hoth, A.B., McClimon, B.J., Schnipper, J.L., 2006. Clinical pharmacists and inpatient medical care. *JAMA Internal Medicine*. 166(9), pp.955-964.

Kahn, S., Abramson, E.L., 2019. What is new in paediatric medication safety? *Archives of Disease in Childhood.* 104, pp.596-599.

Kallio, H., Pietilä, A.M., Johnson, M., Kangasniemi, M., 2016. Systematic methodological review: developing a framework for a qualitative semi-structured interview guide. *Journal of Advanced Nursing*. 72(12), pp.2954-2965.

Kaushal, R., Bates, D.W., Landrigan, C., McKenna, K.J., Clapp, M.D., Federico, F., Goldmann, D.A., 2001. Medication errors and adverse drug events in pediatric inpatients. *Journal of the American Medical Association*. 285, pp.2114-2120.

Kelly, D.V., Young, S., Phillips, L., Clark, D., 2014. Patient attitudes regarding the role of the pharmacist and interest in expanded pharmacist services. *Canadian Pharmacists Journal.* 147(4), pp. 239-247.

Khaira, M., Mathers, A., Gerard, N.B., Dolovich, L., 2020. The evolving role and impact of integrating pharmacists into primary care teams: experience from Ontario, Canada. *Pharmacy (Basel).* 8(4), pp.234.

Khaldi, K., 2017. Quantitative, qualitative or mixed research: which research paradigm to use? *Journal of Educational and Social Research.* 7(2), pp.15-24.

Khan, A., Furtak, S.L., Melvin, P., Rogers, J.E., Schuster, M.A., Landrigan, C.P., 2016. Parent-reported errors and adverse events in hospitalized children. *JAMA Pediatrics.* 170(4), e154608.

Khan, K.S., Kunz, R., Kleihnen, J., Antes, G., 2003. Five steps to conducting a systematic review. *Journal of the Royal Society of Medicine.* 96, pp.118-121.

Kirchner, J.E., Smith, J.L., Powell, B.J., Waltz, T.J., Proctor, E.K., 2020. Getting a clinical innovation into practice: an introduction to implementation strategies. *Psychiatry Research.* 283, Art no. 112467.

Kirk, M.A., Kelley, C., Yankey, N., Birken, S.A., Abadie, B., Damschroder, L., 2016. A systematic review of the use of the Consolidated Framework for Implementation Research. *Implementation Science*. 11, Art no. 72.

Kitson, A., Harvey, G, McCormack, B., 1998. Enabling the implementation of evidence based practice: a conceptual framework. *Quality in Health Care.* 7(3), pp. 149-158.

Klaic, M., Kapp, S., Hudson, P., Chapman, W., Denehy, L., Story, D., Francis, J.J., 2022. Implementability of healthcare interventions: an overview of reviews and development of a conceptual framework. *Implementation Science.* 17, Art no. 10.

Kozer, E., Berkovitch, M., Koren, G., 2006. Medication errors in children. *Pediatric Clinics of North America.* 53, pp.1155-1168.

Kradjen, W.A., Schulz, R., Christensen, D.B., Stergachis, A., Sullivan, S., Fullerton, D.S., Sturm, L., Schneider, G., 1999. Patients' perceived benefit from and satisfaction with asthma-related pharmacy services. *Journal of the American Pharamceutical Assosication.* 39(5), pp.658-666.

Lam, A.H.Y., 2018. How much should Hong Kong spend on its healthcare? *British Journal of Healthcare Management.* 24(4), pp.181-190.

Lam, A.H.Y., 2017. Strategies of Hong Kong's Healthcare System in Aging Population. In: *Official Conference Proceedings from the Asian Conference on Aging & Gerontology* [online]. Available from: https://papers.iafor.org/wp-content/uploads/papers/agen2017/AGEN2017_36030.pdf [Assessed on 13 Jun 2022]

Lau, W.M., Pang, J., Chui, W., 2011. Job satisfaction and the association with involvement in clinical activities among hospital pharmacists in Hong Kong. *International Journal of Pharmacy Practice.* 19(4), pp.253-263.

Layland, A., 2018. Why is trust important for effective healthcare teams? *British Journal of Healthcare Management.* 24(2), pp.61-63.

Lee, C.P., 2018. Health care system and pharmacy practice in Hong Kong. *Canadian Journal of Hospital Pharmacy*.71(2), pp.140-148.

Lee, H., Ryu, K., Sohn, Y., Kim, J., Suh, G.Y., Kim, E.Y., 2019. Impact on patient outcomes of pharmacist participation in multidisciplinary critical care teams: a systematic review and meta-analysis. *Critical Care Medicine.* 47(9), pp.1243-1250.

Lee, I.H., Rhie, S.J., Je, N.K., Rhew, K.Y., Ji, E., Oh, J.M., Lee, E., Yoon, J.H., 2016. Perceived needs of pharmaceutical care services among healthcare professionals in South Korea: a qualitative study. *International Journal of Clinical Pharmacy.* 38, pp.1219-1229.

Lemay, J., Waheedi, M., Al-Taweel, D., Bayoud, T., Moreau, P., 2018. Clinical pharmacy in Kuwait: service provided, perceptions and barriers. *Saudi Pharmaceutical Journal*. 26, pp.481-486.

Li, X., Huo, H., Kong, W., Li, F., Wang, J., 2014. Physicians' perceptions and attitudes toward clinical pharmacy services in urban general hospitals in China. *International Journal of Clinical Pharmacy.* 36(2), pp.443-450.

Llardo, M.L., Speciale, A., 2020. The community pharmacist: perceived barriers and patient-centered care communication. *International Journal of Environmental Research and Public Health.* 17(2), pp.536.

Lombardi, N., Wei, L., Ghaleb, M., Pasut, E., Leschiutta, S., Rossi, P., Troncon, M.G., 2018. Evaluation of the implementation of a clinical pharmacy service on an acute internal medicine ward in Italy. *BMC Health Services Research.* 18(1), pp.259.

Loo, J.S.E., Lo, E.M.Y., Mai, C.W., Gan, P.W., Lee, E.L., Tiong, J.J.L., 2019. Separation of prescribing and dispensing in Malaysia: public perception of pharmacists' roles and agreement towards a separation policy. *Journal of Pharmacy Practice and Research.* 50(1), pp.5-12.

Luetsch, K., Rowett, D., 2016. Developing interprofessional communication skills for pharmacists to improve their ability to collaborate with other professions. *Journal of Interprofessional Care.* 30(4), pp.458-465.

Lynton, J.J., Mersch, A., Ferguson, P.J., 2020. Multidisciplinary practice advancement: role of a clinical pharmacy specialist in a pediatric specialty clinic. *American Journal of Health-System Pharmacy.* 77(21), pp.1771-1777.

Maaskant, J.M., Vermeulen, H., Apampa, B., Fernando, B., Ghaleb, M.A., Neubert, A., Thayyil, S., Soe, A., 2015. Interventions for reducing medication errors in children in hospital. *Cochrane Database of Systematic Reviews.* 3, Art. No. CD006208.

Macedo, L.A., Silva, R.O.S., Silvestre, C.C., Alcăntara, T.D.S., Simŏes, S.M., Lyra Jr, D.P., 2021. Effect of pharmacists' interventions on health outcomes of children with asthma: a systematic review. *Journal of the American Pharmacists Association.* 61(3), pp.e28-43.

Macfarlane, H., Maidment, I., 2020. Recruiting people with severe mental illness through community pharmacies: real-world experiences from a UK study. *BMC Family Practice.* 21, Art no. 172.

Makowsky, M.J., Schindel, T.J., Rosenthal, M., Campbell, K., Tsuyuki, R.T., Madill, H.M., 2009. Collaboration between pharmacists, physicians and nurse practitioners: a qualitative investigation of working relationships in the inpatient medical setting. *Journal of Interprofessional Care.* 23(2), pp.169-184.

Martin, S., Shaw, N., Burnage, K., Petty, D., 2022. Role of advanced practice pharmacists in general practice. *Prescriber.* 33(1), pp. 15-18.

Maskrey, N., Underhill, J., 2014. The European statements of hospital pharmacy: achieving consensus using Delphi and world café methodologies. *European Journal of Hospital Pharmacy.* 21, pp. 264-266.

Mattingly, A.N., Mattingly, T.J., 2018. Advancing the role of pharmacy technician: a systematic review. *Journal of the American Pharmacists Association.* 58(1), pp.94-108.

McCullough, M.B., Petrakis, B.A., Gillespie, C., Solomon, J.L., Park, A.M., Ourth, H., Morreale, A., Rose, A.J., 2016. Knowing the patient: a qualitative study on care-taking and the clinical pharmacist-patient relationship. *Research in Social and Administrative Pharmacy.* 12(1), pp.78-90.

McNair, R., Taft, A., Hegarty, K., 2008. Using reflexivity to enhance in-depth interviewing skills for the clinician researcher. *BMC Medical Research Methodology.* 8, pp.73.

Means, A.R., Kemp, C.G., Gwayi-Chore, M.C., Gimbel, S., Soi, C., Sheer, K., Wagenaarm B.H., Wasserheit, J.N., Weiner, B.J., 2020. Evaluating and optimizing the consolidated framework for implementation research (CFIR) for use in low- and middle-income countries: a systematic review. *Implementation Science.* 15, Art no: 17.

Mekkonnen, A.B., McLachlan, A.J., Brien, J.E., 2016. Effectiveness of pharmacist-led medication reconciliation programmes on clinical outcomes at hospital transitions: a systematic review and meta-analysis. *BMJ Open*. 6: e010003.

Menon, U., Gentry-Maharaj, A., Ryan, A., Sharma, A., Burnell, M., Hallett, R., Lewis, S., Lopez, A., Godfrey, K., Oram, D., Herod, J., Williamson, K., Seif, M., Scott, I., Mould, T., Woolas, R., Murdoch, J., Dobbs, S., Amso, N., Leeson, S., Cruickshank, D., McGuire, A., Campbell, S., Fallowfield, L., Skates, S., Parmar, M., Jacobs, I., 2008. Recruitment to multicentre trials – lessons from UKCTOCS: descriptive study. *British Medical Journal*. 337, Art no. a2079.

Meyers, D.C., Durlak, J.A., Wandersman, A., 2012. The quality implementation framework: a synthesis of critical steps in the implementation process. *American Journal of Community Psychology.* 50, pp.462-480.

Miller, C.J., Smith, S.N., Pugatch, M., 2020. Experimental and quasi-experimental designs in implementation research. *Psychiatry Research.* 283, Art. no. 112452.

Mira, J.J., Lorenzo, S., Guilabert, M., Navarro, I., Perez-Jover, V., 2015. A systematic review of patient medication error on self-administering medication at home. *Expert Opinion on Drug Safety*. 14(6), pp.815-838.

Moadebi, S., Kwan, F., Stackhouse, S., Reddekopp, L., 2013. The impact of interprofessional collaboration on nurses' satisfaction and comfort with intranasal fentanyl. *International Emergency Nursing.* 21, pp.58-63.

Mohammed, M.A., Moles, R.J., Chen, T.F., 2016. Meta-synthesis of qualitative research: the challenges and opportunities. *International Journal of Clinical Pharmacy*. 38, pp.695-704.

Moher, D., Liberati, A., Tetzlaff, J., Altman, D.G., 2009. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Medicine*. 6, Art no. e1000097.

Montgomery, A.T., Kälvemark-Sporong, S., Henning, M., Tully, M.P., Kettis-Lindblad, A., 2007. Implementation of a pharmaceutical care service: prescriptionists', pharmacists' and doctors' views. *Pharmacy World & Science*. 29, pp.593-602.

Moore, G.D., Kosirog, E.R., Vande Griend, J.P., Freund, J.E., Saseen, J.J., 2018. Expansion of clinical pharmacist positions through sustainable funding. *American Journal of Health-system Pharmacy.* 75(13), pp. 978-981.

Morecroft, C.W., Thornton, D., Caldwell, N.A., 2013. Inpatients' expectations and experiences of hospital pharmacy services: qualitative study. *Health Expectations.* 18(5), pp.1009-1017.

Morley, I., Cashell, A., 2017. Collaboration in health care. *Journal of Medical Imaging and Radiation Sciences.* 48, pp.207-216.

Mott, A., Kafka, S., Sutherland, A., 2016. Assessing pharmaceutical care needs of paediatric in-patients: a team based approach. *Archive of Disease in Childhood.* 101, Art no. e2.

Moullin, J.C., Sabater-Hernández, D., Benrimoj, S.I., 2016. Qualitative study on implementation of professional pharmacy services in Australian community pharmacies using framework analysis. *BMC Health Services Research.* 16, pp.439.

Moullin, J.C., Dickson, K.S., Stadnick, N.A., Albers, B., Nilsen, P., Broder-Fingert, S., Mukasa, B., Aarons, G.A., 2020. Ten recommendations for using implementation frameworks in research and practice. *Implementation Science Communications.* 1, Art no. 42.

Munn, Z., Peters, M.D.J., Stern, C., Tufanaru, C., McArthur, A., Aromataris, E., 2018. Systematic review or scoping review? guidance for authors when choosing between a systematic or scoping review approach. *BMC Medical Research Methodology.*18, Art no. 143.

Mysak, T.M., 2010. Care providers' satisfaction with restructured clinical pharmacy services in a tertiary care teaching hospital. *The Canadian Journal of Hospital Pharmacy.* 63(2), pp.105-112.

National Health Service England/Direct Commissioning Change Projects, 2018. *Responsibility for Prescribing Between Primary, Secondary and Tertiary Care* [online]. Available from: https://www.england.nhs.uk/wp-content/uploads/2018/03/responsibility-prescribing-between-primary-secondary-care-v2.pdf [Accessed on 24 Dec 2021]

National Health Service, 2019. *The NHS Long Term Plan* [online]. Available from: https://www.longtermplan.nhs.uk/publication/nhs-long-term-plan/ [Accessed on 8 Mar 2023]

National Health Service England. NHS commissioning: who is considered a carer? [online]. Available from: https://www.england.nhs.uk/commissioning/comm-carers/carers/ [Accessed on 6 Mar 2023]

National Institute of Health and Care Excellence, 2017. *Clinical commissioning policy: commissioning medicines for children in specialised services* [online]. Available from: https://www.england.nhs.uk/wp-content/uploads/2017/03/commissioning-medicines-children-specialised-services.pdf [Accessed on 16 Apr 2020]

National Institutes of Health, 2013. *Frequent asked questions about: Implementation science.* Available from http://www.fic.nih.gov/News/Events/implementation-science/Pages/faqs.aspx. [Accessed on 8 Oct 2023].

National Institute of Health and Care Excellence, 2009. *Medicines adherence: involving patients in decisions about prescribed medicines and supporting adherence [CG76]* [online]. Available from https://www.nice.org.uk/CG76 [Accessed on 28 Apr 2019].

National Institute of Health and Care Excellence, 2015. *Medicines optimisation: the safe and effective use of medicines to enable the best possible outcomes [NG5]* [online]. Available from https://www.nice.org.uk/guidance/ng5 [Accessed on 28 Apr 2019].

Neonatal & Paediatric Pharmacists Group, 2017. *Recent consultations NPPG has responded to (Dec 2015 – Oct 2017)* [online]. Available from: http://nppg.org.uk/consultations/ [Accessed on 22 March 2021]

Newington, L., Metcalfe, A., 2014. Factors influencing recruitment to research: qualitative study of the experiences and perceptions of research teams. *BMC Medical Research Methodology.* 14, Art no. 10.

Nilsen, Per., 2015. Making sense of implementation theories, models and frameworks. *Implementation Science.* 10, Art. No.:153.

Noel Hall Report, 1970. *"Report of the working party on the hospital pharmaceutical service".* London: H.M.S.O.

Okumura, L.M., da Silva, D.M., Comarella, L., 2016. Relation between safe use of medicines and clinical pharmacy services at pediatric intensive care units. *Revista Paulista de Pediatria.* 34(4), pp.397-402.

Olmos-Vega, F.M., Stalmeijer, R.E., Varpio, L., Kahlke, R., 2023. A practical guide to reflexivity in qualitative research: AMEE Guide no. 149. *Medical Teacher.* 45(3), pp. 241-251.

Olswang, L.B., Prelock, P.A., 2015. Bridging the gap between research and practice: implementation science. *Journal of Speech, Language, and Hearing Research.* 58, pp. S1818-1826.

Omar, N.E., Elazzazy, S., Abdallah, O., Nashwan, A.J., Eltorki, Y., Afifi, H.M., Kassem, N., Yassin, M., Hamad, A., 2020. Perceptions and expectations of health care providers towards clinical pharmacy services at a tertiary cancer centre in Qatar. *Journal of Oncology and Pharmacy Practice.* 26(5), pp.1086-1096.

Onatade, R., Appiah, S., Stephens, M., Garelick, H., 2018. Evidence for the outcomes and impact of clinical pharmacy: context of UK hospital pharmacy practice. *European Journal of Hospital Pharmacy.* 25, pp.21-28.

Onozato, T., dos Santos Cruz, C.F., da Costa Farre, A.G.M., Silvestre, C.C., de Oliveira Santos Silva, R., dos Santos Junior, G.A., de Lyra, P.D., 2020. Factors influencing the implementation of clinical pharmacy services for hospitalized patients: a mixed-methods systematic review. *Research in Social and Administrative Pharmacy.* 16(4), pp.437-449.

Osborn, R., Moulds, D., Schneider, E.C., Doty, M.M., Squires, D., Sarnak, D.O., 2015. Primary care physicians in ten countries report challenges caring for patients with complex health needs. *Health Affairs*. 34(12), pp.2104-2112.

Our Hong Kong Foundation. Health system capacity constraints – The severe shortage of doctors in Hong Kong public hospitals [Presentation] 2019. Available from: https://www.ourhkfoundation.org.hk/sites/default/files/media/pdf/ManpowerPPT_20190410_full_eng.pdf [Accessed on 22 June 2022]

Palaganas, E.C., Sanchex, M.C., Molintas, M.V.P., Caricativo, R.D., 2017. Reflexivity in qualitative research: a journey of learning. *The Qualitative Report.* 22(2), pp.426-438.

Palinkas, L.A., Horwitz, S.M., Green, C.A., Wisdom, J.P., Duan, N., Hoagwood, K., 2015. Purposeful sampling for qualitative data collection and analysis in mixed method

implementation research. *Administration and Policy in Mental Health and Mental Health Services Research.* 42(5), pp.533-544.

Pande, S., Hiller, J.E., Nkansah, N., Bero, L., 2013. The effect of pharmacist-provided non-dispensing services on patient outcomes, health service utilisation and costs in low- and middle-income countries. *Cochrane Database of Systematic Reviews*. Art. No.: CD010398.

Parand, A., Garfield, S., Vincent, C., Freanklin, B.D., 2016. Carers' medication administration errors in the domiciliary setting: a systematic review. *PLoS ONE.* 11(12), Art no. e0167204.

Park, H., Sha, M.M., 2015. Do different recruitment methods reach different Asian demographics? *Survey Practice.* 8(4).

Park, Y., Konge, L., Artino, A.R., 2020. The positivism paradigm of research. *Academic Medicine: Journal of the Association of American Medical Colleges.* 95(5), pp.690-694.

Penm, J., Chaar, B., Moles, R.J., 2016. Use of the international pharmaceutical federation's Basal statements to assess and advance hospital pharmacy practice: a scoping review. *Canadian Journal of Hospital Pharmacy.* 69(2), pp.131-137.

Penm, J., Moles, R., Wang, H., Li, Y., Chaar, B., 2014. Factors affecting the implementation of clinical pharmacy services in China. *Qualitative Health Research*. 24(3), pp.345-356.

Peters, D.H., Adam, T., Alonge, O., Agyepong, I.A., Tran, N., 2013. Implementation research: what is it and how to do it. *The British Medical Journal.* 347, Art no: f6753.

Peters, D.H., Tran, N.T., Adam, T., 2013. Implementation research in health: a practical guide. *Alliance for Health Policy and Systems Research, World Health Organization.* pp.8-10.

Phellas, C., Bloch, A. and Seal, C., 2012. 'Chapter 11. Structure methods: interviews, questionnaires and observation', in Seale, C., *Researching society and Culture.* 3rd ed. London: Sage Publication Ltd..

Phillips, C.J., Marshall, A.P., Chaves, N.J., Jankelowitz, S.K., Lin, I.B., Loy, C.T., Rees, G., Sakzewski, L., Thomas, S., To, T.P., Wilkinson, S.A., Michie, S., 2015. Experiences of using the Theoretical Domains Framework across diverse clinical environments: a qualitative study. *Journal of Multidisciplinary Healthcare.* 8, pp. 139-146.

Polit, D.F., Beck, C.T., 2008. 'Part 1. Foundations of nursing research and evidence-based practice', in *Nursing research: generating and assessing evidence for nursing practice.* 8th ed. Philadelphia: Wolters Kluwer.

Powell, B.J., Waltz, T.J., Chinman, M.J., Damschroder, L.J., Smith, J.L., Matthieu, M.M., Proctor, E.K., Kirchner, J.E., 2015. A refined compilation of implementation strategies: results from the Expert Recommendations for Implementation Change (ERIC) project. *Implementation Science.* 10, Art no: 21.

Preslaski, C.R., Lat, I., MacLaren, R., Poston, J., 2013. Pharmacist contributions as members of the multidisciplinary ICU team. *CHEST*, 144(5), pp.1687-1695.

Presseau, J., Kasperavicius, D., Rodrigues, I.B., Braimoh, J., Chambers, A., Etherington, C., Giangregorio, L., Gibbs, J.C., Giguere, A., Graham, I.D., Hankivsky, O., Hoens, A.M., Holroyd-Leduc, J., Kelly, C., Moore, J.E., Ponzano, M., Sharma, M., Sibley, K.M., Straus, S. Selecting implementation models, theories, and frameworks in which to integrate intersectional approaches. *BMC Medical Research Methodology.* 22, Art no: 212.

Price, D., Edwards, M., Carson-Stevens, A., Cooper, A., Davies, F., Evans, B., Hibbert, P., Hughes, T., Rainer, T., Siriwardena, N., Edwards, A., 2020. Challenges of recruiting emergency department patients to a qualitative study: a thematic analysis of researchers' experiences. *BMC Medical Research Methodology.* 20, Art no. 151.

Proctor, E., Bunger, A. Implementation Science. *Encyclopedia of Social Work.* Available from https://oxfordrecom.eproxy.lib.hku.hk/socialwork/view/10.1093/acrefore/9780199975839.001.0001/acrefore-9780199975839-e-1338 [Accessed on 8 Oct 2023].

Proctor, E.K., Powell, B.J., McMillen, J.C., 2013. Implementation strategies: recommendations for specifying and reporting. *Implementation Science.* 8(139), pp. 1-11.

Proctor, E., Silmere, H., Raghavan, R., Hovmand, P., Aarons, G., Bunger, A., Griffey, R., Hensley, M., 2011. Outcomes for implementation research: conceptual distinctions, measurement challenges, and research agenda. *Administration and Policy in Mental Health.* 38, pp.65-76.

Rahayu, S.A., Widianto, S., Defi, I.R., Abdulah, R., 2021. Role of pharmacists in the interprofessional care team for patients with chronic diseases. *Journal of Multidisciplnary Healthcare*. 14, pp.1701-1710.

Rattanachophanit, T., Limwattananon, C., Limwattananon, S., Johns, J., 2008. Assessing the efficiency of hospital pharmacy services in Thai public district hospitals. *The Southeast Asian Journal of Tropical Medicine and Public Health.* 39(4), pp.753-765.

Rigby, D., 2010. Collaboration between doctors and pharmacists in the community. *Australian Prescriber*. 33, pp.191-193.

Rinke, M.L., Bundy, D.G., Velasquez, C.A., Rao, S., Zerhouni, Y., Lobner, K., Blanck, J.F., Miller, M.R., 2014. Interventions to reduce pediatric medication errors: a systematic review. *Pediatrics.* 134(2), pp.338-360.

Rishoej, R.M., Nielsen, H.L., Strzelec, S.M., Refer, J.F., Beck, S.A., Gramstrup, H.M., Thybo Christesen, H., Juel Kjeldsen, L., Hallas, J., Almarsdottir, A.B., 2018. Qualitative exploration of practices to prevent medication errors in neonatal intensive care units: a focus group study. *Therapeutic Advances in Drug Safety*. 9(7), pp.343-353.

Robinson, O.C., 2014. Sampling in interview-based qualitative research: a theoretical and practical guide. *Qualitative Research in Psychology.* 11(1), pp.25-41.

Rogers, E., 1962. *Diffusion of innovations*. 1st Edition. Free Press, NYC.

Roman, C., Edwards, G., Dooley, M., Mitra, B., 2018. Roles of the emergency medicine pharmacist: a systematic review. *American Journal of Health-System Pharmacy.* 75(11), pp.796-806.

Rose, A.J., Witt, D., Azran, C., Nissan, R., 2021. Seven key parameters that facilitate clinical pharmacy practice: a comparison between Israel and the United States. *Israel Journal of Health Policy Research*. 10, Art no. 37.

Rosenfeld, E., Kinney, S., Weiner, C., Newall, F., Williams, A., Cranswick, N., Wong, I., Borrott, N., Manias, E., 2018.Interdisciplinary medication decision making by pharmacists in pediatric hospital settings: an ethnographic study. *Research in Social and Administrative Pharmacy.* 14, pp.269-278.

Rotta, I., Salgado, T.M., Silva, M.L., Correr, C.J., Fernandez-Llimos, F., 2015. Effectiveness of clinical pharmacy services: an overview of systematic reviews (2000-2010). 37, pp. 687-697.

Rowley, E., Morriss, R., Currie, G., Schneider, J., 2012. Research into practice: Collaboration for Leadership in Applied Health Research and Care (CLAHRC) for Nottinghamshire, Derbyshire, Lincolnshire (NDL). *Implementation Science.* 7, Art no. 40.

Royal Pharmaceutical Society, 2013. *Advanced practice framework* [online]. Available from: https://www.rpharms.com/resources/frameworks/advanced-pharmacy-framework-apf [Accessed on 28 Dec 2021]

Royal Pharmaceutical Society, 2013. *Medicines optimisation: Helping patients to make the most of medicines* [online]. Available from: https://www.rpharms.com/Portals/0/RPS%20document%20library/Open%20access/Policy/helping-patients-make-the-most-of-their-medicines.pdf [Accessed on 28 Apr 2019]

Ryan, M., Shao, H., Yang, L., Nie, X.Y., Zhai, S.D., Shi, L.W., Lubawy, W.C., 2008. Clinical pharmacy education in China*. American Journal of Pharmaceutical Education.* 72(6), pp.129.

Sanghera, N., Chan, P.Y., Khaki, Z.F., Planner, C., Lee, K.K.C., Cranswick, N.E., Wong, I.C.K., 2006. Interventions of hospital pharmacists in improving drug therapy in children: a systematic literature review. *Drug Safety.* 29, pp.1031-1047.

Sarkies, M., Robinson, S., Ludwick, T., Braithwaite, J., Nilsen P. Understanding implementation science from the standpoint of health organisation and management: an interdisciplinary exploration of selected theories, models and frameworks. *Journal of Health Organization and Management.* 35(7), pp. 782-801.

Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., Burroughs, H., Jinks, C., 2018. Saturation in qualitative research: Exploring its conceptualization and operationalization. *Quality & Quantity.* 52(4), pp.1893-1907.

Schepel, L., Atonpuro, K., Kvarnstrom, K., Holmstrom, A.R., Lehtonen, L., Lapatto-Reiniluoto, O., Laaksonen, R., Carlsson, K., Airaksinen, M., 2019. Strategies for improving medication safety in hospitals: Evolution of clinical pharmacy services. *Research in Social and Administrative Pharmacy.* 15(7), pp.873-882.

Schoeb, V., 2016. Healthcare Service in Hong Kong and its Challenges. *China Perspectives*. 4, pp.51-58.

School of Pharmacy, The Chinese University of Hong Kong, 2016. *Continuing education (courses): advanced courses in specialty training – PHAR5951 Advanced course in specialty training of paediatric pharmacist.* Available from: https://www.pharmacy.cuhk.edu.hk/1/education/ce/ [Accessed on 7 Nov 2023].

Scullin, C., Hogg, A., Luo, R., Scott, M.G., McElnay, J.C., 2011. Integrated medicines management – can routine implementation improve quality? *Journal of Evaluation in Clinical Practice.* 18(4), pp.807-815.

Shanika, L.G.T., Wijekoon, C.N., Jayamanne, S., Coombes, J., Coombes, I., Mamunuwa, N., Dawson, A.H., Asita de Silva, H., 2017. Acceptance and attitudes of healthcare staff towards the introduction of clinical pharmacy service: a descriptive cross-sectional study from a tertiary care hospital in Sri Lanka. *BMC Health Services Research.* 17, Art no. 17.

Shoemaker, S.J., Curran, G.M., Swan, H., Teeter, B.S., Thoams, J., 2017. Application of the consolidated framework for implementation research to community pharmacy: a framework for implementation research on pharmacy services. *Research in Social and Administrative Pharmacy.* 13, pp.905-913.

Sin, C.M., Huynh, C., Dahmash, D., Maidment, I.D., 2022. Factors influencing the implementation of clinical pharmacy services on paediatric patient care in hospital settings. *European Journal of Hospital Pharmacy.* 29, pp.180-186.

Smith, F., 2002. *Research Methods in Pharmacy Practice.* London: Pharmaceutical Press.

Stewart, D.C., George, J., Bond, C.M., Cunningham, I.T.S., Diack, H.L., McCaig, D.J., 2008. Exploring patients' perspectives of pharmacist supplementary prescribing in Scotland. *Pharmacy World & Science.* 30(6), pp.892-897.

Strifler, L., Barnslet, J.M., Hillmer, M., Straus, S.E., 2020. Identifying and selecting implementation theories, models and frameworks: a qualitative study to inform the development of a decision support tool. *BMC Medical Informatics and Decision Making.* 20, Art no: 91.

Stuckey, H.L., 2013. Three types of interviews: qualitative research methods in social health. *Jounral of Social Health and Diabetes*. 1(2), pp.56-59.

Suri, H., 2011. Purposeful sampling in qualitative research synthesis. *Qualitative Research Journal.* 11(2), pp.63-75.

Tabak, R.G., Khoong, E.C., Chambers, D.A., Brownson, R.C., 2012. Bridging research and practice: models for dissemination and implementation research. *American Journal of Preventive Medicine.* 43(3), pp.337-350.

Tang, C., 2021. Liability for dispensing errors in Hong Kong. *Asian Bioethics Review.* 13(4), pp. 435-462.

Tariq, S., Woodman, J., 2013. Using mixed methods in health research. *Journal of the Royal Society of Medicine Short Reports.* 4(6), Art no. 2042533313479197.

Teherani, A., Martimianakis, T., Stenfors-Hayes, T., Wadhwa, A., Varpio, L., 2015. Choosing a qualitative research approach. *Journal of Graduate Medical Education.* 7(4), pp.669-670.

The Government of the Hong Kong Special Administrative Region, 2016. *Hong Kong: the facts* [online]. Available from: https://www.gov.hk/en/about/abouthk/facts.htm [Accessed on 22 March 2021]

The Royal Pharmaceutical Society, 2019. *One-RPS principles and behaviours – together we are pharmacy.* Available from: https://www.rpharms.com/Portals/0/RPS%20document%20library/Open%20access/Policy/One-RPS%20Principles%20and%20Behaviours%20August%202019.pdf?ver=2019-11-13-132710-747 [Accessed on 18 Dec 2022].

The Society of Hospital Pharmacists of Australia, 2014. *Clinical pharmacy services – optimising patient health outcomes.* Available from: https://shpa.org.au/publicassets/e81fef5e-5789-ec11-90fc-00505696223b/clinpham_fact_sheetv2.pdf [Accessed pm 02 October 2023]

Thompson, J., Al-Attbi, S., Patel, B., 2022. Patient perceptions of clinical pharmacists in general practice. *International Journal of Pharmacy Practice.* 30, S1, pp.i37-38.

Thomas, R., Huntley, A.L., Mann, M., Huws, D., Elwyn, G., Paranjothy, S., Purdy, S., 2014. Pharmacist-led interventions to reduce unplanned admissions for older people: a systematic review and meta-analysis of randomised controlled trials. *Age Aging.* 43(2), pp. 174-187.

Tobiano, G., Bucknall, T., Marshall, A., Guinane, J., Chaboyer, W., 2015. Patients' perceptions of participation in nursing care on medical wards. *Scandinavian Journal of Caring Sciences.* 30(2), pp.260-270.

Tong, A., Flemming, K., McInnes, E., Oliver, S., Craig, J., 2012. Enhancing transparency in reporting the synthesis of qualitative research: ENTREQ. *BMC Medical Research Methodology.* 12, pp.181.

Tong, A., Sainsbury, P., Craig, J., 2007. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 19(6), pp.349-357.

Touchette, D.R., Doloresco, F., Suda, K.J., Perez, A., Turner, S., Jalundhwala, Y., Tangonam, M.C., Hoffman, J.M., 2014. Economic evaluations of clinical pharmacy services: 2006-2010. *Pharmacotherapy.* 34(8), pp.771-793.

Trein, P., Fuino, M. and Wagner, J., 2021. Public opinion on health care and public health. *Preventive Medicine Reports.* 23, Art no. 101460.

Tripathi, S., Crabtree, H.M., Fryer, K.R., Graner, K.K., Arteaga, G.M., 2015. Impact of clinical pharmacist on the pediatric intensive care practice: an 11-year tertiary center experience. *The Journal of Pediatric Pharmacology and Therapeutics.* 20(4), pp.290-298.

Umar, R.M., Apikoglu-Rabus, S., Yumuk, P.F., 2020. Significance of a clinical pharmacist-led comprehensive medication management program for hospitalized oncology patients. *International Journal of Clinical Pharmacy.* 42, pp.652-661.

Van Beek, J.L., 2015. The future for pharmacists: dose physician-pharmacist collaborative practice means collaborative liability? *Journal of Legal Medicine.* 36(3-4), pp. 442-458.

Vat, L.E., Ryan, D., Etchegary, H., 2017. Recruiting patients as partners in health research: a qualitative descriptive study. *Research Involvement and Engagement.* 3, Art no. 15.

Vinterflod, C., Gustafsson, M., Mattsson, S., Gallego, G., 2018. Physicians' perspectives on clinical pharmacy services in Northern Sweden: a qualitative study. *BMC Health Services Research.* 18, pp.35.

Visacri, M.B., Figueiredo, I.V., Lima, T.M., 2021. Role of pharmacist during the COVID-19 pandemic: a scoping review. *Research in Social and Administrative Pharmacy.* 17(1), pp.1799-1806.

Walsh, R., 2003. The methods of reflexivity. *Humanist Psychology.* 31(4), pp.51-66.

Waltz, T.J., Powell, B.J., Chinman, M.J., Matthieu, E.K., Damchroder, L.J., Chinman, M.J., Smith, J.L., Proctor, E.K., Kirchner, J.E., 2015. Use of concept mapping to characterize relationships among implementation strategies and assess their feasibility and importance: results from the Expert Recommendations for Implementing Change (ERIC) study. *Implementation Science*. 10, Art no. 109.

Watt, S., Sword, W., Krueger, P., 2005. Implementation of a health care policy: an analysis of barriers and facilitators to practice change. *BMC Health Services Research.* 5, Art no. 53.

Weir, N.M., Newham, R., Dunlop, E., Bennie, M., 2019. Factors influencing national implementation of innovations within community pharmacy: a systematic review applying the consolidated framework for implementation research. *Systematic Review.* 14, Art no. 21.

Wenke, R. and Mickan, S., 2016. The role and impact of research positions within health care settings in allied health: a systematic review. *BMC Health Services Research.* 16, pp.355.

Westerlund, A.W., Nilsen, P., Sundberg, L., 2019. Implementation of implementation science knowledge: the research-practice gap paradox. *Worldviews on evidence-based nursing.* 16(5), pp. 332-334.

Wheeler, J.S., Chisholm-Burns, M., 2018. The benefit of continuing professional development for continuing pharmacy education. *The American Journal of Pharmaceutical Education.* 82(3), pp. 6461.

White, C.M., 2014. Pharmacists need recognition as providers to enhance patient care. *Annals of Pharmacotherapy.* 48(2), pp.268-273.

Whitley, G.A., Munro, S., Hemingway, P., Law, G.R., Siriwardena, A.N., Cooke, D., Quinn, T., 2020. Mixed methods in pre-hospital research: understanding complex clinical problems. *British Paramedic Journal.* 5(3), pp.44-51.

Willmeroth, T., Wesselborg, B., Kuske, S., 2019. Implementation outcomes and indicators as a new challenge in health services research: a systematic scoping review. *The Journal of Health Care Organization, Provision, and Financing*. 56; pp.1-17.

Wong, I.C.K., 2017. Improving medication safety and diabetes management in Hong Kong – a multi-disciplinary approach. *Hong Kong Medical Journal.* 23(2), pp.158-167.

Wong, I.C.K., Wong, L.Y.L., Cranswick, N.E., 2009. Minimising medication errors in children. *Archives of Disease in Childhood.* 94(2), pp.161-164.

World Health Organization, 2018. *Global Health Expenditure Database* [online]. Available from: https://apps.who.int/nha/database [Accessed on 16 Apr 2020]

World Health Organization. 2021. *Global Health Expenditure Database* [online]. Available from: https://apps.who.int/nha/database/country_profile/Index/en [Accessed on 24 Dec 2021]

Wranik, W.D., Price, S., Haydt, S.M., Edwards, J., Hatfield, K., Weir, J., Doria N., 2019. Implications of interprofessional primary care team characteristics for health services and patient health outcomes: a systematic review with narrative synthesis. *Health Policy*. 123(60), pp.550-563.

Yin, H.S., Mendelsohn, A.L., Wolf, M.S., Parker, R.M., Fierman, A., van Schaick, L., Bazan, I.S., Kline, M.D., Dreyer, B.P., 2010. Parents' medication administration errors: role of dosing instruments and health literacy. *Archives of Pediatrics and Adolescent Medicine*. 164(2), pp.181-186.

You, J.H., Wong, F.Y., Chan, F.W., Wong, E.L., Yeoh, E.K., 2011. Public perception on the role of community pharmacists in self-medication and self-care in Hong Kong. *BMC Clinical Pharmacology.* 11, pp.19.

Yuan, Y., Hunt, R., 2009. Systematic reviews: the good, the bad, and the ugly. *The American Journal of Gastroenterology.* 104(5), pp.1086-1092.

Zielinska-Tomczak, L., Cerbin-Koczorowska, M., Przymuszala, P., Marciniak, R., 2021. How to effectively promote interprofessional collaboration? a qualitative study on physicians' and pharmacists' perspectives driven by the theory of planned behavior. *BMC Health Services Research.* 21(1), pp.903.

Zhang, J., Li, X., Xie, J., Zheng, W., 2020. Evaluation of a clinical pharmacist consultation service for patients with infectious diseases in China: a systematic review and meta-analysis. *European Journal of Hospital Pharmacy.* 27, pp.131-136.

Zhang, L., Hu, Y., Pan, Panpan., Hong, C., Fang, L., 2021. Estimated manipulation of tablets and capsules to meet dose requirements for Chinese children: a cross-sectional study. *Frontiers in Pediatrics.* 9, Art no. 747499.

Zhou, M., Desborough, J., Parkinson, A., Douglas, K., McDonald, D., Boom, K., 2019. Barriers to pharmacist prescribing: a scoping review comparing the UK, New Zealand, Candian and Australian experiences. *International Journal of Pharmacy Practice*. 27, pp.479-489.

Appendix I – Original data extraction form

Reference ID	*Main Author*	*Year*	*Study location*	*Aim*	*Study design*	*Hospital/ community*	*Methods*
1	Al-Fageh (King Saud Uni, Department of Clinical Pharmacy)	2018	Saudi Arabia	To explore physicians' perceived causes of prescribing errors in Saudi hospitals.	FG discussion with physicians from different clinical areas were conducted; discussions were analysed using a qualitative approach.	Hospital	Quali
2	Girard D (Uni Paris Diferot)	2013	France	To collect information on the perceptions and experience of health professionals involved in hospital-based paediatric drug trials.	2 independent researchers conducted in-depth semi-structured interviews	Hospital	Quali
3	Gray NJ (Green Line Consulting Limited)	2017	UK	There were 3 phases of the study. The objective of the stakeholder interviews (phase 2) was to share ideas of practicing pharmacists about their current and future roles in the support of young people (10-24yrs) who take medication for chronic illness with stakeholders to devise a list of roles for prioritization.	The first 2 phases – pharmacists FGs and stakeholder telephone interviews, reflecting the dearth of literature in this area and the need to capture and record ideas about current and future roles. The final phase – multidisciplinary discussion groups was quantitative, encouraging pharmacists and rheumatology professionals to discriminate between ideas and to priortise roles to be developed or enhanced.	Hospital and community	Mixed-methods (triangulation)
4	Mekonnen AB (Uni of Gondar)	2013	Ethiopia	To explore key informants' perspective in the implementation of clinical pharmacy practice	A qualitative study was conducted through in-depth interviews with heads of departments.	Hospital	Quali
5	Rishoej RM (Department of Public Health, Uni of Southern Denmark)	2018	Denmark	To explore current and potential future practices to prevent medication errors experienced by physicians and nurses.	2 FGs, one including physicians and one including nurses were conducted at each NICU (total: 6 FGs). A min of 3 participants to a max of 6 per FG.	Hospital	Quali

6	Rosenfeld MPH (University of Melbourne)	2018	Australia	To examine interdisciplinary medication decision making by pharmacists in paediatric hospital settings	An ethnographic design comprising observation, SSIs and FGs.	Hospital	Quali

Study design	*Hospital/ community*	*Methods*	*Site information*	*Study population*
FG discussion with physicians from different clinical areas were conducted; discussions were analysed using a qualitative approach.	Hospital	Quali	3 tertiary hospitals in Riyadh, Saudi Arabia: 2 academic and 1 government military hospital.	Physicians with experience in writing Rxs from differen specialties with different levels of clinical experience.
2 independent researchers conducted in-depth semi-structured interviews	Hospital	Quali	Nationwide	Principal investigators (17), pharmacists (7), sponsor representatives (4) and drug regulatory representatives (3).
The first 2 phases – pharmacists FGs and stakeholder telephone interviews, reflecting the dearth of literature in this area and the need to capture and record ideas about current and future roles. The final phase – multidisciplinary discussion groups was quantitative, encouraging pharmacists and rheumatology professionals to discriminate between ideas and to priortise roles to be developed or enhanced.	Hospital and community	Mixed-methods (triangulation)	Nationwide	2 pharmacy policy makers, 3 service commissioners, 2 pharmacy staff, 5 rheumatology professionals and 3 lay advocates
A qualitative study was conducted through in-depth interviews with heads of departments.	Hospital	Quali	Jimma University Specialised Hospital, a teaching and referral centre.	Heads of departments (internal medicine, paediatric, surgery, nurse, pharmacy, medical director and administration) and pharmacy student representatives
2 FGs, one including physicians and one including nurses were conducted at each NICU (total: 6 FGs). A min of 3 participants to a max of 6 per FG.	Hospital	Quali	3 largest tertiary NICUs. All units were involved in the complex treatment of extremely premature neonates and other newborns with severe complications.	3 nurses FGs with 3,3 and 6 participants; 3 physicians FGs with 3,4 and 4 participants.

An ethnographic design comprising observation, SSIs and FGs.	Hospital	Quali	A major Australian paediatric teachning hospital.	Pharmacists, registered nurses and doctors from diverse clinical wards.

Recruitment method	*Inclusion/ exclusion criteria*	*Data collection*	*Analysis*
Via personal emails and phone calls. A reminder invitiation was sent after 2 weeks to all participants and those who did not respond within another week were consindered non-respondents.	Not specified	13 physicians attended to FGs with 7 in the first group and 6 in the second. 2/13 were paediatricians with one resident and one consultant. Both were managed by a moderator and audio taped. The discussion was held in English as the official language.	The discussions were transcribed verbatim by the researcher, and then subject to thematic content analysis by 2 independent researchers, with a deductive approach. Data were categorised into themes based on the accident causation model. Focusing on the latent failures, error producing conditions and defences. The resulting themes were then discussed among the 2 researchers to agree on the final analysis.
Samples of PIs and sponsor reps were taken random. For PIs, the random selection procedure was stratified on hospital in which they worked.	Healthcare professionals who had participated in a clinical AP-HP (Assistance Publique-Hopitaux de Paris)-sponsored trial in paediatrics and experimental drugs between 2002-2008.	Interview guides were designed for the semi-structured interviews for each profession. Guides focused on: establishment of collaborations among various health professionals involved, pharmaceutical issues, financial aspects and education for clinical research.	Transcribed interviews were analysed and coded by 2 researchers, who used both case-oriented and variable-oriented methods. Each interview was parsed by theme, and recurring themes were identified inferentially. Cross-validation of thematic analysis using text analysis software (Tropes). Results were compared and discussed.
Stakeholders for interviews were generated by advisory group members and the project team.	Participation at a senior level in a pharmacy or rheumatology organisation.	Stakeholders were sent a briefing note prior to the telephone interview. It combined "Arthriting" blog quotes, innovative pharmacist case studies, and an interim analysis of phase 1 FGs (with pharmacists).	A framework approach was used for telephone interview analysis. Each respondent had chosen his priority pharmacy roles. The responses were summarised by one of the interviewers and were independently reviewed by the project manager. Consistency within and between phases was monitored to assess the trustworthiness of the findings.
Purposeful sampling	Not specified	Semi-structured interviews were chosen for collection of data. Questions were ordered so that they have a flow from one topic to another. Open-ended questions were asked to describe their perspectives regarding the integration of clinical pharmacists with the multidisciplinary team. All interviews were conducted by a single researcher. Data collectors were trained and pilot interviews were conducted with one chief pharmacist.	Thematic analysis was carried out. The transcripts and notes were read repeatedly, and emerging topics were identified as themes and sub-themes. Next, coding of interview text relating to these themes and sub-themes were performed.
Local project managers emailed info about the study prior to FGs	NICU physicians and nurses were eligible to participant if they had at least 1 month of work experience at the NICU and provided direct patient care.	During each FG, participants were asked to express their attitudes towards discussing prevention of MEs. Next, a poster was presented to the participants (with factors influencing ME identified	Using content analysis. 3 coders were involved. 2 coders predefined categories and colour-codes to be used. They met after finalising the analyses and evaluated the identified categories in each transcript. A third coder reviewed the final analyses and discusses possible additions

Not specified	Inclusion criteria for the sample involved pharmacists, nurses and doctors who were recruited from diverse wards including. Children cared for by these health professionals therefore had a diverse range of conditions in relation to these various ward settings. In addition, the sample included specialist nurses in pain management, burns and diabetes education in how they interacted with other health professionals. Exclusion criteria included nurses who had only completed a one-year course and therefore had no medication responsibilities, and health professionals who were not employees of the hospital.	The study was conducted from March 2014 to February 2016. Participants were recruited following the conduct of information sessions with the pharmacy department and ward managers. The health professionals recruited for the study worked together with other health professionals situated in the same ward. However, health professionals were recruited as individuals.	Data were thematically analyzed according to the'framework' approach. Through social action, the experiences of individuals are examined and interpreted in terms of the demands, constraints and enablers affecting health care practice. For this study, the needs relate to the process of interdisciplinary decision making about medications, the behaviors are how various individuals interrelate with each other, the system is the micro-context of the inpatient setting, and the culture relates to the specific characteristics and roles of pharmacists and the health professionals with whom they interact. Transcription was undertaken by the researchers who conducted observations. Field notes were consulted for context. Data were repeatedly scrutinised in an iterative process to identify major themes. Emergent themes were grouped and coded, and subthemes further articulated. Results were reviewed by three researchers for concordance. FGs of nurses and pharmacists were then conducted to gain feedback on the themes obtained, to enable further refinement of themes, and to verify that no important information had been omitted.

Study findings
The participants felt that the relationship between the pharmacist and physician is not well-established. Inappropriate communication between pharmacists and physicians, especially when prescribing rarely used medications or alternative medications, were reported to negatively affect teamwork. In addition, langauge barriers that result due to the multinational composition of healthcare providers were another factor. All participants agreed on the important role of the clinical pharmacist in reducing the risk of prescribing errors. However, they also complained about the lack of clinical pharmacists. They mentioned that in most hospitals there are not enough clinical pharmacists to have one assigned for each department. A successful defence cited was the clinical pharmacist, as they have an important role in defencing the medication regimen to be
When asked about pharmaceutical issues, 12 (71%) principal investigators reported difficulties, describing a lengthy process and a need to overcome many obstacles. They were not aware of the details and stated that they usually left these issues to the pharmacists. Despite the major delays in trial implementation related to pharmaceutical issues, the principal investigators acknowledged the pharmacists' commitment. Among the principal investigators, 7 (41%) felt that earlier involvement of the pharmacists in trial implementation was important.
Qualitative data were presented with phase 1 (FG with pharmacists) and phase 2 (interviews with stakeholders). The development of generic healthcare skills among young people was a strong theme across the phases, reflected by rheumatologist. The integration of the hospital pharmacist into the multidisciplinary specialty team was prioritized in phase 3. Many young people with chronic illnesses are seen in hospital outpatient clinics rather than inpatient wards; pharmacists are not traditionally involved in these clinics but there was openness to include them. Other rheumatologists described innovation with pharmacists. One centre had a pharmacist prescribing methotrexate in clinic. Another team had a dedicated pharmacist attached to their group, who answered the team's queries but did not attend clinic. Whether it was reasonable for a generalist practitioner such as community pharmacist to embrace the specialty knowledge for all paediatric conditions was also discussed.
Majority of those interviewed observed that pharmacy has a unique role in the healthcare system and that pharmacists should be involved in clinical practice in the best interest of patient care. From the interview data it became clear that important changes are required in a number of aspects of pharmacy education in Ethiopia of pharmacists are to provide high-quality patient-oriented service. All the respondents believed the pharmacist as a patient-care provider should be a part of the multidisciplinary team and appreciated the way they are going towards pharmaceutical care through clinical pharmacy. Majority of the respondents described that clinical pharmacy can contribute a number of benefits to healthcare ranging from inpatient counseling to drug therapy changes. They put the final goal as societal benefit. Provision of a cognitive service begins with the recognition of a possible patient drug therapy problem and is followed by intervention to verify that the problem is clinically relevant and to determine an appropriate solution.
One theme emerged from the FGs was hospital pharmacy services. Nurses generally considered iv antibiotics prepared by the pharmacy safer than medication preparation conducted by nurses and felt that it decreased nurses' workload and interruptions. However, nurses in one group expressed that they did not feel safe trusting unknown pharmacy staff to prepare medication; furthermore, limited opening hours of pharmacy service raised a concern, as 24-hour service was considered

Three interdisciplinary medication decision themes were identified. These themes were: pharmacists' role in interdisciplinary complex medication decisions; factors facilitating pharmacists' involvement with other health professionals in medication decisions; and challenges impeding pharmacists' ability to make medication decisions. Pharmacists were integral to medication decision making, which included complex medication decision making, involving off-label prescribing, clarifying administration issues when protocols were absent or ambiguous, mediating administration conundrums between patient safety and inflexible protocol adherence, and maintaining heightened vigilance when patients received multiple medications. Facilitators in decision making comprised strong relationships among pharmacists,
doctors and nurses, thereby enabling communication, and having a culture that supported open disclosure of medication errors. Challenges in decision making related to the lack of availability of pharmacists in the emergency department, limited after-hours pharmacy staff, and competing responsibilities for the conduct of discharge interviews and dispensing, with case note review. In this study, the strength of pharmacists' inter-professional relationships stimulated effective medication interactions while challenges to these interactions, the lack of an emergency department pharmacist, limited access to after-hours pharmacy expertise, and pressure of discharge planning, had an impact on decision making. The study revealed an open, vigorous and actively fostered culture of collaboration about medication decisions between disciplines. In particular, junior doctors valued pharmacists' information, not just about the rationale for prescribing antibiotics or proton pump inhibitors (PPIs), but the strength of medications, the amounts per bottle or box, their possible adverse effects, and their pediatric application when doctors had mostly prescribed for adults. There was a palpable camaraderie between registrars and pharmacists who worked closely together on wards. This study provides new knowledge about how pharmacists collaborate with nurses as well as doctors. The ease with which nurses communicated with ward pharmacists and junior doctors, however, seemed more a matter of propinquity than hierarchy: pharmacists were regularly on ward, shared nurses' knowledge of patients' conditions and medications and could resolve queries
swiftly. Pharmacists were viewed by staff as primary authorities about medication issues, particularly in making complex

Reference ID	*Main Author*	*Year*	*Study location*	*Aim*	*Study design*	*Hospital/ community*	*Methods*
7	Alomi YA (National Clinical Pharmacy and Pharmacy Practice and Pharmacy R&D Administration, Ministry of Health, KSA	2019	Riyadh, Saudi Arabia	To explore patient satisfaction of ambulatory care services	4-month cross-sectional survey of patient satisfaction of ambulatory care pharmacy services.	Hospital	Quan
8	Cesarz JL (University of Wisconsin Hospital and Clinics)	2013	USA	To determine the rate and types of intervention associated with emergency medicine pharmacist review of Rxs for patient being discharged from the ED. The 2nd purpose was to evaluate the perceived usefulness of this service to ED healthcare professionals.	A prospective observational study in the ED of an academic medical centre. Data for interventions were collected during a continuous 3-week period in 2010, with the survey conducted 4 months after the implementation.	Hospital	Multi-methods
9	Chen C (Department of Pharmacy, Kandang Kerbau Women's and Children's Hospital)	2013	Singapore	To evaluate the utility of tailored educational pharmacist counselling in improving knowledge and self-reported confidence in patient care by caregivers of children with epilepsy	Pharmacists worked with neurologists to individualise counselling for patients, using the handbook and hardcopy presentation slides during counselling. Pharmacists arranged follow-up sessions over the telephone 2 weeks after the counselling session, discussing the frequency and changes in characteristics of seizures and enquring on the compliance with therapy and presence of side effects. Caregivers were provided with a self-administered questionnaire pre- and post-counselling session, with another questionnaire administered over the telephone.	Hospital	Quan
10	Cheong JYV (Department of Pharmacy, Kandang Kerbau Women's and Children's Hospital)	2019	Singapore	The primary objective was to assess the impact of a pharmacist-led eczema counselling service. The secondary objective was to evaluate caregiver's satisfaction of the service and their confidence in handling the patient's coundition after counselling.	A propective, questionnaire-based observational study.	Hospital	Quan
11	Flannery DD (Alfred I duPont Hospital for Children)	2014	USA	To assess prescribers attitudes about the Antibiotic Stewardship Programme, aimed to identify perceived strengths and weaknesses of the service, with the ultimate goal of maximising its effect on future prescribing behaviours.	A 10-question survey questionnaire was designed by a paediatric resident, 2 ID attending physicians and the ID pharmacist using SurveyMonkey.	Hospital	Quan

12	Hunter KA (Washington State University)	1994	USA	3 main objectives: 1) obtain a general assessment of patient/family knowledge regarding asthma; 2) develop and implement an educational programme to improve understanding; 3) evaluate the impact of the programme on the participants' understandings.	A 17-item questionnaire prior to educational programme and a 19-item questionnaire post the programme.	Not specified	Quan
13	Moadebi SM (University of British Columbia)	2013	Canada	To measure the impact of the interprofessional collaboration and educational sessions conducted by the clinical pharmacist on ED nurses' level of comfort and satisfactin with intranasal fentanyl for children.	A protocol for administering intranasal fentanyl for children age 1–15 years with acute pain was introduced to the ED Nursing staff by an educational session conducted by a clinical pharmacist. Nurses' level of satisfaction and comfort was surveyed prior to and following IPE. Compliance with patient monitoring was determined by chart review.	Hospital	Multi-methods

Site information	*Study population*	*Recruitment method*	*Inclusion/ exclusion criteria*	*Data collection*
The survey was disctributed to 3 types of ambulatory care hospitals in Riyadh city; included the public, paediatric and emergency hospitals.	The hospital has emergency care and ambulatory care services with 250 beds for paediatrics and maternity. The emergency hospital consist of 280 beds, consisting great emergency services and neonated critical care. 606 patients responded to the survey.	Not sepcified	Not specified	The survey consisted of 48 questions divided into: i) demographics and ii) medication availability, patient counselling, pharmacist and patient relationship, medication reconciliation, medication aberrance, pharmacy location, pharmacy waiting area, communications, waiting time, signposting and overal satisfaction. A 5-point Likert scale was employed.
A 32-bed ED that serves both adult and paediatric patients, with an annual consus of appox. 45,000 patients.	All ED pharmacists, attending physicians, residents and nurses were invited to participate in the survey involving the service. Survey responses were anonymous. 74/82 (90%) replied to the satisfaction survey.	Not sepcified	Not specified	To determine the perceived value of this service, a satisfaction survey was conducted through an online vendor (Survey Monkey) 4 months after implementation. Each potential respondent was assigned a randomized number through which results were handled anonymously. The survey was composed of multiple-choice, response-rated, and openended questions.
A 830 bed hospital that provides specialised paediatric and women's healthcare services.	Caregivers who accompainied epileptic patients on neurology follow-up visits. (n=27)	Not sepcified	Patients were aged below 18 years and must have been seeing a neurologist at the inistitution. They could have been either newly diagnosed or have existing epilepsy. These patients were either commencing treatment with a new AED, changing an AED or were non-compliant to AEDs. The caregivers must be able to understand English or Mandarin. They were excluded if they were not contactable by telephone on 3 separate occasions for 2 weeks post counselling.	3 sets of questionnaires (Set A-C) were used with set A & C being knowledge-based. Both questionnaires were the same administered randomly pre and post counselling. Set B was the perception questionnaire. It was adapted from the validated instrument developed by Larson et al. For set A&C, scoring followed by negative grading system. A maximum of 21 points was posible for these 2 sets. Set B, "excellent" ratings were assigned 5 points, followed by "very good", "good", "satisfactory" and "poor". For questions on confidence, the scores ranged from "very confident" to "no confidence".
A tertiary paediatric hospital	Caregivers of new paediatric patients diagnosed with mild to moderate atopic dermatitis by dermatologists. (n=50)	Not sepcified	Caregivers were included if they reside in Singapore, were between 21 and 80 years of age and were able to comprehend English or Chinese.	Questionnaire A included items on demographics and items assessing the caregiver's knowledge of AD and its management. Each correct response was awarded 1 point, and incorrect responses was graded negative 1 point, and "not sure" was awarded with 0. Possible range was -24 to 24. Questionnaire B was adapted from a validated instrument by Larson et al and contained items on the caregivers satisfaction of the counselling service and their level of confidence in management. Both were self-administered by the caregivers. Questionnaire C contained only knowledge-based items similar to A but in reverse order during follow-up. The primiary outcome knowledge score was collected prior to treatment and at 4 weeks after the counselling session. Satisfaction were collected immediately postcounselling.
A 180-bed tertiary care academic paediatric hospital	93/153 (61%) of respondents participated: 67% (48/72) of resident physicians, 91% (10/11) of hospitalists, 41% (9/22) of PEM attendings. 38% (8/21) of paediatric fellows and 67% (18/27) of APN/PAs.	Not sepcified	Participants were selected based on frequency of Rx of antimicrobial medications. Because the institution is a teaching hospital, the majority of orders are placed by resident physicians. Paediatric fellows were also included. For attending physicians, only hospitalists and paediatric emergency medicine were included, given that other attending physicians do not usually prescribe at the hospital. Certain inpatient advanced practitioner nurses and physician assistants were also invited.	Survey was sent to participants using institutional email addresses. A reminder email was sent out 2 weeks after the original email.

Not specified	Children, birth to 17 years of age, with a history of respiratory illness were eligible to participate. Using ICD9-CM codes, names of children were obtained througha search of medical records of patients.	Purposeful	Children under care of WellCare Administration, Inc of Kingston, NY. Due to a low number of participants from the managed care group, a second group of managed care members from Community Health Plan (CHP) was invited to participate. 12/61 (19.7%) completed the study by returning the second questionnaire.	Participants completed the initial questionnaire and attended the educational programme received a follow-up questionnaire on the say of the educational programme.The initial questionnaire consisted of 17 items from demographics, severity of illness, understanding of asthma and needs assessment plus open-ended questions. The follow-up questionnaire consisting of 19 items was developed to determine if the information presented during the educational programme improved participants understanding or perceptions about asthma, and if they were satisfied with the information and knowledge gained from the programme.
Lions Gate Hospital, a 335-bed acute care community teaching hospital. Paediatric visits contribute to approximately 20% of all visits.	All nurses working in the site's ED. The ED Clinical Nurse Educator assigned staff nurses to attend the education classes who were employed full time at our 24 acute bed and minor care ED. A total of 71 nurses were included in the study. The majority of the nurses who responded to the practice assessment had over 5 years of nursing experience.	Not sepcified	The sample group included all Emergency Department staff nurses who completed the educational session.	Participants were recruited in a formal educational presentation by clinical pharmacist. Nurses' experience with intranasal fentanyl was assessed by questionnaire before the educational presentation. Those nurses identified with past experience were asked to rate their satisfaction or comfort level with a five-point Likert scale. An online survey using SurveyMonkey was administered post educational intervention to evaluate satisfaction and comfort with administrating intranasal fentanyl. Content validity was established by the expert judging panel (two pharmacists and one nurse) reviewing each survey question as essential items measuring skill or knowledge. Item clarity was assessed in pilot testing and minor changes to wording were addressed. The reliability of the scales used for the satisfaction questionnaire was tested applying Cronbach's alpha coefficient set at alpha < 0.70.

Analysis	*Study findings*
Not specified	Despite the general high rating of pharmacy counseling, there was a low level of satisfaction in areas like explaining the side effects and storage of the medication and their labeling; however, our results are still in the range of those reported in the literature and are better than the study conducted in Ethiopia.The results regarding pharmacist and patient relationship satisfaction were fairly good and similar in our study, but the results were less than those reported in a national study conducted in the primary healthcare centers. In the area of medication reconciliation, our results were found to be low because this service is not supported at all hospitals and pharmacies yet. However, our results agree with some other studies. The results on patient satisfaction were not found to be significantly different among the three studied hospitals
Not specified	A survey response of "strongly agree" or "agree" was considered a positive response. Overall, ED care providers answered positively that this service improved patient safety (99%), optimised medication regimens (96%), and improved patient satisfaction (95%). A majority (73%) believed that the service decreased the number of callbacks to the ED from local pharmacies about discharge Rxs. 96% of respondents agreed that discharge efficiency was not impaired by adding the pharmacist review to the process. 99% of respondents believed that this service should be continued. There was a significant difference between the number of interventions in adult and paediatric patients. Pharmacists are an integral member of the interdisciplinary patient care team and have demonstrated their abilities to improve patient safety. These benefits can be translated to the ED through prospective medication order review, involvement in trauma and medical resuscitations, providing patient-specific clinical consultations, and reviewing discharge Rxs. With physicians increasingly being pulled in multiple directions, this Rx review also has the potential for reducing interruptions to workflow
The confidence scores before and after counselling and after telephone follow-up were compared using Wilcoxon signed ranks test. Statistical significance was defined as $p<0.05$.	The mean caregiver knowledge score for set C was significantly higher than that of set A (14.7 ± 4.6 v 10.4 ± 3.4, $p<0.05$). The confidence of caregivers in administering the AEDs improved after counselling (from 3.60 to 3.94). In regards to the patient satisfaction survey, scores between four and five suggested that the caregivers felt that that particular aspect of service was either very good or excellent. The caregivers were most satisfied with knowledge that the pharmacist displayed during the counseling and the courtesy shown to the caregivers (average score = 4.70 out of 5). This may reflect that the training of the pharmacists is adequate. Study results also suggested that the caregivers may not be satisfied with the time allocated for each counseling session (average score = 4.44). As the nature of the question on the original instrument was not specific to the appropriateness of the duration of the session, more detailed questioning may be needed to elicit such information.
Continuous outcomes were summarised as mean, and categorical outcomes were summarised as frequency. Paired sample t test was used to compare the difference in average knowledge scores before and after. Univariate analysis was performed to identify potential factors affecting changes in score. The statistical significance was set at $p<0.05$.	Majority (81.3%) of caregivers found the information provided during counselling easy to understand (score 5). All caregivers provided a rating of 4 or 5 on the usefulness of the counselling session, with 78.1% finding it very useful (socre 5). Approximately half (56.3%) of all caregivers found that time spent on counselling service was appropriate. After counselling, majority (90.6%) of caregivers provided a rating of 4 or 5 on confidence in handling their child's condition, with 53.1% rating "very confident".Our caregivers were largely satisfied with various aspects of the service including usefulness of counseling session and ease of understanding the information conveyed. An eczema counseling session took an estimated 20 minutes. However, a substantial number of caregivers found the session too short, suggesting that more aspects on eczema can be discussed during counseling.
The data obtained by SurveyMonkey were analysed in Stata v11. Descriptive analyses were performed, and statistical tests utilised included the Kruskal-Wallis test and Mann Whitney U test. A P value of 0.05 was used as representative of statistical significance.	Recommendations from the ID pharmacist were found to be more than somewhat helpful by 82%. All individual aspects of the ASP were found to be more than somewhat helpful (4 or 5) by greater than 60% of respondents. Comparing resident physicians with nonresidents, residents reported accessing the ASP online resources more often (p=0.0001), reported more familiarity with the ID pharmacist (p=0.0014). The effectiveness of an ASP relies heavily on behaviour change by prescribing clinicians. This study found that interventions such as real-time feedback and other educational interventions were well received. Respondents reported positive experiences with specific aspects of the ASP, including prospective audit and real-time feedback, required preauthorisation and indication for Rx of antimicrobials, CPOE order sets and ID pharmacist.

Not specified	When asked how well they felt their disease was managed with their present knowledge and understanding of asthma, participants answered very well, usually well and not very well 34%, 55% and 11% of the time, respectively. After the intervention the response was 33%, 67% and 0%, respectively. It appears that participants perceived themselves to have an increased understanding of asthma management after the programme. As well, they appeared to feel that this newly obtained information would better help them manage and understand asthma. This programme has increased participants' awareness about the amount of information their pharmacist has available to offer them, regarding not only medications, but specific disease states as well. It offers one method for pharmacists to become involved in patient care through the provision of education and counselling. It also provides an avenue to encourage patients and their families to gain a deeper understanding of asthma and its management.
Data were analyzed using SurveyMonkey, and Microsoft Excel software. Statistics on the Likert scale questionnaire items were computed, including means, standard deviations (SDs) and significance values ($p < 0.05$). The significant differences in comfort level between intranasal fentanyl and intravenous morphine in the nursing group based on practice were assessed using a paired student t-test. Confidence intervals were calculated using the GraphPadQuickCalcs. The level of significance was set at $p < 0.05$. The Cronbach's alpha coefficient calculated by Excel setting the benchmark alpha level <0.70.	Nurses reported a high level of understanding of medication dose and monitoring schedule (4.15 ± 0.89; 3.8–4.5) and side effects (3.98 ± 0.90; 3.6–4.2). Most nurses felt very comfortable with intranasal fentanyl administration but there was increased comfort with intravenous morphine (83% versus 98%, $p < 0.05$). Nurses rated high level of satisfaction the written medication handout (80%). The handout was an excellent tool to provide information on side effects to increase comfort in giving the medication as well as having the appropriate actions for the patient should a side effect occur. Interprofessional practice-based interventions are strategies put into place in healthcare settings to improve work interactions and processes between two or more types of healthcare professionals. This educational intervention was provided by the team of nurse educator and hospital clinical pharmacist to improve nurse practice acceptance with the launch of intranasal fentanyl. This appropriate collaboration of health care professionals is reflected by the philosophy of teamwork at our community hospital. The proximity of the pharmacist to the department allows for direct consultation and medication review by the pharmacist. Furthermore, the pharmacist's participation in educational in-services two days per week has helped to alleviate the nurse educator workload allowing more time to implement new educational programs in the ED. Authors expected the availability of a clinical pharmacist in the department would decrease barriers for using intranasal fentanyl.

Reference ID	*Main Author*	*Year*	*Study location*	*Aim*	*Study design*	*Hospital/ community*	*Methods*	*Site information*
14	Bhakta ZN (University of Utah Hospitals and Clinics)	2013	USA	The primary purpose of this study is to assess the role of pharmacist activities at Cystic Fibrosis Foundation-accredited care centers in the US, from the CF center director's perspective.	A national cross-sectional survey was sent to the CFF-accredited paediatric and/or adult programme directors	Hospital	Quan	Nationwide
15	Brooks T (Leeds Children's Hospital)	2016	UK	To audit the new pharmacist-led telephone service for warfarin dosing and monitoring of INR, and compare it to the previous system.	To compare the NPSA safety standards for warfarin dosing between the two services; for parent/carer satisfaction, a questionnaire was sent to parents/carers of all patients who were under the care of the pharmacist-led children's warfarin clinic.	Hospital	Multi-methods	A children's hospital
16	Christiansen N (Barts Health NHS Trust, London)	2014	UK	The study aimed to explore the factors affecting medication adherence in paediatric cystic fibrosis patients and to obtain patient opinions on pharmacist-led interventions to improve adherence.	A cross-sectional, delf-report questionnaire study.	Hospital	Quan	Not specified
17	Chung E (The Hospital for Sick Children)	2017	Canada	To evaluate the impact of this program on clinical outcomes, assessed family/patient satisfaction and knowledge on low molecular weight heparin (LMWH) post-discharge, obtained staff feedback, and determined net cost benefit.	A thrombosis pharmacist pilot programme was implemented its health outcomes were compared against a pre-implementation period. Survey was conducted to measure satisfaction to the new service.	Hospital	Multi-methods	A children's hospital
18	Conway C (Our Lady of Lourdes Hospital)	2012	Ireland	To evaluate the clinical significance of interventions made by a pharmacist on 'medicines management' and assess the perceptions of healthcare professionals.	The pharmacist attended the NICU to review prescriptions over a three month period with interventions captured. Survey instrument was used for healthcare professional's satisfaction.	Hospital	Multi-methods	A 16-bed NICU

19	Foster ME (Le Bonheur Children's Medical Centre)	2010	USA	To evaluate the ED staff perspective on medication safety and error rates two years post-pharmacist implementation.	A blinded internet-based survey was created utilizing a pre-existing internet survey tool.	Hospital	Quan	A paediatric emergency department in a children's hospital
20	Kim A (Kosair Children's Hospital)	2015	USA	To evaluate the utility of pharmacist-led, supplemental, institution-specific educational training to nursing staff regarding the use of chemotherapy and its supportive care and to identify a core programme that will serve as an objective for nursing orientation.	Nurses were eligible to participate in a 3-session educational programme regarding chemotherapy principles, chemotherapy adverse event management, and chemotherapy supportive care.	Hospital	Multi-methods	A children's hospital
21	Lissick JR (Children's Minnesota Minneapolis)	2018	USA	To determine if the addition of a pharmacist to inpatient discharge education for enoxaparin at a pediatric facility would enhance caretaker's knowledge, satisfaction, and feeling of preparedness and therefore improve safety and clinical outcomes.	This was a prospective study of patients discharged from Children's Minnesota receiving enoxaparin for antithrombotic treatment or prophylaxis between November 1, 2016 and September 30, 2017. Patients were randomized to two cohorts. Cohort 1 received the institution's current standard of care which consisted of discharge education by a nurse and provider. Cohort 2 received structured teaching and handouts from a pharmacist at the bedside prior to discharge in addition to the standard of care. Caretakers completed a standardized anticoagulation knowledge assessment over the phone approximately two weeks after discharge.	Hospital	Quan	A children's hospital

Study population	*Recruitment method*	*Inclusion/ exclusion criteria*	*Data collection*	*Analysis*
Centre directors of CDD-accredited care centres in the US.	Not specified	Not specified	Use of an electronic survey tool (SurveyMonkey).	Not specified
Computerised system revealed 73 patients on warfarin with a total of 1547 INRs, and looked for any complications or out of range results. This to be compared to a previous audit of the original system of 44 patients on warfarin with a total of 1289 INRs. 38 out of 53 (72%) parents/carers returned the satisfaction survey	Not specified	Not specified	Not specified	Not specified
Twelve CF patients between 12–16 years took part in the study.	Not specified	Not specified	The adherence to each treatment option was described on a four point likert scale and additional questions were asked assessing the reason for non-adherence as well as the children's perception of the necessity of the medication. The second section used open and closed questions to assess the potential pharmacist-led interventions the children would perceive to improve adherence.	Not specified
94 and 64 patients during the pre- and post- pilot periods respectively were selected.	Not specified	Not specified	Surveys were conducted on telephone for patients and families, and conducted online for staff.	Not specified
110 patients on NICU were reviewed during the study period. Number of respondents of the survey was not specified.	Not specified	Not specified	All interventions were assessed by a clinical pharmacist for both clinical significance and level of risk. A random sample of these interventions was also assessed by a NICU/PICU pharmacist and a consultant neonatologist for validation. An anonymous questionnaire was circulated to healthcare professionals in the NICU to assess their perception of the new service.	Not specified

103 ED staff members completed the survey. Nurses accounted for 51.5% of the response total, while attending and resident physicians comprised 28.1% of participants. The remaining responses came from other allied health professionals.	Not specified	Not specified	The survey asked the participant to assess the following using a five-level Likert-based scale: their job role, their position on medication safety, the ED pharmacist's effect on medication errors, their use of the ED pharmacist for drug information, and their view on the expansion of ED pharmacy services. A final question allowed for open-ended comments. The survey was available for a one month period.	Not specified
A total of 31 oncology/ haematology nurses participated in the educational programme	Not specified	Not specified	Ten question pre- and post-tests were administered using a unique identification code to ensure anonymity during each 30-min session to assess baseline and acquired knowledge. An attitudes survey was given to nurses prior to the first session and after the last session to assess the nurse's comfort with administration and management of chemotherapy.	Not specified
A total of 32 patients and families consented to the study. Four subjects dropped out and were excluded from study results because enoxaparin was discontinued prior to discharge.	Not specified	Patients were excluded if they had an active prescription for enoxaparin at the time of admission or were discharged to another healthcare facility. Patients were identified through the electronic medical record and became eligible when a provider indicated a discharge plan for home enoxaparin use.	The knowledge assessment contained 13 questions and was scored with one point per question. Questions were scored based on predefined criteria for correct answers with no partial credit awarded. Caretakers also ranked their satisfaction with discharge education and preparedness for home enoxaparin on a scale of one to ten. Data were collected for one month post discharge to evaluate any hospital readmissions and emergency department visits.	Not specified

Study findings
A total of 40.6% (106/261) of the CFF-accredited center directors completed the survey. Pharmacist's involvement in the care of CF patients is evident throughout the US CFF-accredited centers; however nearly 40% of the CFF center directors do not have a pharmacist as a core member of the CF team. All (100%) of the center directors in which pharmacist involvement does not currently play a major role feel that having a pharmacist would be beneficial for patient care. The major barrier that center directors identified to having a pharmacist as a core CF team member was financial (75%), followed by lack of institutional support (40.9%) and lack of pharmacy admin support (34.1%) (n=44).
Changing to the pharmacist-led service has meant that it is now compliant with NPSA standards and the safety indicators are comparable to the original service. The service has generally been very well received, with all parents/carers finding the service at least satisfactory and 78% found itexcellent. The pharmacist-led service is unique, as it uses a computerised system for documentation, with the aim to produce a paediatric dosing algorithm.
Different pharmacist-led interventions to improve adherence were assessed. Information provision on new medication in the CF clinic is predominantly led by the doctors, with 8 (66.7%) of the children reporting that doctors explain 'the dose' and some reported 'doctors explains but not in detail'. 4 (33.3%) children had not been given information about the new medication. When asked about what way of providing medication information would be most useful 5 (41.7%) stated medicines information leaflet, 3 (25%) children preferred a CD-ROM with the information and 4 (33.3%) felt that information provision would not help at all. Lastly children were asked whether having a pharmacist attending CF clinics would help and explain their answer. 6 (50%) children reported that 'it would not make any difference' and 6 (50%) reported 'it would help in providing more information about CF medications'.
An increase in anticoagulation control (for LMWH and warfarin) during the pilot period was observed. Staff highly recommended the thrombosis pharmacist position to continue, with improvement in family/patient satisfaction and LMWH knowledge by 15.63%. The net cost benefit was $348 806. A paediatric thrombosis pharmacist can provide substantial improvement to anticoagulation management and may lead to significant cost avoidance to healthcare payers.
73 interventions were made during the study period; the incidence rate for interventions was 5.4/100 patient care days and 9.1/100 reviewed prescriptions. Dosing errors accounted for 47.9% of all interventions. Over 69% of the interventions were considered significant and 11.1% very significant. The clinicians' acceptance rate of the interventions was 91.8%. The majority of responders to the questionnaire agreed that the presence of the ward pharmacist improved medication safety and the quality of care.

Survey analysis revealed that 92.2% strongly agreed that medication safety had improved and error rates were decreased over the two year period. Furthermore, 86.3% strongly agreed with utilizing the ED pharmacist as a valuable drug information resource. Overall, 93.2% strongly agreed that coverage should be expanded to 24 hours per day, including weekends. Open-ended comments were provided by 49% of respondents, all of which were favorable with regards to the ED pharmacist.
Pre- and post-test scores improved by 4%, 22%, and 16% for the first, second, and third session, respectively. Across the 3 sessions, overall test scores improved from 62% to 77% ($p<0.001$). A pre-survey of nursing attitudes revealed that nurses felt least comfortable identifying errors in patient's chemotherapy orders and educating patients and families. The post-survey revealed that 100% of the nurses planned to incorporate aspects of the program into their daily patient care activities and agreed the educational sessions should be offered in the future.
The cohorts were similar at baseline with respect to age, sex, race, ethnicity, and caregiver education level. Upon follow up, cohort 2 had a higher knowledge assessment score (7.54 vs. 9.53; $p=0.0061$). Caregiver satisfaction was also higher in cohort 2 (8.38 vs. 9.37, $p=0.0497$). No difference was found in preparedness scales, emergency department visits or readmission to Children's Minnesota.

Appendix II – Quality appraisal form

Qualitative studies

Main author	Clear research questions?	Data allow to address the research questions?	Approach appropriate to answer the research question?	Comments	Data collection methods adequate to address the research question?	Comments	Are the findings adequately derived from the data?	Comments
Al Fageh	Yes	Yes	Yes	*Qualitative approach is an appropriate method for finding out factors causing prescribing errors.*	Yes	*Method of data collection: focus group, Two focus group discussions were held. The first lasted for one hour and forty minutes, and the second for one hour and twenty minutes. Both were managed by a moderator and audio taped. The discussion was held in English as the official language used among healthcare staff in Saudi Arabia. The form of data: discussions were transcribed verbatim by the researcher, and then subject to thematic content analysis by two independent researchers, with a deductive approach.*	Yes	*The discussions were transcribed verbatim by the researcher, and then subject to thematic content analysis by two independent researchers, with a deductive approach.*
Mekonnen	Yes	Yes	Yes	*The methodology of the study is a qualitative descriptive which in depth interview is among the acceptable list. The authors interviewed both the heads of departments (internal medicine, paediatrics, surgery, nurse, pharmacy, medical director, administration) and pharmacy student representatives. Qualitative approach is appropriate to address the research question.*	Yes	*Semi-structured interviews with heads of departments and pharmacy representatives were adequate; Purposeful sampling was reported to be the recruitment method; A 30-min interview at respondent's office provided adequate time and comfortable place for the interviews; Quality of data collection was ensure by training for data collector with pilot interviews in place; Authors did not specify who the data collectors were – possible social desirable bias?*	Yes	*The data analysis is appropriate for the study design. The qualitative data analysis was done after audiotapes were transcribed verbatim and notes were compiled. Thematic analysis was carried out. The transcripts and notes were read repeatedly, and emerging topics were identified as themes and sub-themes. Next, coding of interview text relating to these themes and subthemes was performed. Quotes that would help in understanding of the content of the theme or sub-theme were identified. Quotes were designated as 'pharm' for pharmacy staff and pharmacy student representatives, 'Nur' for nurses and 'Doc' for doctors.*
Rishoej	Yes	Yes	Yes	*The methodology of the study is a qualitative descriptive in the form of focus groups interviews using a semi structured interview guide to facilitate discussion. Qualitative approach is appropriate to address the research question.*	Yes	*Focus groups were used which were adequate but one-to-one semi-structured interviews might be more appropriate as medication error is a sensitive issue; The setup of focus groups was appropriate, including venue, recording methods and pilot tested.*	Yes	*The data analysis is appropriate for the study design. The qualitative data analysis was done after audiotapes were transcribed verbatim and notes were compiled. Analysis of the focus group transcripts was conducted using qualitative content analysis. There was two coders involved to analyse the data individually.*
Rosenfeld	Yes	Yes	Yes	*The methodology of the study is a qualitative descriptive in the form of ethnographic design including observations, semi structured interviews and focus group. Qualitative approach is appropriate to address the research question.*	Yes	*An ethnography approach was used to describe and interpret behavior which is appropriate; Observations with the use of field notes and audio taping (note: only pharmacists and nurses were shadowed, as authors found that shadowing doctors led to disjointed interactions with patients); Semi-structured interviews: in a room in clinical setting, at the time convenient for participants for approx. 1 hr.; Focus groups: data analysis from interviews provided themes for FGs. (note: doctors' FG did not happen in view of difficulties in organising).*	Yes	*The data analysis is appropriate for the study design. The qualitative data analysis was done after audiotapes were transcribed verbatim thematically analyzed using the framework approach.*

Qualitative studies (Cont'd)

Main author	Interpretation of results sufficiently substantiated by data?	Comments	Coherence between data sources, collection, analysis and interpretation?	Comments
Al Fageh	Yes	*The interpretation of results was supported by the data collected. There were sufficient quotes to justify each subtheme and additional (technology) was identified in addition to the causation model used.*	Yes	*There is a clear link between the data source and the collection and analysis and interpretation, but there seem to have a bias towards "pharmacists" being the solution to medication errors and a strong emphasis. There is more of an issue on reflexivity, e.g. all the authors are pharmacists, so obviously may have an influence on the interpretation of the results.* **Total score: 5**
Mekonnen	Yes	*Results were supported by quotes that justified the themes.*	Yes	*There was a clear link between the data collection analysis and interpretation and the data source. They have interviewed the heads related department as well as pharmacy student representatives and used their quotes to come up with themes.* **Total score: 5**
Rishoej	Yes	*Results were supported by quotes that justified the themes.*	Yes	*There was a clear link between the data collection analysis and interpretation and the data source. They have interviewed physicians and nurses and used their quotes to come up with themes.* **Total score: 5**
Rosenfeld	Yes	*The results were supported by the data collected with first-order interpretation quotes.*	Yes	*There was a clear link between the data collection analysis and interpretation and the data source.* **Total score: 5**

Quantitative studies

Main author	Clear research questions?	Data allow to address the research questions?	Sampling strategy relevant to address the research question?	Comments	Sample representative of the target population?	Comments	Are the measurements appropriate?	Comments
Alomi	Yes	Yes	No	*The author mentions the study site, and how representative it is to the city; however, the authors have not described how they distributed their survey. Another issue is that they mentioned that the authors interviewed the patients with electronic survey documentation. If this is the case, did they interview all the patients being admitted to the hospital who would consent to taking part?*	No	*Although the authors describe the setting of which they recruited participants from, they did not go into details about how they identified or invited participants to take part in the questionnaire, e.g. was it a convenience sample over that cross sectional period or randomised?*	No	*No details of whether the survey was piloted nor any examples of the survey or the questioning of the survey. As the authors have pointed out that the authors were interviewing patients with an electronic survey, this could have an effect in terms of the way they were asked and also uncertain if all interviewers would deliver the questions consistently.*
Cesarz	Yes	Yes	Yes	*The selection of participants were clearly stated, for example the 4 emergency medicine pharmacists who would be screening the discharge prescriptions from ED as a new intervention, and all emergency staff were invited to participate in the survey involving this new pharmacy service.*	Yes	*Variable measure were accurately defined and measured.*	N/A	*Each item was appropriate to measure the level of satisfaction but survey 4 month post implementation not pre-tested and not validated nor reliability tested; in addition, it was not clear how many missed prescription to able to measure the outcome.*
Chen	Yes	Yes	Yes	*Patients with epilepsy who the neurologist refers to the pharmacists and agreed to be referred to a pharmacist took part and the sample size was small but it does exactly what the aim (which is narrow in terms of evaluating a pharmacist service in neurology in one hospital site in Singapore). But the way the patients (all who were happy to be referred to a pharmacist) were sampled could produce biased results as you would only find the ones that are happy to receive pharmacist counselling and follow up.*	Yes	*There is a clear description of the inclusion and exclusion criteria, however, no clear statement regarding the reason why some participants declined to participate.*	Yes	*The perception questionnaire (Set B) was adapted from a validated instrument (Larson et al); The questionnaire was reviewed several times, incorporating inputs from pharmacists and neurologists; The questionnaires were pilot-tested but Cronbach Alpha not tested.*
Cheong	Yes	Yes	Yes	*The sampling strategy was all participants who referred by paediatric dermatologists for pharmacy counselling at the outpatient pharmacy. This could have been clearer. Also only those who could speak English and Chinese were included in the study.*	No	*The study made it clear who they were targeting, which would not represent all of the target population, but would address the research question, they have stated their limitations however.*	Yes	*Items were appropriate to address satisfaction/ confidence and can reflect what they are supposed to measure – but could possibly explore more by designing a more in-depth questionnaire; Questionnaire B was adapted from a validated instrument (Larson et al) but not pilot test has carried out and tests such as Crobach's alpha for internal consistency were not performed.*
Flannery	Yes	Yes	Yes	*A single site with doctors who are likely to prescribe antibiotics were recruited. Involvement of advanced practitioner nurses and physician assistants was also appropriate.*	Yes	*61% (93/153) completion rate showed the samples could represent the target population, which are doctors who prescribe antibiotics at the study site. The analysis would be difficult to be interpreted by other institutions.*	No	*The questionnaire was not reported to have piloted and Cronbach's Alpha was not tested, thus the reliability and validity are questionable; The use of Likert scale was appropriate.*
Moadebi	Yes	Yes	Yes	*The source of sampling is relevant to the targeted population and a clear discussion about the targeted population was stated that is in line with the research question.*	Yes	*There is a clear description of the sample that will be recruited as well as the setting and all approached and recruited participants took part in the study.*	Yes	*The survey framework was guided by an educational intervention assessment used for obstetric nurses reported in the literature. Also a clarity pilot test for the survey was conducted and some amendments were done accordingly.*

Quantitative studies (Cont'd)

Main author	Is the risk of nonresponse bias low?	Comments	Statistical analysis appropriate to answer the research question?	Comments
Alomi	N/A	*Socially desirable bias is possible. "The authors interviewed the patients with an electronic survey documentation"- how were they contacted was unclear; Nonresponse bias could exist as actual target patient is not known hence there was no response rate; furthermore there were no explanations on the reasons for nonresponse nor statistical compensation for nonresponse.*	N/A	*Descriptive statistics was appropriate but the test used was not reported; Each item could be tested against demographic data/ different hospitals using Mann-Whitney U test for better analysis in order to answer the research question.* **Total score: 0**
Cesarz	Yes	*Nonresponse bias was relatively low as 90% (74/82) responded, but authors did not investigate the reasons for nonresponse; Socially desirable bias was possible since the authors were pharmacists at the study site. They tried to minimise the risk by handling the data anonymously.*	Yes	*Standardized tool was used throughout; The intervention and impact of intervention as well as the internal reliability was reported.* **Total score: 4**
Chen	No	*Bias is possible in that the neurologist were only referring a small number of cases they deem suitable for a pharmacist; in addition, social desirable bias is high as the questionnaire was completed straight after the counselling session and the authors were the pharmacists conducting the sessions. Nonresponse bias is also possible, when 22/55 (40%) of the target population did not participate. Authors did not identify the reasons for not participating.*	Yes	*The survey design (5-point Likert scale) allowed good statistical analysis (i.e. paired sample t test for Set A & C); Confidence scores before and after counselling and after telephone follow-up were compared using Wilcoxon Signed Ranks test which was appropriate.* **Total score: 4**
Cheong	N/A	*The authors justified the small sample size due to the short study period. Nonresponse bias possible but low; reasons for nonresponse were not reported; Social desirable bias might exist as questionnaires were completed at the end of session at the counselling area.*	Yes	*Descriptive statistics for satisfaction items was appropriate in view of limited data due to study design.* **Total score: 3**
Flannery	Yes	*High response rate for this survey and clear statement regarding why some eligible participants did not take part.*	Yes	*Descriptive statistics and non-parametric tests such as Kruskal-Wallis and Mann-Whitney U tests to compare two independent variables were appropriate.* **Total score: 4**
Moadebi	N/A	*The response rate for the survey was 56% and the author had to remove 3 of the submitted surveys form the analysis as they were incomplete. There was a clear justification to the low number of participants within the limitation section of the paper.*	No	*Means, SDs and significance values of $p<0.05$ were used; Non-parametric test would be more appropriate for Likert scales where you rank according to discrete values (ordinal data).* **Total score: 3**

Mixed methods studies

Main author	Clear research questions?	Data allow to address the research questions?	Adequate rationale for using a mixed methods design?	Comments	Different components of the study effectively integrated?	Comments	Outputs of the integration of both components adequately interpreted?	Comments
Gray	Yes	Yes	Yes	*The sequential mixed methods study design was adequate – the qualitative part of the study reflected the dearth of literature in this area and recorded idea from interviewees, this provided a framework and themes identified for the quantitative phase.*	Yes	*Results from all phases were integrated using Triangulation approach. At the end of phase two the data of both qualitative phases were compared and to incorporate into phase 3.*	Yes	*There was a clear interpretations derived from integrating qualitative and quantitative findings from all phases which was clearly described in the results.*
			Are divergences and inconsistencies between both results adequately addressed?	**Comments**	**Do the different components adhere to the quality criteria of each tradition of the methods involved?**	**Comments**		
			No	*It was unable to tell if there was inconsistencies between qualitative and quantitative data as these were not explicitly stated or compared and contrasted; However, the study stated that participants recruited across the phases were similar.*	Yes	*No issues with the quantitative phase; However, in the qualitative phases, three pediatric rheumatology centres within the country for whom authors had contact among the project team and/or advisory group members – 1) high risk of bias as centres were not selected randomly; 2) 3 centres (out of 15, as reported) might not represent across the country. In addition, the nonresponse bias is high. Authors did not report the number of potential respondents form the 26 respondents who participated. It is not known that how the facilitators from the 3 centres recruited these respondents.* **Total score: 4**		

Appendix III – Interview guides

IG.3 Interview Guide for Clinical Pharmacists

Introduction

Greeting. **I would like to introduce myself. I am Conor Sin from Aston University and I am a research student interested in pharmacy services in children.**

Thank you for taking part in this interview, I really do appreciate the time you have given. Before we begin, I want to make it clear that if you wish to skip any question(s) during the interview, or if you want to stop the interview, all you have to do is say; you do not need to give any explanation for doing so.

Have you read the information sheet and do you have any questions before we start?

(Check whether consent form has been signed)

Are you happy for me to begin?

Can you describe your role as a paediatric clinical pharmacist in your hospital?

The next few questions I am going to ask a few questions with regard to your personal view on clinical pharmacy services.

Can you tell me about your thoughts on CPS implementation in paediatrics in Hong Kong?

Prompt: Comparing with other countries/the structure/the development

Do you feel confident in providing the services? What makes you feel confident/not confident?

Do you think the service is as good as it can be or can it be driven further? Any reasons for you answer?

How supportive are clinical pharmacists in your hospital in implementing CPS?

How do you think CPS implementation may affect patients?

Prompt: Do you think patient outcome may be affected? Do you think the implementation could influence the way that patients view pharmacists?

In the next section, I am going to ask questions in regard to the skills of clinical pharmacists.

What would help or facilitate your ability to implement CPS?

Prompt: are there any resources or tools you can think of? Is there anything that has been or could be changed to make this easier?

What would get in the way of, or be a barrier to, your ability to implement CPS?

Prompt: What is the biggest thing standing in your way? Your biggest frustration/problem/worry?

The next few questions are about the relationship with other healthcare professionals.

Can you describe your work relationship with other healthcare professionals?

Prompt: Awareness of the service; proactively seeking advice; reliability of clinical pharmacist

Do you think the communication between clinical pharmacists and other healthcare professionals in your hospital is adequate? How do you think this can be improved?

The last section of the interview focuses on your opinions about future services that clinical pharmacist can provide in Hong Kong.

How can the current service model change in order to provide a more successful implementation of CPS in your hospital?

Can you give some examples of what could be the potential barriers to achieve this?

Any other things you wish to add?

~ Thank you for taking part ~

IRAS ID: 004-2021-CS Interview Guide for Clinical Pharmacists [V 2.0] 21/01/2021

IG.2 Interview Guide for Physicians and Nurses

Greeting. **I would like to introduce myself. I am Conor Sin from Aston University and I am a research student interested in pharmacy services in children.**

Thank you for taking part in this interview, I really do appreciate the time you have given. Before we begin, I want to make it clear that if you wish to skip any question(s) during the interview, or if you want to stop the interview, all you have to do is say; you do not need to give any explanation for doing so.

Have you read the information sheet and do you have any questions before we start?

(Check whether consent form has been signed)

Are you happy for me to begin?

Can you please confirm what your job title is?

The next few questions I am going to ask a few questions with regard to the role of clinical pharmacists.

Can you describe to me what are the roles of clinical pharmacists whom you work with?

Is the current CPS similar to what you have expected? Can you tell me the difference between what was expected and reality?

In the next section, I am going to ask questions in regard to your experience to the clinical pharmacy service.

How do you think clinical pharmacists have helped you in your practice?

Do you think CPS implementation could influence the way how doctors/nurses view pharmacists?

How do you think CPS implementation affects patients?

Prompt: Do you think patients will benefit or be harmed? How about patient outcomes?

The next few questions are about the relationship with clinical pharmacist.

Do you feel that clinical pharmacists are a part of your team? If not, why not?

From your observation, do doctors/nurses support the implementation of CPS?

Prompt: Do you feel there is a culture of support? Do you get a feeling that you or your colleagues think the CPS is important or unimportant?

The last section of the interview focuses on your opinions about future services that clinical pharmacist can provide in Hong Kong.

What do you think if clinical pharmacists help to perform more drug-related duties? For examples, the pharmacist can help in ambulatory care by setting up clinics; they can also help in medicines management at inpatient such as TPN prescribing, TDM monitoring and dosage adjustments, and even independent prescribing in some countries.

Prompt: to other healthcare professional's practice; to patient.

What would help to facilitate, or get in the way to the implementation of any new CPSs?

How, in your opinion, do you think the service can improve?

Prompt: in order to make improvements, what should take place?

~ Thank you for taking part ~

IG.1 Interview Guide for Parents and Caregivers

Introduction

Greeting. **I would like to introduce myself. I am Conor Sin from Aston University and I am a research student interested in pharmacy services in children.**

Thank you for taking part in this interview, I really do appreciate the time you have given. Before we begin, I want to make it clear that if you wish to skip any question(s) during the interview, or if you want to stop the interview, all you have to do is say; you do not need to give any explanation for doing so.

Have you read the information sheet and do you have any questions before we start?

(Check whether consent form has been signed)

Are you happy for me to begin?

Can you tell me something about your child? E.g. his age, his medical condition(s) and its management and so on.

The next few questions I am going to ask a few questions with regard to your experience on clinical pharmacy services.

Can you tell me about the experience you have had with clinical pharmacist?

Prompt: What did he/she do? Inpatient or outpatient?

How much time did the pharmacist spend with you? Do you feel the time spent was appropriate?

How do you feel about the advice you have been given by the pharmacist?

In the next section, I am going to ask questions in regard to the role of clinical pharmacist.

Can you describe to me, to the best of your knowledge, what does a clinical pharmacist do in a hospital?

In your opinion, what should the role of clinical pharmacist be in terms of improving your child's health?

Prompt: In what place can clinical pharmacist fit in in hospital care – Inpatient, ambulatory care..

Do you think that clinical pharmacists should take up more responsibilities in looking after your child's medications? What are the benefits and risk of this?

Prompt: Give some examples of clinical pharmacist activities.

The next few questions are about your attitude towards clinical pharmacists.

Tell me about how you feel about clinical pharmacists' place on the care of your child.

Prompt: In terms of how helpfulness of the activities, the benefits to the child, the communication...

Do you trust clinical pharmacists to manage your child's medications? If so, why?

Prompt: Explain about manage – dosage recommendation, drug administration, appropriateness of drugs...

Will you be happy to visit clinical pharmacist's clinic to review your child's medications or to have educational sessions?

Prompt: How about replacing doctor's appointment/ having additional visits in between doctor's appointment

The last section of the interview focuses on your opinions about future services that clinical pharmacist can provide in Hong Kong.

In your opinion, do you think the service could improve?

Prompt: In order to make any improvements, what should take place?

What are your expectations of clinical pharmacists' future role in supporting parents/caregivers with regard to their children's medication management?

~ Thank you for taking part ~

IRAS ID: 004-2021-CS Interview Guide for Parents and Caregivers [V 2.0] 22/01/2021

Appendix IV – Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist for the programme of research

Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist

Developed from:

Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Study 2 – Clinical pharmacists' perceptions of the barriers and facilitators to the implementation of paediatric clinical pharmacy services in Hong Kong

No. Item	Guide questions/description	Reported on Page #
Domain 1: Research team and reflexivity		
Personal Characteristics		
1. Interviewer/facilitator	Which author/s conducted the interview or focus group?	Page 66 (Chapter 3.3)
2. Credentials	What were the researcher's credentials? E.g. PhD, MD	Page 73 (Chapter 3.4)
3. Occupation	What was their occupation at the time of the study?	Page 73 (Chapter 3.4)
4. Gender	Was the researcher male or female?	Not reported
5. Experience and training	What experience or training did the researcher have?	Page 73 (Chapter 3.4)
Relationship with participants		
6. Relationship established	Was a relationship established prior to study commencement?	Page 74 (Chapter 3.4) *(Some participants knew PI before study commencement as they worked in the same site. There might be interactions between PI and some other participants from meetings but no other work relations were established.)*
7. Participant knowledge of the interviewer	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	Page 74 (Chapter 3.4) *(All participants were aware that this research was part of PI's PharmD research*

		project. This was explained in the invitation email and information sheet.)
8. Interviewer characteristics	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	Page 73 (Chapter 3.4) *(Explained in the reflexivity section, Table 5)*
Domain 2: study design		
Theoretical framework		
9. Methodological orientation and Theory	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	Page 64–65 (Chapter 3.2) *(A constructivist thematic methodology was employed)*
Participant selection		
10. Sampling	How were participants selected? e.g. purposive, convenience, consecutive, snowball	Page 67-68 (Chapter 3.3.1) *(Purposive sampling – maximum variation approach was used)*
11. Method of approach	How were participants approached? e.g. face-to-face, telephone, mail, email	Page 88 (Chapter 4.2.2) *(Via hospital emailing system)*
12. Sample size	How many participants were in the study?	Page 88 (Chapter 4.3) *(12 clinical pharmacist participated)*
13. Non-participation	How many people refused to participate or dropped out? Reasons?	Study site participation: Page 87 (Chapter 4.2.1) Clinical pharmacist participation: Not asked
Setting		
14. Setting of data collection	Where was the data collected? e.g. home, clinic, workplace	Page 71 (Chapter 3.3.2) *(As interviews were conducted using telephone, the location of interviewees was not questioned)*
15. Presence of non-participants	Was anyone else present besides the participants and researchers?	No
16. Description of sample	What are the important characteristics of the sample? e.g. demographic data, date	Page 87 (Chapter 4.2.1)

Data collection		
17. Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	Page 69-71 (Chapter 3.3.2) and Appendix III
18. Repeat interviews	Were repeat inter views carried out? If yes, how many?	No
19. Audio/visual recording	Did the research use audio or visual recording to collect the data?	Page 71 (Chapter 3.3.2) *(Audio recording using PI's mobile device)*
20. Field notes	Were field notes made during and/or after the interview or focus group?	Page 75 (Chapter 3.4) *(Field notes were made during the interviews)*
21. Duration	What was the duration of the interviews or focus group?	Page 88 (Chapter 4.3) *(The duration ranged from 15 to 30 mins)*
22. Data saturation	Was data saturation discussed?	Page 66–67 (Chapter 3.3.1) and Page 88 (Chapter 4.3) *(The use of thematic data saturation was discussed and it was reached after 12 interviews)*
23. Transcripts returned	Were transcripts returned to participants for comment and/or correction?	Page 69 (Chapter 3.3.2) *(Member checking was performed with two clinical pharmacist participants)*
Domain 3: analysis and findings		
Data analysis		
24. Number of data coders	How many data coders coded the data?	Page 71-72 (Chapter 3.3.3) *(Two researchers coded the data – CS & CH)*
25. Description of the coding tree	Did authors provide a description of the coding tree?	No. All themes and subthemes are summarised in tabulated form for each study.
26. Derivation of themes	Were themes identified in advance or derived from the data?	Page 64 (Chapter 3.2) *(An inductive thematic approach was used)*
27. Software	What software, if applicable, was used to manage the data?	Page 71 (Chapter 3.3.3)

		(QSR NVivo v.12 was used)
28. Participant checking	Did participants provide feedback on the findings?	No *(Participants were notified when the manuscript was published)*
Reporting		
29. Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	Page 73 – 92 (Chapter 4.3) *(Quotations were presented throughout the results, each participant was given a reference and Table 6 provided information of the characteristics)*
30. Data and findings consistent	Was there consistency between the data presented and the findings?	Page 110-113 (Chapter 4.4) *(the data presented in the results were consistent with discussion)*
31. Clarity of major themes	Were major themes clearly presented in the findings?	Page 90 (Chapter 4.3) *(Major themes were presented on Table 7)*
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	Page 90 (Chapter 4.3) *(Minor themes were presented on Table 7)*

Study 3 - Physicians' and nurses' perceptions of the factors influencing the implementation of paediatric clinical pharmacy services

No. Item	Guide questions/description	Reported on Page #
Domain 1: Research team and reflexivity		
Personal Characteristics		
1. Interviewer/facilitator	Which author/s conducted the interview or focus group?	Page 66 (Chapter 3.3)
2. Credentials	What were the researcher's credentials? E.g. PhD, MD	Page 73 (Chapter 3.4)
3. Occupation	What was their occupation at the time of the study?	Page 73 (Chapter 3.4)
4. Gender	Was the researcher male or female?	Not reported
5. Experience and training	What experience or training did the researcher have?	Page 73 (Chapter 3.4)
Relationship with participants		
6. Relationship established	Was a relationship established prior to study commencement?	Page 74 (Chapter 3.4) *(There is a work relationship between physician and nurse participants and PI for one study site (United Christian Hospital) and there are no other relationships established with other participants from other study sites prior to study commencement)*
7. Participant knowledge of the interviewer	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	Page 74 (Chapter 3.4) *(All participants were aware that this research was part of PI's PharmD research project. This was explained in the invitation email and information sheet.)*
8. Interviewer characteristics	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	Page 73 (Chapter 3.4) *(Explained in the reflexivity section, Table 5)*
Domain 2: study design		
Theoretical framework		
9. Methodological orientation and Theory	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	Page 64–65 (Chapter 3.2) *(A constructivist thematic methodology was employed)*

Participant selection		
10. Sampling	How were participants selected? e.g. purposive, convenience, consecutive, snowball	Page 67-68 (Chapter 3.3.1) *(Purposive sampling – maximum variation approach was used)*
11. Method of approach	How were participants approached? e.g. face-to-face, telephone, mail, email	Page 115 (Chapter 5.2.1) *(Via group email once approvals from heads of department were received)*
12. Sample size	How many participants were in the study?	Page 116 (Chapter 5.3) *(7 physicians and 10 nurses participated)*
13. Non-participation	How many people refused to participate or dropped out? Reasons?	Study site participation: Page 87 (Chapter 4.2.1) Clinical pharmacist participation: Not asked
Setting		
14. Setting of data collection	Where was the data collected? e.g. home, clinic, workplace	Page 71 (Chapter 3.3.2) *(As interviews were conducted using telephone, the location of interviewees was not questioned)*
15. Presence of non-participants	Was anyone else present besides the participants and researchers?	No
16. Description of sample	What are the important characteristics of the sample? e.g. demographic data, date	Page 115-116 (Chapter 5.2.1)
Data collection		
17. Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	Page 69-71 (Chapter 3.3.2) and Appendix III
18. Repeat interviews	Were repeat inter views carried out? If yes, how many?	No
19. Audio/visual recording	Did the research use audio or visual recording to collect the data?	Page 71 (Chapter 3.3.2) *(Audio recording using PI's mobile device)*

20. Field notes	Were field notes made during and/or after the interview or focus group?	Page 75 (Chapter 3.4) *(Field notes were made during the interviews)*
21. Duration	What was the duration of the interviews or focus group?	Page 88 (Chapter 4.3) *(The duration ranged from 15 to 30 mins)*
22. Data saturation	Was data saturation discussed?	Page 66–67 (Chapter 3.3.1) and Page 88 (Chapter 4.3) *(The use of thematic data saturation was discussed and it was reached after 12 interviews)*
23. Transcripts returned	Were transcripts returned to participants for comment and/or correction?	Page 69 (Chapter 3.3.2) *(Member checking was performed with two clinical pharmacist participants)*
Domain 3: analysis and findings		
Data analysis		
24. Number of data coders	How many data coders coded the data?	Page 71-72 (Chapter 3.3.3) *(Two researchers coded the data – CS & CH)*
25. Description of the coding tree	Did authors provide a description of the coding tree?	No. All themes and subthemes are summarised in tabulated form for each study.
26. Derivation of themes	Were themes identified in advance or derived from the data?	Page 64 (Chapter 3.2) *(An inductive thematic approach was used)*
27. Software	What software, if applicable, was used to manage the data?	Page 71 (Chapter 3.3.3) *(QSR NVivo v.12 was used)*
28. Participant checking	Did participants provide feedback on the findings?	Page 69-71 (Chapter 3.3.2) and Appendix III
Reporting		
29. Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	Page 118-138 (Chapter 5.3) *(Quotations were presented throughout*

		the results, each participant was given a reference and Table 8 provided information of the characteristics)
30. Data and findings consistent	Was there consistency between the data presented and the findings?	Page 138-146 (Chapter 5.4) *(the data presented in the results were consistent with discussion)*
31. Clarity of major themes	Were major themes clearly presented in the findings?	Page 117 (Chapter 5.3) *(Major themes were presented on Table 9)*
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	Page 117 (Chapter 5.3) *(Minor themes were presented on Table 9)*

Study 4 - Barriers and facilitators to the implementation of paediatric clinical pharmacy services in hospitals in Hong Kong from parents', caregivers' and former patients' perspectives

No. Item	Guide questions/description	Reported on Page #
Domain 1: Research team and reflexivity		
Personal Characteristics		
1. Interviewer/facilitator	Which author/s conducted the interview or focus group?	Page 66 (Chapter 3.3)
2. Credentials	What were the researcher's credentials? E.g. PhD, MD	Page 73 (Chapter 3.4)
3. Occupation	What was their occupation at the time of the study?	Page 73 (Chapter 3.4)
4. Gender	Was the researcher male or female?	Not reported
5. Experience and training	What experience or training did the researcher have?	Page 73 (Chapter 3.4)
Relationship with participants		
6. Relationship established	Was a relationship established prior to study commencement?	No relationship was established prior to study commencement
7. Participant knowledge of the interviewer	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	Page 74 (Chapter 3.4) *(All participants were aware that this research was part of PI's PharmD research project. This was explained in the invitation email and information sheet.)*
8. Interviewer characteristics	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	Page 73 (Chapter 3.4) *(Explained in the reflexivity section, Table 5)*
Domain 2: study design		
Theoretical framework		
9. Methodological orientation and Theory	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	Page 64–65 (Chapter 3.2) *(A constructivist thematic methodology was employed)*
Participant selection		
10. Sampling	How were participants selected? e.g. purposive, convenience, consecutive, snowball	Page 67-68 (Chapter 3.3.1) & Page 149 (Chapter 6.2.2) *(Purposive sampling – maximum variation*

		approach was intended but was faced with recruitment challenges which was outlined in Chapter 6.4.2)
11. Method of approach	How were participants approached? e.g. face-to-face, telephone, mail, email	Page 149 (Chapter 6.2.2) *(Via email through patient support groups)*
12. Sample size	How many participants were in the study?	Page 150 (Chapter 6.3) *(7 parents were recruited))*
13. Non-participation	How many people refused to participate or dropped out? Reasons?	Study site participation: Page 87 (Chapter 4.2.1) Patient support group participation: Page 150-151 (Chapter 6.3) *(Four groups replied there were no suitable members, two did not respond)* Parent participation: Not informed by groups
Setting		
14. Setting of data collection	Where was the data collected? e.g. home, clinic, workplace	Page 71 (Chapter 3.3.2) *(As interviews were conducted using telephone, the location of interviewees was not questioned)*
15. Presence of non-participants	Was anyone else present besides the participants and researchers?	No
16. Description of sample	What are the important characteristics of the sample? e.g. demographic data, date	Page 115-116 (Chapter 5.2.1)
Data collection		
17. Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	Page 69-71 (Chapter 3.3.2) and Appendix III
18. Repeat interviews	Were repeat inter views carried out? If yes, how many?	No
19. Audio/visual recording	Did the research use audio or visual recording to collect the data?	Page 71 (Chapter 3.3.2) *(Audio recording using PI's mobile device)*

20. Field notes	Were field notes made during and/or after the interview or focus group?	Page 75 (Chapter 3.4) *(Field notes were made during the interviews)*
21. Duration	What was the duration of the interviews or focus group?	Page 88 (Chapter 4.3) *(The duration ranged from 15 to 30 mins)*
22. Data saturation	Was data saturation discussed?	Page 66–67 (Chapter 3.3.1) and Page 88 (Chapter 4.3) *(The use of thematic data saturation was discussed and it was reached after 12 interviews)*
23. Transcripts returned	Were transcripts returned to participants for comment and/or correction?	Page 69 (Chapter 3.3.2) *(Member checking was performed with two clinical pharmacist participants)*
Domain 3: analysis and findings		
Data analysis		
24. Number of data coders	How many data coders coded the data?	Page 71-72 (Chapter 3.3.3) *(Two researchers coded the data – CS & CH)*
25. Description of the coding tree	Did authors provide a description of the coding tree?	No. All themes and subthemes are summarised in tabulated form for each study.
26. Derivation of themes	Were themes identified in advance or derived from the data?	Page 64 (Chapter 3.2) *(An inductive thematic approach was used)*
27. Software	What software, if applicable, was used to manage the data?	Page 71 (Chapter 3.3.2) *(QSR NVivo v.12 was used)*
28. Participant checking	Did participants provide feedback on the findings?	No *(Participants will be notified when the manuscript was published but is still in progress)*
Reporting		

29. Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	Page 152-164 (Chapter 6.3) *(Quotations were presented throughout the results, each participant was given a reference and Table 10 provided information of the characteristics)*
30. Data and findings consistent	Was there consistency between the data presented and the findings?	Page 164-172 (Chapter 6.4.1) *(the data presented in the results were consistent with discussion)*
31. Clarity of major themes	Were major themes clearly presented in the findings?	Page 151 (Chapter 6.3) *(Major themes were presented on Table 11)*
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	Page 151 (Chapter 6.3) *(Minor themes were presented on Table 11)*

Appendix V – A summary of the constructs within the CFIR framework and their short descriptions

Topic/Description	Short Description	Topic/Description	Short Description
1. Intervention characteristics		***2. Outer setting***	
• Intervention source	Perception of key stakeholders about whether the intervention is externally or internally developed.	• Patient needs & resources	The extent to which patient needs, as well as barriers and facilitators to meet those needs accurately known and prioritised by the organisation.
• Evidence strength & quality	Stakeholders' perceptions of the quality and validity of evidence supporting the belief that the intervention will have desired outcomes.	• Cosmopolitanism	The degree to which an organisation is networked with other external organisations.
• Relative advantage	Stakeholders' perception of the advantage of implementing the intervention versus an alternative solution.	• Peer pressure	Mimetic or competitive pressure to implement an intervention; typically because most or other key peer or competing organisations have already implemented or in a bid for a competitive edge.
• Adaptability	The degree to which an intervention can be adapted, tailored, or reinvented to meet local needs.	• External policy & incentives	A broad construct that includes external strategies to spread interventions including policy and regulations, external mandates, recommendations and guidelines, collaboratives, and public or benchmark reporting.
• Trialability	The ability to test the intervention on a small scale in the organisation, and to be able to reverse course if warranted.	***3. Inner setting***	
• Complexity	Perceived difficulty of implementation, reflected by duration scope. Radicalness, disruptiveness, centrality, and intricacy and number of steps required to implement.	• Structural characteristics	The social architecture, age, maturity, and size of an organisation.
• Design quality and packaging	Perceived excellence in how the intervention is bundled, presented, and assembled.	• Networks & communications	The nature and quality of webs of social networks and the nature and quality of communications within an organisation.
• Cost	Costs of the intervention and costs associated with implementing that intervention including investment, supply, and opportunity costs.	• Culture	

			Norms, values, and basic assumptions of a given organisation.
Topic/Description	**Short Description**	**Topic/Description**	**Short Description**
3. Inner setting (cont'd)		***4. Characteristics of individuals (cont'd)***	
• Implementation climate	The absorptive capacity for change, shared receptivity of involved individuals to an intervention and the extent to which use of that intervention will be rewarded, supported, and expected within their organisation.	• Self-efficacy	Individual belief in their own capabilities to execute courses of action to achieve implementation goals.
• Readiness for implementation	Tangible and immediate indicators of organisational commitment to its decision to implement an intervention.	• Other personal attributes	A broad construct to include other personal trails such as tolerance of ambiguity, intellectual ability, motivation, values, competence, capacity, and learning style.
4. Characteristics of individuals		***5. Process***	
• Knowledge & beliefs about the intervention	Individual's attitudes toward and value placed on the intervention as well as familiarity with factors, truths, and principles related to the intervention.	• Planning	The degree to which a scheme or method of behaviour and tasks for implementing an intervention are developed in advance and the quality of those schemes or methods.
• Individual stage of change	Characterisation of the phase an individual is in, as he or she progresses toward skilled, enthusiastic, and sustained use of the intervention.	• Engaging	Attracting and involving appropriate individuals in the implementation and use of the intervention through a combined strategy of social marketing, education, role modelling, training, and other similar activities.
• Individual identification with organisation	A broad construct related to how individuals perceive the organisation and their relationship and degree of commitment with that organisation.	• Executing	Carrying out or accomplishing the implementation according to plan.
		• Reflecting & evaluating	Quantitative and qualitative feedback about the progress and quality of implementation accompanied with regular personal and team debriefing about progress and experience.

Appendix VI – Information sheets (for healthcare professional group and parent & caregiver group)

Perceived barriers and facilitators to the implementation of paediatric clinical pharmacy services in hospitals in Hong Kong

Participant Information Sheet

(for Healthcare Professional Group - Doctors, Nurses or Clinical Pharmacists)

Invitation

We would like to invite you to take part in a research study.

Before you decide if you would like to participate, please take time to read the following information carefully and, if you wish, discuss it with others such as your family, friends or colleagues.

Please ask a member of the research team, whose contact details can be found at the end of this information sheet, if there is anything that is not clear or if you would like more information before you make your decision.

The results of the study will form part of Principal Investigator, Conor Sin's research for Doctorate in Pharmacy (PharmD) in the Aston University, UK.

What is the purpose of the study?

The purpose of this study is to find out what affects the implementation of children services provided by clinical pharmacists in Hong Kong's public hospitals for your perspective as a healthcare professional.

Why have I been chosen?

Invitations for the interviews had been sent through the internal group mailing list electronically to the three public hospitals with paediatric services.

You are being invited to take part in this study because you are either a clinical pharmacist who is working from UCH and TKOH whereas doctor and nurse who is working from UCH, TKOH and KWH. We aim to recruit around 15 participants in total.

What will happen to me if I take part?

If you decided to take part, you will be invited to participate in an individual interview session. The session can be conducted either via telephone conversation or video-conferencing using Zoom. During the interview, we will talk about your experience on clinical pharmacy service and your opinion towards it. The interview session will take approximately 30 to 45 minutes with interviews being audio recorded to facilitate the analysis process.

The interview session will be held between mid-June to November, 2021.

[REC ID: 004-2021-CS, Version [1.0], 9/June/2021]

Do I have to take part?

No. Participation in the study is voluntary. It is up to you to decide whether or not you wish to take part.

If you do decide to participate, you will be asked to sign and date a consent form. You would still be free to withdraw from the study at any time and without giving any reason during the study, and this will not affect your training or evaluation in any manner being affected. If you withdraw from the study, the data collected up to your withdrawal will not be used unless with your consent. You may also express your consent to the research team through Informed Consent Form to allow them to continuously use the data collected before your withdrawal for research purpose.

What are the possible benefits of taking part?

You will have no direct benefit from taking part in this study. However, the data from the interview sessions will be used to determine factors that affects the implementation of clinical pharmacy services (CPSs). This information could provide directions and strategies to policy makers when planning for the CPS development in paediatrics.

What are the possible risks and burdens of taking part?

As the current study is collecting data about your opinion on this issue, hence there won't be any significant risk associated with study participation. Some people may find that they are compelled to participate and to provide answers that is favourable towards the institution or organisation. Please be reassured that the information you give is solely for research purposes and your information will remain anonymous throughout the study.

How will the conversation during the interview be recorded and the information I provide managed?

With your permission we will audio record the interview and take notes. The recording will be typed into a document (transcribed) by a transcriber approved by Aston University. The study team will check a number of translated transcripts for accuracy. This process will involve removing any information which could be used to identify individuals e.g. names, locations etc.

Audio recordings will be destroyed as soon as the transcripts have been checked for accuracy. We will ensure that anything you have told us that is included in the reporting of the study will be anonymous.

You of course are free not to answer any questions that are asked without giving a reason.

What will happen to the results of the study?

The results of this study may be published in scientific journals and/or presented at conferences. If the results of the study are published, your identity will remain confidential.

A lay summary of the results of the study will be available for participants when the study has been completed and the research team will ask if you would like to receive a copy.

Will I receive any expenses and payments?

There will be no expenses and payments for participation in this study.

Who is funding this research?

There is no external funding for this study.

Under which circumstances will the study be terminated prematurely?

Under any circumstances, the study team will not terminate your participation.

Will I receive any compensation and treatment for study related injury?

This study should not cause additional risk or discomfort to the participants. No compensations will be provided.

Will my taking part in this study be kept confidential?

Your confidentiality will be the highest priority. If the information you provide is reported or published, this will be done in a way that does not identify you as its source. To ensure the highest form of confidentiality, your name will be replaced by a coded number throughout the study. Your signed consent form will be stored separately from your interview notes and personal data to further protect your confidentiality. Access to the data will be restricted to the Principal Investigator of this study. Along with this, the audiotapes, interview notes as well as personal data will be stored in the computers which are only accessible by the Principal Investigator. Data can be withdrawn before the time of publication if requested by you and all data will be destroyed six years after the completion of the study.

Under the laws of Hong Kong (in particular the Personal Data (Privacy) Ordinance, Cap 486), you enjoy or may enjoy rights for the protection of the confidentiality of your personal data, such as those regarding the collection, custody, retention, management, control, use (including analysis or comparison), transfer in or out of Hong Kong, non-disclosure, erasure and/or in any way dealing with or disposing of any of your personal data in or for this study. For any query, you should consult the Privacy Commissioner for Personal Data or his officer (Tel no.: 2827 2827) as to the proper monitoring or supervision of your personal data protection so that your full awareness and understanding of the significance of compliance with the law governing privacy data is assured.

By signing a written consent form, you are authorising the Aston University and Research Ethics Committee (REC) will be granted direct access to your study data for data verification.

Who is organising this study and acting as data controller for the study?

Aston University is organising this study and acting as data controller for the study.

Who has reviewed the study?

This study has been reviewed and approved by the Aston University and Research Ethics Committee (Kowloon Central/Kowloon East) of Hospital Authority.

What if I have a concern about my participation in the study?

If you have any concerns about your participation in this study, please speak to the research team and they will do their best to answer your questions. Contact details can be found at the end of this information sheet.

If the research team are unable to address your concerns or you wish to make a complaint about how the study is being conducted you should contact the Aston University Research Integrity Office at research_governance@aston.ac.uk or telephone +44 (0)121 204 3000.

If you have questions related to your rights as a research participant, please contact Research Ethics Committee (Kowloon Central/Kowloon East) at 3506 8888.

Research Team

Conor MH Sin, Pharmacist, Department of Pharmacy, United Christian Hospital (telephone: 39493593; email: sincm@aston.ac.uk)

Chi Huynh, Lecturer, Pharmacy School, Aston University (telephone: +44 (0)121 204 3231; email: c.huynh3@aston.ac.uk)

Thank you for taking time to read this information sheet. If you have any questions regarding the study, please don't hesitate to ask one of the research team.

Perceived barriers and facilitators to the implementation of paediatric clinical pharmacy services in hospitals in Hong Kong

Participant Information Sheet

(For Public Group- former paediatric patients, parents or caregivers)

Invitation

We would like to invite you to take part in a research study.

Before you decide if you would like to participate, please take time to read the following information carefully and, if you wish, discuss it with others such as your family, friends or colleagues.

Please ask a member of the research team, whose contact details can be found at the end of this information sheet, if there is anything that is not clear or if you would like more information before you make your decision.

The results of the study will form part of Principal Investigator, Conor Sin's research for Doctorate in Pharmacy (PharmD) in the Aston University, UK.

What is the purpose of the study?

The purpose of this study is to find out what affects the implementation of children services provided by clinical pharmacists in Hong Kong's public hospitals for your perspective as a healthcare professional.

Why have I been chosen?

You are being invited to take part in this study because you are either a former paediatric patient, or a parent/caregiver whose child under your care was a recipient of a service provided by a clinical pharmacist in Kwong Wah Hospital, United Christian Hospital or Tseung Kwan O Hospital. Around 15 participants will be invited to join this study.

We made contact to the representatives of patient groups, which were found in the HA's patient information website ("Smart Patient Website") with details of this study. We have asked them to cascade the invitation to the members of these associations.

What will happen to me if I take part?

If you decided to take part, you will be invited to participate in an individual interview session. The session can be conducted either via telephone conversation or video-conferencing using Zoom. During the interview, we will talk about your experience on clinical pharmacy service and your opinion towards it. The interview session will take approximately 30 to 45 minutes with interviews being audio recorded to facilitate the analysis process.

The interview session will be held between mid-June to November, 2021.

Do I have to take part?

No. Participation in the study is voluntary. It is up to you to decide whether or not you wish to take part.

If you do decide to participate, you will be asked to sign and date a consent form. You would still be free to withdraw from the study at any time and without giving any reason during the study, and this will not affect your/your child's present or future medical care. If you withdraw from the study, the data collected up to your withdrawal will not be used unless with your consent. You may also express your consent to the research team through Informed Consent Form to allow them to continuously use the data collected before your withdrawal for research purpose.

What are the possible benefits of taking part?

You will have no direct benefit from taking part in this study. However, the data from the interview sessions will be used to determine factors that affects the implementation of clinical pharmacy services (CPSs). This information could provide directions and strategies to policy makers when planning for the CPS development in paediatrics.

What are the possible risks and burdens of taking part?

As the current study is collecting data about your opinion on this issue, hence there won't be any significant risk associated with study participation. Recalling a particular event in life might cause distress and might trigger emotional responses. However, the interviewer has received adequate training in qualitative research and has experience in conducting interviews and focus groups. He can provide reassurance to the participant and to divert the conversation. If needed, the interview can be stopped and resumed later, or they can withdraw from the study if they wish.

How will the conversation during the interview be recorded and the information I provide managed?

With your permission we will audio record the interview and take notes. The recording will be typed into a document (transcribed) by a transcriber approved by Aston University. The study team will check a number of translated transcripts for accuracy. This process will involve removing any information which could be used to identify individuals e.g. names, locations etc.

Audio recordings will be destroyed as soon as the transcripts have been checked for accuracy. We will ensure that anything you have told us that is included in the reporting of the study will be anonymous.

You of course are free not to answer any questions that are asked without giving a reason.

What will happen to the results of the study?

The results of this study may be published in scientific journals and/or presented at conferences. If the results of the study are published, your identity will remain confidential.

A lay summary of the results of the study will be available for participants when the study has been completed and the research team will ask if you would like to receive a copy. The results of this study

will be used as part of the thesis by the main researcher, Mr Conor Sin, for his doctorate degree at Aston University.

Will I receive any expenses and payments?

There will be no expenses and payments for participation in this study.

Who is funding this research?

There is no external funding for this study.

Under which circumstances will the study be terminated prematurely?

Under any circumstances, the study team will not terminate your participation.

Will I receive any compensation and treatment for study related injury?

This study should not cause additional risk or discomfort to the participants. No compensations will be provided.

Will my taking part in this study be kept confidential?

Your confidentiality will be the highest priority. If the information you provide is reported or published, this will be done in a way that does not identify you as its source. To ensure the highest form of confidentiality, your name will be replaced by a coded number throughout the study. Your signed consent form will be stored separately from your interview notes and personal data to further protect your confidentiality. Access to the data will be restricted to the Principal Investigator of this study. Along with this, the audiotapes, interview notes as well as personal data will be stored in the computers which are only accessible by the Principal Investigator. Data can be withdrawn before the time of publication if requested by you and all data will be destroyed six years after the completion of the study.

Under the laws of Hong Kong (in particular the Personal Data (Privacy) Ordinance, Cap 486), you enjoy or may enjoy rights for the protection of the confidentiality of your personal data, such as those regarding the collection, custody, retention, management, control, use (including analysis or comparison), transfer in or out of Hong Kong, non-disclosure, erasure and/or in any way dealing with or disposing of any of your personal data in or for this study. For any query, you should consult the Privacy Commissioner for Personal Data or his officer (Tel no.: 2827 2827) as to the proper monitoring or supervision of your personal data protection so that your full awareness and understanding of the significance of compliance with the law governing privacy data is assured.

By signing a written consent form, you are authorizing the Aston University and Research Ethics Committee (REC) will be granted direct access to your study data for data verification.

Who is organising this study and acting as data controller for the study?

Aston University is organising this study and acting as data controller for the study.

Who has reviewed the study?

This study has been reviewed and approved by the Aston University and Research Ethics Committee (Kowloon Central/Kowloon East) of Hospital Authority.

[REC ID: 004-2021-CS, Version [1.0], 9/June/2021]

What if I have a concern about my participation in the study?

If you have any concerns about your participation in this study, please speak to the research team and they will do their best to answer your questions. Contact details can be found at the end of this information sheet.

If the research team are unable to address your concerns or you wish to make a complaint about how the study is being conducted you should contact the Aston University Research Integrity Office at research_governance@aston.ac.uk or telephone +44 (0)121 204 3000.

If you have questions related to your rights as a research participant, please contact Research Ethics Committee (Kowloon Central/Kowloon East) at 3506 8888.

Research Team

Conor MH Sin, Pharmacist, Department of Pharmacy, United Christian Hospital (telephone: 39493593; email: sincm@aston.ac.uk)

Chi Huynh, Lecturer, Pharmacy School, Aston University (telephone: +44 (0)121 204 3231; email: c.huynh3@aston.ac.uk)

Thank you for taking time to read this information sheet. If you have any questions regarding the study, please don't hesitate to ask one of the research team.

[REC ID: 004-2021-CS, Version [1.0], 9/June/2021]

探討影響在香港醫院實施兒科臨床藥劑服務的障礙和促進因素研究
參與者須知

(對公衆組別: 前兒科病人、父母或照顧者)

邀請

我們誠意邀請你參與此項研究。

請在決定是否參與本研究前細心閱讀下列說明。如有需要，你可以與你的家人、朋友或同儕作詳細討論。

如欲取得更多與本研究有關的資料或對本研究有任何疑問，請向研究員查詢 (聯絡資料列於此須知第三頁)。

此研究的結果將成為研究生線明浩先生，在英國阿斯頓大學（Aston University）藥劑博士學位（PharmD）研究項目的一部分。

研究目的

此研究旨在從前兒科病人、家長與照顧者之角度，探討影響臨牀藥劑師在香港公立醫院推行兒科臨牀藥劑服務之各種因素。

爲何我會被挑選？

你被邀請參與本研究，是因爲作爲前兒科病人、家長或照顧者，你/你的孩子曾於公立醫院兒科病房或在專科門診內接受過臨床藥劑師提供的藥物諮詢服務。將邀請大約 15 位參與者參加這項研究。

我們從早前從醫管局網頁的「智友站」聯繫了病人組織，並詳細介紹了本研究。然後透過病人組織協助，現誠邀各位參與本研究。

若我決定參與研究，我會?

若你同意參與研究，我們會邀請你進行單獨的會談，可以通過電話對話或 Zoom 網上視像會議進行會談。會談的內容會大致上關於你對臨床藥劑服務的經驗和你對此的看法，需時約三十至四十五分鐘。並且對話內容將會被錄音，以協助資料分析。

會談將會安排於 2021 年九月至十一月期間舉行。

我是否必須參與研究?

不是。參與這項研究純屬自願性質，你可以自行決定參與與否。

若你決定參與，則會要求你在知情同意書上簽署並註明日期。即使如此，你仍可隨時中途退出本研究，無需給予任何理由，絕不會影響你/你的孩子現在或日後所接受的醫療及護理服務。如若決定退出本研究，除非得到你的同意，否則已收集的數據張不會在這研究採用。請你在知情同意書向研究團隊表示你的意向，以允許繼續使用在您退出研究之前收集的數據進行研究。

預期參與的好處

你不會因為參與本研究而獲得任何直接的益處，但本項研究的結果會用以探討影響推行臨床藥劑服務的各種因素。有關資訊對未來發展兒科臨床藥劑服務時，可以為決策者提供指導和策略 。

預見的有關風險與阻礙

由於當前的研究正在收集有關你對此問題的觀點的數據，因此參與本研究不會有任何相關的重大風險。部分參加者或會因在會談期間聯想或提及其個別經歷，因而牽動情緒。若你有任何不適，研究員將會盡力為你提供協助。你亦可稍作休息，甚至隨時終止會談。

我們的對話與我提供的資訊將如何被記錄和管理?

依照你的授權，我們將就會談進行錄音及文字記錄。對話錄音將會由阿斯頓大學核准之抄錄員抄錄成文字檔案。研究團隊會將部份的翻譯副本作檢查已確定副本的準確性。當中任何牽涉你的個人身份和私隱的資訊（例如姓名、住址等）絕不會被記錄。

所有錄音檔案將會在核實抄錄文件的準確性後被銷毀。我們會確保在研究結果中維持你所提供的資訊之匿名性。

你可在不給予任何理由的情況下拒絕回答任何一條問題。

研究結果

本研究的結果可能會被刊登在科學期刊與/或在會議中匯報. 如果研究結果公開 你的身份仍將保持機密。

當完成研究後，研究員將會諮詢你是否需要一份研究結果摘要之副本。

研究結果亦會用於首席研究員綠明浩先生修習阿斯頓大學藥劑學博士課程的專題研究之內。

參與研究收費及報酬

你參與這項研究不需要支付額外的費用，亦不會收到報酬。

誰是此項研究的資助者?

此研究沒有額外資助者。

在什麼情況下研究會提前終止？

無論在什麼情況下，研究人員不會終止你的參與。

我是否會因與研究有關的傷害獲得任何補償和治療？

本研究不會對參與者引起額外的風險或造成不適，所以並不涉及賠償的問題。

保密及私隱

你的身份將會絕對保密。所有需要發表的資料或報導皆不會顯示你的身份。為確保最高的保密性，我們將在研究中安排一組代號以取代你的名字。你所簽署的知情同意書、會談記錄及個人資料將會被分開保存。所有參與者的錄音、會談記錄及個人資料將會存放在只有首席研究員可以接觸的電腦內。所得資料可以在發表研究結果前因應你的要求而抽出，並在研究完成後六年銷毀。

根據香港法律規定（特別是第 486 章《個人資料（私隱）條例》），你享有或可享有確保您的個人資料保密的權利，例如在或為本研究中有關收集、監管、保留、管理、控制、使用（包括分析或比較）、轉進或轉出香港、不披露、清除和／或以任何方式處理或棄置的權利。如有任何問題，請你咨詢個人資料

私隱專員或其職員（電話號碼：2827 2827），以了解妥善監控或監管你的個人資料保護之事宜，以確保你完整掌握和瞭解遵守規管個人資料私隱的法律之重要性。

因為簽訂書面同意書，您授權阿斯頓大學及臨床研究倫理委員會和監管機構直接核查您的研究數據。

誰會統籌此項研究及管理其研究資料?

阿斯頓大學會負責統籌此項研究及管理其數據。

哪裏是此項研究的審視機構?

本研究已經阿斯頓大學及醫管局九龍中及九龍東聯網臨床研究倫理委員會審視和批核。

我能如何就參與研究之事宜提出疑問?

若你對參與研究之事宜有任何疑問，歡迎聯絡研究團隊，我們將盡力解答你的疑問。聯絡資料將列於下一部分。

如果你認為研究團隊的回應未能釋除你的疑慮，或你希望就研究方法作出投訴，你可以循電郵（research_governance@aston.ac.uk）或致電 +44 (0)121 204 3000 聯絡阿斯頓大學研究誠信辦公室。

如果你對自己作為研究參與者的權利有疑問，請聯絡九龍中及九龍東聯網臨床研究倫理委員會（電話號碼: 35068888)。

研究團隊

基督教聯合醫院 藥劑部 藥劑師 線明浩先生，（聯絡電話: 3949 3593; 電郵: sincm@aston.ac.uk）

阿斯頓大學 藥劑學系 講師 Chi Huynh（聯絡電話: +44 (0)121 204 3231; 電郵: c.huynh3@aston.ac.uk）

感謝你花費時間閱讀此須知。如你有任何關於此研究的查詢，歡迎聯絡我們其中一位的研究團隊。

Appendix VII – Consent forms

Perceived barriers and facilitators to the implementation of paediatric clinical pharmacy services in hospitals in Hong Kong

Informed Consent Form

Name of Principal Investigator: Conor MH Sin

To participate in the study, please initial ALL the boxes below:

		Please initial boxes
1.	I confirm that I have read and understand the **PARTICIPANT INFORMATION SHEET** for the above study. I have had opportunities to ask questions and all my questions have been satisfactorily answered. I have received enough information about the study.	
2.	I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason and without my legal rights being affected.	
3.	If I request to withdraw from this study, I **AGREE/DISAGREE** my research data provided before my withdrawal will be continuously used by the investigator.	
4.	I agree to my personal data and data relating to me collected during the study being processed as described in the Participant Information Sheet.	
5.	I agree to my interview being audio recorded and to anonymised direct quotes from me being used in publications resulting from the study.	
6.	I understand that my identity will be kept confidential. I agree to authorise the Research Ethics Committee (REC) and the regulatory authority(ies) a direct access to my research data for verification, without violating my confidentiality, to the extent permitted by the applicable laws and regulations.	
7.	I agree to take part in this study.	

Participant's Name (in BLOCK Letter)	Signature	Date
Name of Person receiving	Signature	Date

[REC ID: 004-2021-CS, Version [1.0], 28/May/2021]

Aston University　基督教聯合醫院 UNITED CHRISTIAN HOSPITAL　將軍澳醫院 Tseung Kwan O Hospital　三東院華 SINCE 1874

探討影響在香港醫院推行兒科臨牀藥劑服務之因素研究

知情同意書

研究員：綠明浩 先生

如閣下同意參與研究，請在以下所有的空格簽名：

請在以下方格內簽名

1.	**本人已細讀上述研究之參與者須知** [臨床研究倫理委員會 編號：004-2021-CS，版本[1.0]，18/May/2021]。**本人有機會向研究員提出疑問，而研究員亦已完滿地解答本人的疑問。對於此研究，本人已獲得足夠的資料。**	
2.	**本人明白是次參與研究屬自願性質，本人可不提出任何原因而於任何時間退出本研究，同時不影響本人的任何法律權利。**	
3.	**若本人要求退出本研究，本人同意／不同意研究員可以繼續使用本人退出本研究前所提供的研究數據。**	
4.	**本人同意按參與者須知所述之程序處理研究所收集本人的個人資料及其它有關本人的資料。**	
5.	**本人同意研究員在會談期間錄音，並在出版研究結果時匿名引用本人的直接話語。**	
6.	**本人明白，本人之身份將獲得保密處理。本人亦允許臨床研究倫理委員會及有關法定機構在合適的條例及法例容許下及在不侵犯本人的私隱情況中，直接翻查本人的研究數據以核實臨床研究資料。**	
7.	**本人茲同意參與這項研究。**	

_____	_____	_____
參與者姓名（正楷）	**參與者簽署**	**日期**
_____	_____	_____
研究員姓名	**研究員簽署**	**日期**

Appendix VIII – Invitation email to patient support groups/ associations

Invitation to interview (Patient Association Groups)

Project Title: Perceived barriers and facilitators to the implementation of paediatric clinical pharmacy services in hospitals in Hong Kong (Ref: KC/KE-21-0089)

My name is Conor Sin, a clinical pharmacist who is practicing in the area of paediatrics at United Christian Hospital. I am currently reading a doctorate degree in pharmacy at Aston University (UK), with an interest in the development of clinical pharmacy services in paediatrics in Hong Kong.

The projects of my degree involve qualitative studies, with an aim to identify perceived factors that influence the implementation of paediatric clinical pharmacy service from former paediatric patients, parents or caregivers' point of view. I would like to recruit members of your patient group whose child (or him/herself if he/she was a paediatric patient) had received service provided by clinical pharmacists.

I would be grateful if you can kindly disseminate this invitation to your members and forward the information sheet and consent form to them for their consideration.

Should they agree to take part, please ask them to sign the form either digitally or on a hardcopy. They may email it back to me at scm096@ha.org.hk or mail it to Mr Conor Sin, Pharmacy Department, G/F, S Block, United Christian Hospital, 130 Hip Wo Street, Kwun Tong, Kowloon.

Please be reminded that responses before the end of September is appreciated.

Thank you very much for your time and I look forward to hearing from you and members of your association.

Best wishes,

Conor Sin
Pharmacist
United Christian Hospital
Tel: 39493593/3890

[REC ID: 004-2021-CS, Version [1.0], 08/June/2021]

訪問邀請（病人組織/協會）

探討影響在香港醫院實施兒科臨床藥劑服務的障礙和促進因素研究

大家好。本人是一名在基督教聯合醫院從事兒科的臨床藥劑師，現正研究有關於兒科臨床藥劑服務在香港的發展。此研究旨在從兒科病人、家長與照顧者之角度，探討各種影響臨牀藥劑師在香港公立醫院推行兒科臨牀藥劑服務之因素。

我希望能邀請您參與是次研究，通過電話會談形式來談及您對臨床藥劑服務的體會和想法，需時約三十分鐘。如果您同意參加，請致電（67981311, whatspp/ signal 也可）或以電郵（scm096@ha.org.hk）回覆。

非常感謝您能抽出寶貴時間。

此致

線明浩

(基督教聯合醫院藥劑師)

Appendix IX – A summary of the implementation strategies, organised by cluster

		Importance	Feasibility
Use evaluative and iterative strategies			
	Assess for readiness and identify barriers and facilitators	4.60	4.57
	Audit and provide feedback	4.40	4.13
	Purposefully reexamine the implementation	4.40	4.03
	Develop and implement tools for quality monitoring	4.37	3.63
	Develop and organise quality monitoring systems	4.33	3.37
	Develop a formal implementation blueprint	4.30	4.47
	Conduct local need assessment	4.27	4.33
	Stage implementation scale up	3.97	3.77
	Obtain and use patients and family feedback	3.67	3.80
	Conduct cyclical small tests of change	3.63	4.03
Provide interactive assistance			
	Facilitation	4.13	3.77
	Provide local technical assistance	3.97	3.20
	Provide clinical supervision	3.83	3.10
	Centralise technical assistance	2.73	3.10
Adapt and tailor to context			
	Tailor strategies	4.37	4.00
	Promote adaptability	3.90	3.57
	Use data experts	3.23	3.13
	Use data warehousing techniques	2.87	2.50
Develop stakeholder interrelationsips			
	Identify and prepare champions	4.20	3.77
	Organise clinician implementation team meetings	3.97	3.53
	Recruit, designate, and train for leadership	3.93	3.20
	Inform local opinion leaders	3.90	4.03
	Build a coalition	3.77	3.63
	Obtain formal commitments	3.77	3.17
	Identify early adopters	3.70	3.70
	Conduct local consensus discussions	3.63	4.07
	Capture and share local knowledge	3.63	3.87
	Use advisory boards and workgroups	3.40	3.87
	Use an implementation advisor	3.30	3.70
	Model and simulate change	3.30	3.20

	Visit other sites	3.17	3.73
	Involve executive boards	2.97	3.63
	Develop and implementation glossary	2.87	4.57
	Develop academic partnerships	2.83	3.40
	Promote network weaving	2.70	2.77
Train and educate stakeholders			
	Conduct ongoing training	4.17	3.87
	Provide ongoing consultation	4.17	3.63
	Develop educational materials	3.80	4.83
	Make training dynamic	3.67	4.00
	Distribute educational materials	3.50	4.77
	Use train-the-trainer strategies	3.33	3.50
	Conduct educational meetings	3.27	4.50
	Conduct educational outreach visits	3.10	4.07
	Create a learning collaborative	3.10	3.43
	Shadow other experts	2.87	3.37
	Work with educational institutions	2.73	3.30
Support clinicians			
	Facilitate relay of clinical data to providers	4.17	3.43
	Remind clinicians	3.23	3.77
	Develop resources sharing agreements	3.07	3.13
	Revise professional roles	3.00	2.30
	Create new clinical teams	2.67	2.67
Engage consumers			
	Involve patients and family members	3.87	3.63
	Intervene with patients to enhance uptake and adherence	3.50	3.07
	Prepare patients to be active participants	3.40	3.03
	Increase demand	3.30	2.33
	Use mass media	2.17	2.70
Utilise financial strategies		2.86	2.09
	Fund and contract for the clinical innovation		
	Access new funding	3.57	2.40
	Place innovation on fee for service lists	3.40	2.10
	Alter incentive/ allowance structures	3.17	2.23
	Make billing easier	2.93	1.77
	Alter patient fees	2.60	2.03
	Use other payment schemes	2.30	1.87

	Develop disincentives	2.17	2.13
	Use capitated payments	1.97	1.80
Change infrastructure			
	Mandate change	3.23	2.63
	Change record system	2.83	2.23
	Change physical structure and equipment	2.60	2.27
	Create or change credentialing and/or licensure standards	2.23	1.47
	Change service sites	2.20	2.20
	Change accreditation or membership requirements	2.17	1.80
	Start a dissemination organisation	2.03	2.13
	Change liability laws	1.87	1.33
The importance rating scale ranged from 1 (relatively unimportant) to 5 (extremely important), and the feasibility scale ranged from 1 (not at all feasible) to 5 (extremely feasible).			

Appendix X – Systematic review published paper

Factors influencing the implementation of clinical pharmacy services on paediatric patient care in hospital settings

Conor Ming-Ho Sin [1,2], Chi Huynh [1], Dania Dahmash,[1] Ian D Maidment [1]

► Additional material is published online only. To view, please visit the journal online (http://dx.doi.org/10.1136/ejhpharm-2020-002520).

[1]Aston Pharmacy School, College of Health and Life Sciences, Aston University, Birmingham, UK
[2]Pharmacy Department, United Christian Hospital, Kwun Tong, Kowloon, Hong Kong

Correspondence to
Conor Ming-Ho Sin, Aston Pharmacy School, College of Health and Life Sciences, Aston University, Birmingham, UK; scm096@ha.org.hk

Received 10 September 2020
Revised 2 December 2020
Accepted 4 January 2021

EAHP Statement 4: Clinical Pharmacy Services.

To cite: Sin CM-H, Huynh C, Dahmash D, *et al*. *Eur J Hosp Pharm* Epub ahead of print: [please include Day Month Year]. doi:10.1136/ejhpharm-2020-002520

ABSTRACT

Objectives This systematic review (SR) was undertaken to identify and summarise any factors which influence the implementation of paediatric clinical pharmacy service (CPS) from service users' perspectives in hospital settings.

Methods Literature search from EMBASE, MEDLINE, Web of Science (Core Collection), Cochrane Library, Scopus and CINAHL databases were performed in order to identify any relevant peer-reviewed quantitative and qualitative studies from inception until October 2019 by following the inclusion criteria. Boolean search operators were used which consisted of service, patient subgroup and attribute domains. Studies were screened independently and included studies were quality assessed using Mixed Methods Appraisal Tool. The study was reported against the 'Enhancing Transparency in Reporting the Synthesis of Qualitative Research' statement.

Results 4199 citations were screened by title and abstract and 6 of 32 full publications screened were included. There were two studies that were graded as 'high' in quality, with four graded as 'moderate'. The analysis has led to the identification of seven factors categorised in five predetermined overarching themes. These were: other healthcare professionals' attitudes and acceptance; availability of clinical pharmacist on ward or outpatient settings; using drug-related knowledge to perform clinical activities; resources for service provision and coverage; involvement in a multidisciplinary team; training in the highly specialised areas and development of communication skills.

Conclusion Evidence for paediatric CPS was sparse in comparison to a similar SR conducted in the adult population. An extensive knowledge gap within this area of practice has therefore been identified. Nevertheless, majority of the factors identified were viewed as facilitators which enabled a successful implementation of CPS in paediatrics. Further research is needed to identify more factors and exploration of these would be necessary in order to provide a strong foundation for strategic planning for paediatric CPS implementation and development.

INTRODUCTION

Special attention needs to be paid in optimising medicines use in children as they are at high risk of harm as the result of medication errors, since such errors are potentially more hazardous to them than to adults.[1–3] In 2014, the American Academy of Paediatrics has reported that paediatric medication orders resulted in a medication error with rates as high as 5%–27% in their systematic review.[4] Factors that contribute to paediatric medication errors include the manipulation of formulations, calculation according to children's weight or body surface area, the change in pharmacokinetics and off-label use of drugs with no standardised dosing.[5 6]

A joint opinion of the Paediatric Pharmacy Advocacy Group and the Paediatrics Practice and Research Network has advocated the need for clinical pharmacy services (CPSs) in the paediatric population.[7] Evidence on benefits of CPS were shown in literature across the wide array of clinical settings;[8–10] however, most studies were conducted in a controlled setting. When the evidence is translated into the 'real world' situation, the results might not always be the same.[11] The difference may arise from the context of the interventions, which plays a key role in the uptake and sustainability of what are being tested.[11] For instance, a recent systematic review has evaluated the benefits of CPSs in paediatrics in comparison with adult patients in hospital settings.[12] The authors concluded that clinical pharmacist (CP) in paediatric wards may improve patient outcomes but have also highlighted that there are barriers to the involvement of pharmacists.[12] How these barriers affect the involvement of CPS was beyond the scope of their review and hence were not elaborated; however, the context of implementation plays a critical role because it includes various factors that could influence the process of the service, thus affecting the results of service outcome.[13] Therefore, by identifying these factors that enable or hinder the implementation of CPS, solutions to overcome process barriers can be developed and the introduction of innovations in healthcare system can be promoted on a larger scale.[14]

Currently, there is no known systematic review that has examined the factors that influence the implementation of paediatric CPS in the hospital settings. The aim of this systematic review was to identify factors that influence paediatric hospital CPS implementation from service users' perspectives, which include healthcare professionals, children, parents or caregivers who had received any type of services provided by CPs. The objectives of this review were to identify:

- any facilitators that enable or
- any barriers that hinder a successful implementation of paediatric CPS in hospital setting.

METHODS

Search strategy

The identifying and screening process were reported using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)

Table 1 Search strategies for MEDLINE and other selected databases

	Service domain	Patient subgroup domain	Attribute domain
MeSH terms	► Pharmaceutical Services ► Pharmacist ► Pharmacy Services, Hospital	► Adolescent ► Child ► Infant ► Paediatrics	► Attitude ► Attitude of Health Personnel
Text words	► Exp clinical pharmac*/ ► Exp hospital pharmac*/	► Exp adolescent*/ ► Exp child*/ ► Exp infant*/ ► Exp p$ediatric*/	► Exp attitude*/ ► Exp belief*/ ► Exp experience*/ ► Exp opinion*/ ► Exp satisfaction*/

flow diagram.[15] EMBASE, MEDLINE, Web of Science (Core Collection), Cochrane Library, Scopus and Cumulative Index to Nursing and Allied Health Literature (CINAHL) were searched for studies published from inception up until October 2019. Search strategy consisted of domains of service involved, patient subgroup and attributes, with the use of Boolean logic to combine the search (see online supplemental appendix 1). Table 1 outlines the search strategies. The searched results were exported to EndNote Web (Clarivate Analytics, USA) to facilitate screening with duplications identified and removed.

Study selection

Inclusion criteria were peer-reviewed quantitative and qualitative studies on CPSs with the participants, interventions and outcomes addressed below. Only English-language publications or articles in other languages with full English translation were included in this review. Any studies not meeting the following inclusion criteria were excluded in this review.

I. Participants: Hospitalised children from 0 to 18 years of age. When both adults and children participants were recruited in a study, only data that explicitly referred to the paediatric population were included.
II. Interventions: Any CPs' interventions, activities or duties.
III. Outcome measures: Direct or indirect findings which report factors that influence the implementation of paediatric CPS.

Data collection

A list was created for all identified studies from all the databases searched. Citation search for included articles was performed. CS and DD assessed the titles of the studies, and if the title seemed relevant to the objective of this review, the abstract was retrieved. CS and DD independently assessed these abstracts to evaluate their potential eligibility. The full-text of all articles identified as potentially inclusive studies by both researchers were retrieved. These studies were then assessed independently by CD and DD based on the inclusion criteria, with CH checked against the selected full-text articles for relevancy and appropriateness. IM oversaw the data analysis process and acted as an impartial evaluator for making consensus decisions in disagreements that arose. Finally, all four reviewers were met and key concepts emerged from data analysis were discussed.

A standardised form (Microsoft Excel 2010, Microsoft, USA) was used to extract data from the included studies for quality assessment and evidence syntheses. Table 2 outlines the categories from the data extracted.

Table 2 Data extraction categories

General information	Methodologies	Study findings
1. Main author 2. Year published 3. Study location 4. Study objective(s)	5. Study design 6. Nature of study 7. Study population 8. Recruitment method 9. Inclusion/exclusion criteria 10. Data collection 11. Data analysis	12. Study results or any relevant findings

Data analysis and synthesis

The Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ) checklist was followed on the reporting of the synthesis.[16] An integrated convergent synthesis approach, as adopted from Jennings *et al*, was performed in this systematic review.[17] Rather than segregating the qualitative and quantitative synthesis, the findings were assimilated to each other during the same phase of the process in a parallel manner. Once transformed and merged, all data were subject to thematic synthesis using the steps described by Braun and Clarke.[18] The software package QSR NVivo v11 (QSR International, Australia) was used to facilitate data analysis and synthesis.

Quality assessment

CS and DD independently assessed the study quality of included studies using the Mixed Methods Appraisal Tool (MMAT).[19] The quality rating approach was adopted from Wranik *et al*, with studies ranked from 0 to 5 points based on meeting the five-item MMAT criteria.[20] Studies scoring between 0–2 points were rated as low, 3–4 points as moderate and 5 points as high in terms of quality. CS, DD and CH discussed and agreed on the final quality rating for each study.

This systematic review was registered with PROSPERO database (registration number: CRD42019137123).

RESULTS

Search results and characteristics

A total of 4199 citations were identified from the initial literature search and 32 full-texts articles were assessed for eligibility. At the end of the selection process, six studies were included. Figure 1 describes the steps involved for the selection process.

Of the six included studies, two were qualitative, three were quantitative and one was mixed methods. The study characteristics of the included studies are listed in table 3 (see online supplemental appendix 2 for full version).

Quality appraisal

There were two studies that were graded as 'high' in quality,[21 22] with four graded as 'moderate'.[23–26] Common areas of weakness were lack of sample representativeness of the target population,[23] questionnaires were not tested nor piloted for validity or reliability[24] and lack of clarity on minimising biases such as socially desirable and nonresponse bias (see online supplemental appendix 3 for full appraisal).[23 26]

A framework approach was employed with themes derived from studies which have analysed indicators that address implementation quality in healthcare services.[27] These indicators have been successfully adopted into pharmacy settings by Garcia-Cardenas *et al*.[28] Table 4 shows these adopted themes with their definitions for the purpose of results reporting in this systematic review.

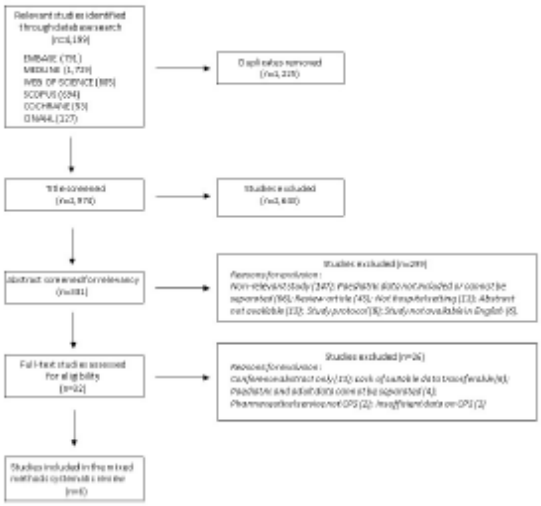


Figure 1 Flowchart of study selection process adapted from PRISMA. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

The analysis led to the identification of seven implementation factors which fell within five of the predetermined overarching themes. Figure 2 shows a thematic map presenting the themes and implementation factors identified from the included studies.

Acceptability of clinical pharmacist

Other healthcare professionals' attitudes and acceptance

There was generally a positive attitude towards the role of CP from both physicians and nurses.[22 24–26] Our data have showed that healthcare professionals' attitudes were found to be a prominent facilitator which interrelated to other implementation factors such as penetration into the institution and CP's self-efficacy:

> … junior doctors valued pharmacists' information… the strength of medications, the amounts per bottle or box, their possible adverse effects, and their paediatric application when doctors had mostly prescribed for adults.[22]

> Physician and nurses in our study considered medication preparation by hospital pharmacy staff and involvement of clinical pharmacists at the NICU as potential benefit…[21]

However, some physicians felt the involvement of CP might affect their prescribing which would in effect pose as a barrier to CPS implementation, as illustrated by the quote below:

> …study also reported some perception of loss of physician autonomy, interference in decision making, and even a feeling of being threatened by ASP (Antimicrobial Stewardship Programme) interventions.[24]

Feasibility of the clinical pharmacy service model in the setting

Availability of clinical pharmacist on ward and outpatient settings

The availability of CPs was found to be a strong facilitator which enables CPS implementation.[21 22 26] Studies described the benefits which physicians and nurses perceived when CPs were readily available to perform their duties:

> The proximity of the pharmacist to the department (Emergency Department) allows for direct consultation and medication review by the pharmacist.[26]

Using drug-related knowledge to perform clinical activities

Another subtheme that has submerged was that CPs can exert their expert knowledge in paediatric pharmacotherapy when performing activities which were more relevant to their roles.[23 26] Evidence suggested that with CP performing drug-related activities, other healthcare professionals could redirect their energies into performing other clinical activities.[26] Furthermore, with CP performing these activities, it was found that healthcare professionals' felt more confident in improving patient outcomes, such as medication safety:

> It is nice that you can just go out and pick it up without having to worry about looking for someone to perform double check… I also think that it is safer that way.[21]

Implementation costs of CPS

Resources for service provision and coverage

We found that the scarcity in financial resource was a barrier to CPS implementation, which has a subsequent negative effect on other factors such as the availability of CPs and training provided for them.[21–23] The lack of resources was reflected by the constraint in manpower or time that CPs face:

> Pharmacists' capacity for daily review of case notes was inhibited by the large volume of discharge interviews, admission reconciliation and discharge dispensing.[22]

Despite the limitation in resources, we found that the service users' expectation of CPS remained high, and this has caused enormous pressure on CPs who provided these services.[22]

Penetration into the institution

Involvement in a multidisciplinary team

The collaboration between CPs and other healthcare professionals was found to be a factor that facilitates the integration of CPS.[22 24–26] The level of collaboration was reflected by the philosophy of teamwork, which plays a key role in influencing a successful implementation.[22] The integration of hospital pharmacist into the multidisciplinary team was found to be highly desirable by healthcare professionals, especially in managing chronic illnesses.[23 25] Moreover, the recognition of multidisciplinary approach created an opportunity to implement new services, which is also interrelated to the availability of CPs:

> Many young people with chronic illnesses such as arthritis are seen in hospital outpatient rather than inpatient wards. The pharmacist is not traditionally involved in these clinics beyond the dispensing task, but there was openness to include them.[25]

Clinical pharmacist's self-efficacy

Training in the highly specialised areas

One of the core skill identified which was fundamental to the service implementation was the expert knowledge of pharmacotherapy that CPs possess for this specific population. Examples from the literature have showed the need of skill development in areas such as neonatology and managing children with chronic illnesses.[21 25] Appropriate training was perceived as a necessity from service users prior to service implementation:

> However, clinical pharmacists are currently not involved in general in the medication treatment at the Danish NICUs and should

Table 3 Characteristics of the included studies (n=6) for the systematic review

Reference	Main author	Year of publication	Country	Site information	Study design	Participants	Study objectives	Data analysis	CPS involved	Quality rating
23	Chen	2013	Singapore	A 830 bed hospital that provides specialised paediatric and women's healthcare services	Quantitative (survey)	Caregivers who accompanied epileptic patients on neurology follow-up visits	To evaluate the utility of tailored educational pharmacist counselling in improving knowledge and self-reported confidence in patient care by caregivers of children with epilepsy.	Descriptive statistics	Medication counselling	4 (Moderate)
24	Flannery	2014	USA	A 180-bed tertiary care academic paediatric hospital	Quantitative (survey)	Physicians including paediatric fellows and advanced practice nurses	To assess prescribers attitudes about the Antibiotic Stewardship Programme, aimed to identify perceived strengths and weaknesses of the service, with the ultimate goal of maximising its effect on future prescribing behaviours.	Descriptive statistics	Antibiotic Stewardship Programme	4 (Moderate)
25	Grey	2017	UK	Nationwide	Mixed methods (focus groups, semi-structured interviews and survey)	two pharmacy policy makers, three service commissioners, two pharmacy staff, five rheumatology professionals and three lay advocates	There were three phases of the study. The objective of the stakeholder interviews (phase 2) was to share ideas of practicing pharmacists about their current and future roles in the support of young people who take medication for chronic illness with stakeholders to devise a list of roles for prioritisation.	A 'middle-ordered' thematic approach	Pharmaceutical care	4 (Moderate)
26	Moadebi	2013	Canada	Lions Gate Hospital, a 335-bed acute care community teaching hospital	Quantitative (survey)	All nurses working in the site's Emergency Department	To measure the impact of the interprofessional collaboration and educational sessions conducted by the clinical pharmacist on ED nurses' level of comfort and satisfaction with intranasal fentanyl for children.	Descriptive statistics	Education sessions	3 (Moderate)
21	Rishoej	2018	Denmark	Three largest tertiary NICUs	Qualitative (focus groups)	Physicians and nurses who practiced at NICUs	To explore current and potential future practices to prevent medication errors experienced by physicians and nurses.	Qualitative content analysis	Clinical pharmacy services	5 (High)
22	Rosenfeld	2018	Australia	A major Australian paediatric teaching hospital	Qualitative (ethnographic study, focus groups and semi-structured interviews)	Pharmacists, registered nurses and doctors from diverse clinical wards	To examine interdisciplinary medication decision making by pharmacists in paediatric hospitals settings.	Thematic analysis according to the 'framework' approach	Ward service, medication decision making	5 (High)

Table 4 Themes used for this systematic review

Overarching themes	Operational definition
Acceptability	The perception among implementation stakeholders that CPS is agreeable, palatable or satisfactory.
Appropriateness	The extent to which CPS is suitable, fitting or proper for the hospital.
Feasibility	The extent to which CPS can be successfully used or carried out within the hospital.
Fidelity	The degree to which CPS is implemented and provided as it was described.
Implementation costs	Cost impact of CPS implementation effort.
Penetration	Level of integration of CPS within the hospital and its subsystems.
Service implementation Efficiency (self-efficacy)	The degree to which clinical pharmacist improves his/her skills and abilities to provide it

CPS, clinical pharmacy service.

receive training before involvement, as these units are highly specialised.[21]

The attainment of the required knowledge in these specialised areas facilitates the acceptability of CPS, and the following quote illustrate how these factors were interrelated:

> Pharmacists were viewed by staff as primacy authocities about medication issues, particularly in making complex (medication) decisions...[22]

Development of communication skills

Evidence showed that good communication between CP and nurses helped to develop a strong relationship, thus enabling the use of the service;[22] however, similar findings cannot be identified between physicians and CPs. CPs were often found to work as a bridge between doctors and nurses for resolving pharmaceutical issues:

> Communication informing medication decisions were principally dyadic... The ease with which nurses communicated with ward pharmacists and junior doctors, however, seemed more a matter of propinquity than hierarchy...[22]

Our review has also revealed that pharmacist's face-to-face interaction with parents or caregivers has increased their confidence in managing children's conditions.[23] This experience extended to adolescents who seek help from pharmacists directly, as data suggested adolescents were more likely than other age groups to consider pharmacist a trustworthy source of information, thus showing how communication enables CPS implementation from their point of view.[23]

DISCUSSION

With only six studies included in this review, the lack of research in this area seemed apparent. Heterogeneity of the service provided was shown across the inclusive studies. The difference in the characters of each service might have variable factors which influence the implementation. However, due to the limited evidence available, analysis of individual service was not possible; as a result, the data were analysed collectively as a whole.

The year of publications for the included studies suggested a recent growth of interest in this area, which is comparable with a recent systematic review in the adult setting.[29] The majority of publications were countries with relatively high health expenditure,[30] reflecting the gap exposed in research in countries with lower health expenditure in this area.

Healthcare professionals' attitude can be a facilitator for the implementation of paediatric CPS. Its value in CPS implementation was supported by research which advocated that positive attitudes between healthcare professionals nurtured teamwork and trust, which improves the quality and safety of patient care as a result.[31] Unfortunately, we were unable to identify factors

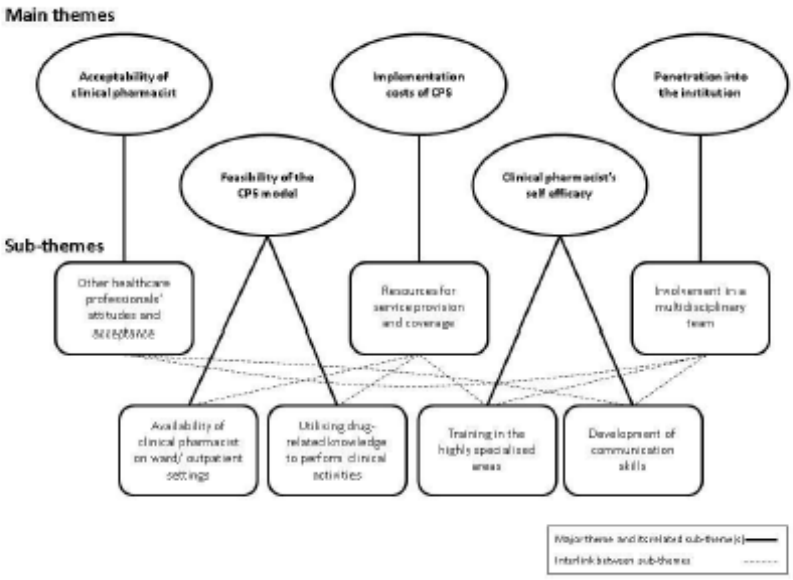


Figure 2 Thematic map showing the factors which influence the implementation of paediatric CPS in hospitals. The overarching themes were adopted from Garcia-Cardenas *et al*, with their subsequent subthemes derived from the data collected using thematic analysis. The broken lines illustrate the interrelationship between the subthemes identified from the analysis. CPS, clinical pharmacy service.

which demonstrate how patients, parents or caregivers' attitudes affect the implementation of CPS. Effort should be made in exploring how this can influence implementation, as evidence were apparent in other healthcare settings.[32–34]

Studies have shown that the hierarchical structure within healthcare discourages interprofessional communication and collaboration.[35] Our findings suggested that CPs can help to mitigate this barrier, especially when they were available in real time situations such as ward round or impromptu conversations, acting as a bridge between physicians and nurses to solve any pharmaceutical-related issues.[22 25] The benefits of having CPs available in the outpatient settings were also observed from patients' perspectives.[36] The benefits of such implementation were that long-term relationships could be developed which leads pharmacists to make individualistic, personalised interventions.[36] Our data suggested that similar perception was found in paediatric CPS.

The employment of CPs' expertise in performing clinical duties helped other healthcare professionals to focus on their non-drug-related duties, and the belief of improved quality of patient care was also observed. This appealing factor could lead to successful implementation of CPs, but study found that this was highly variable which depends on individual's perception and experience towards CPS.[37]

Studies have pointed out that a multidisciplinary team supports high-quality care, patient and staff engagement and organisational efficiency.[38] The impact of the involvement of CP in multidisciplinary team on patient outcomes was evidential.[39 40] This was found to be a strong implementation facilitator and its importance was reflected by the principle of the 'medication optimisation' paradigm endorsed by National Institute for Health and Care Excellence (NICE).[41]

The lack of resources was found to be a barrier to implement paediatric CPS. Shortages of CPs prevent proper collaboration such that understaffed pharmacists were overloaded with responsibilities, thus affecting the quality of CPS.[42] Previous studies have found that the initiation of CPS by healthcare bodies or government was a facilitator to implementation.[27] However, we did not find any governmental or institutional policies in place to provide funding to advocate the implementation of paediatric CPS within the included studies. The support could be hindered by the scarce human and technological resources, pressure on cost containment as well as the lack of a motivational professional and career pathway development.[43] Research into the impact of CPS on patient outcomes and health economic data could perhaps help to ascertain its value.

In an economic evaluation of CPS in USA, training was found to be an important factor within the CPS structure which renders a cost-effective pharmacy programme.[44] Apparently, strategies such as clinical training for pharmacists could help to enhance the pharmacists' confidence and motivation to implement CPS in hospitals;[29] however, this was hindered with the fiscal restraint as shown from the included studies.

Researchers showed that the identification of implementation factors is one of the most important strategies to implement change.[45] Although our review has identified number of factors which could influence paediatric CPS implementation, a large knowledge gap in this area was also identified. Researchers should therefore focus on conducting implementation studies to allow policy makers to appreciate the multifactorial considerations for paediatric CPS implementation in hospitals.

This is a first systematic review to identify the factors which influence the implementation of paediatric CPS in hospital settings. We have used robust and recognised methods to integrate qualitative and quantitative data, and reported the synthesis against the ENTREQ. Nevertheless, there are limitations to this review. First, some studies included both paediatric and adult patients in their study design and we were not able to separate the data; therefore, these studies had to be excluded. Second, the limited number of studies and majority of studies being single-site limited their transferability and generalisability to other healthcare systems. Third, since grey literature was not considered, it is not clear how this can influence the review. Last, since there was no consensus on the literature to exclude studies based on quality assessment, the majority of included studies were moderate in quality; therefore, study designs which produce high quality evidence is warranted.

CONCLUSION

This systematic review has found six studies, with seven factors identified which either facilitate or hinder the implementation of paediatric CPS in hospitals. These factors were: healthcare professionals' attitude and acceptance; the availability of CP; resources for service provision; involvement in a multidisciplinary team; using expert knowledge to perform drug-related activities; training in the specialised areas and the development of communication skills. There was very little research on how to implement paediatric CPS in hospitals and an extensive knowledge gap within this area has been identified. Nevertheless, this review has lent insight into some factors which influence the implementation of paediatric CPS in hospital settings. Due to the heterogeneity of different CPS activities provided in the included studies, further research should focus on identifying the factors that influence each individual service. Further research should also focus on how the characteristics of the individual CP affect implementation. With the enriched content available, analysis can be performed to highlight the factors which affect the implementation of each CPS activity, thus providing a strong foundation for strategic planning for paediatrics CPS implementation and development including the required personal training and development.

Contributors CM-HS wrote the manuscript. CM-HS and DD conducted the study selection process and CH reviewed for the appropriateness of the included studies. CM-HS, DD and CH participated in the critical appraisal process. IDM and CH supervised the project and contributed to the final version of the manuscript.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; externally peer reviewed.

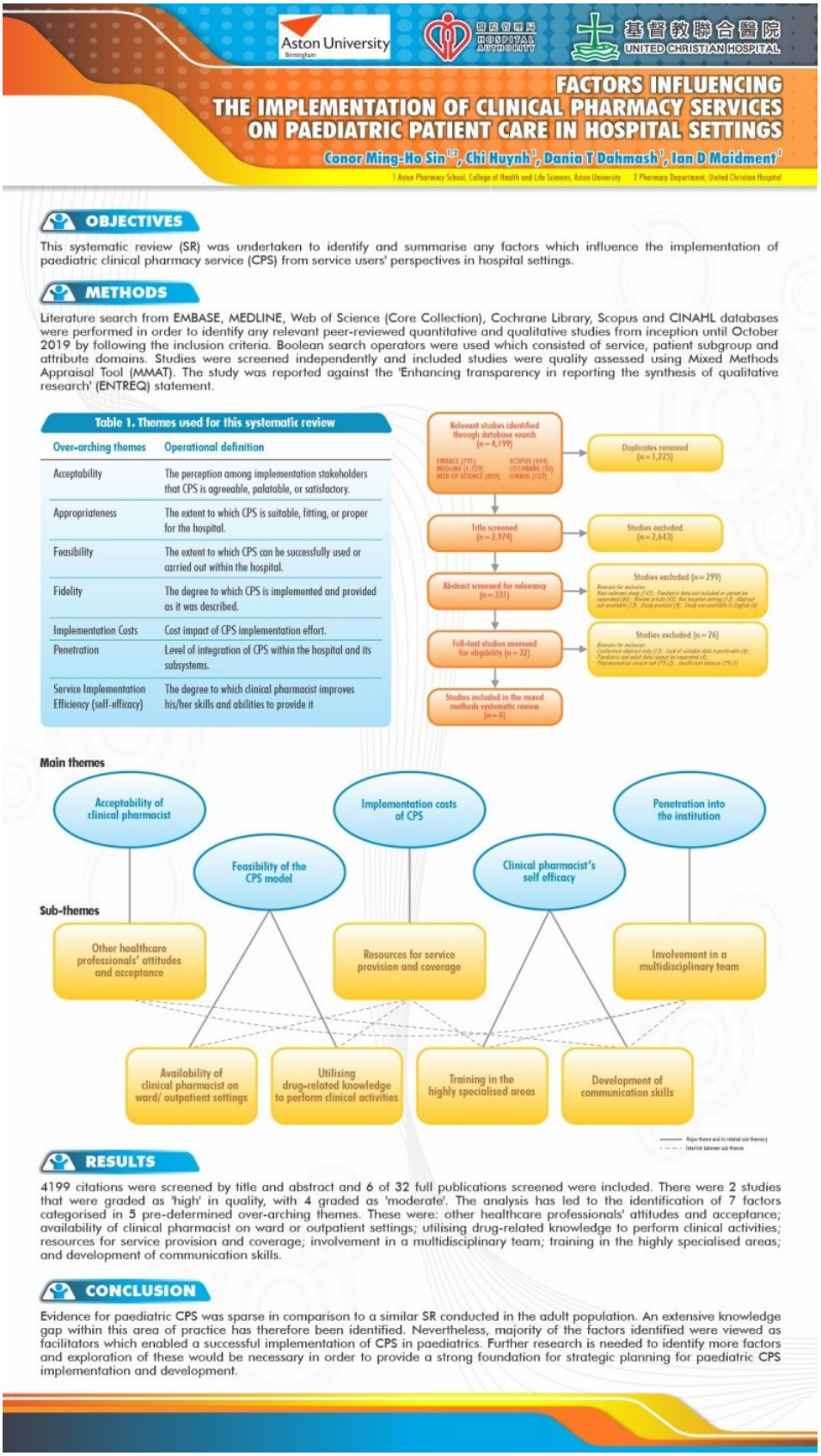
Data availability statement Data are available in a public, open access repository.

ORCID IDs
Conor Ming-Ho Sin http://orcid.org/0000-0002-2125-1672
Chi Huynh http://orcid.org/0000-0001-6982-6642
Ian D Maldment http://orcid.org/0000-0003-4152-9704

REFERENCES

1 Maaskant JM, Vermeulen H, Apampa B, *et al*. Interventions for reducing medication errors in children in hospital. *Cochrane Database Syst Rev* 2015;3:CD006208.
2 Wong ICK, Wong LYL, Cranswick NE. Minimising medication errors in children. *Arch Dis Child* 2009;94:161–4.
3 Kaushal R, Bates DW, Landrigan C, *et al*. Medication errors and adverse drug events in pediatric inpatients. *JAMA* 2001;285:2114–20.
4 Rinke ML, Bundy DG, Velasquez CA, *et al*. Interventions to reduce pediatric medication errors: a systematic review. *Pediatrics* 2014;134:338–60.
5 Farre A, Cummins C. Understanding and evaluating the effects of implementing an electronic paediatric prescribing system on care provision and hospital work in paediatric hospital ward settings: a qualitatively driven mixed-method study protocol. *BMJ Open* 2016;6:e010444.
6 Kozer E, Berkovitch M, Koren G. Medication errors in children. *Pediatr Clin North Am* 2006;53:1155–68.
7 Bhatt-Mehta V, Buck ML, Chung AM, *et al*. Recommendations for meeting the pediatric patient's need for a clinical pharmacist: a joint opinion of the pediatrics practice and research network of the American College of clinical pharmacy and the pediatric pharmacy advocacy group. *Pharmacotherapy* 2013;33:243–51.
8 Stemer G, Lemmens-Gruber R. Clinical pharmacy activities in chronic kidney disease and end-stage renal disease patients: a systematic literature review. *BMC Nephrol* 2011;12:35.
9 Mekonnen AB, McLachlan AJ, Brien J-AE. Pharmacy-led medication reconciliation programmes at hospital transitions: a systematic review and meta-analysis. *J Clin Pharm Ther* 2016;41:128–44.
10 Cheema E, Sutcliffe P, Singer DRJ. The impact of interventions by pharmacists in community pharmacies on control of hypertension: a systematic review and meta-analysis of randomized controlled trials. *Br J Clin Pharmacol* 2014;78:1238–47.
11 Koh HK, Oppenheimer SC, Massin-Short SB, *et al*. Translating research evidence into practice to reduce health disparities: a social determinants approach. *Am J Public Health* 2010;100(Suppl 1):S72–80.
12 Drovandi A, Robertson K, Tucker M, *et al*. A systematic review of clinical pharmacist interventions in paediatric hospital patients. *Eur J Pediatr* 2018;177:1139–48.
13 Li X, Huo H, Kong W, *et al*. Physicians' perceptions and attitudes toward clinical pharmacy services in urban general hospitals in China. *Int J Clin Pharm* 2014;36:443–50.
14 Al-Arifi MN, Alghamdi B, Al-Saadi M, *et al*. Attitudes and perceptions of healthcare providers towards clinical pharmacy services at a tertiary care hospital in Riyadh, Saudi Arabia. *Trop J Pharm Res* 2015;14:913–8.
15 Moher D, Liberati A, Tetzlaff J, *et al*. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med* 2009;6:e1000097.
16 Tong A, Flemming K, McInnes E, *et al*. Enhancing transparency in reporting the synthesis of qualitative research: ENTREQ. *BMC Med Res Methodol* 2012;12:181.
17 Jennings AA, Foley T, Walsh KA, *et al*. General practitioners' knowledge, attitudes and experiences of managing behavioural and psychological symptoms of dementia: protocol of a mixed methods systematic review and meta-ethnography. *Syst Rev* 2018;7:62.
18 Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006;3:77–101.
19 Hong QN, Fàbregues S, Bartlett G, *et al*. The mixed methods appraisal tool (MMAT) version 2018 for information professionals and researchers. *EFI* 2018;34:285–91.
20 Wranik WD, Price S, Haydt SM, *et al*. Implications of interprofessional primary care team characteristics for health services and patient health outcomes: a systematic review with narrative synthesis. *Health Policy* 2019;123:550–63.
21 Rishoej RM, Lal Nielsen H, Strzelec SM, *et al*. Qualitative exploration of practices to prevent medication errors in neonatal intensive care units: a focus group study. *Ther Adv Drug Saf* 2018;9:343–53.
22 Rosenfeld E, Kinney S, Weiner C, *et al*. Interdisciplinary medication decision making by pharmacists in pediatric hospital settings: an ethnographic study. *Res Social Adm Pharm* 2018;14:269–78.
23 Chen C, Lee DSH, Hie SL. The impact of pharmacist's counseling on pediatric patients' caregiver's knowledge on epilepsy and its treatment in a tertiary hospital. *Int J Clin Pharm* 2013;35:829–34.
24 Flannery DD, Swami S, Chan S, *et al*. Prescriber perceptions of a pediatric antimicrobial stewardship program. *Clin Pediatr* 2014;53:747–50.
25 Gray NJ, Shaw KL, Smith FJ, *et al*. The role of pharmacists in caring for young people with chronic illness. *J Adolesc Health* 2017;60:219–25.
26 Moadebi S, Kwan F, Stackhouse S, *et al*. The impact of interprofessional collaboration on nurses' satisfaction and comfort with intranasal fentanyl. *Int Emerg Nurs* 2013;21:58–63.
27 Willmeroth T, Wesselborg B, Kuske S. Implementation outcomes and indicators as a new challenge in health services research: a systematic scoping review. *Inquiry* 2019;56:1–17.
28 Garcia-Cardenas V, Benrimoj SI, Ocampo CC, *et al*. Evaluation of the implementation process and outcomes of a professional pharmacy service in a community pharmacy setting. A case report. *Res Social Adm Pharm* 2017;13:614–27.
29 Onorato T, Francisca Dos Santos Cruz C, Milhome da Costa Farre AG, *et al*. Factors influencing the implementation of clinical pharmacy services for hospitalized patients: a mixed-methods systematic review. *Res Social Adm Pharm* 2020;16:437–49.
30 World Health Organisation (WHO). Global health expenditure database. Available: https://apps.who.int/nha/database [Accessed on 16 Apr 2020].
31 Layland A. Why is trust important for effective healthcare teams? *Br J Healthcare Manage* 2018;24:61–3.
32 Abraham O, Brothers A, Alexander DS, *et al*. Pediatric medication use experiences and patient counseling in community pharmacies: perspectives of children and parents. *J Am Pharm Assoc* 2017;57:38–46.
33 Kradjan WA, Schulz R, Christensen DB, *et al*. Patients' perceived benefit from and satisfaction with asthma-related pharmacy services. *J Am Pharm Assoc* 1999;39:658–66.
34 Deshpande M, Schauer J, Mott DA, *et al*. Parents' perceptions of pharmacists as providers of influenza vaccine to children. *J Am Pharm Assoc* 2013;53:488–95.
35 Alsuhebany N, Alfehaid L, Almodaimegh H, *et al*. Attitude and perception of physicians and nurses toward the role of clinical pharmacists in Riyadh, Saudi Arabia: a qualitative study. *SAGE Open Nurs* 2019;5:2377960819888976.
36 McCullough MB, Petrakis BA, Gillespie C, *et al*. Knowing the patient: a qualitative study on care-taking and the clinical pharmacist-patient relationship. *Res Social Adm Pharm* 2016;12:78–90.
37 Sjölander M, Gustafsson M, Gallego G. Doctors' and nurses' perceptions of a ward-based pharmacist in rural northern Sweden. *Int J Clin Pharm* 2017;39:953–9.
38 Morley L, Cashell A. Collaboration in health care. *J Med Imaging Radiat Sci* 2017;48:207–16.
39 Chan DS, Callahan CW, Moreno C. Multidisciplinary education and management program for children with asthma. *Am J Health Syst Pharm* 2001;58:1413–7.
40 Copley LAB, Kinsler MA, Gheen T, *et al*. The impact of evidence-based clinical practice guidelines applied by a multidisciplinary team for the care of children with osteomyelitis. *J Bone Joint Surg Am* 2013;95:686–93.
41 National Institute for Health and Care Excellence (NICE). Medicines optimisation: the safe and effective use of medicines to enable the best possible outcomes [NG5]. Available: https://www.nice.org.uk/guidance/ng5 [Accessed 28 Apr 2019].
42 Chevalier BAM, Watson BM, Barras MA, *et al*. Hospital pharmacists' and patients' views about what constitutes effective communication between pharmacists and patients. *Int J Pharm Pract* 2018;26:450–7.
43 Chisholm-Burns MA, Lee JK, Spivey CA. US pharmacists' effect as team members on patient care: systematic review and meta-analyses. *Med Care* 2010;28:923–33.
44 Touchette DR, Doloresco F, Suda KJ, *et al*. Economic evaluations of clinical pharmacy services: 2006-2010. *Pharmacotherapy* 2014;34:771–93.
45 Waltz TJ, Powell BJ, Matthieu MM, *et al*. Use of concept mapping to characterize relationships among implementation strategies and assess their feasibility and importance: results from the expert recommendations for implementing change (ERIC) study. *Implement Sci* 2015;10:109.

Appendix XI – Systematic review conference poster



Appendix XII – Study 1 published paper

International Journal of Pharmacy Practice, 2022, **XX**, 1–6
https://doi.org/10.1093/ijpp/riac058
Advance access publication 28 July 2022
Research Paper

IJPP International Journal of Pharmacy Practice

OXFORD

Clinical pharmacists' perceptions of the barriers and facilitators to the implementation of paediatric clinical pharmacy services in Hong Kong

Conor Ming-Ho Sin[1,2,*], Chi Huynh[1] and Ian D. Maidment[1]

[1]Aston Pharmacy School, College of Health and Life Sciences, Aston University, Birmingham, UK
[2]Pharmacy Department, United Christian Hospital, Kwun Tong, Kowloon, Hong Kong

*Correspondence: Conor Ming-Ho Sin, Pharmacy Department, United Christian Hospital, 130 Hip Wo Street, Kwun Tong, Kowloon, Hong Kong.
Email: scm096@ha.org.hk

Abstract

Objectives To identify barriers and facilitators that influenced the implementation of paediatric clinical pharmacy service (CPS) in Hong Kong's public hospitals from clinical pharmacists' perspective.

Methods A qualitative study based on semi-structured interviews of clinical pharmacists who practiced in paediatrics in public hospitals in Hong Kong. Interview schedule was designed based on determined themes identified in previous research and pilot testing was performed. The coding process was performed by two researchers with the resulting topics organised by thematic analysis. Consensus was reached amongst the researchers for the identification of themes that emerged during the interviews. The Consolidated Criteria for Reporting Qualitative Research guideline was followed to ensure the complete and transparent reporting of this research. Ethical approval for this study was obtained from the research ethics committee of the relevant institutions.

Key findings Of the 32 clinical pharmacists from across the study sites, 12 were interviewed. Five barriers and three facilitators were identified as main themes. The barriers that were identified which hindered service implementation include the service penetration into the healthcare system, practice environment constraints, lack of affirmation from the administrative stakeholders, governance of the profession and partnership with universities. The facilitators that were identified which enabled service implementation include other healthcare professionals' trust and confidence in the service, the support from the pharmacy management team and clinical pharmacists' self-efficacy.

Conclusions Clinical pharmacists interviewed reported that the successful implementation of CPS in paediatrics in public hospitals in Hong Kong is an area of continued development with several key barriers identified.

Keywords: clinical pharmacy; paediatrics; pharmaceutical care; professional practice

Introduction

Clinical pharmacists work directly with patients and other healthcare professionals to ensure that medications contribute to the best possible health outcomes for the former group.[1] The UK National Healthcare Service supports the role that clinical pharmacists play in achieving medication optimisation, explaining that clinical pharmacists facilitate medicines optimisation by looking at the value that medicines deliver and thereby ensuring that they are clinically effective and cost-effective.[2] Special attention needs to be given to optimising medicine use in children as they are at high risk of harm resulting from medication errors, because such errors are potentially more hazardous to them relative to adults.[3–5]

In 2014, the Hong Kong Hospital Authority (HA), a statutory body that governs all public hospitals within the special administrative region, implemented a clinical pharmacy service (CPS) programme for paediatric general and intensive care units in all public hospitals. Although CPSs have been provided for almost a decade now, research investigating its implementation has not been conducted yet. Formative evaluations are therefore needed to assess the extent to which CPS implementation is effective so that the benefits of the intervention could be optimised and sustained.[6]

The implementation of CPSs, which is a challenging and complex process influenced by multiple factors, varies across different services; in addition, clinical pharmacists' perceptions towards CPSs influence their implementation.[7] Although studies have highlighted that the development of Hong Kong's CPS programme is hindered by resource limitations and the overwhelming workload of clinical pharmacists, the views of clinical pharmacists about the programme have yet to be explored using qualitative methodologies.[8] The aim of this study was to identify the facilitators and barriers that have influenced the implementation of hospital paediatric CPSs in Hong Kong from the perspective of clinical pharmacists.

Methods

Study design

Data were collected using semi-structured interviews (SSIs). SSIs have been extensively used as a rigorous data collection method for evaluating the factors that influence clinical

Received: 16 March 2022 Accepted: 20 June 2022

pharmacy.[9–11] The questions in the interview schedule were based on previously determined themes and subthemes identified in paediatric CPSs.[12] The interview schedule was developed through consultations with all team members. Pilot testing was performed with three study participants to confirm the coverage and relevance of the content of the formulated guides and to identify the possible need to reformulate the questions. Since all researchers agreed that no changes needed to be made to the schedule, the data were included in the analysis.

Participants and recruitment

The 32 clinical pharmacists who were working within the field of paediatrics in the four (out of five) participating public hospitals (i.e. Hong Kong Children's Hospital, Kwong Wah Hospital, Tseung Kwan O Hospital and United Christian Hospital) situated in east and central Kowloon in Hong Kong were invited to take part in this study. The non-participating hospital did not specify the reason for non-participation. Based on the average number of participants needed to achieve data saturation in similar studies,[13, 14] between 10 and 15 participants were targeted for enrolment in this study. Cluster sampling was used to select random samples evenly distributed across different study sites. An invitation email was sent to HA's paediatric CPS working group representatives, requesting them to disseminate the invitation to relevant paediatric clinical pharmacists, with an information sheet and a consent form provided therein. A reminder email was sent to the representatives 1 month after the initial invitation email was delivered. Signed consent forms were received either electronically or in hardcopies before the interviews.

Data collection

Participants were given the choice to select either telephone or video conferencing via Zoom (Zoom Video Communications, USA) for their SSI. Face-to-face interviews were not recommended owing to social distancing and gathering restrictions set by local government and university policies given the COVID-19 pandemic. An inductive thematic saturation approach was used, where saturation was focused on the identification of new codes.

The interviews were conducted by the principal investigator (PI) (C.S.) in spoken Cantonese. The audio recordings were translated and transcribed directly into English by the PI, and a sample of the translated transcripts was subsequently checked by a member of the research team fluent in spoken Cantonese Chinese (C.H.) for accuracy and to minimise transcriptional error. Once translated and transcribed as Microsoft Word documents, all transcripts were entered into QSR NVivo Version 12 (QSR International, Australia) to support data analysis.

Data analysis and reporting

The resulting topics were organised by thematic analysis as described by Braun and Clarke.[15] All the transcripts were coded by the PI, with another researcher coded 20% of the transcripts individually. The two sets of coding were then compared and discrepancies were discussed until consensus was reached amongst the researchers. The subthemes were then mapped onto the corresponding main themes in tabular form and as text description. The COREQ (Consolidated Criteria for Reporting Qualitative Research) guidelines were used to ensure the confirmability and transparency of this research.[16] Preparation of field notes, self-reflection with items on the COREQ checklist (see Supplementary Material) and member checking were performed during the research process to support research reflexivity.

Ethical approval

Ethical approval for this study was obtained from the research ethics committees of the relevant institutions (HKCH-REC-2021-031 [8 September 2021], KC/KE-21-0089 [22 June 2021] and 1741 [9 March 2021]).

Results

Of the 14 clinical pharmacists who agreed to take part, 12 were interviewed by telephone that allowed for data saturation to be reached. Each interview lasted approximately 30–45 min. Five barriers and three facilitators were identified as the main themes. The main themes and their corresponding subthemes are outlined in Table 1.

Table 1 Summary of themes and subthemes

Barriers	Facilitators
• Penetration into the healthcare system ◦ Understanding of clinical pharmacist's role ◦ Culture of medical dominance ◦ Time for service to implement • Practice environment constraints ◦ Increased workload ◦ Competing priorities • Support from the administrative stakeholders ◦ Acknowledgement of outcome measures ◦ Limitation of resources ◦ Budget allocation in pharmacy services • Governance of the profession ◦ Lack of standardisation of practice ◦ Need of professional bodies for practice guidelines and accreditation • Partnership with universities ◦ Liaise to bring local research to evidence-based practice ◦ Provision of training for specific needs	• Healthcare professionals' trust and confidence in CPSs ◦ Seeing the benefit ◦ Coherent and direct communication • Support from the pharmacy management team ◦ Provision of comprehensive training ◦ Allocating manpower to provide service coverage • Clinical pharmacists' self-efficacy ◦ Job satisfaction and self-esteem ◦ Attitude to drive the profession forward

Barriers

Penetration into the healthcare system

Some participants felt that their role was not well recognised and expressed that the lack of recognition was not an issue of trust or confidence, but rather a lack of understanding of their role. The culture of medical dominance was also perceived as a barrier. Participants observed that CPSs were not appreciated by some physicians. They contested that some physicians were reluctant to change their practice:

> ...when you talk about dosage adjustments and TDM [therapeutic drug monitoring] etc ... who should do it? Traditionally this is a role of doctors ... it is not that they have taken our service away per se, but rather this is set like as the foundation of their job. (P8, Hospital D)

The reasons for said resistance to change were multifaceted, including the belief in whether clinical pharmacists can provide good services and the idea of deskilling in medication knowledge. Some clinical pharmacists contended that such resistance was interlinked with internal factors within the pharmacy profession, which are described in a subsequent section of this paper. Participants also expressed that the current CPS programme might not have been implemented as successfully as was the case for other countries because the programme was introduced only recently in Hong Kong, such that its implementation is acknowledged to progress only with time.

Practice environment constraints

Participants felt difficulty performing their services because of their heavy workload. They believed that CPSs were under tremendous pressure and sometimes stretched beyond capacity:

> We can only afford to provide a half-day service due to the limitation of manpower ... as a result, we cannot participate in the afternoon medical rounds... (P5, Hospital C)

The pharmacist-to-patient ratio was also put into question. Some participants expressed that their work has been constrained by the number of patients under their care each day as a result of limited resources. Some participants believed that supply was prioritised over clinical services:

> I think at the moment our priority has been put onto the operational side of work. It feels that the clinical work is something in addition.... (P4, Hospital C)

One participant believed that the root of the problem with the availability of clinical pharmacists was also related to the lack of clear division between primary and secondary care. Participants highlighted that a better-structured pharmacy framework, with a well-defined separation of roles within the department, could enhance the availability of clinical pharmacists to perform their duties.

Support from administrative stakeholders

Clinical pharmacists expressed their difficulty with obtaining support from administrative stakeholders because they held different views on outcome measures:

> It is quality versus quantity. A lot of statistics have shown that the focus is on quantity, no measurements on quality based on my understanding. (P7, Hospital A)

As a consequence, administrative stakeholders were not committed to investing in clinical pharmacists, thus limiting the resources available. One participant explained that from the stakeholders' perspective, investing in clinical pharmacists might not be as attractive as investing in other healthcare professionals in terms of cost-effectiveness. Moreover, clinical pharmacists commented on their struggle with manpower allocation because of resource shortages. A paradigm shift to what clinical service pharmacists should provide and the fact that resource allocation towards paediatric CPSs lacked sustainability to provide requested services were pointed out as well.

Governance of the profession

Participants reflected that the level of implementation differed across hospitals owing to a lack of standardisation in practice; this made it difficult for stakeholders to comprehend the role of clinical pharmacists, thus leading to the profession being less recognised. Some pointed out that having general professional bodies such as councils or societies in place can help provide not only standard practice guidelines but also training requirements so that the skills of clinical pharmacists can be maintained at a competent level:

> ...for example in SickKids [The Hospital for Sick Children, Canada], clinical pharmacists would need some sort of credentialing ... whether we are competent to provide these services, they should all be included in the guidelines.... (P9, Hospital D)

Moreover, they believed that a professional body could also act as a credentialing organisation to ensure that all paediatric clinical pharmacists maintain their current credentials and skills, thus providing stakeholders with reassurance that all clinical pharmacists have undergone stringent scrutiny regarding their ability to practice:

> ...we should have something similar to the PGY [residency programme] system in the USA, where it is clearly defined what competencies have to be fulfilled and what to expect when you deliver the service.... (P12, Hospital D)

Partnership with universities

Stronger collaboration with universities was suggested by participants. They believed that it helps provide localised evidence that administrative stakeholders seek and enables clinical pharmacists to deliver evidence-based practice in paediatrics:

> ...I think that the research aspect within the clinical pharmacy in Hong Kong is rather weak, and we often need to extrapolate the data towards our own population ... personnel from universities can help to consolidate, analyse and to publish papers. (P3, Hospital B)

With regard to centralised training, some clinical pharmacists claimed that the paediatric advanced training course provided to them did not match their practice and lacked sustainability; they suggested that continuous developmental education in this specific area should be embedded in their training.

Facilitators

Healthcare professionals' trust and confidence in CPSs

Most participants felt that paediatric CPSs were well supported by doctors and nurses:

> ...because of the development of the service we often see them [doctors and nurses] directly, and the exchange of information has improved as we often see face-to-face, and therefore we have become the provider of some important information.... (P3, Hospital B)

Examples of how CPSs have helped other healthcare professionals include their time efficiency, training provision and prevention of medication errors. In addition, participants believed that CPSs have allowed for more direct and coherent communication with other healthcare professionals and that this, in turn, has helped encourage good rapport, thereby resulting in the development of trust and confidence in CPSs.

Support from the pharmacy management team

As a whole, clinical pharmacists thought that the support given by the pharmacy management team was adequate, whether it was centrally or peripherally provided:

> Colleagues had the opportunity to receive overseas training ... for local training, apart from inter-cluster training where pharmacists can have a better understanding of how other hospitals provide their service, HA would also collaborate with CUHK [the Chinese University of Hong Kong] to provide advanced specialty training course.... (P2, Hospital A)

Participants acknowledged the team's effort in providing a wide spectrum of training to equip them in delivering seamless services. They agreed that the team has put considerable effort into providing adequate training, for which they showed appreciation.

Clinical pharmacists' self-efficacy

Participants' attitudes were affected by factors, such as manpower, training, work relationship and support, and these interlinked factors consequently affected participants' perceptions towards the implementation of CPSs. Another attitudinal factor that was identified to be key to successful CPS implementation was self-initiative. Participants believed that being enthusiastic and passionate about the job was important and hence affected their work outcomes:

> ...it is important for individuals to have the passion to drive the service forward ... because even though there is adequate training, they can only deliver what is best if they have the passion.... (P11, Hospital A)

They believed that CPSs have enhanced their involvement in disease management and made them feel that they were part of a multidisciplinary team. Participants also reflected that CPSs have given parents or caregivers an opportunity to understand their children's medications better.

Discussion

Factors that influenced the implementation of paediatric CPSs in Hong Kong were identified in this study using a qualitative research methodology. These included penetration into the system, practice environment constraints, support from the administrative stakeholders and pharmacy management team, governance of the profession, healthcare professionals' trust and confidence, partnership with university and clinical pharmacists' self-efficacy.

As it is the first qualitative study to be conducted in Hong Kong in paediatric CPS, its results can help provide qualitative evidence to promote systematic uptake of research findings into routine practice. A robust reporting system was used to ensure the credibility and confirmability of the research. However, this study has some limitations. First, its results have limited generalisability as the participants were recruited from one city only; participant sampling across more hospitals would be desirable but due to the limitation in resources and the difficulties in nominating additional PIs for each region as per local research ethics committee guidelines, we were unable to recruit in more study sites. Second, with the participants having been interviewed via telephone, the possibility of loss of non-verbal data cannot be excluded. Lastly, as the focus of this study was on public services, the implementation of CPSs in the private sector was not explored.

The availability of clinical pharmacists has a major influence on the implementation of CPSs. This barrier was related to both the institutional and organisational levels, with administrative factors being reasons behind the hindrance. The availability was further limited by the operational demand of dispensing work. A well-structured pharmacy service framework (e.g. that which separates clinical from dispensing duties) and the designation of specific roles (e.g. training, information technology and drug information) could help clinical pharmacists provide clinical services as described. To achieve this, stakeholders must first recognise the importance of this specialised branch of pharmacy within the healthcare system; however, persuasion of administrative stakeholders may be challenging, as researchers have highlighted the paucity of robust research regarding the impact of CPSs on organisational and patient outcomes and the lack of information to support the most efficient use of available resources.[17] With scarce support from administrative stakeholders, the implementation costs for service provision and coverage serve as a barrier. Indeed, staff shortages, workforce issues and timeliness of services were identified as important factors that influenced service access shortcomings in Hong Kong.[18] The lower health expenditure in Hong Kong compared with that in countries with well-established CPSs, such as the USA and the UK, could partially explain why administrative stakeholders have been under careful scrutiny concerning their healthcare budget allocation.[19, 20] A high level of collaboration between hospitals and universities could help consolidate the evidence on the impact of paediatric CPSs on clinical, humanistic and economic outcomes using systematic and pragmatic approaches, which would provide robust and localised evidence to the stakeholders.

The infrastructure of Hong Kong's healthcare system also has an effect on the implementation of paediatric CPSs. A shared-care healthcare model between the primary and secondary care sectors is vital in ensuring that patients receive high-quality care.[21] For example, the National Healthcare Service has stipulated guidance on the responsibility of prescribing and supplying medicines between primary and secondary or tertiary care, thus advocating the provision of medicines optimisation.[21] Such organisational initiatives could make the best use of clinical time and resources in different healthcare disciplines, including clinical pharmacy.

Healthcare professionals' attitudes were a major factor that influenced the implementation of paediatric CPSs in Hong Kong. Participants highlighted that other healthcare professionals were not clear on clinical pharmacists' roles

and where they stand within the healthcare infrastructure. A lack of knowledge of pharmacists' clinical roles amongst nurses and physicians has been identified by other studies, thus reflecting the lack of interprofessional academic training and collaborative practice agreements in this aspect.[22, 23] This barrier has been identified in various clinical areas, including dementia and in geriatric healthcare. The reluctance of some physicians to accept a shared-care model has been articulated, and this resistance to change challenges the implementation of paediatric CPSs. This finding is somewhat unsurprising as medical dominance continues to define Hong Kong's health policy, which reinforces the classical view of professional hierarchy.[18] With the growing interest in a collaborative model of healthcare delivered by multidisciplinary teams across global healthcare systems, coordinated action is needed and is crucial to fostering true collaboration across influential institutional bodies at the professional, managerial and governmental levels. It will influence the regulatory and economic factors that facilitate a multidisciplinary healthcare framework.[24]

Clinical pharmacists' psychological factors, including lack of confidence and fear of risk-taking, are frequently identified as barriers when implementing clinical services, even in countries with more established CPSs, such as Australia, Canada and the UK.[25, 26] Training was a factor that affects clinical pharmacists' attitudes. A more structured training programme is warranted across the spectrum of paediatric clinical pharmacy career stages. Additionally, stronger collaboration with universities to provide continuous and specialised training, such as the clinical pharmacy training provided by the Centre for Pharmacy Postgraduate Education in the UK, is highly recommended because emerging evidence has suggested that having university research positions within the healthcare system influences the research skills and participation of allied healthcare professionals.[27]

Standardisation of practice is essential to facilitate the implementation of CPSs, and the regulation of the profession could allow for the skills of paediatric clinical pharmacists to be maintained and sustained at a high level. For example, in the UK, the Royal Pharmaceutical Society has developed the Advanced Practise Framework.[28] In doing so, the society defined the multiple domains of practice necessary for advanced practice and provided clarity on what skill differentiation, at various levels, is prerequisite to progress along the practice spectrum, while also being responsible for the credentialing process.[28]

Hong Kong has a statutory body responsible for pharmacist registration, namely, the Pharmacy and Poison Board, but it lacks a professional council, unlike the case for the medical and nursing professions. Nevertheless, a call to enact government policies establishing a pharmacy council dedicated to the continuous quality enhancement of professional practice, with consistent standards as an agenda, is currently in motion. The definition of clinical practice competence and the creation of an infrastructure to allow for the development of competence skills across the spectrum of different career stages are important in equipping clinical pharmacists in their delivery of paediatric CPSs in Hong Kong.[29]

Conclusion

The clinical pharmacists interviewed in this study reported that the successful implementation of paediatric CPSs in public hospitals in Hong Kong is an area of continued development with several key barriers. The major implementation barriers identified include the availability and coverage of clinical pharmacists for service provision. Nevertheless, clinical pharmacists and healthcare professionals were found to have not only positive attitudes towards CPSs but also support from clinical and pharmacy management teams. An enhanced internal and external governance infrastructure within the pharmacy profession would allow for the standardisation of practice and training, which would ultimately help drive the implementation of CPSs forward as a whole.

Supplementary Material

Supplementary data are available at *International journal of Pharmacy Practice* online.

Acknowledgements

The authors thank Moon Cheung and Cherry Lam for their efforts as PIs at study sites and all clinical pharmacists who took part in this study.

Author Contributions

C.S. was the PI for this research and was responsible for the study design, data collection including the translation of data and preliminary coding, data analysis and wrote the manuscript. C.H. was responsible for the study design, reviewed the transcriptions, coding process and provided comments for the manuscript. I.D.M. supervised the project and contributed to the final version of the manuscript.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of Interest

The authors declare that they have no conflicts of interest to disclose.

Data availability

The data underlying this article will be shared on reasonable request to the corresponding author, and the COREQ checklist of this article is available in its online supplementary material.

References

1. American College of Clinical Pharmacy (ACCP). *Standards of Practice for Clinical Pharmacists*. https://www.accp.com/docs/positions/guidelines/standardsofpractice.pdf (25 November 2021, date last accessed).
2. The National Healthcare Service. *Medicines Optimisation*. https://www.england.nhs.uk/medicines-2/medicines-optimisation/ (30 November 2021, date last accessed).
3. Maaskant JM, Vermeulen H, Apampa B et al. Interventions for reducing medication errors in children in hospital. *Cochrane Database Syst Rev* 2015; 3: CD006208. https://doi.org/10.1002/14651858.CD006208.pub3

4. Wong ICK, Wong LYL, Cranswick NE. Minimising medication errors in children. *Arch Dis Child* 2009; 94: 161–4. https://doi.org/10.1136/adc.2007.116442
5. Kaushal R, Bates DW, Landrigan C et al. Medication errors and adverse drug events in pediatric inpatients. *JAMA* 2001; 285: 2114–20. https://doi.org/10.1001/jama.285.16.2114
6. Damschroder LJ, Aron DC, Keith RE et al. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implement Sci* 2009; 4: Art. 50. https://doi.org/10.1186/1748-5908-4-50
7. dos Santos Junior GA, Ramos SF, Pereira AM et al. Perceived barriers to the implementation of clinical pharmacy services in a metropolis in Northeast Brazil. *PLoS One* 2018; 13: e0206115. https://doi.org/10.1371/journal.pone.0206115
8. Lee CP. Health care system and pharmacy practice in Hong Kong. *Can J Hosp Pharm* 2018; 71: 140–8. https://doi.org/10.4212/cjhp.v71i2.1865
9. Bëchet C, Pichon R, Giordan A et al. Hospital pharmacists seen through the eyes of physicians: qualitative semi-structured interviews. *Int J Clin Pharm* 2016; 38: 1483–96. https://doi.org/10.1007/s11096-016-0395-1
10. Auta A, Strickland-Hodge B. Challenges to clinical pharmacy practice in Nigerian hospitals: a qualitative exploration of stakeholders' views. *J Eval Clin Pract* 2016; 22: 699–706. https://doi.org/10.1111/jep.12520
11. Vinterflod C, Gustafsson M, Mattsson S et al. Physicians' perspectives on clinical pharmacy services in Northern Sweden: a qualitative study. *BMC Health Serv Res* 2018; 18: 35. https://doi.org/10.1186/s12913-018-2841-3
12. Sin CM, Huynh C, Dahmash D et al. Factors influencing the implementation of clinical pharmacy services on paediatric patient care in hospital settings. *Eur J Hosp Pharm* 2022; 29: 180–6. https://doi.org/10.1136/ejhpharm-2020-002520
13. Onatade R, Appiah S, Stephens M et al. Evidence for the outcomes and impact of clinical pharmacy service: context of UK hospital pharmacy practice. *Eur J Hosp Pharm* 2018; 25: e21–28. http://doi.org/10.1136/ejhpharm-2017-001303
14. Penm J, Moles R, Wang H et al. Factors affecting the implementation of clinical pharmacy services in China. *Qual Health Res* 2014; 24: 345–56. https://doi.org/10.1177/1049732314523680
15. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006; 3: 77–101. https://doi.org/10.1191/1478088706qp063oa
16. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care* 2007; 19: 349–57. https://doi.org/10.1093/intqhc/mzm042
17. Lee IH, Rhie SJ, Je NK et al. Perceived needs of pharmaceutical care services among healthcare professionals in South Korea: a qualitative study. *Int J Clin Pharm* 2016; 38: 1219–29. https://doi.org/10.1007/s11096-016-0355-9
18. Schoeb V. Healthcare service in Hong Kong and its challenges. *China Perspect [Online]* 2016; 4: 51–8. https://doi.org/10.4000/chinaperspectives.7118
19. Food and Health Bureau (The Government of the Hong Kong Special Administrative Region). *Statistics. Domestic Health Accounts – Estimates of Health Expenditure: 1989/90 – 2019/20*. https://www.fhb.gov.hk/statistics/en/dha/dha_summary_report.htm (24 December 2021, date last accessed).
20. World Health Organization. *Global Health Expenditure Database*. https://apps.who.int/nha/database/country_profile/Index/en (24 December 2021, date last accessed).
21. NHS England/Direct Commissioning Change Projects. *Responsibility for Prescribing between Primary, Secondary and Tertiary Care*. 2018. https://www.england.nhs.uk/wp-content/uploads/2018/03/responsibility-prescribing-between-primary-secondary-care-v2.pdf (24 December 2021, date last accessed).
22. de Leon-Castaneda CD, Gutierrez-Godinez J, Colado-Velazquez J et al. Healthcare professionals' perceptions related to the provision of clinical pharmacy services in the public health sector: a case study. *Res Social Adm Pharm* 2019; 15: 321–9. https://doi.org/10.1016/j.sapharm.2018.04.014
23. Bourgeault IL, Mulvale G. Collaborative health care teams in Canada and the USA: confronting the structural embeddedness of medical dominance. *Health Sociol Rev* 2006; 15: 481–95. https://doi.org/10.5172/hesr.2006.15.5.481
24. Brazinha I, Fernandez-Llimos F. Barriers to the implementation of advanced clinical pharmacy services at Portuguese hospitals. *Int J Clin Pharm* 2014; 36: 1031–8. https://doi.org/10.1007/s11096-014-9991-0
25. Zhou M, Desborough J, Parkinson A et al. Barriers to pharmacist prescribing: a scoping review comparing the UK, New Zealand, Canadian and Australian experiences. *Int J Pharm Pract* 2019; 27: 479–89. https://doi.org/10.1111/ijpp.12557
26. Frankel GEC, Austin Z. Responsibility and confidence: identifying barriers to advanced pharmacy practice. *Can Pharm J* 2013; 36: 1031–8. https://doi.org/10.1177/1715163513487309
27. Wenke R, Mickan S. The role and impact of research positions within health care settings in allied health: a systematic review. *BMC Health Serv Res* 2016; 16: 355. https://doi.org/10.1186/s12913-016-1606-0
28. Royal Pharmaceutical Society. *Advanced Practice Framework*. 2013. https://www.rpharms.com/resources/frameworks/advanced-pharmacy-framework-apf (28 December 2021, date last accessed).
29. Forsyth P, Rushworth GF. Advanced pharmacist practice: where is the United Kingdom in pursuit of this 'Brave New World'? *Int J Clin Pharm* 2021; 43: 1426–30. https://doi.org/10.1007/s11096-021-01276-5

Appendix XIII – Study 1 conference abstract

and teaching from this was also included in the teaching programme.

Results Since December 2020, it took six months for the number of incidents due to prescribing errors to reduce from 14 in six months (December 2020-May 2021) to 10 in six months (June-November 2021). Audit results showed that since December 2020 we were scoring >90% in 3 out of the 10 domains. Three months into the teaching programme this improved to 4 out of 10 of the domains and at six months, 6 out of 10 domains. When re-audited with our revised audit tool, we achieved >90% initially in 10 out of 16 domains and then consistently maintained our standards across 11–12 out of 16 domains over a four-month period (October 2021-January 2022).

Conclusions This project has shown that despite a global pandemic, a combination of innovation, education, technology, multidisciplinary skills and MDT working can implement and embed change to improve patient safety. When considering the bigger picture, we recognise this is a small part of the larger systemic processes that can influence medication errors and that with perseverance, we can aim to reduce the risk of adverse events due to medication errors and therefore provide the best care for our patients.

REFERENCES

1. Ghaleb MA, Barber N, Franklin BD, *et al*. The incidence and nature of prescribing and medication administration errors in paediatric inpatients. *Arch Dis Child* 2010;**95**:113–118.
2. Elliot RA, Camacho E, Jankovic D, *et al*. Economic analysis of the prevalence and clinical and economic burden of medication error in England. *BMJ Quality & Safety* 2021;**30**:96–105.
3. RCPCH Paediatric Prescribing Error Audit Tool. https://qicentral.rcpch.ac.uk/medsiq/safe-prescribing/paediatric-prescribing-error-an-audit-tool/

P03 LEFLUNOMIDE TREATMENT FOR INFLAMMATORY BOWEL DISEASE AND INTESTINAL FAILURE CAUSED BY TTC7A DEFICIENCY

Emma Williams. *Cambridge University Hospitals NHS Foundation Trust*

10.1136/archdischild-2023-NPPG.3

TTC7A deficiency Ultra-rare autosomal-recessive variants in tetratricopeptide repeat domain 7A gene (TTC7A) have been discovered in patients presenting with severe intestinal disease. Mutations in the TTC7A gene cause intestinal epithelial and immune defects resulting in apoptotic enterocolitis, multiple intestinal atresia, and recurrent intestinal stenosis. Patients face high mortality rates with palliation as the current standard of care.[1]

Leflunomide In 2020 a high throughput screen identified drugs that increased cell viability in patients with TTC7A; leflunomide reduced caspase 3 and 7 (responsible for cell death) activity in cells by 96%. In zebrafish with disruption of TTC7A, leflunomide restored gut motility, reduced intestinal tract narrowing, and increased intestinal cell survival.[1] From a literature review, only 3 patients in the world have been prescribed leflunomide for TTC7A deficiency with 'encouraging results'.[2] however no case reports have been completed on treatment safety or effectiveness.

A common adverse effect of leflunomide is liver toxicity due to production of a toxic intermediate; however, the reaction appears to be idiosyncratic and unpredictable.[3] Full blood count and liver function tests must be checked before initiation of leflunomide, every two weeks during the first six months of treatment, and every 8 weeks thereafter.[4]

The patient A 7-year-old male on home parenteral nutrition with TTC7A deficiency was admitted to hospital with high ileostomy output and persistent vomiting with a background of mucosal gastrointestinal inflammation and pyloric stenosis. On behalf of the gastroenterology team, the paediatric gastroenterology pharmacist applied for urgent internal funding and clinical governance approval for leflunomide treatment with the aim to ameliorate intestinal disease. Leflunomide 10 mg daily costs £3.11/month. Treatment was approved, the patient and his family were counselled by the pharmacist and the patient began treatment of leflunomide 10 mg via PEG tube daily.

Adverse event After two weeks of treatment the patient's alkaline phosphate (ALP) and Gamma GT (GGT) had doubled and their alanine transaminase (ALT) had increased 10-fold. Advice from the pharmacist was sought. On review of the leflunomide summary of product characteristics[4]: 'Rare cases of severe liver injury, including cases with fatal outcome, have been reported during treatment with leflunomide//If ALT elevations of more than 3-fold the upper limit of normal are present, leflunomide must be discontinued and wash-out procedures initiated.' A decision was made to stop treatment, however a washout procedure with cholestyramine or activated charcoal was not possible as the patient had minimal oral intake due to vomiting. The pharmacist filed a yellow card report.

Follow up The patient's ALT normalised after 3 weeks and GGT after 2 months of treatment cessation. It took 8 months for the patient's ALP to normalise.

Lessons learnt Unfortunately, it was impossible to assess the potential gastrointestinal benefits of leflunomide in this patient due to the rapid onset of significant liver toxicity. Liver toxicity may have been identified sooner if a blood test was taken 1 week after treatment initiation. Monitoring liver function earlier following initiation of leflunomide treatment may be helpful to minimise liver toxicity in patients with TTC7A deficiency.

REFERENCES

1. Jardine S, Anderson S, Babcock S, *et al*. Drug screen identifies leflunomide for treatment of inflammatory bowel disease caused by TTC7A deficiency. *Gastroenterology* 2020;**158**:1000–1015.
2. Cerretani J. Going 'all in' for Khori: new hope for congenital enteropathy [Internet]. Boston Children's Hospital, 2020. [accessed May 2022]. Available from: https://answers.childrenshospital.org/khori-congenital-enteropathy/
3. Nuray Aktay A, Gul Karadag S, Cakmak F, *et al*. Leflunomide in juvenile rheumatoid arthritis. *Future Rheumatol* 2006;**1**(6):673–682.
4. Electronic Medicines Compendium [Internet]. Leflunomide 10 mg film-coated tablets, 2017 [cited May 2022]. Available from: https://www.medicines.org.uk/emc/product/5395/smpc

P04 CLINICAL PHARMACISTS' PERCEPTIONS OF THE BARRIERS AND FACILITATORS TO THE IMPLEMENTATION OF PAEDIATRIC CLINICAL PHARMACY SERVICES IN HONG KONG

Conor Sin, Chi Huynh*, Ian Maidment. *Aston University*

10.1136/archdischild-2023-NPPG.4

Aim To identify barriers and facilitators that influenced the implementation of paediatric clinical pharmacy service (CPS)

in Hong Kong's public hospitals from clinical pharmacists' perspective.

Methods A qualitative study based on semi-structured interviews (SSIs) of clinical pharmacists who practiced in paediatrics in four public hospitals situated in east and central Kowloon of Hong Kong. The questions in the interview schedules were based on previously determined themes identified in paediatric CPSs and were developed through consultations with all researchers.[1 2 4] Pilot testing was performed with three study participants to confirm the coverage and relevance. Participants were given the choice to select either telephone or video conferencing for their SSIs. The interviews were conducted by the principal investigator (PI) in spoken Cantonese. The transcripts were translated into English by the PI, and a sample of the translated transcripts was subsequently checked by the research team for accuracy and to minimise transcriptional error. The transcripts were entered in QSR NVivo v.12 to support data analysis. Two researchers were responsible for the coding process. The resulting topics were organised by thematic analysis. Consensus was reached amongst the researchers for the identification of themes that emerged during the interviews. The Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines were used.[3] Ethical approval for this study was obtained from the research ethics committees of the relevant institutions.

Results Of the 32 clinical pharmacists from across the study sites, 12 were interviewed by telephone that allowed for theoretical data saturation to be reached. Five barriers and three facilitators were identified as main themes. The barriers that were identified which hindered service implementation include the service penetration into the healthcare system, practice environment constraints, lack of affirmation from the administrative stakeholders, governance of the profession, and partnership with universities. The facilitators that were identified which enabled service implementation include other healthcare professionals' trust and confidence in the service, the support from the pharmacy management team, and clinical pharmacists' self-efficacy.

Conclusion The clinical pharmacists interviewed in this study reported that the successful implementation of paediatric CPS in public hospitals in Hong Kong is an area of continued development with several key barriers. The major implementation barriers identified include the availability and coverage of clinical pharmacists for service provision. Nevertheless, clinical pharmacists and healthcare professionals were found to have not only positive attitudes towards CPS but also support from clinical and pharmacy management teams. An enhanced internal and external governance infrastructure within the pharmacy profession would allow for the standardisation of practice and training, which would ultimately help drive the implementation of CPS forward as a whole.

REFERENCES

1. Brazinha I, Fernandez-Llimos F. Barriers to the implementation of advanced clinical pharmacy services at Portuguese hospitals. *International Journal of Clinical Pharmacy* 2014;**36**:1031–1038.
2. Damschroder LJ, Aron DC, Keith RE, *et al*. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implementation Science* 2009;**4**:50 https://doi.org/10.1186/1748-5908-4-50
3. Tong A, Sainsbuty P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care* 2007;**9**:349–57.
4. Onatade R, Appiah S, Stephens M, *et al*. Evidence for the outcomes and impact of clinical pharmacy: context of UK hospital pharmacy practice. *European Journal of Hospital Pharmacy* 2018;**25**:e21–28.

P05 TREATING CHILDREN WITH HCV CLOSE TO HOME THROUGH A VIRTUAL NATIONAL MULTIDISCIPLINARY NETWORK

[1]Kinza Ahmed, [2]Joanne Crook*, [1]Alison Tennant, [3]Penny North-Lewis, [1]Tayebah Abbasi, [1]Carla Lloyd, [1]Maxine Brown, [4]Deirdre Kelly. *[1]Birmingham Women and Children's NHS Foundation Trust; [2]King's College NHS Foundation Trust; [3]Leeds General Infirmary; [4]Liver Unit, Birmingham Women and Children's NHS Foundation Trust*

10.1136/archdischild-2023-NPPG.5

Aim Hepatitis C Virus (HCV) infection is a major global health problem. Direct Acting Anti-viral therapy (DAA) has cure rates of 99% in adults and adolescents.[1] DAAs were licensed for children 3 – 12 years during the recent coronavirus pandemic. In order to ensure equitable access and a safe, effective and convenient supply of these medications during lockdown, we established a virtual national treatment pathway for children with HCV in England and evaluated its feasibility, efficacy and treatment outcomes.

Method A paediatric Multidisciplinary Team Operational Delivery Network (pMDT ODN), supported by NHS England (NHSE), was established with relevant paediatric specialists, including pharmacists, to provide a single point of contact for referrals and information. Referral, treatment protocols and family friendly patient information were developed for all HCV therapy. On referral the pMDT ODN discussed and agreed the most appropriate DAA therapy based on clinical presentation and patient preferences, including ability to swallow tablets. Treatment was then prescribed and supplied in association with the local paediatrician and pharmacist, without the need for families to travel to national centres. All children were eligible for NHS funded therapy, each referring centre was approved by the pMDT ODN, prior to approval to dispense medication and funds were reclaimed via Blueteq authorisation. Demographic, clinical and social data was collected, and treatment outcomes were recorded. Feedback on feasibility and satisfaction on the pathway and supply of medication was sought from referrers.

Results 34 children were referred during the first six months; median (range) age 10 (3.9 – 14.5) years; 15M; 19F: Majority of referrals are HCV genotype type 1 (n=17) and 2 (n=12). DAA treatments prescribed: Sofosbuvir/Ledipasvir (n=21); Sofosbuvir/Velpatisvir (n=11) Glecaprevir/Pibrentasvir (n=2).

27/34 confirmed as able to swallow tablets; 3/7 have received training and are now able to successfully swallow tablets; 4/7 are awaiting release of granules. All children who have completed treatment to date (11/27) have cleared virus at the end of treatment. Once the network was established, referrers found the virtual process easy to access. They valued being able to discuss their patients with the MDT providing a single point of contact with national specialists to discuss therapy. Specialist pharmacists within the pMDT were able to provide pharmaceutical information and support local Trusts to ensure safe, timely and funded supply of medication to children. There were three reported dispensing errors, where adult strength tablets were dispensed in error locally, however no doses were taken as parents noticed the error prior to giving a dose. A delay in availability of the granule or pellet formulations due to manufacturing delays during COVID, has meant a delay in referring and treating those children unable to swallow tablets.

Conclusion Pharmacists were a valuable resource within the National HCV Paediatric MDT Operational Delivery Network.

Appendix XIV – Study 2 publication

Original research

Physicians' and nurses' perceptions of the factors influencing the implementation of paediatric clinical pharmacy services in Hong Kong: a qualitative study

Conor Ming-Ho Sin [1,2], Chi Huynh [1], Ian D Maidment [1]

► Additional supplemental material is published online only. To view, please visit the journal online (http://dx.doi.org/10.1136/ejhpharm-2023-003796).

[1]Aston Pharmacy School, College of Health and Life Sciences, Aston University, Birmingham, UK
[2]Pharmacy Department, United Christian Hospital, Kwun Tong, Kowloon, Hong Kong

Correspondence to
Conor Ming-Ho Sin, Aston Pharmacy School, College of Health and Life Sciences, Aston University, Birmingham, B4 7ET, UK; scm096@ha.org.hk

Received 6 April 2023
Accepted 24 July 2023

EAHP Statement 4: Clinical Pharmacy Services.

ABSTRACT

Objectives To identify barriers and facilitators that influence the implementation of paediatric clinical pharmacy services in Hong Kong public hospitals from physicians' and nurses' perspectives.

Methods A qualitative study was conducted based on semistructured interviews of physicians and nurses who worked in the field of paediatrics in four public hospitals in Hong Kong. Interviews were held via telephone conversations using spoken Cantonese which were audio recorded, then translated and transcribed directly into English by the research team. Thematic analysis was used for data analysis and reflexivity was engaged through member checking, making field notes and reporting using the Consolidated Criteria for Reporting Qualitative Studies checklist.

Results A total of six barriers and five facilitators were identified from interviewing 17 participants, which included 7 physicians and 10 nurses. The barriers identified were the public's lack of understanding and recognition of clinical pharmacists, a culture of medical dominance, lack of resources and heavy workload, the need for a more transparent and defined role of clinical pharmacist at the institutional level, lack of proactive approach and involvement in direct patient care activities. The facilitators identified were the belief in the improvement of patient outcomes and the overall pharmaceutical service efficiency, trust and confidence in clinical pharmacy services, filling the clinical gap as a medicine information provider, and direct and coherent communication as a multidisciplinary team member.

Conclusions Physicians and nurses reported that the implementation of paediatric clinical pharmacy services was adequate, but several key barriers were identified at both the external and internal levels.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Evidence on the benefits of paediatric clinical pharmacy services was shown across the literature but most studies were conducted in controlled settings. How these interventions can be translated into the healthcare system was typically not investigated and thus the research-to-practice gaps were usually not addressed.

WHAT THIS STUDY ADDS

⇒ Our results have helped to fill in a gap in research by the use of a rigorous qualitative methodology, thus promoting the systematic uptake of research findings into practice.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This research has identified evidence-informed implementation factors which enable stakeholders to develop appropriate strategies to enhance the implementation of paediatric clinical pharmacy services in public hospitals in Hong Kong.

INTRODUCTION

The implementation of clinical pharmacy services (CPSs) within a healthcare setting is a challenging and complex process influenced by multiple factors including the perceptions of physicians and nurses.[1–3] Al-Arifi and colleagues identified factors such as the belief and expectation of the service, the work environment, and the collaboration between clinical pharmacists and other healthcare professionals that influence CPS implementation in different ways.[4]

Although the positive impact of CPSs on clinical, economic and humanistic outcomes has been demonstrated across the literature, most of these studies were conducted in controlled settings. How these interventions can be translated into the real world were not investigated and therefore the research-to-practice gaps were usually not addressed.[5]

Hong Kong is still in the early stages of clinical pharmacy development, with the public hospitals implementing CPSs for their paediatric patients, which are known to be at higher risk of harm resulting from medication errors.[6 7] While research has highlighted that the development of Hong Kong's CPS programme is hindered by resource limitations and the overwhelming workload of clinical pharmacists, formative evaluations of how well the CPS has been implemented are lacking.[8] Therefore, the exploration of the views of other healthcare professionals could help to assess the extent to which CPSs have been implemented.

Aim

To identify the factors that have influenced the implementation of hospital paediatric CPSs in Hong Kong from the perspectives of physicians and nurses.

METHODS

Study design

A qualitative approach was used for this study as it allows for a rich understanding of complex intervention such as the implementation of a healthcare service. Qualitative research has been performed in pharmacy practice research in order to provide explanations for

To cite: Sin CM-H, Huynh C, Maidment ID. *Eur J Hosp Pharm* Epub ahead of print: [*please include* Day Month Year]. doi:10.1136/ejhpharm-2023-003796

and understanding of a broad range of phenomena in this area.[9] The methodology of this study was informed by an earlier publication from the same research team with clinical pharmacists.[10] Semistructured interviews (SSIs) were used for data collection, with the interview guide developed from the themes and subthemes identified in systematic reviews identifying factors in both adult and paediatric CPSs (see online supplemental file).[11 12] As all researchers agreed that no amendments were required after pilot testing the guide with three participants, the data were included in the analysis.

Participants and recruitment

All physicians and nurses, with a workforce estimated at more than 300 staff, who worked in the field of paediatrics in four participating public hospitals (ie, Hong Kong Children's Hospital, Kwong Wah Hospital, Tseung Kwan O Hospital and United Christian Hospital) situated in the east and central Kowloon in Hong Kong, were invited to take part in this study. The target number of participants was estimated to be between 10 and 15, and this was based on the average sample size required to achieve data saturation reported by other studies.[13] Participants were selected using purposeful maximum variation sampling. Invitation emails, including an information sheet and consent form (see online supplemental file), were sent to each subgroup within the group directory via an internal emailing system.

Data collection

The interviews were conducted by the principal investigator (PI) in Cantonese to optimise the participants' range of expression. The PI was trained in conducting SSIs from the completion of a certified course in qualitative research organised by Bristol Medical School, University of Bristol.[14] The interviews were audio recorded, then translated and transcribed directly into English by the PI. CH, a member of the research team fluent in Cantonese, subsequently checked three of the translated transcripts for accuracy. QSR NVivo V.12 (QSR International, Australia) was used to facilitate the analysis process.

Participants had a choice to select either video conferencing (Zoom Video Communications, USA) or telephone for their SSIs, owing to the social distancing restrictions imposed by the local government due to the COVID-19 pandemic. An inductive thematic data saturation approach was employed. This approach focuses on the identification of new themes and is based on the quantity of such themes rather than the completeness of existing theoretical categories.[15] Thematic saturation is said to be achieved when further observations and analysis reveal no new theme can be derived from the dataset.[16]

Data analysis and reporting

Thematic analysis was used for exploring and interpreting patterned meaning across the dataset. As described by Braun and Clarke, it is an iterative process which involves six phases: becoming familiar with the data; generate initial codes or categories for placement of themes; collate codes into potential themes; review themes in relation to the coded extracts and dataset; define the themes and produce the write-up.[16] CM-HS was responsible for the coding process, with CH coding 20% of the total transcripts. Discrepancies found between the two sets of coding were resolved upon discussion among the two researchers, and a consensus was reached among the whole research team. The researchers have engaged in reflexivity through member checking, making field notes and reporting the study using the Consolidated Criteria for Reporting Qualitative Studies checklist.

RESULTS

A total of 25 paediatric physicians and nurses across four study sites agreed to participate in the study and 17 were interviewed by telephone which allowed reaching thematic data saturation. This included 7 physicians and 10 nurses. The interview duration ranged from 11 to 30 min (M=20; SD=5.73). Table 1 shows the demographic details of the physician and nurse participants.

There were six barriers and five facilitators that were identified and categorised as subthemes, and the quotes linked to each category were attributed to the relevant anonymised interview participant. These themes and subthemes are outlined in table 2.

Barriers

Public understanding and recognition of clinical pharmacists

Participants commented that the general population in Hong Kong was not clear about the role of clinical pharmacists, as pharmacists are typically portrayed as medicine suppliers. Some identified a causality dilemma between the recognition of clinical pharmacists and professional autonomy. They contended that pharmacists' status as a healthcare professional was

Table 1 Characteristics of physician and nurse participants in this study

Key	Study site	Gender	Years of experience in paediatrics	Subspecialty	Interview duration (min)
Physician 1	Hospital C	M	>10	Oncology and haematology	18
Physician 2	Hospital C	M	>10	Paediatric intensive care unit	15
Physician 3	Hospital B	M	>10	Oncology and haematology	11
Physician 4	Hospital C	M	5–10	Gastroenterology	20
Physician 5	Hospital A	M	>10	General paediatrics	16
Physician 6	Hospital A	M	5–10	General paediatrics	25
Physician 7	Hospital A	F	5–10	Neonatal intensive care unit	23
Nurse 1	Hospital A	F	5–10	General paediatrics	13
Nurse 2	Hospital C	F	>10	Oncology and haematology	18
Nurse 3	Hospital D	F	<5	General paediatrics	30
Nurse 4	Hospital D	F	5–10	General paediatrics	17
Nurse 5	Hospital B	F	<5	General paediatrics	15
Nurse 6	Hospital A	F	>10	General paediatrics	28
Nurse 7	Hospital D	F	5–10	General paediatrics	13
Nurse 8	Hospital A	F	>10	Paediatric intensive care unit	28
Nurse 9	Hospital A	F	5–10	Neonatal intensive care unit	25
Nurse 10	Hospital A	F	>10	Neonatal intensive care unit	23

Table 2 Summary of themes and subthemes identified

Barriers	Facilitators
Related to external bodies including the public and government ► Public understanding and recognition of clinical pharmacists ► A culture of medical dominance	Related to the patients ► Improvement of patient outcomes ► Improvement of the overall pharmaceutical service efficiency
Related to the organisation and institutions ► Lack of resources and heavy workload including clinical and dispensing duties ► The need for a more transparent and defined role of clinical pharmacists at institutional level	Related to the healthcare team ► Trust and confidence in the CPS ► Filling the clinical gap as a medicine information provider ► Direct and coherent communication as a multidisciplinary team member
Related to clinical pharmacists ► The need to have a more proactive approach ► Lack of involvement in direct patient care activities	

CPS, clinical pharmacy service.

negatively affected due to the lack of supportive legislation, such as prescribing rights. However, some participants highlighted that the public have to understand the importance of clinical pharmacists before related legislation can be enacted:

> I think the public or the community needs to be aware of this [CPS] and to accept this. They need to know that the benefits would bring with clinical pharmacists' involvement… and from that, we can perhaps explore the opportunity on the legislation level. (P4)

A culture of medical dominance

Participants remarked that medical dominance is based on traditional values embedded in the culture. However, medical and nursing participants gave different reasons for the resistance to change. Some physicians believed that the barrier was underpinned by cultural aspects that disfavour the empowerment of clinical pharmacists' role in medicines management, largely due to the public viewpoint which was interlinked with the public's understanding of the profession. However, some nurses revealed that physicians might have some resistance toward CPSs as they might be threatened by the increasing power of clinical pharmacists:

> … I feel that as a whole picture doctors would think that patient management is their job, and they should be managing the whole care… why should clinical pharmacist stake parts of their clinical roles away? (N2)

Lack of resources and heavy workload including clinical and dispensing duties

The general perception of both professions was that the current manpower of CPSs has already stretched to its limit. Participants identified that the lack of clinical pharmacists was a major factor that limited service implementation, as a high patient-to-pharmacist ratio and coverage of multiple wards were highlighted. Some participants felt that clinical pharmacists were also constrained by their dispensing duties, thus affecting their time in the wards. They reflected that these limitations have a knock-on effect on the quality and extent of service provision.

The need for a more transparent and defined role of clinical pharmacists at institutional level

Generally, members of both disciplines found it difficult to describe the scope of a paediatric CPS. Some participants expressed that they were not aware of CPS until their paediatric rotation because it is not uniformly implemented across all specialties and institutions. They expressed that the organisation and its hospitals should take a leading role in informing physicians and nurses on the role of clinical pharmacists in order for the service to be implemented successfully. Some participants also mentioned that healthcare professional bodies can help to achieve this.

The need to have a more proactive approach

Although the implementation was supported by the recognition of clinical pharmacists' activities by physicians and nurses, some felt that the implementation can be more successful if clinical pharmacists are more proactive:

> I do feel that they should have more authority in the medications used… to have more decision making, letting us know how to use drugs properly… rather than a more passive role as currently, they would need to approach us on dosage adjustments… (P4)

Other areas in which participants wished clinical pharmacists could involve more include the participation of multidisciplinary meetings and the provision of teaching sessions. Additionally, drug counselling was viewed as one of the most important clinical services provided by clinical pharmacists, but clinical pharmacists only counsel patients or their parents upon referral by physicians or nurses. Many participants expressed that the ideal situation would be when the service is initiated by the clinical pharmacists.

Lack of involvement in direct patient care activities

Participants reflected that direct patient care activities, such as providing drug counselling, are an important aspect of the CPS. Physicians believe that through drug counselling by clinical pharmacists, parents gained a better understanding of medicines for their children. Some participants believed that the implementation was influenced by the observation that clinical pharmacists' input has improved medication compliance. However, many participants expressed the view that clinical pharmacists were not as involved in direct patient care activities as they anticipated:

> I have had some cases where they [clinical pharmacists] would provide drug education to the parents… but it's not often… it's good because they are the expert on drugs and I would think it is better if they can speak with the parents more. (N3)

Participants also expressed that the implementation of direct patient care services is limited to the hospitalisation period currently and it should be extended to post-discharge so that there is a continuity of care.

Facilitators

Improvement of patient outcomes

Participants believe that the involvement of clinical pharmacists performing their duties has improved patient outcomes and that the successful experience in the implementation of current CPS has become a facilitator for further service implementation. Some participants think that the service helps patients and their parents better understand their medications, such as their indications and precautions, which in turn improved medication adherence or concordance. Additionally, participants commented that clinical pharmacists helped to improve the safety of medicine use in children, which was perceived to pose a high risk of error:

> … there's always involvement in calculations when prescribing drugs for children… there is more variation in dosages… and therefore they [clinical pharmacists] are very important. (N5)

Improvement of the overall pharmaceutical service efficiency

Physicians and nurses believe that the CPS has made the overall pharmaceutical service more efficient because they can interact directly with a representative of the pharmacy department.

Furthermore, with the clinical pharmacists being based on the wards, they possess a more direct and thorough picture of patients' clinical needs, which supported the prompt implementation of any queries or drug-related issues. Participants also remarked that one role of clinical pharmacists was to act as a liaison to communicate with the pharmacy, thus facilitating the supply process and saving a lot of time and effort.

Trust and confidence in the CPS

Participants reported that they trust clinical pharmacists, believing them to possess highly specialised skills and knowledge, which helps the participants to provide optimal patient care management:

> I think they use their expert knowledge as pharmacists... I think that the knowledge that clinical pharmacists possess is quite different from that of physicians. (P4)

With healthcare professionals trusting clinical pharmacists, their confidence in the CPS was demonstrated as a result. Some participants were confident that clinical pharmacists in Hong Kong could provide advanced services similar to those of other countries with more developed CPSs.

Filling the clinical gap as a medicine information provider

Generally, both physicians and nurses showed appreciation for clinical pharmacists providing them with medicine information that facilitates their clinical practice. Information provided that was reported frequently by physicians to support CPS implementation includes reviewing medicine regimens, performing literature searches, and providing information and the procurement of new pharmaceutical products. Nursing participants believed that the provision of practical information such as drug formulation and administration methods has enhanced the safety of their nursing practice.

Direct and coherent communication as a multidisciplinary team member

Physicians valued the participation of clinical pharmacists in medical rounds, where they have ad hoc discussions on medicine management with clinical pharmacists. They believe that direct communication forms a rapport between healthcare professionals:

> ...now we know which clinical pharmacist is following the cases, and this has increased the level of communication... this is more direct. (P1)

Physicians also believed that direct communication has formed a good working relationship between healthcare professionals in which they can learn and support each other. In contrast, nurses valued having direct communication with clinical pharmacists as some pointed out that this has made the health service more efficient, thus benefiting the patients.

DISCUSSION

The results from this study confirmed that several facilitators enabled the implementation of paediatric CPS in Hong Kong, one of which is the perception that clinical pharmacists could improve patient outcomes. Their view was concordant with evidence across the literature.[17 18] Furthermore, a certain level of trust in clinical pharmacists was shown by both physicians and nurses which was another factor in a successful implementation.[19]

The involvement of clinical pharmacists is believed to improve interprofessional communication, which is a prerequisite for collaborative practice.[20] Their contribution to multidisciplinary teams helps to create a sense of belonging among their members in coordination, cooperation and decision-making.[21] Members of both disciplines believed that the service helps provide relief for counselling and medicine information, thereby allowing them to focus on other aspects of their work. Participants also believed that clinical pharmacists were in a better position to provide medication counselling due to their expertise in this specialised area, which is thought to improve patient outcomes and also results in better adherence to medications.[22]

There are several barriers identified from this study. First, the public in Hong Kong was perceived not to understand the role of clinical pharmacists and this negatively impacted the implementation of CPS, since patients' attitudes and expectations of CPSs could influence policymakers' decisions on healthcare legislation that determines the functionality of professional services.[23] Additionally, the clarification of clinical pharmacists' roles within multidisciplinary teams could help to enhance the effectiveness of CPS in patient care, thus facilitating its implementation.[24]

Another associated barrier that was identified is the culture of medical dominance, and this is consistent with the literature reporting healthcare services in Hong Kong.[25] Participants from both healthcare professions confirmed this issue, as they explained that the traditional and cultural values place physicians at the top of the professional hierarchy. Studies have confirmed a striking dominance of hierarchical culture in Hong Kong's public hospitals.[26]

One of Hong Kong's prevailing problems is its shortage of healthcare professionals, and the challenges for clinical pharmacists were found to be due to limited resources and their engagement in medication supply duties. Hospital pharmacists in Hong Kong have always been heavily involved in medical supply, and a survey conducted in 2008 found that drug distribution constituted about 55.5% of pharmacist activities.[8] Although that survey was conducted some years ago, the lack of separation between the clinical and supply roles was still present in our data.

As suggested by the participants, one way to improve the service implementation is for clinical pharmacists to proactively engage in more direct patient care activities, which is a concept advocated by the American College of Clinical Pharmacy.[27] Studies found that healthcare professionals considered clinical pharmacists' proactive communication with patients as an essential factor to enhance patient care.[24] The implementation of a successful direct patient care service not only helps achieve better patient-related outcomes but could also improve the public's and other healthcare professionals' recognition of clinical pharmacists as healthcare providers, thus establishing their unique role within the healthcare system in Hong Kong.

The results of this study needed to be interpreted with caution in light of some limitations. Although thematic data saturation was reached, the selection of participants was not as widely diversified as desired due to low participation rate in some study sites. This could affect the richness of the dataset and consequently the number of themes identified. In order to achieve this, strategies to increase the participation rate from those sites and recruitment of additional participants across more study sites would be ideal. Furthermore, the use of theoretical rather than thematic data saturation approach would mean more participants to be interviewed, as it focuses on the depth of research data which could yield more constructs about the emerging grounded theory. However, we were unable to use this approach due to the limitation in resources such as time, number of interviewers and PI's experience in qualitative research. Another limitation to note was that the second coder was only able to code a portion of the transcripts due to other work commitment. This

might affect the consistency of interpretations or the range of concepts that could be developed from the dataset. Lastly, the interview method might have affected the results in several ways. The inability to read non-verbal language with telephone interviews may have an impact on the interpretation of the data. In addition, in-person interviews may provide visual access to the interviewee's environment allowing the researcher to collect key contextual data which video or telephone interviews may not be able to capture. Another perceived disadvantage with telephone or video interviews is the lack of a 'natural encounter' for the interviewer to build rapport with interviewees, thus making it more difficult in stimulating interviewees to speak openly and freely on selected topics.

CONCLUSION

The physicians and nurses interviewed in this study reported that the successful implementation of paediatric CPSs in public hospitals in Hong Kong is an area for continued development with several key barriers. The major implementation barriers identified include the understanding of clinical pharmacists' roles both externally and internally, the culture of medical dominance, the dearth of resources and the lack of direct patient care activities. Nevertheless, healthcare professionals in general appear to have positive attitudes toward the service, as trust in clinical pharmacists was established with their roles as medicine information providers and as part of multidisciplinary teams helping to facilitate the implementation of the CPS, and the result was thought to be an overall improvement in patient outcomes.

Acknowledgements The authors thank Moon Cheung and Cherry Lam for their efforts as principal investigators at study sites and all physicians and nurses who took part in this study.

Contributors CM-HS acted as the guarantor and principal investigator for this research and was responsible for the study design, data collection including the translation of data and preliminary coding, data analysis and wrote the manuscript. CH was responsible for the study design, reviewed the transcriptions and coding process and provided comments for the manuscript. IDM supervised the project and contributed to the final version of the manuscript.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not required.

Ethics approval This study involves human participants and ethical approval for this study was obtained from the research ethics committees of the relevant institutions (HKCH-REC-2021-031 (September 2021), KC/KE-21-0089 (June 2021) and 1741 Aston University (March 2021)). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data are available.

ORCID iDs
Conor Ming-Ho Sin http://orcid.org/0000-0002-2125-1672
Chi Huynh http://orcid.org/0000-0001-6982-6642

REFERENCES

1 Chevalier B, Neville HL, Thompson K, *et al*. Health care professionals' opinions and expectations of clinical pharmacy services on a surgical ward. *Can J Hosp Pharm* 2016;69:439–48.
2 Håkansson Lindqvist M, Gustafsson M, Gallego G. Exploring physicians, nurses and ward-based pharmacists working relationships in a Swedish inpatient setting: a mixed methods study. *Int J Clin Pharm* 2019;41:728–33.
3 Somers A, Claus B, Vandewoude K, *et al*. Experience with the implementation of clinical pharmacy services and processes in a University hospital in Belgium. *Drugs Aging* 2016;33:189–97.
4 Al-Arifi MN, Alghamdi B, Al-Saadi M, *et al*. Attitudes and perceptions of healthcare providers towards clinical pharmacy services at a tertiary care hospital in Riyadh, Saudi Arabia. *Trop J Pharm Res* 2015;14:913.
5 Drovandi A, Robertson K, Tucker M, *et al*. A systematic review of clinical pharmacist interventions in paediatric hospital patients. *Eur J Pediatr* 2018;177:1139–48.
6 Maaskant JM, Vermeulen H, Apampa B, *et al*. Interventions for reducing medication errors in children in hospital. *Cochrane Database Syst Rev* 2015;3:CD006208.
7 Wong ICK, Wong LYL, Cranswick NE. Minimising medication errors in children. *Arch Dis Child* 2009;94:161–4.
8 Lee CP. Health care system and pharmacy practice in Hong Kong. *Can J Hosp Pharm* 2018;71:140–8.
9 Baumbusch J. Semi-structured interviewing in practice-close research. *J Spec Pediatr Nurs* 2010;15:255–8.
10 Sin C-H, Huynh C, Maidment ID. Clinical pharmacists' perceptions of the barriers and facilitators to the implementation of paediatric clinical pharmacy services in Hong Kong. *Int J Pharm Pract* 2022;30:466–71.
11 Sin C-H, Huynh C, Dahmash D, *et al*. Factors influencing the implementation of clinical pharmacy services on paediatric patient care in hospital settings. *Eur J Hosp Pharm* 2022;29:180–6.
12 Onozato T, Francisca Dos Santos Cruz C, Milhome da Costa Farre AG, *et al*. Factors influencing the implementation of clinical pharmacy services for hospitalized patients: a mixed-methods systematic review. *Res Social Adm Pharm* 2020;16:437–49.
13 Onatade R, Appiah S, Stephens M, *et al*. Evidence for the outcomes and impact of clinical pharmacy: context of UK hospital pharmacy practice. *Eur J Hosp Pharm* 2018;25:e21–8.
14 Britsol Medical School, University of Bristol. Introduction to qualitative research methods. n.d. Available: https://www.bristol.ac.uk/medical-school/study/short-courses/courses/qualitative-research-methods/
15 Saunders B, Sim J, Kingstone T, *et al*. Saturation in qualitative research: exploring its conceptualization and operationalization. *Qual Quant* 2018;52:1893–907.
16 Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006;3:77–101.
17 Vinterflod C, Gustafsson M, Mattsson S, *et al*. Physicians' perspectives on clinical pharmacy services in northern Sweden: a qualitative study. *BMC Health Serv Res* 2018;18:35.
18 Omar NE, Elazzazy S, Abdallah O, *et al*. Perceptions and expectations of health care providers towards clinical pharmacy services at a tertiary cancer centre in Qatar. *J Oncol Pharm Pract* 2020;26:1086–96.
19 Shanika LGT, Wijekoon CN, Jayamanne S, *et al*. Acceptance and attitudes of healthcare staff towards the introduction of clinical pharmacy service: a descriptive cross-sectional study from a tertiary care hospital in Sri Lanka. *BMC Health Serv Res* 2017;17:46.
20 Luetsch K, Rowett D. Developing interprofessional communication skills for pharmacists to improve their ability to collaborate with other professions. *J Interprof Care* 2016;30:458–65.
21 Rahayu SA, Widianto S, Defi IR, *et al*. Role of pharmacists in the interprofessional care team for patients with chronic diseases. *J Multidiscip Healthc* 2021;14:1701–10.
22 Chandrasekhar D, Mohanlal SP, Mathew AC, *et al*. Impact of clinical pharmacist managed patient counselling on the knowledge and adherence to antiepileptic drug therapy. *Clin Epidemiol Glob Health* 2020;8:1242–7.
23 Trein P, Fuino M, Wagner J. Public opinion on health care and public health. *Prev Med Rep* 2021;23:101460.
24 Alsuhebany N, Alfehaid L, Almodaimegh H, *et al*. Attitude and perception of physicians and nurses toward the role of clinical pharmacists in Riyadh, Saudi Arabia: a qualitative study. *SAGE Open Nurs* 2019;5.
25 Schoeb V. Healthcare service in Hong Kong and its challenges. *Chinaperspectives* 2016;2016:51–8.
26 Andres EB, Song W, Schooling CM, *et al*. The influence of hospital accreditation: a longitudinal assessment of organisational culture. *BMC Health Serv Res* 2019;19:467.
27 American College of Clinical Pharmacy. Standards of practice for clinical pharmacists. *Pharmacotherapy* 2014;34:794–7.

Appendix XV – Study 2 – conference poster presentation

Physicians' and nurses' perceptions on the implementation of paediatric clinical pharmacy services

Aston University BIRMINGHAM UK | Pharmacy School | HOSPITAL AUTHORITY

Conor Ming-Ho Sin[1,2], Ian D Maidment[1], Chi Huynh[1]

[1]Aston Pharmacy School, College of Health and Sciences, Aston University, Birmingham, UK.
[2]United Christian Hospital, 130 Hip Wo Street, Kwun Tong, Kowloon, Hong Kong.
Email: sincm@aston.ac.uk / scm096@ha.org.hk

NPPG Poster

Introduction

- It is evidential that clinical pharmacy services (CPSs) help achieving medication optimisation by ensure the clinical and cost-effectiveness of medicines, thereby reducing adverse drug events, medication errors, mortality rates, and costs [1].
- The implementation of CPSs within a healthcare setting is a challenging and complex process influenced by multiple factors, such as the perceptions of physicians and nurses.
- The degree of CPS implementation varies at the international level, as studies have highlighted that the implementation of advanced CPSs is more successful in high-income countries [2].
- While research has highlighted that the development of Hong Kong's CPS programme is hindered by resource limitations and the overwhelming workload of clinical pharmacists, formative evaluations of how well the CPS has been implemented are lacking.

Aim

- The aim of this qualitative research is to identify from the perspective of hospital physicians and nurses: facilitators and barriers that influence the implementation of hospital paediatric CPSs in Hong Kong.

Ethics approval

- Ethical approval for this study was obtained from the research ethics committees of the relevant institutions (HKCH-REC-2021-031 [Sep 2021], KC/KE-21-0089 [Jun 2021], and 1741 Aston University [Mar 2021].

Method

Study Design Semi-structured interviews were used for data collection, with the interview guide developed based on factors identified in paediatric CPSs [3]. All researchers agreed that no amendments were required after pilot testing the guide with three participants and therefore the data were included in the analysis.

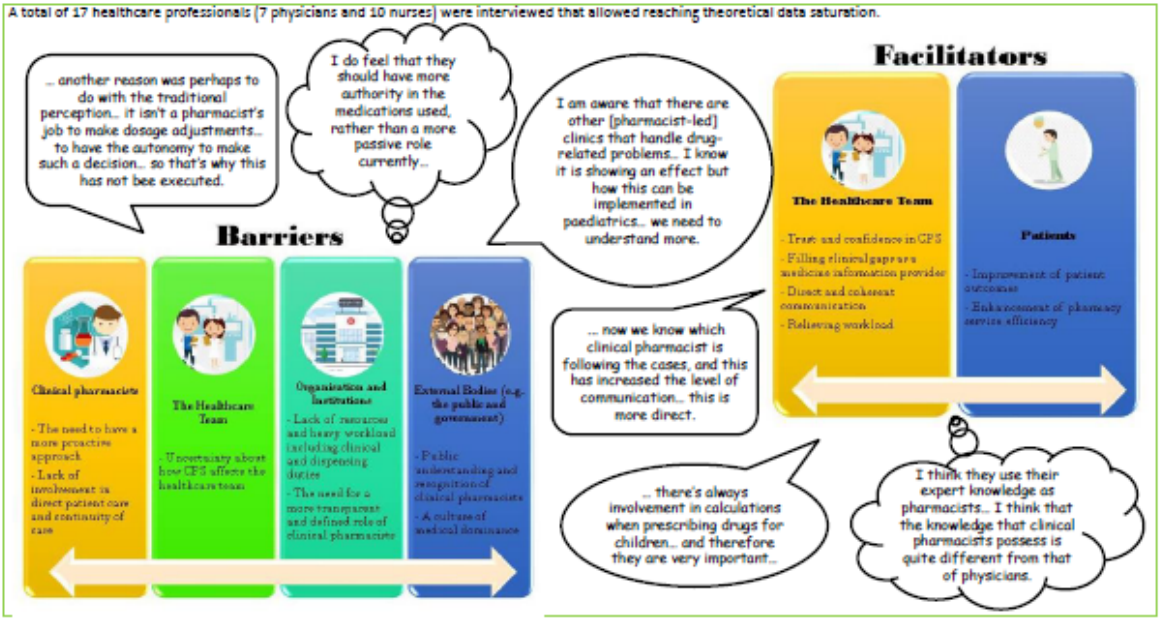
Participants All physicians and nurses who worked in the field of paediatrics in four participating public hospitals (Hong Kong Children's Hospital, Kwong Wah Hospital, Tseung Kwan O Hospital, and United Christian Hospital) situated in the east and central Kowloon in Hong Kong, were invited. Participants were selected using cluster sampling. Invitation emails, including the information sheet and consent form, were sent to each subgroup directory via internal emailing system.

Data Collection The interviews were audio recorded, then translated and transcribed directly into English by the Principal Investigator (CS). CH, a member of the research team fluent in Cantonese, subsequently checked a sample of the translated transcripts for accuracy. QSR Nvivo v12 was used to facilitate the analysis process. Participants could choose between video conferencing or telephone for their interviews. An inductive thematic saturation was employed with a focus on the emergence of new codes.

Data Analysis Thematic analysis was used for exploring and interpreting patterned meaning across dataset. The researchers have engaged in reflexivity through member checking, making of field notes, and reporting the study using the COREQ checklist.

Results

A total of 17 healthcare professionals (7 physicians and 10 nurses) were interviewed that allowed reaching theoretical data saturation.



Conclusion

- The physicians and nurses interviewed reported that the successful implementation of paediatric CPSs in public hospitals in Hong Kong is an area of continued development with several key barriers.
- Both physicians and nurses in general appear to have positive attitudes toward the CPS, as trust in clinical pharmacists was established with their roles as medicine information providers and as part of multidisciplinary teams helping to facilitate the implementation of CPS, and the result was thought to be an overall improvement in patient outcomes.
- The major barriers identified include the understanding of clinical pharmacists' roles both externally and internally, and the culture of medical dominance.

References [1] Anderson SV, Schumock GT. Evaluation and justification of clinical pharmacy services. *Expert Rev Pharmacoeconomics Outcomes Res.* 2009; 9: 539-45. [2] LeBlanc JM, Seoane-Vazquez E, Dasta JF. Survey of hospital activities outside of United States. *Am J Heal Syst Pharm.* 2007; 16: 1748-55. [3] Sin CMH, Huynh C, Dahmash D, et al. Factors influencing the implementation of clinical pharmacy services on paediatric patient care in hospital settings. *Eur J Hosp Pharm.* 2022; 29: 180-6.