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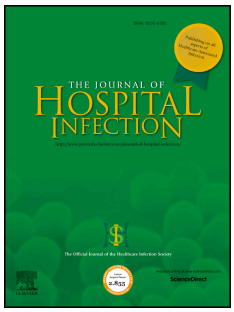

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The drugs don't work: evaluation of educational theatre to gauge and influence public opinion on antimicrobial resistance

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Summary

Increased public awareness of antimicrobial resistance (AMR) is a key component of effective antimicrobial stewardship strategies. Educational theatre combined with an expert panel was used to engage the public about AMR through delivery of a play entitled "The drugs don't work". Audience knowledge and understanding of AMR were measured by pre- and post-play questionnaire. Delivery of the play and discussion with the expert panel significantly improved audience knowledge and understanding of AMR, including antibiotic misuse and prescribing. Educational theatre provides a positive learning experience and is an innovative method of public engagement to disseminate important public health messages.

Key Words

Educational theatre, antimicrobial resistance, health education, public engagement

Introduction

Antimicrobial resistance (AMR) is a global problem in the 21st century. Equipping the public with a better comprehension of AMR, correct antibiotic use and problems associated with antibiotic misuse, for example how and when to take antibiotics, could play an important role in effective antimicrobial stewardship.[1-3] Antibiotic awareness campaigns conducted at national, European and global levels have promoted better public awareness of AMR through communication using factsheets, posters, videos, social media and interactive games. The 'active ingredients' of interventions targeting the public's engagement with AMR and how they might work have been analysed by McParland *et al*.[4] They reported that only 15% of behaviour change techniques have been applied in AMR interventions, thus providing a clear opportunity for the development of novel interventions in this context. Theatre performance is an alternative educational campaign for increasing public awareness of health issues such as HIV/AIDS [5] and smoking.[6] We explored the value of this approach to increase public awareness of AMR. A three-act play entitled "The drugs don't work" was written to highlight important issues surrounding antibiotics and the consequences of their misuse. The three acts covered the public's unrealistic expectations of antibiotics, misuse and misconceptions of the efficacy of antibiotics, and the consequences and impact of resistance. Issues raised in the play were

discussed through dialogue between an expert panel and the audience between each act. The objectives of the study reported here were to assess the knowledge and understanding of AMR of members within the general public and the impact of educational theatre combined with an expert panel on raising awareness of this global issue.

Methods

The play was written, produced and presented in collaboration with the Hobgoblin Theatre Company, a national touring theatre company specialising in provision of original educational theatre (visit http://www.hobgoblintheatrecompany.co.uk). The script was developed with reference to the Antibiotics-e-Bug young adult educational resource documents for 15-18 year old students following the UK key stages 4 and 5 in science relating to AMR.[7] The play presented a fictional scenario in which a pop music singer developed a sore throat before a live performance. In the first act she sought, and subsequently received a course of antibiotics as treatment. This first act illustrated the issues surrounding the unrealistic expectations and public demand for antibiotics, for treatment of a respiratory infection most likely to be of viral origin. The second act investigated attitudes towards the correct use of antibiotics. After a successful performance the character felt better and decided not to continue with the course of antibiotics. The final act explored the possible consequences of unnecessary use and poor compliance on the use of antibiotics. One year after the sore throat incident, while on a world tour, the character acquired a serious gastrointestinal infection that failed to respond to all available antibiotics. This raised key questions on antibiotic resistance concerning what or who was responsible. Was

the outcome the direct result of the character's demand for antibiotics to treat a trivial infection and her failure to follow instructions on their use? These issues were explored with the audience through discussion with members of an expert panel between each act and following the presentation of the play. The panel comprised clinical and medical microbiologists, pharmacists, biochemical engineers and social scientists.

The play was presented on three separate occasions: to school and family audiences at two workshops held at the Birmingham Think Tank Science Museum in April 2017 and to a mainly adult audience at the Cheltenham Science Festival in June 2017. The Think Tank is an award-winning science museum located in Birmingham, UK, which houses a wide array of interactive science exhibits and historical collections (https://www.birminghammuseums.org.uk/thinktank). Located within the museum complex is a theatre, which hosts a variety of educational theatre and interactive science events. The Cheltenham Science Festival is an annual five-day event held in Cheltenham, UK, which incorporates a wide range of interactive science and engineering activities (https://www.cheltenhamfestivals.com/science). Audience knowledge, attitude and opinions on AMR were recorded using paper questionnaires before and after the play. The pre and post event questionnaires were assigned with a unique code identifier to ensure that pre and post questionnaires were correctly aligned to the participating individual. The pre event questionnaire was issued to all individuals upon entry to the events and collected, with responses, prior to commencement of the play. Post event questionnaires were issued following the performances. The questionnaires were collected following

audience responses and aligned to the pre event responses based on the unique participant code identifier.

The audience members scored their responses to questions 1-8 before and after performance of the play using a Likert scale where 1 = “strongly disagree” and 5 = “strongly agree”. The non-parametric Wilcoxon matched-pairs test was used to compare the Likert scores for pre- and post-performance responses for each question, both direction and magnitude of change were taken into account (GraphPad Prism version 7.00 for Windows, GraphPad Software, La Jolla California USA).

Results

The Cheltenham Science Festival presentation was attended by 105 people (mean age (years) 47; range 17-94), whilst the combined Think Tank presentation was attended by 137 people (mean age (years) 23; range 6-67). Table 1 presents a summary of audience knowledge, attitude and opinions on AMR obtained using self-administered questionnaires before and after the play.

Mean self-assessed responses to the eight questions asked pre- and post-performance of the play by the Cheltenham and combined Think Tank audiences are shown in Figure 1. Significantly altered scores for questions 1, 2, 3, 4 and 7 ($p<0.05$) were recorded for both audiences after presentation of the play. Significant changes in scores for questions 5, 6 and 8 were apparent only in the Think Tank audiences.

This difference in audience response most likely reflect the mean scores for the Science Festival audience that were low for question 5 and high for questions 6 and 8 before performance of the play, allowing little scope for significant change. Scores for questions 1 and 2 indicate that the play had a positive effect on increasing knowledge in the areas of microbiology and antibiotics, and awareness of the importance of AMR for all audiences. Scores for question 3 indicated that the play improved appreciation of the lack of tests available to distinguish between viral and bacterial throat infections in primary care. Whilst rapid test for bacterial infection of the throat (eg. Group A streptococcus) are available they are not recommended in the National Institute for Health and Care Excellence (NICE) guidelines and are unlikely to be a cost –effective use of NHS resources.[8]

The play also decreased audience expectation of receiving antibiotics for a sore throat from their GP (decreased scores for question 4 after performance of the play). Questions 6, 7 and 8 suggest that attitudes and behaviour of the audience members towards their use of antibiotics were appropriate before the play.

Discussion

The AMR play provided a novel platform to gauge the level of knowledge, attitudes and behaviour of the audience towards the use of antibiotics. The mean responses to items on the pre- and post-questionnaire demonstrated an overall change in the scores following presentation of the play. These mean values include responses from audience members whose views did not change after presentation. The significance of the changes was determined by analysis of those audience members

whose responses did change. The members of the Think Tank audiences significantly changed their responses to all of the questions. The Think Tank audiences comprised a majority of students (87/137) in the key stage 4 age group, whose attitudes were clearly influenced by the play. By contrast, the Cheltenham audience comprised a majority of adults (97/105). Members of this audience whose responses changed following presentation of the play showed significant changes to questions 1, 2, 3, 4 and 7 but not to questions 5, 6 and 8. This observation supports the targeting of information on AMR issues to young adults under key stages 4 and 5 as part of the Personal, Social and Health Education curriculum and through initiatives such as e-Bug.[7]

Using a range of formats to engage the public is central to promoting important healthcare messages. The Antibiotic Guardian campaign launched by Public Health England in 2014, included an online pledge system to increase commitment from healthcare professionals and members of the public to reduce AMR. Almost half (45.5%) of those who participated in the campaign reported an increase in knowledge about AMR post-campaign. Similarly, the Wellcome Trust Monitor report based on a UK public opinion poll, showed that whilst 56% of respondents considered their knowledge to be good, 33% believed that antibiotic resistance referred to the human body becoming resistant to antibiotics, rather than antibiotic resistant microorganisms.[9] Furthermore, whilst 41% of respondents understood that antibiotics only work against bacteria, 38% suggested that they acted against viral infections and 21% against fungal infections. Thus, there is a need for educational initiatives to improve public understanding of the specific use of antibiotics and AMR.

The findings from our study demonstrate, in line with previous studies, that there is a general lack of awareness, understanding and knowledge within the general public regarding the use and misuse of antibiotics. Our study also demonstrates that the use of innovative and 'enjoyable' platforms such as educational theatre, supported by an expert panel, significantly raises awareness of key public health issues post event. It may be that the general public are more likely to engage with key health issues if they are presented in an engaging way and in an environment that is accessible to all age groups and backgrounds. In more traditional public health interventions the key messages are typically 'pushed' onto the audience whereas in the interactive play format, the issues are presented and the audience invited to question their understanding. In this way the key messages are 'pulled' from the audience giving them a greater sense of ownership, involvement and engagement with the issue.

AMR reflects a very contemporary topic for a range of science and healthcare practitioners and there is an urgency to explore and identify effective strategies to influence public knowledge, attitudes and behaviour. Antibiotic Guardian campaigns have sought to increase commitment from healthcare professionals and members of the public to reduce antimicrobial resistance[10] and whilst the importance of AMR campaigns is undisputed, little is known about the most effective mechanisms to influence knowledge, attitudes and behaviour. Therefore, exploring how to generate impactful campaigns for different audiences presents a valuable opportunity to conduct multidisciplinary and multimodal research. The work described in this paper demonstrates such an initiative, and it is also likely that greater attention to the process of influencing knowledge and attitudes may also help to better understand

how, why and for whom educational approaches are particularly effective. Individuals learn differently and employing a range of strategies to influence personal knowledge acquisition that goes beyond simply reading or hearing information is vital.

Conclusions

This study demonstrated that educational theatre in conjunction with an expert panel is a simple, innovative tool which positively impacts upon individual knowledge, understanding and attitudes towards AMR. Whist this study focussed upon AMR, we believe that this platform for raising awareness of other key public health issues is a significant step in the right direction. However, it is beyond the scope of this study to ascertain if this shift in knowledge and understanding is retained over time and whether it has an impact upon individual behaviour post event.

Declarations

Ethics approval and consent to participate

An application was submitted to the University Research & Ethics Committee and considered by the Life & Health Sciences (LHS) Ethics Committee under application #1107. As an evaluation of a public engagement event, the requirement for ethical approval was waived by the chair of the LHS committee.

Consent for publication

Not applicable

Availability of data and material

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare they have no competing interests.

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Author's contributions

RA, AB, JC, AH, PL, ET and TW authored the play and contributed to the event expert panel. JB and SW contributed to the development and analysis of the event evaluation materials. CH and JT made a major contribution to the public health education and policy aspects of the manuscript. All authors contributed to, read and approved the final manuscript.

Acknowledgements

Not applicable.

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292 **Table 1.** Questions posed to the audience pre- and post-performance of the play

	Question
1	I know a lot about microbiology and antibiotics
2	Antimicrobial resistance is a very serious problem
3	My GP can establish if a sore throat is bacterial or viral
4	When I am suffering from a sore throat and seek medical attention I should expect my GP to give antibiotic medication
5	When I am suffering from a sore throat and seek medical attention if my GP does not prescribe antibiotic medication they are not doing their job
6	Even if I feel better I will complete a full course of antibiotics
7	I only use antibiotics prescribed to me
8	I never use antibiotics left over from a previous prescription

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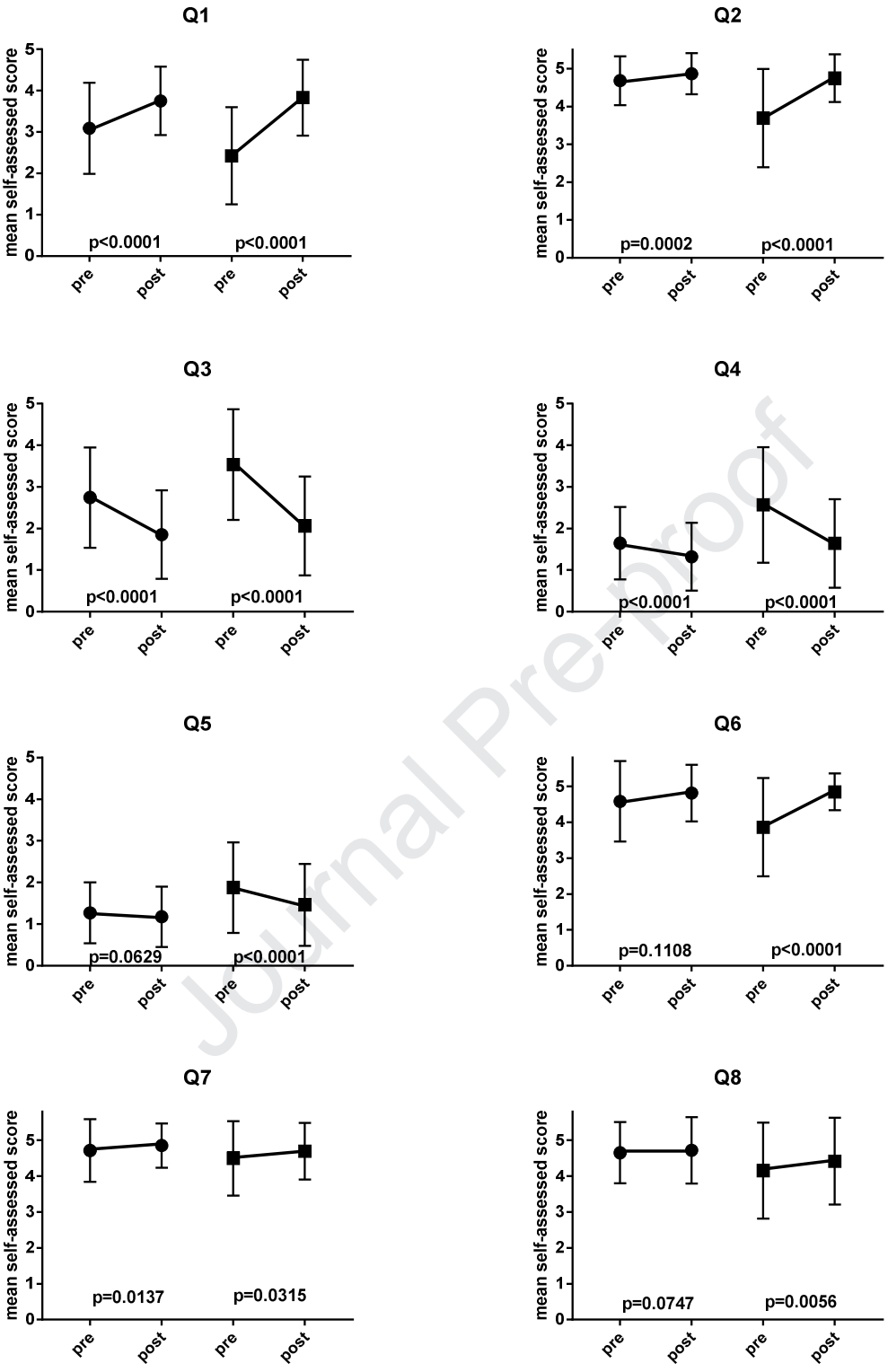

Figure 1. Mean response scores pre- and post-performance of the play

Mean self-assessed scores to each question pre- and post- performance of the play. Mean Likert scores (1 = “strongly disagree” and 5 = “strongly agree”) are shown with

SD as bars for the Cheltenham Science Festival audience (filled circles) and the combined Think Tank audiences (filled squares). The significance of the differences in self-assessed scores to each question pre- and post-performance of the play was determined by calculation of exact p values by Wilcoxon matched-pairs tests of all the self-assessed scores to the questions, including those that did not change.