Children as agents of change in combatting antibiotic resistance

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Abstract: Antibiotic resistance is a worldwide problem and changes are needed in the way antibiotics are used. The value of engaging children as key contributors in health care campaigns to increase the appropriate use of antibiotics has not been fully recognised. Little is known about how to design educational materials for children in order to enable them to be agents of change in their communities. Science education needs to improve the way it engages children so as to give them the tools needed to make responsible decisions on antibiotic use.

Introduction

Antibiotics play a key role in the treatment of many infectious diseases. However, inappropriate use contributes to the development of antibiotic resistance. This has increased over the last few years¹ and is one of the most pressing challenges to health throughout the world.² It has led to increased costs and increased morbidity and mortality.³ Although new drugs may help, their impact will be short lived unless large-scale changes in antibiotic use are achieved.⁴ Antibiotic resistance is often poorly communicated to the public which leads to people thinking they know when they require antibiotics.⁵ Antibiotic resistance is difficult to comprehend and many people believe that a solution will be found regardless of their behaviour. Moreover, most assume that it is a person that becomes resistant to the drug and not the bacteria.⁵

There are several challenges. First, there are countries where antibiotics are sold over-the-counter but even in countries where antibiotics need a prescription, use is not always

appropriate. Second, doctors find it hard to turn down a patient's request for antibiotic,⁵ and those doctors who believe that patients expect antibiotics are more likely to prescribe them even if they are not needed.⁶ And third, some patients take antibiotics which have been prescribed for other people.⁷

Changes in public attitudes and behavior could have a major impact in reducing antimicrobial resistance. Simple educational interventions have been shown to be effective in increasing the completion rates for courses of diphtheria-polio-tetanus and hepatitis immunization.⁸ Similar results may be obtained for the use of antibiotics, thus reducing their inappropriate use and the pressure on doctors to prescribe. However, there have been few studies of interventions to improve health literacy in the field of infectious disease and infection prevention.⁹ In particular there has been a lack of studies that address children.^{9, 10}

Involving children

Children are already actively involved in decision-making in organisations such as the United Nations General Assembly Special Session on Children, United Nations Study on Violence Against Children and The Committee on the Rights of the Child.¹¹ As children are key consumers of antibiotics, they are an important segment of the population that needs to be considered and targeted as part of awareness campaigns. It is also easier to teach and instil ideas early on than to change behaviour at a later stage when this has already occurred. Children could also be seen as agents of change in their communities and, through their knowledge, they may educate their parents and their communities.

Children as agents of change

Children influence parents' food purchasing behavior,^{12, 13} use of malaria control¹⁴, hand washing¹⁵ and, along with other members of the family, help-seeking behavior of patients

with type 2 diabetes.¹⁶ Children have been able to stimulate small health behavior changes by communicating knowledge and behavior to family members as long as they were provided with help and guidance in doing so.¹⁷ This is partly due to mothers having a high level of trust in the health information that children learn at school. Thus, improving children's knowledge may help with combatting antibiotic resistance and would also allow them to feel more in control of their health.¹⁸

Inevitably, there are some challenges to overcome. First, children need to be provided with discrete activities and guidance in order for them to act as agents of change.¹⁷ It is not known whether findings about other topics are applicable to antibiotic resistance (or in other contexts that focus, for example, on responsible use of health care resources). Therefore, how to design activities in the context of antibiotic resistance needs to be better understood. Second, quantifying the impact that children can have is not known. We need to understand how to give children the tools needed to be change agents and how different communities interact and disseminate knowledge.

Rethinking science education

Posters and leaflets are often used as part of awareness campaigns targeting the general public. However, they have been shown to have little or no impact on knowledge, behavior or prescription rates among adults and they are as likely not to work with children.¹⁹ Moreover, science teaching in schools is often not engaging relying as it does on delivery of information without epistemological learning goals.²⁰ Passive methods do not promote long term retention²¹ or deep understanding of critical concepts.²² More emphasis should therefore be put on involving children in the scientific process and developing learning processes that resemble science. Although these are often difficult to reproduce in a

classroom due to health and safety concerns or the cost of the necessary equipment, technology could help achieve this through games and simulations or virtual and augmented reality.²⁰

Games illustrate several principles that teachers, psychologists and neuroscientists believe enhance learning.²³ Educational games are seen as motivating and providing an enjoyable learning experience for their players. Moreover, they can help children acquire skills that would be otherwise difficult to acquire in real life. They allow children to test different strategies and experience the consequences of their actions without suffering real consequences. Therefore, children could acquire information free of risk with no real consequences if poor decisions are made, but with the ability to see and analyze the consequences of poor decisions, if any, and get feedback quickly on their decisions that may not always be possible in life. Games are not without limitations and the direct and indirect effects of games are still not fully understood.²⁴ Understanding what works, how and why it works still needs to be addressed.

The current passive methods that teaching and health care campaigns employ could take advantage of existing technology. This could be used to actively engage children with the delivered message and invoke cognitive or emotional responses that could lead to changes in the cognitive processes at the individual level.²⁵ In turn, parents' behavior could be affected by their children.

It is also important to consider the context. There are countries where antibiotics are overused (United Kingdom²⁶), countries where they are being both overused and underused

(South Africa²⁷) or countries where populations have no access or cannot afford antibiotics.²⁸

Moreover, access to technology is very different between low, middle and high income countries. Therefore, no single approach to educational materials will work and different contexts need to be carefully considered.

Given the importance of antibiotics in health care, people from all age groups need access to the right information if antibiotic resistance is to be tackled. This should include children. How to effectively design educational materials to empower children needs to involve multidisciplinary teams to understand the strengths and limitations of different approaches and to optimize educational outcomes leading to responsible antibiotic use.

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