Antibiotic resistance awareness

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standard framework for the analysis of microeconomic behavior. Nevertheless, it also led to the development of a new class of strategic form games. The number of competitors in the industry is that the structure of the game is a main component. At the micro level, are exogenous variables and important works on entry by firms (M. Henceforth) we open the 'black box'.

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there is no room for extra profits as mark-ups are zero and the number of firms (set) values are not determined by the market. Blanchard and Kiyotaki (1987), perfect competition in general equilibrium models of aggregate demand and supply in the classical framework assuming monopoly power between an exogenous number of firms.

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dynamic responses of mark-ups consistent with the VAR evidence.

sation by Markov processes. The number of competitors and the impact of demand shocks on the structure of the sector.

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standard and supply shocks. Most of the standard framework for the analysis of microeconomic behavior. The number of competitors and the impact of demand shocks on the structure of the sector.

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Antibiotic resistance awareness: a public engagement approach for all pharmacists

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Keywords

education; health promotion; lay perspectives;
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Abstract

~~It is widely acknowledged that antibiotic resistance is one of the biggest threats facing society today. As healthcare professionals, pharmacists in all sectors have a crucial role to play in educating the public about antibiotics and how to use them effectively. This article describes the different ways by which all pharmacists can help educate the public on key issues, with particular emphasis on the~~
2 next generation.

4 Since the discovery of penicillin in 1928, antibiotics have revolutionised healthcare, significantly reducing deaths from common infections. Prior to antibiotics, 1 in 10 healthy individuals died from pneumonia, meningitis and skin infections. Nowadays this is 1 in 100. However, the overuse and misuse of antibiotics has led to an unexpectedly fast emergence of untreatable superbugs—bacterial infections which resist the effects of antibiotics to which they once succumbed. This threatens the very basis of modern medicine. If bacteria become resistant to antibiotics, many simple infections such as ear, tooth and urine infections, and routine treatments such as hip replacements, chemotherapy and caesarean sections will become increasingly dangerous and life threatening. It has been estimated that if resistance continues to develop at the current rate, by 2050 the deaths attributed to antimicrobial resistance could reach ten million.^[1]

Healthcare professionals and the general public both have a role in limiting the spread of resistance. In a recent survey, 55% of GPs reported feeling under pressure to prescribe antibiotics, even when they were unsure of their need.^[2–4] By providing the general public with information about antibiotics, the pressure felt by, for example, GPs, Dentists and Vets can be relieved, as patients will understand that they are not effective treatments for viral complaints. This however will only occur through raising awareness of key issues, education and promoting good antibiotic stewardship. Since 2008 awareness campaigns in

the UK have been linked to European Antibiotic Awareness Day (EAAD) activities but with mixed success as antibiotic prescription rates have also continued to rise.^[5] Poster and leaflet-based campaigns would appear to have little impact on public attitudes, knowledge and prescribing rates. A greater impact may be achieved by campaigns that utilise a variety of approaches and that are sustained over a number of years.^[6] Pharmacists from all areas of healthcare have an important role to play in trying to limit the rise and spread of antibiotic resistance. Our opinion is that pharmacists could be more proactive rather than reactive by adopting a different approach to the issue which would include educating and informing the public about the risks associated with inappropriate use of antibiotics. Viable, cost-effective ways forward are suggested below. These have been trialled by [enter City Name] Pharmacy School in support of EAAD 2015, all of which are suitable for delivery by qualified, practicing pharmacists.

The aim of the first activity was an awareness evaluation exercise targeting students, staff and visitors at the University of [enter City Name] on EAAD 2015. A trilogy of information workshops were delivered across the University utilising e-Form surveys to gauge participants' perception about antibiotic resistance and to convince individuals to pledge to become Antibiotic Guardians. Survey questions (14) were a mixture of a mixture of Likert-scale ratings (1–5), radio button/text box options and qualitative (free text)

responses covering factual information about infections, antibiotic action, compliance and terminology. To reinforce key messages about correct antibiotic usage, all

participants were offered a specially designed lanyard complete with an attached antibiotic usage information card, to share with family and friends (Figure 1).

The event was a great success with 347 surveys being recorded (Figure 2). Approximately, 40% of participants pledged to become Antibiotic Guardians on the day with 31% stating that they might pledge later. Of the 38% that did not pledge, many were already Guardians. This was an excellent and positive response. The survey did prove educational as there are still misconceptions amongst the general public regarding antibiotic usage.^[7] Around 21% of participants thought that antibiotics would work against flu and 10% against chicken pox with 17% stating that antibiotics worked against viruses. Interestingly, 17% of individuals had taken antibiotics given to them by a family member, friend or neighbour, whilst almost 12% of those surveyed thought that antibiotic resistance was our bodies adapting to the antibiotic! An antibiotic-resistant infection was the most popular descriptive term for this issue (41%) rather than the more commonly used 'antimicrobial resistance'. Perhaps using the right, generally acceptable terminology would go a long way in improving resistance awareness. Whilst primarily used to gauge antibiotic usage knowledge, surveys can also be used as an educational opportunity by community or hospital pharmacists through discussion of participant responses. In this manner, the survey approach can help promote the appropriate and safe use of antibiotics.

The second aim and continuing strand to our campaign was to promote knowledge and good stewardship

Figure 1 Credit-card size antibiotic guardian and information card.

Figure 2 Antibiotic resistance awareness campaign on European Antibiotic Awareness Day 2015.

principles through student-led public engagement workshops in high schools. A Prezi-style presentation (<https://prezi.com/>) was developed to deliver a positive message that the young learners could share with friends and family. The Prezi was designed to be used either as a whole year group assembly lasting 10–15 min, or by the addition of some hands on, interactive activities to illustrate key points that could be extended to a 60–90 min workshop for individual science classes or after school clubs. Copies of the Prezi can be obtained by contacting the corresponding author.

One of the first aims of either presentation was to get the pupils to understand that all microorganisms are not equal with only bacteria responding to antibiotics. This was achieved by pupils matching infections to different classes of microorganism.

The remaining activities are described in more detail elsewhere,^[8] but included illustrating the concept of antibiotic resistance through popping balloons with a needle, resistant bacteria having a piece of masking tape (aka an antibiotic-resistant plasmid) attached; a game of antibiotic resistance skittles where each skittle represented a different bacterial species and the ball an antibiotic; hand washing using an ultraviolet glow-gel and UV glove box or torch to illustrate principles of infection prevention. Fewer infections mean less use of antibiotics. Although not included here, feedback questionnaires have been very positive indeed and encourage expansion of this programme. In our programme undergraduate Pharmacy students delivered the workshops, but there is no reason why pharmacists cannot run similar awareness programmes in community settings such as schools, hospital wards and day centres. Such activities would also enhance their public engagement portfolios.

Advanced publicity was deemed key to a successful campaign. Two “University of [enter City Name]’s Antibiotic Guardians YouTube videos” were produced, one of which was aimed at the public whilst the other (<https://www.youtube.com/watch?v=TEmUsXGKoLo>) targeted local healthcare professionals. The videos were uploaded and “tags” were included in the videos so that people searching for words such as “antibiotics”, “pharmacy” and “health” would see the video appear in their search engine. The ease of modern technology means that virtually anyone

can make a short promotional / educational video and post it online alongside similar content containing videos.

Conclusion

This campaign adopted a direct, person-to-person approach rather than rely on the public or professionals reading information leaflets and posters. Questionnaires were used to not only gauge an individuals’ perception about the correct use of antibiotics, but also as an educational tool. Similarly, by working with high school pupils, the next generation are being informed early on in their lives about the potential dangers associated with neglectful use of antibiotics. In the UK, the emphasis on antibiotic stewardship remains fixed on health promotion and education, through improving awareness and encouraging the appropriate and proper use of antibiotics. Pharmacists have an increasing role in Public Health delivery, and campaigns such as this, with little in the way of resource implications, provide an alternative but excellent educational vehicle to deliver key and (hopefully) lasting messages.

Declarations

Conflict of interest

The Author(s) declare(s) that they have no conflicts of interest to disclose.

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