Inappropriate Antibiotic Use - Combining Intervention Strategies to Change Patient Behaviour

Radhika Sholapurkar
Antimicrobial Resistance and Social Media

Modernising Medical Microbiology

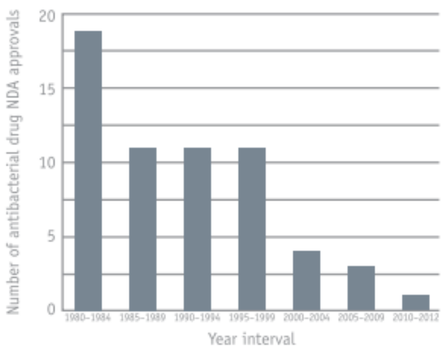
University of Oxford

Nuffield Department of Medicine

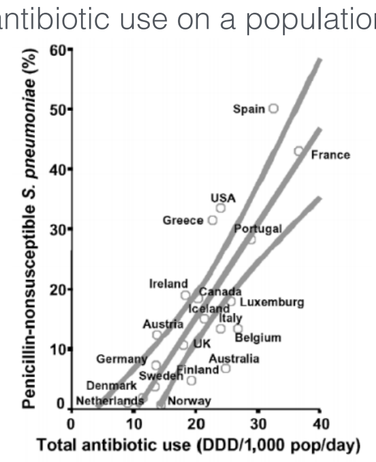
Background - Antimicrobial Resistance

Antimicrobial resistance is on the rise. These 'wonder drugs' are not only needed for the treatment of existing bacterial infection, but are also essential for many procedures that result in compromised immunity, for example, chemotherapy, dialysis, transplantation, general surgery and many more. If the situation continues, we may be forced to use more toxic, expensive and less effective antibiotics[1]. Antibiotic resistance can be addressed by preventing infections and spread, tracking resistance, developing new antibiotics and diagnostic tests and, by improving Abx use. However, the development of antibiotics is a huge investment as it is without the profitability of other more regularly used medications and as a result pharmaceutical industries are reluctant to pursue antibiotic research[2]. The 'antibiotic pipeline' is thus running dry, with fewer and fewer Abx being produced (**Graph 1**) making the situation even more critical. Based on the observation that resistance can be directly correlated with antibiotic use on a population level (**Graph 2**)[3] it is suggested that reducing antibiotic use will reduce resistance. It is thought that up to 50% of the antibiotics prescribed are inappropriate, thus reducing antibiotic use is a priority. A key target for reducing antibiotic use is in respiratory tract infections, where there is little evidence for effectiveness.

Graph 1: Number of new antibiotics approved for use



Graph 2: Antibiotic resistance correlates with antibiotic use on a population level



Methods - Behaviour Change Wheel

In order to change a certain behaviour successfully, a system must be used that characterizes and analyzes interventions that appropriately combat the driving factors that contribute to the behaviour. Behaviour change interventions are a co-ordinated set of activities designed to change specified behavioural patters. The Behaviour Change Wheel (BCW) developed by Michie et al. is such a system, and it comprises of a central hub of behaviour surrounded by 9 intervention functions and 7 policy categories (**Figure 2**). Behaviour can be driven by 3 factors: capability, opportunity and motivation (**COM-B-Figure 1**). Capability is having the necessary knowledge and skills and the psychological and physical capacity. Opportunity is all the factors that make the behaviour possible and even prompt it. Motivation comprises of the brain processes that energize and direct the behaviour [4]. The behaviour, "A patient manages their cough without taking antibiotics," was modelled.

Figure 1: COM-B system

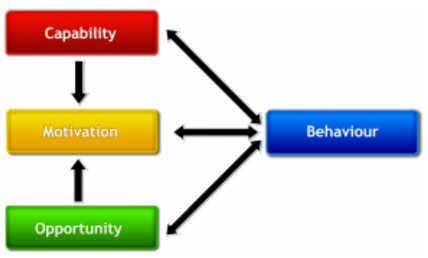
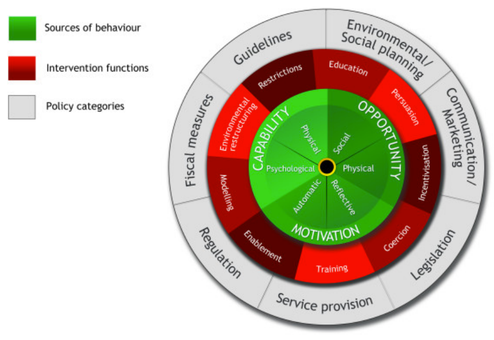


Figure 2: Behaviour Change Wheel



Results - Changing Patient Behaviour

First, beliefs that drive inappropriate antibiotic requesting behaviour were brainstormed:
1. Antibiotics will cure me 2. Without antibiotics I won't be cured 3. Antibiotics will relieve my symptoms 4. Antibiotics will shorten the duration of my illness 5. Antibiotics won't harm me 6. Everyone else is taking antibiotics 7. Government is restricting antibiotics to save money 8. Doctors are restricting antibiotics to save others 9. Antibiotic resistance won't affect me 10. I've taken antibiotics before and they worked.

This was structured into a COM-B system model: A patient manages their cough without taking antibiotics:

Capability: The patients ability to make a decision best for their health requires the understanding that antibiotics don't help most of the time, and that antibiotics can do harm.

Opportunity: Guidance towards non-antibiotic management of coughs by prompting from GPs and other people in positions of trust (colleagues/friends/family) together with good access of information.

Motivation: Belief that non-antibiotic management is good for health.

Interventions and policies centred on encouraging non-antibiotic management of coughs:

Education: Increasing knowledge and understanding of the issues and limitations of antibiotics as well as the current and concerning issue of resistance.

Training: Imparting the skills to identify if they have a bacterial infection and how to relieve symptoms through over the counter medications and alternative therapies.

Incentivisation: Create an expectation that not requesting antibiotics will have a beneficial effect, such as that fighting off the infection yourself will result in strengthened immunity and healthy gut flora.

Coercion: Create an expectation of a cost for use of antibiotics, such as that it can have a harmful effect, undermine natural immunity and not cure you.

Persuasion: Encourage people to wait for infections to self resolve and to try alternative therapies

Modelling: An example or story that depicts a role model for people to follow. For example a celebrity that has chosen not to take antibiotics, has fought off their infection and is stronger and healthier for it.

Environmental Restructuring: Providing on screen prompts at the GP that flag up how many times you have been previously prescribed antibiotics and the risks associated with multiple usage.

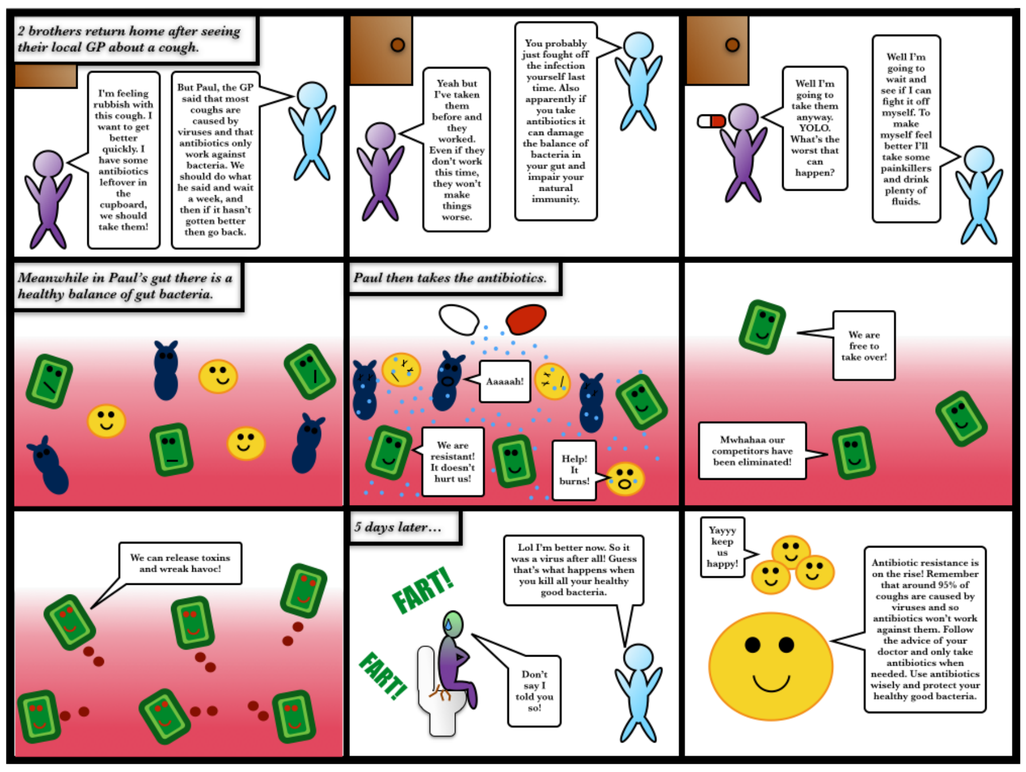
Communication: Spread antibiotic awareness messages through social media.

Fiscal: Increase antibiotic cost to encourage less prescription.

Service Provision: Provide walk in centres which provide symptom relief medication and advice.

Proposal:
Use a simple comic strip to be communicated through social media to spread messages that encourage people to use non-antibiotic management if antibiotics are not needed. This will combine 5 interventions (education, persuasion, incentivisation, coercion and modelling) and the communication policy. Of note, the comic must make efforts to minimize any unintended harm, namely those individuals that need antibiotics that end up not taking them. Figure 3 shows a proposal for this comic strip.

Figure 3: Comic strip proposal



Summary and Future Plan

The comic strip piece above was produced to try and encourage the general public to use antibiotics wisely. It tells a story of 2 brothers, one of which takes antibiotics for his cough (against his doctor's advice), and one who doesn't.
The main messages are: 1. Most infections are viral 2. Antibiotics can kill your healthy good bacteria 3. Antibiotics can cause harm if taken unnecessarily 4. Antibiotic resistance is on the rise 5. You can fight off most infections yourself and protect your healthy good bacteria.
The future plan is to spread this comic strip on social media interfaces such as Twitter and Facebook, and see the attention and engagement it gets from the public. The vocabulary, messages and humour used were targeted primarily at those who use and share social media via the internet.

Acknowledgements

I would like to thank Dr Nicola Fawcett for being an excellent project supervisor and providing plenty of feedback and enthusiasm. I would also like to thank James Arnot. Finally I would like to thank the Modernising Medical Microbiology Group, Dept of Microbiology, John Radcliffe Hospital for allowing me to undertake this SSM with them.

References:
1. Report on Antibiotic Resistance Threats in the United States, 2013. U.S Department of Health and Human Services. CDC. (2014).
2. Abdul Ghafur, K. An obituary on the death of antibiotics! *J Assoc Physicians India.* **58**, 143-4 (2010).
3. Albrich et al. Antibiotic selection pressure and resistance in Streptococcus pneumoniae and Streptococcus pyogenes. *Emerg Infect Dis.* **3**, 514-7 (2004).
4. Michie et al. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implement Sci.* **6**, 42 (2011).