

Antibiotic Prescribing in Primary Care

Insight Report March 2018

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Executive summary

Project background

Inappropriate prescribing of antibiotics is a major cause of antimicrobial resistant (AMR) infections. Following the recommendations of The Review on Antimicrobial Resistance, the Department of Health committed to reducing inappropriate prescribing by 50%, by 2020. In 2016, 85% of antibiotics were prescribed in primary care in NI and rates of prescribing were higher than in other UK countries.

The Innovation Lab, Public Health Agency (PHA) and Health and Social Care Board (HSC Board) have worked together to develop a project which will develop interventions to reducing inappropriate prescribing.

In the first stage of this project, we identified activities which would expand our existing knowledge and address some of our assumptions about attitudes, behaviours, and solutions. This report details the results of a survey that we sent to prescribers and stakeholders.

Prescriber Survey

Theoretical model. Understanding a complex behaviour like prescribing is messy. To design our survey, we found that using a scientific framework for understanding behaviour meant that we could design our survey with confidence, knowing we had thought through all the potential influences on behaviour. The COM-B model of behaviour states that the interaction between three components, Capability, Opportunity, and Motivation (COM) causes the performance of Behaviour (B).

Survey. The survey was issued to all general practice managers in primary care who forwarded it onto prescribers of antibiotics. Approximately 9% responded.

Stakeholder Survey

We also issued a survey to 140 stakeholders (policy makers, not practitioners) to understand their current understanding of the problem and to gather their ideas for solutions.

Stakeholders tended to agree that inappropriate prescribing was most influenced by (1) patients not understanding antimicrobial resistance and (2) asking for antibiotics for viral infections. Stakeholders' most common solutions focused on 'patient education' in different forms. 'Increasing time' allocated for GPs to explain their decision-making was also mentioned many times.

Results and Recommendations

The survey supports arguments for the development of both complex and simple interventions across all three areas of the COM-B model in order to reduce inappropriate prescribing of antibiotics in primary care. Although there is evidence that simple 'nudges' can be effective in changing behaviour, according to research of interventions in health psychology, often it takes a combination of several approaches to create significant behaviour change in the long-term. The next stage of the project will take the findings from the survey in combination with findings from the literature review and use the Behaviour Change Wheel to design an intervention to trial in a few practices in Northern Ireland.

From the results of the survey so far, we recommend the following:

- 1. Use the COM-B model of behaviour when thinking about behaviour change.** Using a comprehensive model of behaviour is an extremely useful tool to use when considering influences on behaviour or why a particular behaviour is not engaged in.
- 2. Build on the finding that prescribers take AMR seriously.** 97% of prescribers agree that antimicrobial resistance is a challenge that needs to be addressed urgently and 88% agree that they have some personal responsibility for addressing AMR in their practice.
- 3. Consider alternative ways in which to help GPs differentiate between bacterial and viral infections and provide practice-level support for their diagnostic decisions.** Almost 70% of prescribers thought it was ‘Important’ or ‘Very Important’ to get refresher training on distinguishing viral from bacterial infections. Prescribers’ opinions were also split into roughly equal thirds of those who said they ‘Agree’, ‘Disagree’, or ‘Neither’ with whether it’s safer to prescribe an antibiotic if they’re not sure if the infection is bacterial or viral. Finding ways to give prescribers better feedback on their clinical decisions – through data or through point-of-care testing devices – may give them more confidence in their decisions.
- 4. Find ways to support prescribers when making diagnostic decisions about the elderly, those in nursing homes, and those with long-term conditions.** Prescribers reported being most likely to give an antibiotic to those three groups – even when a viral infection was suspected. We also found that just under half of prescribers never used the app to access the NI Management of Infection Guidelines. We recommend looking at any barriers to accessing all formats of the Guidelines to maximise their benefit.
- 5. Provide timely feedback to prescribers about their performance of antibiotic prescribing relative to their peers, both locally and in the rest of the UK.** In the survey,

most prescribers believed they prescribe antibiotics less than their peers. We know that providing timely, relevant feedback on behaviour is a good way to change behaviour.

- 6. Understand patient behaviour better and manage patient expectations.** 62% of prescribers reported feeling that patients expect antibiotics 'Often' or 'Very often' and just under 70% of prescribers feel they are 'Sometimes' or 'Most of the time' influenced by that perceived expectation. We also found that, apart from the waiting room, information about appropriate prescribing was very limited in other areas around the practice. Visual cues in the practice such as posters or leaflets could serve as reminders to both patients and prescribers of the value of only taking antibiotics when they are truly needed.
- 7. Develop ways to introduce and mainstream interventions that GPs have confidence in.** We found that GPs were unsure about using, for example, delayed prescriptions or point of care testing. If there is good evidence that an intervention changes behaviour, it is important to understand and address barriers to uptake.
- 8. Avoid momentum solutions without a strong evidence base.** Although important, we recommend stakeholders temporarily put aside go-to 'momentum solutions' such as patient education, and consider alternative possibilities such as the ones outlined above.

The Innovation Lab

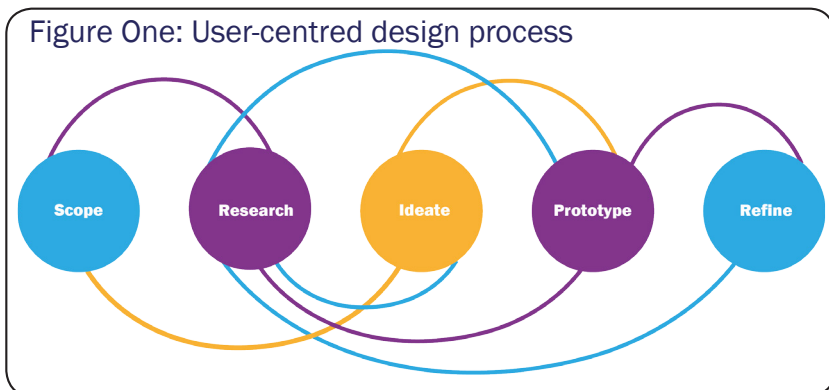
...connecting, collaborating, listening, failing fast, learning, disrupting, inventing, and enabling.

The Innovation Lab was established in 2014 and sits within the Department of Finance. The Lab has a role in Northern Ireland's Innovation Strategy for creating a culture of innovation by encouraging collaboration, openness to new ideas, innovation, and risk taking.

The Lab responds to challenges where effective service provision for the public has proved most difficult. It aims to improve public services by creating new and ground-breaking innovations through transformation and invention. We are committed to inspiring curiosity, empowering creativity, and bringing to life paradigm-shifting ideas. We believe in connecting, collaborating, listening, failing fast, learning, disrupting, inventing, and enabling. Our i-dec philosophy has been developed to address these challenges.

i-dec - innovation through design, experimentation and creativity

Our i-dec philosophy is built on design principles. Namely, putting users first, understanding relationships, developing prototypes, testing iteratively, and scaling up solutions which work. Our process is iterative and not stage-gate; projects will move backwards and forwards depending on what we learn and the ideas we can surface.



Behavioural sciences and the Innovation Lab

The Lab has identified that behavioural science offers new ways of approaching problems and had delivered results in other contexts. It has been working to develop capacity and capability in behavioural science and has been developing behaviourally inspired solutions to business areas across the Northern Ireland public sector.

In essence, this stream of work applies psychological and social science insights to public sector problems with the specific aim of changing or influencing people's behaviour. This is a relatively young field with increasing applications across public policy problems. An important part of this work is using randomised control trials or experiments to test the effectiveness of interventions.

The Lab has been developing services using behavioural science which include the following:

- Assessment of the evidence base
- Design based research on behavioural journeys and existing choice architecture
- Intervention Design
- Intervention Re-design
- Experiment design
- Experiment implementation and analysis

Antibiotic Prescribing in Primary Care: Project Background

Inappropriate prescribing of antibiotics is a major cause of antimicrobial resistant (AMR) infections. Following the recommendations of The Review on Antimicrobial Resistance¹, the Department of Health committed to reducing inappropriate prescribing by 50% by 2020. In 2016, 85% of antibiotics were prescribed in primary care in NI and rates of prescribing were higher than in other UK countries².

We aimed to learn about the factors affecting antibiotic prescribing behaviour in primary care, particularly in the context of diagnostic uncertainty, and to use what we learned to develop and trial interventions to help prescribers and patients manage suspected infections appropriately.

The Innovation Lab have developed the project through engagement with the Department of Health antimicrobial resistance group SAMRHAI and the AMRHAI Improvement Board. We have worked closely with the Improvement Board's working group ASOG on AMR in Primary Care to implement the project.

Activities

The Innovation Lab, Public Health Agency (PHA) and Health and Social Care Board (HSC Board) have worked together to identify key research activities that would enable intervention development. These activities were identified based on how they would expand our existing knowledge and address some of our assumptions about attitudes, behaviours, and solutions. As the project develops, it is likely that we will identify further activities as our knowledge develops and as we begin to design interventions.

¹ O'Neill, J. (2016). Tackling Drug-Resistant Infections Global: Final Report and Recommendations. PDF available at: https://amr-review.org/sites/default/files/160518_Final%20paper_with%20cover.pdf [Accessed 02 Jan 2018]

² Bradley, D., Patterson, L. (2017). Surveillance of Antimicrobial Use and Resistance in Northern Ireland, Annual Report, 2017. PDF available at http://www.publichealth.hscni.net/sites/default/files/AMR_annual_report_final_0.pdf [Accessed 02 Jan 2018]

- 1. Survey** of prescribers of antibiotics in primary care using the COM-B (capability, opportunity, motivation – behaviour) framework for understanding behaviour change. The survey included GPs, nurse prescribers, pharmacists, and Allied Health professionals.
- 2. Stakeholder survey** of key stakeholders in the health system with a role related to AMR. These included people in the Department of Health, the PHA, the HSC Board, people in animal health, water safety, dental health, universities, and a few miscellaneous others.
- 3. Review of the evidence base** for interventions aimed at changing prescribing behaviour in primary care.
- 4. Patient research** to understand patient attitudes, beliefs, and behaviours.

This document details the initial findings of the two surveys.

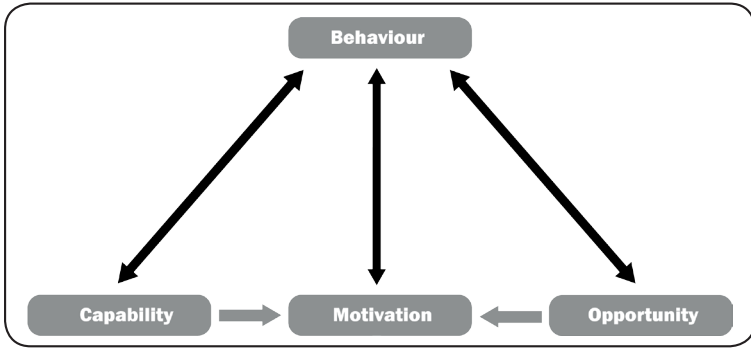
Approach

Introduction to COM-B

We identified that we did not fully understand the behaviour of prescribers of antibiotics in primary care. We could see that there were a lot of assumptions about what prescribers were doing and why, and we wanted to provide a formal analysis of behaviour to help design new solutions. For this project we have used the Mitchie et al. (2011)³ COM-B approach to understanding behaviour. This model analyses behaviour from three inter-related dimensions – capability, opportunity, and motivation. Performing a behaviour is dependent on the presence and interaction of these three dimensions (see Figure Two).

³ Mitchie, S., Maartje M. S., and West, R. (2011). "The Behaviour Change Wheel: A New Method for Characterising and Designing Behaviour Change Interventions." *Implementation Science* : IS 6:42. PMC. Web. 2 Jan. 2018

Figure Two: COM-B model of behaviour



The survey we developed aimed to assess all three influences on antibiotic prescribing behaviour in primary care.

Capability

In the COM-B framework, capability is defined as “the individual’s psychological and physical capacity to engage in the activity concerned. It includes having the necessary knowledge and skills” . There are no obvious physical issues in relation to antibiotic prescribing so our survey focused on psychological skills. We were interested in what prescribers thought about their knowledge of guidelines and of their openness to training. We asked one question about their knowledge of infections that could result from taking antibiotics. We were also interested in how prescribers thought their prescribing practices changed under certain conditions. In COM-B terms, this is called self-regulation – in other words how well can you consistently perform a behaviour when challenged.

Opportunity

The ‘opportunity’ section of the COM-B framework refers to the social and physical opportunity for performing a behaviour, in this case prescribing antibiotics. Opportunity to perform the behaviour can be afforded by physical prompts such as leaflets, posters, reminders, and objects. However, opportunity can also be afforded by social cues. For instance, if I think that everyone else is doing something, this also affords me the opportunity to perform that behaviour. Similarly, if I think that no one will notice me doing something, I might be more likely to do it. Social opportunity can be afforded by individuals or groups. For example, if I ask a doctor for an antibiotic, I am giving them the social opportunity to prescribe.

Motivation

The final section of the COM-B framework examines the role of motivation in whether someone performs a behaviour. Motivation is defined as “all those brain processes that energize and direct behaviour, not just goals and conscious decision-making. It includes habitual processes, emotional responding, as well as analytical decision-making” . It is concerned with automatic habits and emotions as well as more reflective beliefs and personal identity. In the survey we were interested in prescribers’ beliefs about how important AMR is and about what they thought of specific types of interventions, such as delayed prescriptions and CRP testing. We also asked questions about their experience of patients coming to harm as a result of antibiotics and whether that had influenced their prescribing practices.

The next section details the results of the survey as they relate to the capability, opportunity, and motivation of prescribers.

The Prescriber Survey

Using COM-B to understand prescriber
behaviour

Purpose: we conducted a survey because we realised we were making a lot of assumptions about GP behaviour in Northern Ireland that were not based on evidence.

Survey development: The survey questions were developed by the Innovation Lab, the PHA and the HSC and were designed to assess prescribing behaviour against the COM-B framework.

Practical arrangements: The survey was created using CitizenSpace, an online government consultation platform, and emailed from PHA to practice managers who were asked to forward it onto prescribers in their practice. It was also sent to the antibiotic champions who were also asked to forward it onto prescribers in their practice. The survey was left open for two weeks.

Response rate: There are about 1500 prescribers and we received 137 responses, a 9% response rate.

Follow up qualitative research: We hope to follow up some of our conclusions with respondents who indicated they were willing to discuss the issue further.

Results

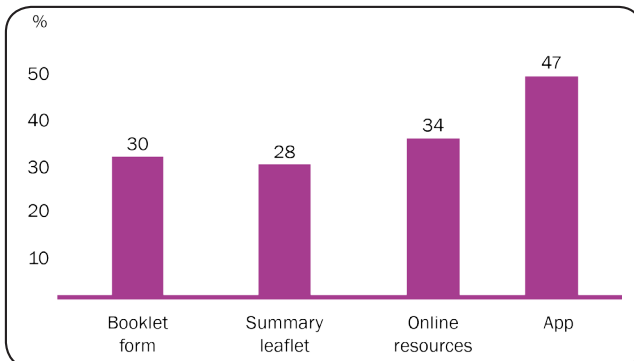
Psychological capability

Because there were no obvious physical barriers to prescribing, our survey focused on the psychological capability needed to prescribe antibiotics effectively. This includes knowledge, skills, and the ability to self-regulate.

Awareness and use of guidance and resources

Providing guidance and resources is a method that is frequently used by system leaders to improve psychological capability and to promote best practice. We wanted to know if prescribers used the guidance that is provided about prescribing as a way of better understanding the psychological capability of prescribers. We found that 15% of prescribers said they were not aware of or 'Not Sure' about the Northern Ireland Management of Infection Guidelines for Primary and Community Care settings. We then asked prescribers how often they used different formats of guidance. Most strikingly, just under half 'Never' or 'Rarely' use the app format of the guidance. (Chart One).

Chart One: Percentage of prescribers who 'never' or 'rarely' use of each format of the NI Management of Infection Guidelines - *categories are not mutually exclusive



Training needs

We thought that prescribers were unlikely to tell us that they had knowledge gaps and, therefore, that the data that those questions would generate would be uninteresting. We still needed to find a way to test psychological capability, so we asked prescribers if they thought they knew enough about some of the issues by asking if they had any training needs.

In general, prescribers thought training was important – including training for non-prescribing staff, on systems to help manage demand for antibiotics, and for implications for AMR in their practice. In particular, we were surprised to find that almost 70% thought it was important to get refresher training on distinguishing viral from bacterial infections, however, 45% said there were not sufficient opportunities to address their training needs.

Self-regulation

One aspect of capability is the ability to maintain behaviours in the context of other pressures or over time. In theory, prescribers are only prescribing antibiotics for bacterial infections, but we know that's not always the case. We hypothesised, therefore, that prescribers would behave differently in different environments. In the question we asked prescribers, we told them a viral diagnosis was probable, provided them with different contexts and asked them to tell us how likely they thought it was that they would prescribe antibiotics on a scale from 'very unlikely' to 'very likely'. They were also given the option to select 'Makes no difference'. Some of the scenarios related to the patient, some related to their work environment (time pressures, for example), and some related to the interactions in a consultation.

Methodological note: These questions rely on self-reported behaviour rather than independently observed behaviour. It is

possible that prescribers are over-estimating their capability or are mis-reporting their behaviour. Their answers to this question, however, do provide useful information even given these caveats as they allows us to understand better their mental models and beliefs about their behaviours.

We found that prescribers said they were **most likely to prescribe** antibiotics, even when they thought a viral diagnosis was probable, in these circumstances (see the Table One for more detail):

1. The patient has a number of long-term conditions;
2. The patient is in a nursing home;
3. The patient is elderly; and
4. The patient insists that you prescribe.

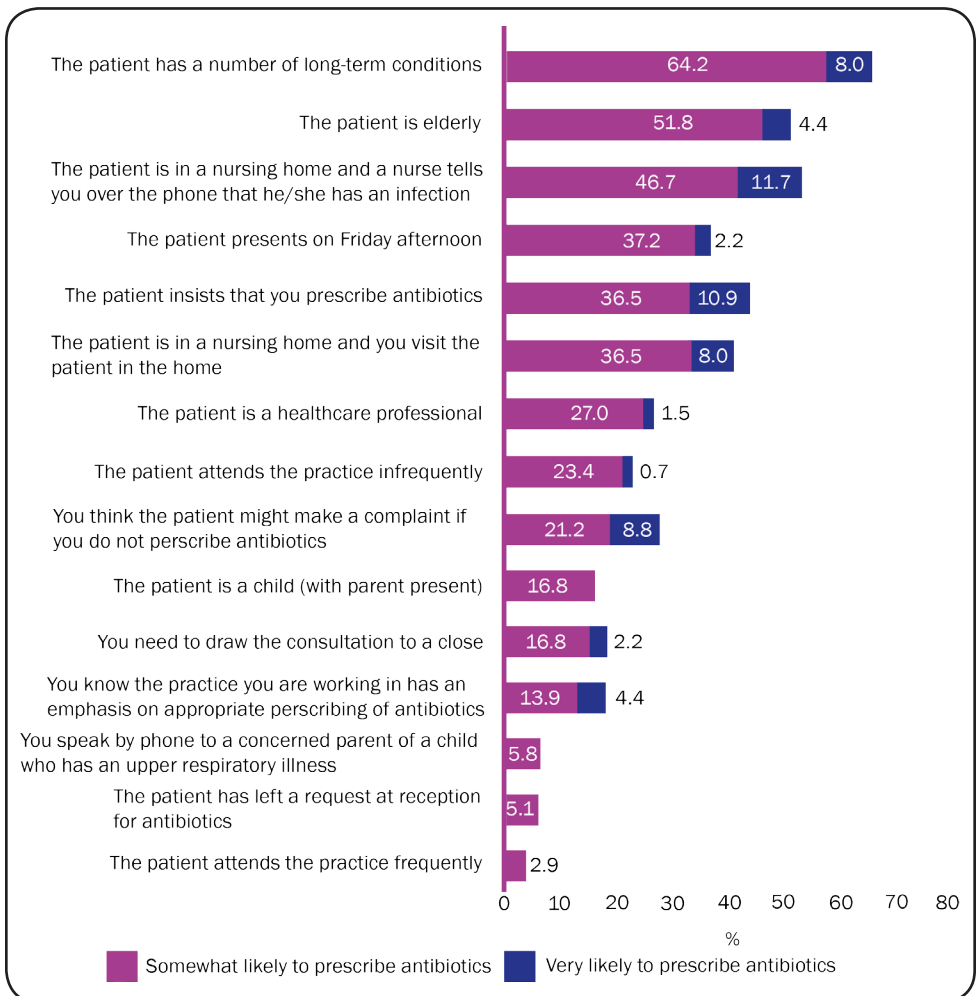
Prescribers also told us they were **least likely to prescribe** if:

1. The patient is a child;
2. You speak on the phone to the parent of a child who has an upper respiratory illness;
3. The patient has left a request at reception; and
4. The patient attends the practice frequently.

These results provide us with useful information about the capability of prescribers not to prescribe antibiotics in certain contexts or under specific conditions. Even if prescribers suspect a viral infection and would rather not prescribe antibiotics, they report that they would be likely to do so anyway if the patient is elderly or has long-term conditions. In contrast, it seems that prescribers are not as likely to prescribe antibiotics when the patient is a child. They also reported that contextual factors, such as time constraints, practice policies, and fear of complaints, were much less likely to influence their prescribing decisions than clinical factors.

We will need to follow up with prescribers to understand more about these particular situations, but on first glance it may be useful to consider ways in which prescribers can be supported when making decisions about whether to prescribe to the elderly or to those with long-term conditions.

Table One: Reported likelihood of prescribing antibiotics under specified conditions if a diagnosis of bacterial infection is uncertain



Self-regulation: Phone prescribing

We also found that just under half of prescribers said they felt comfortable prescribing an antibiotic during a phone conversation if they suspected the patient had a bacterial infection. In the free text of the survey many prescribers wrote that their solution for inappropriate prescribing included making sure that patients are physically seen before prescribing an antibiotic. We don't know how many prescriptions are given out over the phone, but it may be worth understanding more about the circumstances in which prescribers do prescribe over the phone to see if any antibiotics could be avoided.

Capability summary

Before we issued the survey, we thought that capability would be the least interesting area of analysis. We thought that, as experienced and highly trained professionals, knowledge and skills would be the least promising areas for interventions. Instead, it would appear that the inherent difficulties in clinically distinguishing viral and bacterial infections interact with other factors, which means that the prescriber finds it difficult to maintain appropriate prescribing behaviours in the face of certain types of uncertainties. There are also indications that we could design more effective interventions to increase knowledge and best practice.

Opportunity

In the COM-B framework opportunity is defined as “all the factors that lie outside the individual that make the behaviour possible or prompt it”.⁴ Opportunity has two dimensions which impact behaviour – the physical opportunity afforded by the environment and the social opportunity afforded by the attitudes and behaviours of others.

Physical opportunity

Physical opportunity refers to cues or prompts (like leaflets, posters or objects) in the environment that may remind you to do the behaviour, or how the physical environment may encourage or hinder the behaviour. We identified two aspects of physical opportunity that seemed important to find out more about. We wanted to know what information in the physical environment of a GP surgery may serve to remind prescribers and patients about appropriate prescribing and about any perceived time restrictions to explaining to patients about antibiotics.

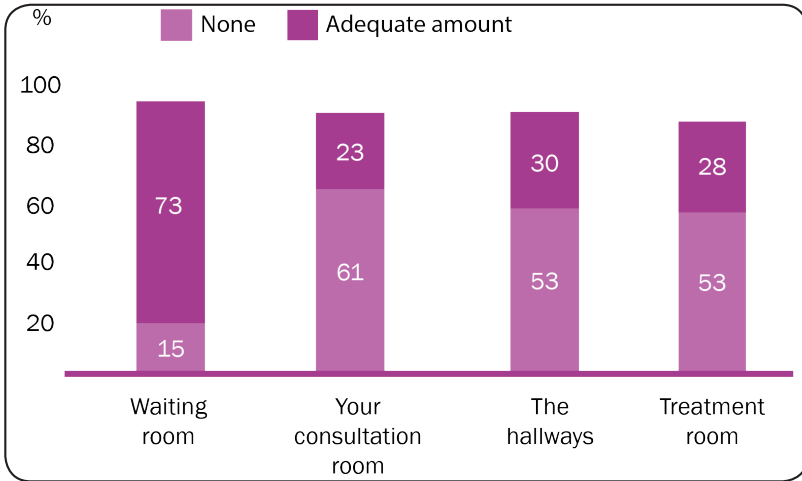
Visible patient information about appropriate prescribing

We asked prescribers about the patient information in their practice. While such information has been designed as an educative or persuasive intervention for patients, it also serves as reminders to prescribers. We haven't looked at the evidence as to its effectiveness but were more interested in its location and prescribers attitudes towards it.

We asked prescribers if they thought that there was an adequate amount of patient information about appropriate prescribing in the practice. We found that, aside from the waiting room, information about appropriate prescribing is limited in other areas (see Chart Two).

⁴ Ibid

Chart Two: : Information about appropriate prescribing in the practice – categories are not mutually exclusive



We didn't ask about the content of the information because we felt that that kind of information would have been difficult to reliably collect in a survey. We'll have to do some observational research to make those kinds of assessments. However, this does tell us about the location of prompts and cues: patients may see prompts in the waiting area but there are few visual cues or reminders about appropriate antibiotic prescribing for prescribers or patients anywhere else in the practice.

Time to prescribe

Time is also part of the environment which places considerable constraints on prescribers' ability to take different courses of action. There are a lot of assumptions about how much time it takes to explain to a patient that they don't need an antibiotic and how that affects prescriber behaviour. We asked a question which simply asked prescribers what they thought about the relative time it would take to explain or prescribe. Just under three-quarters said that it would be quicker to prescribe antibiotics than to explain to a patient

why they don't need antibiotics and another 22% said it would make no difference to the time to explain rather than prescribe. Prescribers do have limited time, and any intervention needs to be mindful of not adding additional time.

Social opportunity

Opportunity can also be social or related to social norms. In other words, what we perceive or see others do or don't do has a very large impact on what we ourselves do. We wanted to know about the social influences on prescribers from patients and from other prescribers. In particular, we wanted to know if prescribers thought their patients expected antibiotics and, if so, how those expectations affected their likelihood of prescribing. We also wanted to know how they viewed their own prescribing patterns compared to other prescribers.

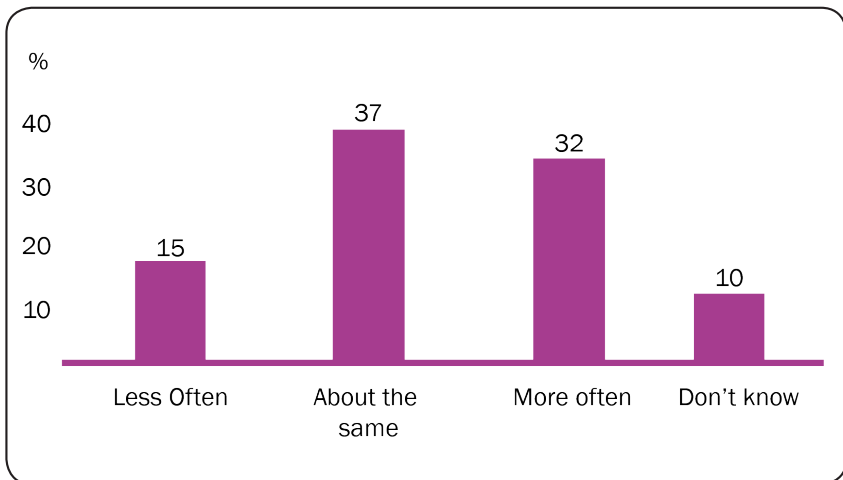
Patients' expectations

Social opportunity to prescribe antibiotics may be afforded by patients expecting or asking for antibiotics. We found that 62% of prescribers reported feeling that patients expect antibiotics 'Often' or 'Very often' and just under 70% of prescribers feel they are 'Sometimes' or 'Most of the time' influenced by that perceived expectation. So prescribers are consciously and knowingly influenced by a sense of expectation from the patient. It is also likely that this influence is more complex and subtle than this.

We also asked a question which was designed to test whether prescribers thought that their patients expected antibiotics more often than patients from other practices, which would, therefore, afford them more social opportunity than other prescribers to prescribe. 32% of prescribers thought their patients asked for antibiotics more often than patients in other practices/areas compared to 15% who thought their patients asked less often

than others (Chart Three). This indicates that there is a tendency for prescribers to perceive their own patients as more demanding than everyone else's patients. Providing information like this to prescribers could help make them aware of their own biases to see their patients as more demanding than others' patients.

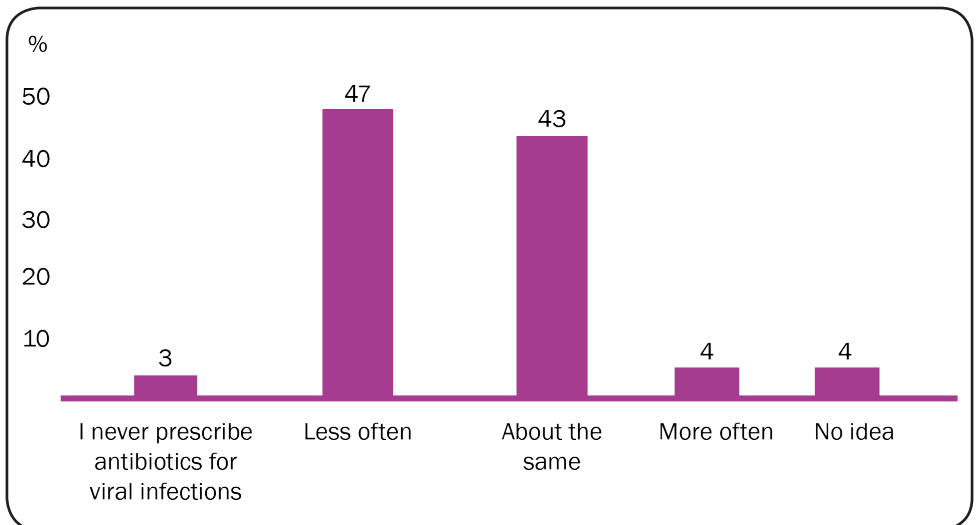
Chart Three: Compared to patients in other practices / areas, how often do you think your patients ask for an antibiotic to treat what you believe is a viral infection?



Comparisons to other prescribers

Social opportunity can also be afforded by our perceptions of what others are doing. We wanted to gage how prescribers view themselves compared to to others so we asked them how often they thought they prescribed antibiotics for viral infections compared to other prescribers. As you can see in Chart Four, 47% of the prescribers who responded to our survey said that they prescribe less than everyone else compared to 43% who said they prescribe about the same as everyone else. Only 4% admitted to having no idea how they compared. We could have gotten these results because we have an unrepresentative sample of prescribers who really do prescribe less than everyone else. We also know from behavioural science literature, however, that people tend to overestimate how well they perform in relation to others and there have been a lot of experiments to find ways to correct for this particular bias.

Chart Four: Compared to other prescribers in primary care, how frequently do you feel you would prescribe an antibiotic when you suspect a viral infection?



In primary care there are, in fact, already mechanisms in place to correct for this bias. The Compass report is a quarterly report given to each practice that highlights their prescribing rates compared to other practices. This report includes a lot of information, including antibiotic prescribing rates, and is discussed with the practice manager on a regular basis. We can hypothesise about some of the reasons why this report is not addressing this particular bias. For example, prescribers may not be prioritising the information on antibiotics because other data is perceived as more important, prescribers may still be experiencing a self-serving bias that means they perceive themselves as performing better than other colleagues in their practice, or the information itself is too overwhelming and prescribers are not able to use it to change their practices easily. This is an interesting area to explore because getting good, reliable, timely feedback on anything you're doing is an excellent starting point for finding ways to change.

Opportunity Summary

The survey illustrates that, currently, there are limited physical opportunities to prompt appropriate prescribing. In contrast, there are lots of social opportunities for inappropriate prescribing in terms of expectations from patients to prescribe antibiotics and perceptions of what other prescribers are doing. Prescribers themselves report that this pressure affects their prescribing patterns. In some of the free text responses, prescribers noted a lack of consistent policy across primary care and out of hours settings, which would further enable this situation to persist.

Motivation

The final section of the COM-B framework examines the role of motivation in whether someone performs a behaviour. To assess reflective motivation we asked prescribers about their beliefs about the AMR and about the efficacy of alternatives to prescriptions. To assess automatic motivation we also asked questions about their experience of patients coming to harm as a result of antibiotics and whether that had influenced their prescribing practices.

Reflective motivation

Importance of AMR to prescribers

We wanted to know if prescribers thought AMR was important and how important it was in relation to the other pressures that they are under. Our hypothesis was that this would speak to their reflective motivation to change bad prescribing practices or maintain good prescribing practices; if prescribers believe AMR is important, they will be more likely to address it.

We found that 97% agreed that AMR is a challenge that needs to be addressed urgently and almost 88% accepted they have some personal responsibility for tackling AMR in their practice.

Beliefs about self-efficacy

We wanted to know if prescribers thought that their actions influenced patient behaviour. In this case, about three-quarters of prescribers agreed that patients will be less likely to ask for antibiotics the next time if they did not prescribe them now. So prescribers feel like their actions and messages to patients do have an effect on patients, at least most of the time. Again, this provides us with indications about the reflective motivation of prescribers.

Beliefs about efficacy of alternatives to prescriptions

In this section we asked questions to provide us with evidence about the beliefs of prescribers about alternatives to prescribing antibiotics. Do prescribers believe that alternatives such as information about self-care, delayed prescriptions and point of care testing are effective mechanisms to treat a patient? And do they think that their beliefs about them influence their prescribing behaviour?

Information about self-care

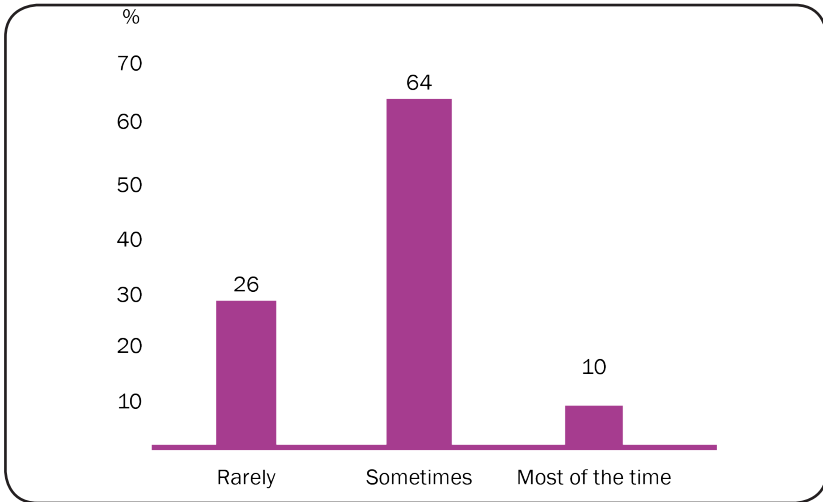
We asked prescribers whether providing information on how to self-care is a useful way to end a consultation, and 73% said they 'Agree' or 'Strongly agree'. Providing self-care information was also a suggestion that came through in many of the free text responses as a method currently used by some prescribers as an alternative to antibiotics. We need to follow up and understand more about the content and delivery of this information and how it is perceived by patients.

Delayed prescriptions

Delayed prescriptions are now an accepted method of treating a patient with a suspected infection, and this is a method which provides an effective safety net to both patient and prescriber.

Almost 95% of prescribers said they would consider using a delayed prescription when it isn't clear whether a mild infection is viral or bacterial, and 58% believe that patients are less likely to take the antibiotic if they're given a delayed prescription than a normal prescription. However, 26% of prescribers reported only 'Rarely' using delayed prescriptions (see Chart Five).

Chart Five: How often would you use a delayed prescription?



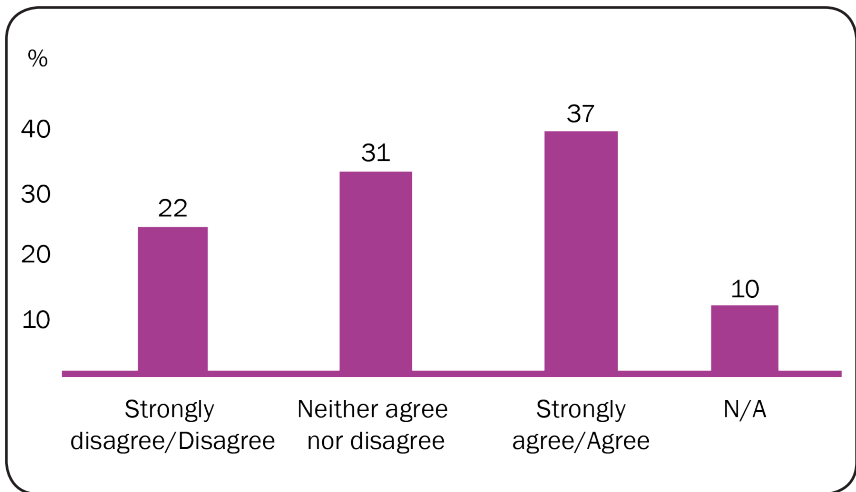
We need to follow up and understand why prescribers don't use delayed prescriptions more often. Are they easy to use? Are they accepted by patients? Are prescribers aware of how often others use them too? Is there enough known about their efficacy in helping patients avoid unnecessary antibiotics? There is a lot to explore here, but at least we know that prescribers do consider them a valid option in some cases.

Point of Care Testing (CRP testing)

We also wanted to know what prescribers thought about CRP testing, a rapid diagnostic tool that can assist in diagnosing bacterial infections on site. We asked if prescribers believed that CRP testing was a useful tool to justify a non-prescription decision for a respiratory tract infection. More people do 'agree' than 'disagree' that CRP testing devices are useful in this situation. However, just under a third, however, said 'Neither agree nor disagree' and an additional 10% said 'Not applicable' indicating that at least 40% of people likely don't know, or have never used them (see Chart Six).

We need to know a bit more about how people use CRP testing devices on-site and how to really make the most them.

Chart Six: CRP testing devices are a useful tool to justify a decision not to prescribe an antibiotic for a lower respiratory tract infection



Automatic Motivation

Beliefs about population-level AMR and perceptions of risk

We asked prescribers about their beliefs of the wider impact of AMR on the population and on individual patients.

Beliefs about population effects

When asked if they think about the population-level antimicrobial resistance when they prescribe an antibiotic to a patient, almost three quarters of prescribers said they 'Agree' or 'Strongly agree'. We're not sure what impact a population-level awareness would have on prescribing patterns, but it's something that seems to be on the radar for most prescribers.

Perceptions of risk

Opinions were split into roughly equal thirds of prescribers who said they agreed, disagreed, and who said 'Neither agree nor disagree' with whether it's safer to prescribe an antibiotic if you're not sure if the infection is bacterial or viral (see Chart Seven). When a diagnosis of a viral infection was slightly more certain, however, most prescribers agreed that not prescribing an antibiotic was not taking a risk with the patient's health (see Chart Eight). It appears that beliefs about uncertainty of the diagnosis and subsequent risks to patient safety could be driving some antibiotic prescribing patterns.

Chart Seven: If I'm not sure if the infection is bacterial or viral, I believe it's safer to prescribe an antibiotic

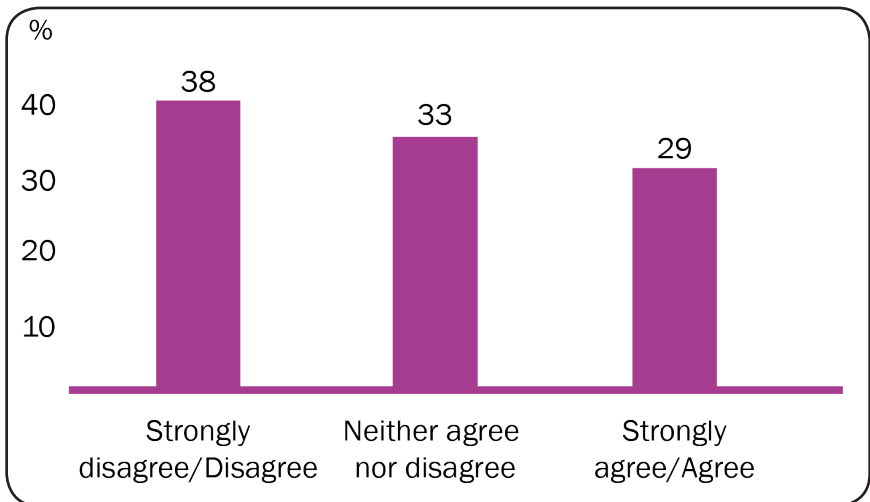
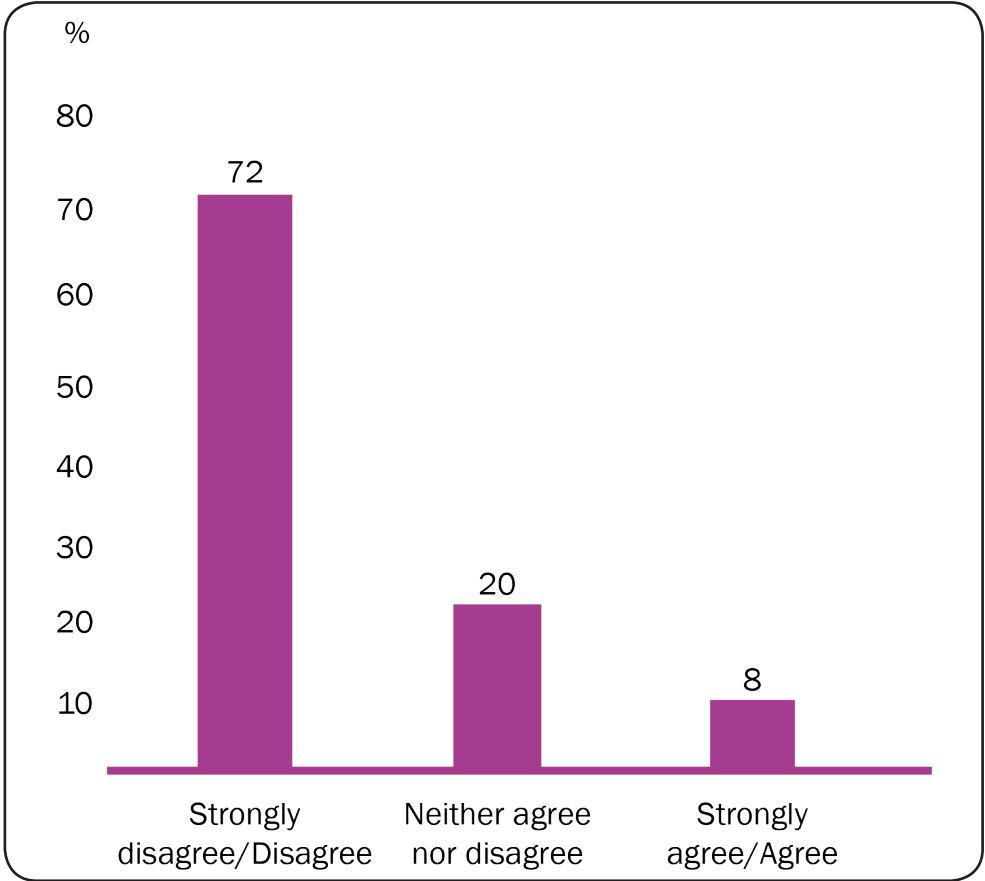


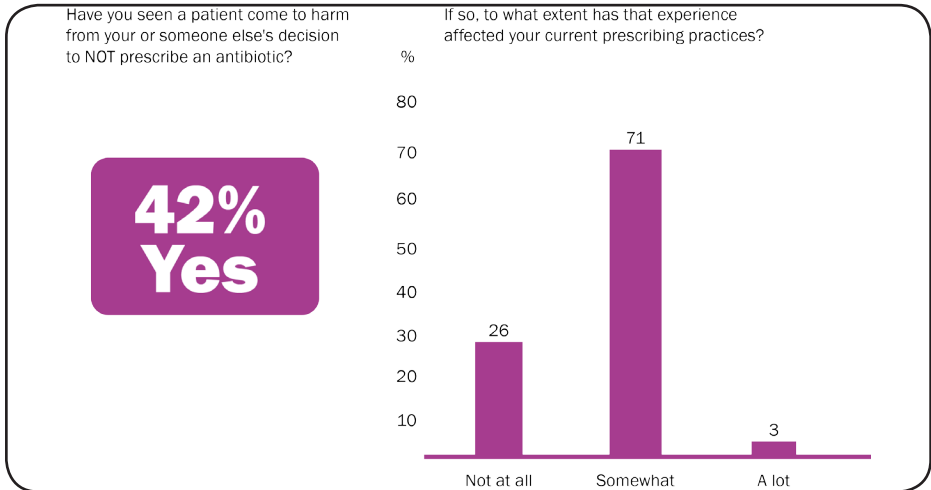
Chart Eight: If I suspected a viral infection and chose not to prescribe an antibiotic, I would be taking a risk with the patient's health



Perceptions of harm and effect on current prescribing patterns

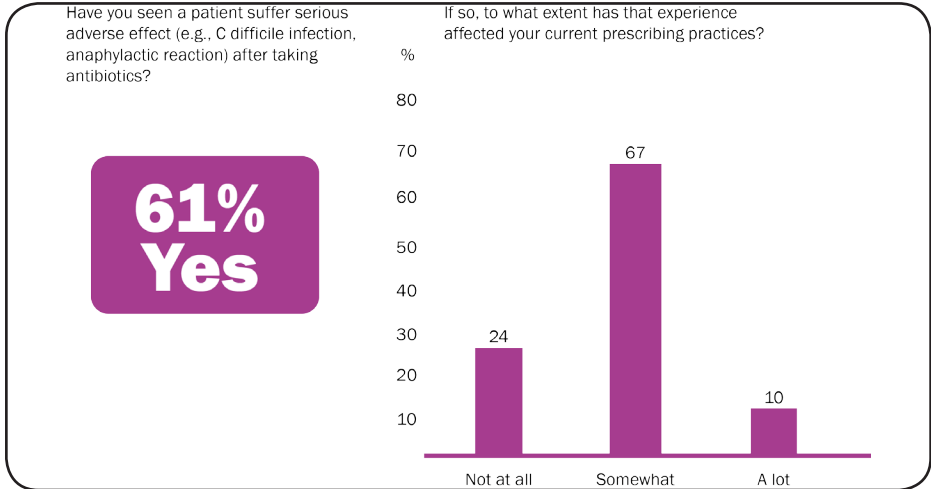
Finally, we wanted to know if having seen patients come to harm in the past affected present prescribing decisions. We found that 42% of prescribers had seen a patient come to harm from either their or someone else's decision NOT to prescribe an antibiotic and only 3% felt that the experience affected their current prescribing practices 'A lot' (see Chart Nine).

Chart Nine: Influence of seeing patient come to harm on prescribing practices



We also found that 61% of prescribers had seen a patient suffer a serious adverse effect (e.g. C.diff infection, anaphylactic reaction) after taking antibiotics, and almost 10% felt that the experience affected their current prescribing practices 'A lot' (see Chart Ten).

Chart Ten: Influence of seeing adverse effect on prescribing practices



About two thirds of those in both groups who had seen harm said the experience ‘somewhat’ affected their current prescribing practices. What this tells us is that, although many prescribers are aware of the harm that can occur by not taking or taking too many antibiotics, the potential future harm does not strongly affect prescribing practices. The reasons for this could be that, compared to the number of patients seen and the number of patients that suffer other debilitating illnesses, the number of incidences of harm from antibiotics appear low and therefore seem relatively unlikely. We don’t know. But we do know that, for most prescribers, these risks are not salient enough to them to be the primary factor influencing their prescribing decisions.

Motivation Summary

The evidence from the survey would indicate that prescribers believe that AMR is important to address and that they believe that their own actions can contribute to solutions by influencing the behaviour of patients. However, it is also clear that there is uncertainty about the effectiveness of some intervention strategies, such as delayed prescriptions, and that these beliefs may be impacting the use of such interventions.

In terms of automatic motivation, we asked questions about personal experience of the adverse effects of AMR. We hypothesised that experience of adverse effects would influence habits and emotions, which would subsequently influence prescribing behaviour. Prescribers generally indicated that this happens, with many of them reporting that they had seen adverse effects, however, the survey also showed a complicated relationship between the perception of risk and the decision to prescribe antibiotics.

Prescriber Survey Conclusions

There are opportunities to develop and trial interventions in all three areas of the COM-B model in order to reduce inappropriate prescribing of antibiotics in primary care. In terms of capability, prescribers need to have the psychological knowledge and skills to prescribe appropriately. Interventions that could increase psychological capability include training, audit of guidelines, and support when making decisions for the elderly or those with long-term conditions.

To increase opportunity, we could look at the role of cues and prompts that remind both patients and prescribers about appropriate prescribing of antibiotics. We can also consider the availability and practicality of alternative forms of prescribing such as delayed prescriptions and self-care prescriptions as well as the practicality of CRP or other point-of-care testing devices. Moreover, providing timely feedback about prescribing patterns of surgeries compared to other surgeries or, even better, of prescribers compared to other prescribers, would give a realistic picture to prescribers of where they stand and make use of social norms to reinforce appropriate prescribing.

Finally, in terms of motivation, prescribers are all aware of the challenge of AMR and accept personal responsibility for the problem. Prescribers are split about their views of the risk of not prescribing antibiotics during diagnostic uncertainty, and support from practice managers and a consistent policy across practices and out-of-hours would be a good starting place to supporting prescribers.



The Stakeholder Survey

Purpose: We typically spend a good deal of time trying to understand what's going on in any system at the start of a project. For us, this is time well spent. It also allows us to take stock of what has already been tried and what new ideas may exist. We, therefore, conducted a survey to understand stakeholder mental models about the causes and potential solutions of inappropriate prescribing.

Survey development: The survey questions were developed by the Innovation Lab, the PHA and the HSC. The questions were designed with the COM-B framework in mind, but COM-B was not the primary focus.

Practical arrangements: The survey was created using CitizenSpace, an online government consultation platform, and was directly emailed to a list of 157 stakeholders identified by the Department of Health as important to the creation and implementation of AMR policy in Northern Ireland.

A/B subject line test: In order to understand better how our stakeholders were engaging with the emails, we set up an A/B subject line test using MailChimp. We knew from behavioural science that people act in ways that make them feel better about themselves (or that boost their egos), so we altered one subject line to appeal to the leadership quality of the stakeholders. We found that both the open rate (how many emails were opened) and the click rate (how many times the link to the survey was clicked) were higher by about 10 percentage points for the subject line that appealed to stakeholders' ego than the subject line that was a simple call to action.

Table Two: Stakeholder engagement levels

Subject line	Open rate	Click rate
The Antimicrobial Resistance Stakeholder Survey: take part now!	30.1% ±6.4%	21.9% ±5.9%
The Antimicrobial Resistance Stakeholder Survey: we need leaders like you to contribute!	41.7% ±7.2%	33.3% ±6.8%

Response rate: There were 157 stakeholders on the list, and we received 49 responses – a 31% response rate. While that is an ok response rate, the numbers are still small so we should exercise caution before jumping to conclusions.

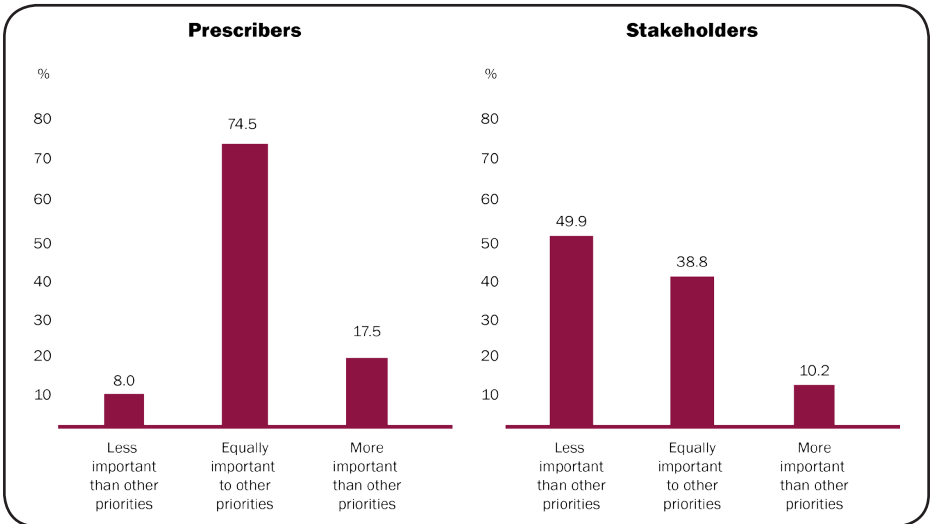
Results

We asked stakeholders about their views of AMR, the causes of inappropriate prescribing, and solutions they would suggest.

Views of AMR

Although, like prescribers, 94% of stakeholders agreed that antimicrobial resistance is a challenge we need to address urgently, stakeholders were more likely than prescribers to think that AMR was less important than other priorities (see Chart Eleven). Prescribers in general think that AMR is equally as important as other priorities, whereas stakeholders didn't and preferred to say that it was less important.

Chart Eleven: How important do prescribers and stakeholders think tackling AMR is in relation to other priorities?



We asked this question to prescribers because we thought it would speak to their motivation to change their prescribing practices, however, we were aware that the question was at the end of the survey and we had effectively primed them to answer this way. There wasn't an obvious fix for this, so we just have to acknowledge it as an issue in the methodology. However, the question was in a similar place in the stakeholder survey and that survey was sent to people identified as key people within the system responsible for leading on AMR. The fact that that group is more ambivalent about its importance means that those leading work in this area will have to put in extra work to understand competing priorities and to make sure everyone is on board.

Causes of inappropriate prescribing

We were also interested in what stakeholders thought caused inappropriate prescribing. Policy and operational interventions are developed on the basis of an analysis of the challenge, so understanding stakeholder views on this question helps us understand what types of solutions are likely to be prioritised. We found that stakeholders clearly preferred explanations for inappropriate prescribing that focused on patients.

We asked a series of questions that asked stakeholders how important a specified factor was in influencing inappropriate prescribing. The highest-rated contributions to inappropriate prescribing were:

1. Patients do not understand antimicrobial resistance;
2. Patients ask for antibiotics for a viral infection;
3. Antibiotic prescribing to care home patients is not effectively controlled;
4. Prescribing antibiotics is quicker than educating patients about alternatives; and
5. Prescribers in primary care prescribe too many antibiotics for viral infections.

We then gave respondents the opportunity to specify other factors, unprompted. This provided a large variety of views on what causes the challenge. We coded the responses thematically and found that the top 5 additional contributions to inappropriate prescribing were:

1. Not enough time for GPs;
2. Patient expectations;
3. Lack of support for near-patient testing;
4. Litigation; and
5. Staffing levels.

It was interesting to note that prescribers did not mention litigation as a cause of the challenge – this seems to be a perspective of stakeholders only.

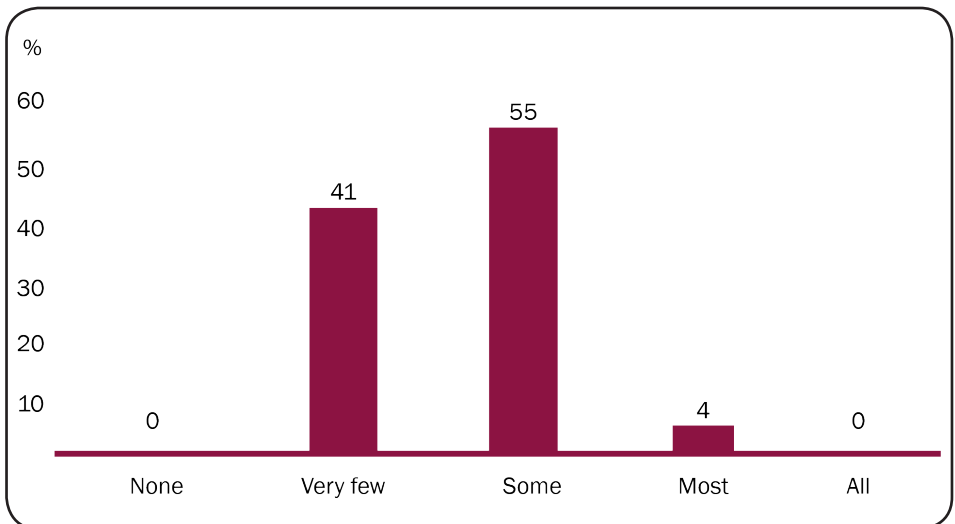
The variety of views on the cause of the problem should not surprise us, but it does have implications for building support for interventions and for creating change in outcomes. What this really means, however, is that there is a lot that we don't know and, in the absence of that, we fill that space with a lot of assumptions about what people are doing and why. We hope to more accurately fill some of that space through this project.

Patients

We asked stakeholders a few other questions about the relationship between patients and inappropriate prescribing. We asked them how often they thought patient expectation influenced the decision to prescribe an antibiotic and found that 25% of stakeholders thought that patient expectation influenced the decision to prescribe an antibiotic 'Most of the time'. This contrasted with only 5% of prescribers who thought the same.

We also asked stakeholders about what proportion of patients they thought understood when antibiotics should and should not be prescribed. About 40% of stakeholders thought 'Very Few' patients understand (see Chart Twelve).

Chart Twelve: What proportion of patients understand when antibiotics should and should not be prescribed?



Solutions

It is important to understand the bank of solutions that already exist within a policy space before embarking on idea development. This allows us to see what has worked, what would have been tried without our involvement, and what types of interventions are acceptable to stakeholders. We found that, overwhelmingly, “patient education” was a dominant solution, while there were a limited number of other interventions that had been tried.

Patient education

Unsurprisingly, patient education was considered by many as the best way to solve the problem; over half of prescribers agreed that literature or posters about appropriate prescribing affect patient decisions to ask for an antibiotic. We saw solution proposed across a wide variety of contexts: from public information campaigns through to one on one education about AMR by the doctor in a consultation.

We see ‘education’ solutions a lot across public sector challenges. Firstly, it is an idea that seems to be the obvious solution. It is usually familiar to most stakeholders and it fits with their mental models of the causes of the problem. It is not that these solutions don’t have a place or don’t work, it is simply that they frequently don’t address the complexity of the challenge, and overlook the variety of other solutions that may be more effective.

Alternatives to prescribing

When we asked stakeholders about other solutions they were aware of, the top solutions included CRP or other testing, delayed prescriptions, having a general discussion with the patient, and giving the patient leaflets. When we asked stakeholders about the effectiveness of delayed prescriptions, almost two thirds agreed that delayed prescriptions affect patient likelihood of taking an antibiotic, though many said they were unaware of the evidence supporting

delayed prescriptions. And although many mentioned ‘patient education’ as a good solution to the problem, 88% agreed that lack of time was an issue when it comes to explaining to a patient why they do not need antibiotics.

Adherence to guidelines

Prescriber education in terms of adherence to guidelines was another form of education mentioned by stakeholders. Almost three quarters of stakeholders said they didn’t think or were unsure if prescribers were sufficiently aware of the NI Management of Infection Guidelines for Primary and Community Care Settings. Moreover, over half did not know or were unsure if prescribers were aware that the guidelines existed in any of the formats available for the guidance, including booklets, leaflets, online, and app format. What this tells us is that, if you think that adherence to guidelines will help prescribers make good decisions, it is worthwhile investigating whether prescribers are actually aware of the tools available, and understanding and promoting good use and practice of the guidance.

“New” ideas

Finally, we asked stakeholders what ideas they had that they thought would help reduce inappropriate prescribing in primary care. Again, the top idea was ‘patient education’ followed by public information campaign, point of care testing, audit of prescribers, and providing financial incentives to prescribers. Many ideas addressed the need to have mechanisms in place to deal with uncertainty and to provide safety netting for patients.

Stakeholder survey summary

If they were asked to define the problem in behavioural terms, stakeholders are likely to agree on the following challenge definition: patients ask for antibiotics when they are not required. The COM-B analysis of the survey showed that stakeholders emphasise psychological capability deficits (patients do not understand when antibiotics are required) and physical opportunity barriers for prescribers (time pressures) that may affect their prescribing decisions.). We can conclude that stakeholders would most likely support for solutions which focus on educating or persuading the patient.

Conclusion

Results and Recommendations

The survey supports arguments for the development of both complex and simple interventions across all three areas of the COM-B model in order to reduce inappropriate prescribing of antibiotics in primary care. Although there is evidence that simple ‘nudges’ can be effective in changing behaviour, according to research of interventions in health psychology, often it takes a combination of several approaches to create significant behaviour change in the long-term. The next stage of the project will take the findings from the survey in combination with findings from the literature review and use the Behaviour Change Wheel to design an intervention to trial in a few practices in Northern Ireland.

From the results of the survey so far, we recommend the following:

- 1. Use the COM-B model of behaviour when thinking about behaviour change.** Using a comprehensive model of behaviour is an extremely useful tool to use when considering influences on behaviour or why a particular behaviour is not engaged in.
- 2. Build on the finding that prescribers take AMR seriously.** 97% of prescribers agree that antimicrobial resistance is a challenge that needs to be addressed urgently and 88% agree that they have some personal responsibility for addressing AMR in their practice.
- 3. Consider alternative ways in which to help GPs differentiate between bacterial and viral infections and provide practice-level support for their diagnostic decisions.** Almost 70% of prescribers thought it was ‘Important’ or ‘Very Important’ to get refresher training on distinguishing viral from bacterial infections. Prescribers’ opinions were also split into roughly equal thirds of those who said they ‘Agree’, ‘Disagree’, or ‘Neither’ with whether it’s safer to prescribe an

antibiotic if they're not sure if the infection is bacterial or viral. Finding ways to give prescribers better feedback on their clinical decisions – through data or through point-of-care testing devices – may give them more confidence in their decisions.

- 4. Find ways to support prescribers when making diagnostic decisions about the elderly, those in nursing homes, and those with long-term conditions.** Prescribers reported being most likely to give an antibiotic to those three groups – even when a viral infection was suspected. We also found that just under half of prescriber never used the app to access the NI Management of Infection Guidelines. We recommend looking at any barriers to accessing all formats of the Guidelines to maximise their benefit.
- 5. Provide timely feedback to prescribers about their performance of antibiotic prescriber relative to their peers, both locally and in the rest of the UK.** In the survey, most prescribers believed they prescribe antibiotics less than their peers. We know that providing timely, relevant feedback on behaviour is a good way to change behaviour.
- 6. Understand patient behaviour better and manage patient expectations.** 62% of prescribers reported feeling that patients expect antibiotics 'Often' or 'Very often' and just under 70% of prescribers feel they are 'Sometimes' or 'Most of the time' influenced by that perceived expectation. We also found that, apart from the waiting room, information about appropriate prescribing was very limited in other areas around the practice. Visual cues in the practice such as posters or leaflets could serve as reminders to both patients and prescribers of value of only taking antibiotics when they are truly needed.
- 7. Develop ways to introduce and mainstream interventions which GPs have confidence in that will reduce inappropriate prescribing.** We found that GPs were unsure about using, for example, delayed prescriptions or point of care

testing. If there is good evidence that an intervention changes behaviour, it is important to understand and address barriers to uptake.

- 8. Avoid momentum solutions without a strong evidence base.** Although important, we recommend stakeholders temporarily put aside go-to 'momentum solutions' such as patient education, and consider alternative possibilities such as the ones outlined above.



Technical Annex

Annex 1: Matrix of how survey maps onto COM-B framework

Question
1. How often do you think that your patients expect to receive antibiotics to treat a self-limiting infection when you feel that an antibiotic is not necessary?
2. How often do you feel patient expectation of receiving an antibiotic influences your decision to prescribe one?
3. Compared to patients in other practices/areas, how often do you think your patients ask for an antibiotic to treat what you believe is a viral infection?
4. I have an effective 'form of words' to use when I suspect a viral infection and don't want to prescribe an antibiotic
5. I believe that patients will be less likely to ask for antibiotics the next time if I do not prescribe them now
6. How often do you believe your patients go to an out of hours GP service to get antibiotics if you decide not to prescribe them?
If you think that a patient is, on balance, likely to have a viral infection (in other words, antibiotics will not be useful), how likely or unlikely are you to prescribe antibiotics in the following circumstances (Relates to questions 7 to 21):
7. The patient has a number of long-term conditions
8. The patient insists that you prescribe antibiotics
9. The patient is a child (with parent present)
10. The patient is elderly
11. You need to draw the consultation to a close
12. The patient presents on Friday afternoon
13. You know the practice you are working in has an emphasis on appropriate prescribing of antibiotics
14. The patient is in a nursing home and a nurse tells you over the phone that he/she has an infection
15. The patient is in a nursing home and you visit the patient in the home
16. You think the patient might make a complaint if you do not prescribe antibiotics
17. The patient is a healthcare professional
18. You speak by phone to a concerned parent of a child who has an upper respiratory illness
19. The patient has left a request at reception for antibiotics
20. The patient attends the practice infrequently
21. The patient attends the practice frequently
22. When it is not clear whether a mild infection is viral or bacterial, do you consider using a 'delayed' prescription for antibiotics?
23. If 'Yes', how often would you use a 'delayed prescription'?

Physical Capability	Psychological Capability	Physical Opportunity	Social Opportunity	Automatic Motivation	Reflective Motivation
			√		√
			√		
			√		√
	√				
					√
					√
	√				
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Question

Q 24 to 27: Please rate your level of agreement with the following statements:

24. Patients are less likely to take the antibiotic if they're given a delayed prescription than if they're given a normal prescription

25. Delayed prescriptions are a useful tool to end a consultation with a patient

26. Providing the patient with written information on how to self-care is a useful way to end a consultation

27. Point of care CRP (C-Reactive Protein) testing devices are a useful tool to justify a decision not to prescribe an antibiotic for a lower respiratory tract infection

28. If, during a phone consultations, you suspect the patient has a bacterial infection, how do you feel about prescribing antibiotics over the phone?

29 If you need to explain to a patient why they don't need antibiotics, how would it affect the length of the consultation compared to just prescribing the antibiotic?

30. Are there other methods you use to avoid prescribing an antibiotic when you feel one isn't needed?

31. How often in the past year have you discussed appropriate prescribing of antibiotics with other staff?

32. Compared to other prescribers in primary care, how frequently do you feel you would prescribe an antibiotic when you suspect a viral infection?

33. Are you in the same practice for the majority of the week?

34. Does your practice have an antibiotic prescribing policy?

35. Is there information about this policy on display for patients in waiting area or reception?

36. Is there information about this policy on display for patients in the practice leaflet?

37. Is there information about this policy on display for patients on the website?

38. Is there information about this policy on display for patients? : other

39. If you answered 'Yes', is there information about this policy on display for patients? No but no objection to doing so

40. If you answered 'Yes', is there information about this policy on display for patients? No and would not consider doing so

41. If you answered 'Yes', how much does this policy influence your day-to-day antibiotic prescribing decisions?

42. In general, how much patient information about appropriate prescribing of antibiotics is visible in the waiting room?

43. In general, how much patient information about appropriate prescribing of antibiotics is visible in your consultation room?

44. In general, how much patient information about appropriate prescribing of antibiotics is visible in the hallways?

45. In general, how much patient information about appropriate prescribing of antibiotics is visible in the Treatment room?

46. In general, how much patient information about appropriate prescribing of antibiotics is visible in? : Other

Physical Capability	Psychological Capability	Physical Opportunity	Social Opportunity	Automatic Motivation	Reflective Motivation
					√
					√
					√
	√				√
	√				√
		√			√
		√			
			√		
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		√			
		√			
		√			√
		√			
		√			
		√			
		√			
		√			

Question

47. How often do you feel that you adjust your antibiotic prescribing patterns to fit the expectations of the practice you're working in?

Q 48 to 53: Please rate your level of agreement with the following statements:

48. Antimicrobial resistance is a challenge that needs to be addressed urgently

49. When prescribing an antibiotic to a patient I think about how it may affect the population-level antimicrobial resistance

50. I have personal responsibility to tackle antimicrobial resistance in my practice

51. If I'm not sure if the infection is bacterial or viral, I believe it's safer to prescribe an antibiotic

52. If I suspected a viral infection and chose not to prescribe an antibiotic, I would be taking a risk with the patient's health

53. If I prescribe an antibiotic to a patient, he/she might get Clostridium difficile infection or a blood stream infection as a direct result

54. How important do you think appropriate prescribing of antibiotics is in the context of other competing priorities?

55. Have you seen a patient come to harm from your decision not to prescribe an antibiotic?

56. If you have seen a patient come to harm from your or someone else's decision to not prescribe an antibiotic, to what extent do you feel that this experience has affected your current prescribing practices?

57. Have you had a patient suffer a serious adverse effect (e.g. C. difficile infection, anaphylactic reaction) after taking antibiotics?

58. If you've seen a patient suffer a serious adverse effect after taking antibiotics, to what extent has this knowledge affected your current prescribing practices?

59. Are you aware of the Northern Ireland Management of Infection Guidelines for Primary and Community Care Settings?

60. How often do you use any of the associated regional resources? Guidelines in booklet form

61. How often do you use any of the associated regional resources?- Summary leaflet of the guidance

62. How often do you use any of the associated regional resources? Online resources

63. How often do you use any of the associated regional resources? Smartphone/tablet App for the guidelines

64. How much would you value: Refresher training on distinguishing viral from bacterial infections

65. How much would you value: More training on the implications of antimicrobial resistance for my prescribing patterns

66. How much would you value: Training on practice systems that could help manage demand for antibiotics

67. How much would you value: More training for non-prescribing staff in the practice on antibiotics and self-care

68. Do you feel there are sufficient opportunities to address your training needs related to management of infections?

69. In my view, the best way to reduce antibiotic prescribing when it's not needed is to:

Physical Capability	Psychological Capability	Physical Opportunity	Social Opportunity	Automatic Motivation	Reflective Motivation
			√		
					√
					√
					√
				√	√
				√	√
	√				√
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Annex 2: Full responses to prescribers survey questions

1. How often do you think that your patients expect to receive antibiotics to treat a self-limiting infection when you feel that an antibiotic is not necessary?

Never	Rarely	Sometimes	Often	Very often	N/A	Not answered
0.0%	1.5%	35.8%	40.1%	21.9%	0.0%	0.7%

2. How often do you feel patient expectation of receiving an antibiotic influences your decision to prescribe one?

Never	Rarely	Sometimes	Most of the time	Always	Not answered
3.6%	25.5%	64.2%	5.1%	0.0%	1.5%

3. Compared to patients in other practices/areas, how often do you think your patients ask for an antibiotic to treat what you believe is a viral infection?

Much less often	Slightly less often	About the same	Slightly more often	Much more often	Don't know	N/A - I'm not in the same practice the majority of the week	Not answered
5.1%	10.2%	37.2%	16.8%	15.3%	9.5%	5.1%	0.7%

4. I have an effective 'form of words' to use when I suspect a viral infection and don't want to prescribe an antibiotic

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	N/A	Not answered
5.1%	4.4%	3.6%	66.4%	19.7%	0.0%	0.7%

5. I believe that patients will be less likely to ask for antibiotics the next time if I do not prescribe them now

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	N/A	Not answered
2.9%	6.6%	14.6%	51.8%	22.6%	0.0%	1.5%

6. How often do you believe your patients go to an out of hours GP service to get antibiotics if you decide not to prescribe them?

Never	Rarely	Sometimes	Most of the time	Always	Don't know	Not answered
0.0%	13.1%	73.0%	7.3%	0.7%	5.8%	0.0%

If you think that a patient is, on balance, likely to have a viral infection (in other words, antibiotics will not be useful), how likely or unlikely are you to prescribe antibiotics in the following circumstances:

	Very unlikely to prescribe antibiotics	Somewhat unlikely to prescribe antibiotics	Makes no difference	Somewhat likely to prescribe antibiotics	Very likely to prescribe antibiotics	Not applicable	Not answered
7. The patient has a number of long-term conditions	5.8%	8.8%	10.9%	64.2%	8.0%	1.5%	0.7%
8. The patient insists that you prescribe antibiotics	10.2%	17.5%	23.4%	36.5%	10.9%	1.5%	0.0%
9. The patient is a child (with parent present)	26.3%	21.2%	34.3%	16.8%	0.0%	1.5%	0.0%
10. The patient is elderly	4.4%	11.7%	26.3%	51.8%	4.4%	1.5%	0.0%
11. You need to draw the consultation to a close	13.9%	9.5%	54.7%	16.8%	2.2%	2.2%	0.7%
12. The patient presents on Friday afternoon	6.6%	12.4%	40.1%	37.2%	2.2%	1.5%	0.0%
13. You know the practice you are working in has an emphasis on appropriate prescribing of antibiotics	14.6%	23.4%	33.6%	13.9%	4.4%	10.2%	0.0%
14. The patient is in a nursing home and a nurse tells you over the phone that he/she has an infection	5.1%	16.1%	17.5%	46.7%	11.7%	2.9%	0.0%
15. The patient is in a nursing home and you visit the patient in the home	8.0%	13.9%	27.7%	36.5%	8.0%	5.1%	0.7%
16. You think the patient might make a complaint if you do not prescribe antibiotics	11.7%	11.7%	44.5%	21.2%	8.8%	2.2%	0.0%
17. The patient is a healthcare professional	9.5%	10.9%	50.4%	27.0%	1.5%	0.7%	0.0%
18. You speak by phone to a concerned parent of a child who has an upper respiratory illness	29.9%	19.7%	40.9%	5.8%	0.0%	3.6%	0.0%
19. The patient has left a request at reception for antibiotics	45.3%	22.6%	24.8%	5.1%	0.0%	2.2%	0.0%
20. The patient attends the practice infrequently	9.5%	8.8%	55.5%	23.4%	0.7%	2.2%	0.0%
21. The patient attends the practice frequently	14.6%	27.0%	53.3%	2.9%	0.0%	2.2%	0.0%

22. When it is not clear whether a mild infection is viral or bacterial, do you consider using a 'delayed' prescription for antibiotics?

No	Yes	I've never heard of them	Not answered
5.1%	94.9%	0.0%	0.0%

23. If 'Yes', how often would you use a 'delayed prescription'?

Rarely	Sometimes	Most of the time	Not answered
25.5%	64.2%	7.3%	2.9%

Q 24 to 27: Please rate your level of agreement with the following statements:

24. Patients are less likely to take the antibiotic if they're given a delayed prescription than if they're given a normal prescription

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	N/A	Not answered
2.9%	16.8%	21.2%	52.6%	5.1%	0.7%	0.7%

25. Delayed prescriptions are a useful tool to end a consultation with a patient

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	N/A	Not answered
2.2%	8.0%	25.5%	59.9%	3.6%	0.7%	0.0%

26. Providing the patient with written information on how to self-care is a useful way to end a consultation

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	N/A	Not answered
1.5%	6.6%	18.2%	54.7%	18.2%	0.7%	0.0%

27. Point of care CRP (C-Reactive Protein) testing devices are a useful tool to justify a decision not to prescribe an antibiotic for a lower respiratory tract infection

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	N/A	Not answered
3.6%	18.2%	31.4%	24.1%	13.1%	9.5%	0.0%

28. If, during a phone consultations, you suspect the patient has a bacterial infection, how do you feel about prescribing antibiotics over the phone?

Very uncomfortable	Fairly uncomfortable	Neutral	Fairly comfortable	Very comfortable	N/A	Not answered
9.5%	27.7%	10.2%	44.5%	5.1%	2.9%	0.0%

29. If you need to explain to a patient why they don't need antibiotics, how would it affect the length of the consultation compared to just prescribing the antibiotic?

It would be quicker to explain than prescribe	There would be no real difference	It would be quicker to prescribe antibiotics	Don't know	N/A	Not answered
1.5%	21.9%	74.5%	0.7%	1.5%	0.0%

30. Are there other methods you use to avoid prescribing an antibiotic when you feel one isn't needed?

The responses here were free text...

31. How often in the past year have you discussed appropriate prescribing of antibiotics with other staff?

Never	Rarely	Sometimes	Most of the time	Always	Not answered
4.4%	11.7%	71.5%	10.9%	1.5%	0.0%

32. Compared to other prescribers in primary care, how frequently do you feel you would prescribe an antibiotic when you suspect a viral infection?

I never prescribe antibiotics for viral infections	Much less often	Less often	About the same	More often	Much more often	No idea	Not answered
2.9%	13.1%	33.6%	43.1%	3.6%	0.0%	3.6%	0.0%

33. Are you in the same practice for the majority of the week?

No	Yes	Not answered
11.7%	88.3%	0.0%

34. Does your practice have an antibiotic prescribing policy?

No	Yes	Don't know	Not answered
15.3%	63.5%	8.8%	12.4%

If you answered 'Yes', is there information about this policy on display for patients?

	No	Yes
35. On display in waiting area or reception	68.6%	31.4%
36. In practice leaflet	86.1%	13.9%
37. On website	81.8%	18.2%
38. Other	97.8%	2.2%

39. If you answered 'Yes', is there information about this policy on display for patients?

Blank	No but no objection to doing so
69.3%	30.7%

40. If you answered 'Yes', is there information about this policy on display for patients?

Blank	No and would not consider doing so
98.5%	1.5%

41. If you answered 'Yes' to "Does your practice have a prescribing policy?", how much does this policy influence your day-to-day antibiotic prescribing decisions?

Not at all	Rarely	Somewhat	Most of the time	Always	N/A	Not answered
5.1%	3.6%	17.5%	27.7%	4.4%	10.2%	31.4%

In general how much patient information about appropriate prescribing of antibiotics is visible in:

	None	Adequate amount	Too much information	Not answered
42. The waiting room	15.3%	73.0%	0.0%	11.7%
43. Your consultation room	61.3%	22.6%	0.7%	15.3%
44. The hallways	53.3%	29.9%	0.7%	16.1%
45. The treatment room	53.3%	28.5%	1.5%	16.8%
46. Other	32.8%	10.9%	0.0%	56.2%

47. If you're not in the same practice the majority of the week, how often do you feel that you adjust your antibiotic prescribing patterns to fit the expectations of the practice you are in?

Never	Rarely	Sometimes	Most of the time	Always	Don't know	N/A	Not answered
1.5%	2.9%	1.5%	2.2%	0.0%	1.5%	2.2%	88.3%

Q 48 to 53: Please rate your level of agreement with the following statements:

48. Antimicrobial resistance is a challenge that needs to be addressed urgently

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Not answered
0.0%	0.7%	2.2%	38.7%	58.4%	0.0%

49. When prescribing an antibiotic to a patient I think about how it may affect the population-level antimicrobial resistance

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Not answered
2.2%	5.8%	18.2%	54.7%	19.0%	0.0%

50. I have personal responsibility to tackle antimicrobial resistance in my practice

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Not answered
0.0%	0.7%	10.2%	56.9%	31.4%	0.7%

51. If I'm not sure if the infection is bacterial or viral, I believe it's safer to prescribe an antibiotic

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Not answered
2.9%	35.0%	32.8%	27.0%	2.2%	0.0%

52. If I suspected a viral infection and chose not to prescribe an antibiotic, I would be taking a risk with the patient's health

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Not answered
18.2%	53.3%	20.4%	7.3%	0.7%	0.0%

53. If I prescribe an antibiotic to a patient, he/she might get Clostridium difficile infection or a blood stream infection as a direct result

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Not answered
0.7%	11.7%	31.4%	52.6%	3.6%	0.0%

54. How important do you think appropriate prescribing of antibiotics is in the context of other competing priorities?

Less important than other priorities	Equally important to other priorities	More important than other priorities	Not answered
8.0%	74.2%	17.5%	0.0%

55. Have you seen a patient come to harm from your decision not to prescribe an antibiotic?

No	No - but I've seen a patient come to harm from someone else's decision not to prescribe an antibiotic	Yes	Not answered
56.9%	24.1%	17.5%	1.5%

56. If you have seen a patient come to harm from your or someone else's decision to not prescribe an antibiotic, to what extent do you feel that this experience has affected your current prescribing practices?

Not at all	Somewhat	A lot	N/A	Not answered
11.7%	32.1%	1.5%	45.3%	9.5%

57. Have you had a patient suffer a serious adverse effect (e.g. C. difficile infection, anaphylactic reaction) after taking antibiotics?

No	No - but I've seen someone else's patient suffer a serious adverse effect after taking antibiotics	Yes	Not answered
38.0%	22.6%	38.7%	0.7%

58. If you've seen a patient suffer a serious adverse effect after taking antibiotics, to what extent has this knowledge affected your current prescribing practices?

Not at all	Somewhat	A lot	N/A	Not answered
16.1%	45.3%	6.6%	27.0%	5.1%

59. Are you aware of the Northern Ireland Management of Infection Guidelines for Primary and Community Care Settings?

No	Yes	Not sure	Not answered
8.0%	84.7%	6.6%	0.7%

How often do you use any of the associated regional resources?

	Never	Rarely	Sometimes	Most of the time	Always	I'm unfamiliar with it	Not answered
60. Guidelines in booklet form	14.6%	15.3%	38.0%	16.1%	9.5%	5.1%	1.5%
61. Summary leaflet of the guidance	12.4%	15.3%	35.0%	19.7%	8.8%	5.8%	2.9%
62. Online resources	17.5%	16.1%	29.2%	21.9%	8.8%	5.1%	1.5%
63. Smartphone/tablet App for the guidelines	35.8%	10.9%	21.2%	11.7%	9.5%	10.2%	0.7%

How would you rate the importance of receiving the following:

	Not at all important	Not important	No opinion	Important	Very important	Not Answered
64. Refresher training on distinguishing viral from bacterial infections	3.6%	16.1%	11.7%	54.7%	13.9%	0.0%
65. More training on the implications of antimicrobial resistance for my prescribing patterns	3.6%	14.6%	18.2%	51.8%	11.7%	0.0%
66. Training on practice systems that could help manage demand for antibiotics	0.7%	6.6%	9.5%	64.2%	19.0%	0.0%
67. More training for non-prescribing staff in the practice on antibiotics and self-care	1.5%	6.6%	13.1%	54.0%	24.1%	0.7%

68. Do you feel there are sufficient opportunities to address your training needs related to management of infections?

No	Yes	Not sure	Not answered
45.3%	38.7%	14.6%	1.5%

69. In my view, the best way to reduce antibiotic prescribing when it's not needed is to:

The responses here were free text...

Annex 3: Demographics

What is your age bracket

<25	25-34	35-44	45-54	55-64	65+	Not answered
0.0%	26.3%	32.8%	24.8%	11.7%	0.7%	3.6%

What is your gender?

Male	Female	Other	Not answered
40.1%	56.2%	0.0%	3.6%

Practice location:

Urban	Rural	N/A	Not answered
54.7%	35.8%	6.6%	2.9%

Local Commissioning Group area:

Belfast	Northern	South Eastern	Southern	Western	N/A	Not answered	Other
21.9%	16.8%	17.5%	16.8%	23.4%	0.7%	2.9%	0.0%

What is the size of your practice?

<4,000	4,000 - 9,000	9,000+	N/A	Not answered	Other
19.0%	49.6%	21.2%	8.0%	2.2%	0.0%

Occupational Group

FT, PT, DoH, Seasonal, Salaried, Partner	GP Trainee	Locum	Nurse	Pharmacist	Not answered
60.6%	15.3%	2.9%	6.6%	11.7%	2.9%

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