**An interdisciplinary mixed-methods approach to developing antimicrobial stewardship interventions: Protocol for the Preserving Antibiotics through Safe Stewardship (PASS) Research Programme.**

**Supplementary materials: Interview topic guides and systematic-review data extraction proforma**

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**Interview Topic Guide [Primary Care] - Prescribers**

**Introduction; agenda setting; check time available; consent etc.**

Thank you for taking the time to do this interview today, it is much appreciated.

Before we start, I hope you’ve has an opportunity to read the information sheet. So just to recap, the purpose of the interview is to get a better understanding of your antibiotic prescribing decisions, and your thoughts about the appropriate use of antibiotics in primary care and antimicrobial resistance.

There are no right or wrong answers to the questions. Also, I’m not a clinician so might have ask you for some clarification at times.

The interview is expected to take between 30-45 minutes. This does depend on your responses but are you available for this length of time now?

Do you have any questions before we get started?

Are you happy to be recorded?

[Obtain verbal consent on the audio recording]

***ORAL CONSENT***

*For the purpose of this audio I’d also like to take oral consent.*

*This interview is with [ ] on the [ ]. Can you confirm that you have: (1) read the information sheet including an oportunity to ask questions and have them answered satisfactorily; (2) Understand your participition is voluntary and you can withdrawn at anytime; (3) Understand the interviewbeing recorderd and transcribed; (4) understand the data may be used by other researchers from other projects and (5) understand all data is anonymous and you will not be identified. Do you agree to take part in this study?*

**Part A – General questions**

I would like to start by asking you some general questions about you and your antibiotic prescribing decisions.

1. How long have you been working as a [insert role here]?
2. How long have you worked at this practice?
3. Are you permanent or a locum at this practice? [GPs only]
4. Can you recall any recent episodes where one of your patients was prescribed an antibiotic, can you talk me through the process that led to an antibiotic being prescribed?

Prompts: What would you typically discuss?

1. Can you recall any instances where you could have prescribed an antibiotic and decided not to, can you talk me through what happened?
2. Can you recall any instances where you did not want to prescribe but ended up giving an antibiotic anyway, can you talk me through what happened?

**Part B – Factors influencing prescribing decisions**

In this next part, I will ask questions about antibiotic prescribing decisions in general, but also for specific patient groups.

1. Can you talk me through, what signs and symptoms you can/cannot treat without antibiotics?
2. Is there anything about a patient that might influence your decision to prescribe antibiotics or not?

Prompts: Would specific groups like COPD/RTIs/children influence your decision to prescribe or not? If so, how? Does knowing the patient history influence your decision to prescribe or not? If so, how?

1. How might other clinicians influence your prescribing decisions?

Prompts: Who? Is it a nurse prescriber and GPs in the practice or pharmacists?

1. In general, how easy/difficult is it to decide when to appropriately prescribe an antibiotic?

Prompts: For specific groups like COPD/RTIs/children? What in particular would makes it easier/harder?

1. In general, how confident are you in managing their signs and symptoms without antibitoics?

Prompts: For specific groups like COPD/RTIs/children? Is it harder for specific groups? What is hard/easy? i.e. coping with patient expectation/demands for an antibiotic

1. In general, are you ever worried about a patient going without an antibiotic?

Prompts: What in particular would worry you? Does it depend on the condition?

1. In general, do you ever feel under pressure to prescribe an antibiotic?

Prompts: If so, what can cause it?

1. To what extent do time considerations influence your prescribing decisions?

Prompts: How so? Does it depend on the condition? Does it depend on the day of the week? When would you use a delayed prescription?

1. To what extent are you likely to use any clinical scoring methods to support your prescribing decision?

Prompts: If so, how do they help? If not, why not? Which ones? (Centors Criteria)

1. What do you think might be the consequences if you do not prescribe an antibiotic?

Prompts: For the specific groups? Do you think it is effective to not use antibiotics?

1. Are there instances in which you think that the risks of prescribing outweights the potential benefits?

Prompts: Does this differ across the specific groups?

1. In general, what are your aims for patient care when prescribing antibiotics?

Prompts: Do your priorities differs across conditions? What are your priorties for the specific groups?

1. Are you aware of the guidelines or recommendations for using antibiotics appropriately?

Prompts: Do you aim to follow all or parts of the guidelines? Which parts? Do you feel that guidelines apply for these specific groups of patients?

1. Are these local or national guidelines?

Prompts: How often do you refer to guidelines? How well do you think they are implemented?

Are they effective in ensuring the recommended use of antibiotics? What would be more effective than guidelines?

1. Do you or the practice have targets for the use of antibiotics?

Prompts: What are the targets? Who decides these targets? Do you think they are achieveable?

Do the targets differ depending on the conditions?

1. Do you or the practice ever receive feedback on your antibiotic prescribing?

Prompts: How well are you and the practice doing relative to the targets? Who provides the feedback? How often? How do you and the practice response to the feedback?

1. Do you or the practice have strategies in place to ensure appropriate use of antibiotics?

Prompts: What are the strategies? How are they decided? Do you review your prescribing performance against them? Do the targets differ depending on the conditions?

1. Do you ever discuss antibiotic prescribing decisions within the practice team?

Prompts: Who is in the team? Why would you discuss it with the team? What do you typically discuss?

1. How important is it to you to ensure that antibiotcs are prescribed appropriately?

Prompts: Is so, why? Does it differ across conditions?

1. Are there any incentices in place to improve your antibiotic prescribing?

Prompts: Do they work? What would work better?

1. In general, what you you think are the potential pros and cons of limiting the use of antibiotics in the future?

Prompts: What are they?

1. In general, to what extent do you feel you have a role to play in helping to ensure antibiotcs are used more appropropriately?
2. Do you feel that nurse prescribers and community pharmacists also have a role in ensuring antibiotics are used appropriately?

Prompts: If not, why? What is that role? Do you think that they could have more of a role? How do you work with pharmacists?

1. To what extent do you think using antibiotics appropriately would help to reduce AMR?

Prompts: What do you think needs to happen to reduce AMR?

1. Can you think of any additional ways of improving antibiotic prescribing in primary care?

Prompts: In this GP practice/in other GP practices? What is needed? What’s not working at the moment?

Thanks, that’s all the questions I would like to ask. Is there anything else that you would like to add that you think has not been covering by my questions? Or is there anything you would like to revisit or expand upon?

Thank you again for taking the time to speak to me.

[Switch off recorder]

**Interview Topic Guide [Secondary Care]**

**Introduction; agenda setting; check time available; consent etc.**

Thank you for taking the time to do this interview today, it is much appreciated.

Before we start, I hope you’ve has an opportunity to read the information sheet. So just to recap, the purpose of the interview is to get a better understanding of management of antibiotics in secondary care

and your thoughts about the appropriate use of antibiotics in secondary care and antimicrobial resistance.

There are no right or wrong answers to the questions. Also, I’m not a clinician so might have ask you for some clarification at times.

The interview is expected to take between 30-45 minutes. This does depend on how much you have to say, but are you available for this length of time now?

Do you have any questions before we get started? [Obtain verbal consent on the audio recording]

**Part A – General questions**

I would like to start by asking you some general questions about your role in the management of antibiotics in secondary care.

1. How long have you been working as a [insert role here]?
2. How long have you worked at this hospital and in this ward?

Can you tell me what your role is in the antibiotic review with regards to starting, reviewing, switching and stopping antibiotics? [Social/Professional Role & Identity]

Prompts: What do you do? When do you become involved? Who else involved etc?

1. Can you talk me through a recent episode where a patient in your care was prescribed an antibiotic? [Memory, Attention & Decision making; Social/Professional Role & Identity]

Prompts: Who prescribed it if not you? At what stage did you take over patient care? What did you do in regards to antibiotic prescribing decisions?

1. What normally happens at the antibiotic review? [Memory, Attention & Decision making]

Prompts: What do you typically do (continue, switch or stop)?

**Part B – Factors influencing prescribing decisions at review**

This next part is a mixture of questions about general antibiotic prescribing decisions, and more specific questions about clinical decision points where antibioitcs are initiated, reviewed, switched or stopped.

1. Is there anything about a patient that might influence your prescribing decisions at a review? [Social Influence]

Prompts: Is it patients with specific conditions? If so, how?

1. Do you ever discuss antibiotic prescribing decisions within the team? [Social/Professional Role & Identity]

Prompts: Who is in the team? Why would you discuss it with the team? What do you typically discuss?

1. How might other clinicians influence your prescribing decisions at a review?[Social Influence]

Prompts: Who? Is it other members of the team or the hospital pharmacists?

1. In general, what are your priorities when reviewing the use of antibiotics? [Goals]

Prompts: How do they differ if deciding to switch or stop? Do your priorities differs across conditions?

1. How does the reviewing of antibiotic prescriptions fit in within with other aspects of your role? [Social/Professional Role & Identity; Goal]

Prompts: How much of a priority it is? Do your think it is your responsibility to be doing the daily review or someone else’s?

1. Do you find it easy/difficult to make appropriate prescribing decisions? [Beliefs about Capabilities]

Prompts: What in particular would makes it easier/harder? Does this differ between deciding to switch or to stop an antibiotic prescription?

1. In general, how confident are you in managing patients without antibitoics? [Beliefs about Capabilities]

Prompts: Is it harder for specific conditions? What is hard/easy?

1. In general, are you ever worried about stopping or switching (not stopping & not switching) an antibiotics? [Beliefs about Consequences; Emotion]

Prompts: What in particular would worry you? Does it depend on the condition?

1. In general, do you ever feel under pressure to continue with antibiotics? [Social Influence]

Prompts: If so, what can cause it?

1. To what extent do time considerations influence your review decisions? [Environmental Context & Resources]

Prompts: How so?

1. What do you use to inform your decisions at the review around whether to switch or stop an antibiotic? [Knowledge]

Prompts: Are culture and sensitivity results ready when you need them?

1. Are there instances in which you think that the risks of not reviewing antibiotics (or not switching or not stopping) prescribing outweighs the potential benefits? [Beliefs about Consequences]

Prompts: Does this depend on whether its IV or oral therapy? Does this differ across the specific groups?

1. Are you aware of the guidelines or recommendations around the appropriate use of antibiotics? [Knowledge]

Prompts: Are these local or national guidelines?

1. To what extent do they guide your practice? [Knowledge; Memory, Attention & Decision-making]
2. Do you or the team have targets for the use of antibiotics? [Behaviour Regulation]

Prompts: What are the targets? Who decides these targets? Do you think they are achieveable?

Do the targets differ depending on the conditions? Do the targets relate to review, switching or stopping antibiotics?

1. Do you or the team ever receive feedback on your antibiotic prescribing? [Behaviour Regulation]

Prompts: (If so) How well do you think you and the team doing relative to the targets? Who provides the feedback? How often? How do you and the team respond to the feedback? Does the feedback received by this ward differ from any other wards?

1. Do you or the team have strategies in place to ensure appropriate prescribing of antibiotics? [Behaviour Regulation]

Prompts: Can you talk me through these? How effective do you think these strategies are?

1. What does antimicrobial stewardship and AMR mean to you? [Knowledge]

Prompts: What antibiotics to use? When to make antibioitic prescribing decisions, i.e. continue, switch or stop?

1. Have you attended any training about antimicrobial stewardship? [Skills]

Prompts: When and where? What is the training cover?

1. To what extent do you think using antibiotics appropriately would help to reduce AMR? [Optimism]

Prompts: What do you think needs to happen to reduce AMR?

1. What do you think could improve antibiotic stewardship? [Optimism]
2. How important is it to you to ensure that antibiotics are prescribed appropriately? [Goal]

Prompts: Is so, why? Does it differ across conditions? Is the importance differ between stopping and switching?

1. Are there any incentives in place to improve your antibiotic prescribing? [Reinforcement]

Prompts: Do they work? What would work better?

1. To what extent do you normally review the use of antibiotics? [Intention; Behaviour Regulation]

Prompts: Do your colleagues on this ward also review antibiotics? Is there a routine for doing it? What could make it more of a habitual?

1. To what extent does the practice in this ward differ from other wards? [Enviromental Context & Resources]

Thanks, that’s all the questions I would like to ask. Is there anything else that you would like to add that you think has not been covering by my questions? Or is there anything you would like to revisit or expand upon?

Thank you again for taking the time to speak to me.

[Switch off recorder]

**Interview Topic Guide [Care Homes]**

Thanks very much for taking the time to speak to me today.

* Can I first double check that you have received a study information sheet and know what the purpose of this interview is?
* As a reminder, the aim of this research is to explore how antibiotics are currently used in care homes and what factors might be influencing this.
* There are no right or wrong answers to any of the questions I will be asking.
* The interview should last about 45 minutes, depending on how much you have to say.
* I just want to remind you that I will be audio recording this interview so that I can accurately capture all of the key points that you share with me.
* Everything is completely anonymous, so that any identifying information you use during the course of our discussion, such as name of colleagues, patients, or organisations will be removed from the transcript.
* Lastly, you are free to skip over any questions that you do not wish to answer and can end the interview at any time if you wish.
* Do you have any questions?
* Are you happy for me to start recording?

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| **QUESTIONS**  |
| **I would just like to start by asking you some general questions about yourself and your role.** |
| 1. How long have you been working as a manager/nurse/care assistant in a care home settings?

If a manager ask if they have a nursing background. | Social professional role and identity |
| 1. How long have you been working in this care home?
 | Social professional role and identity |
| 1. Can you remember any recent episodes where a resident in your care was prescribed an antibiotic, can you take me right back to the beginning and start from there, who discovered the resident wasn’t well? And what happened next. (We would like to know what actually happens rather than what you think should happen)

Prompts: What role did you play in the process? When did you become involved? What did you do? Is this what you usually do? Who else was involved? Were alternatives to prescribing antibiotics considered? If not, why not? | Social professional role and identityBehaviour regulation |
| 1. Can you remember any recent episode when you suspected that a resident might have an infection but antibiotic was not prescribed, can you talk me through this alsoPrompts: What role did you play in the process? When did you become involved? What did you do? Is this what you usually do? Who else was involved?
 | Social professional role and identityBehaviour Regulation;Memory, attention & decision making |

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| **Thank you for providing details about these 2 episodes. Now more broadly, I would like to ask some questions about your management of residents with suspected infections in the care home** |
| 1. In general, if someone is unwell, what symptoms makes you to think that a resident might have an infection?

Prompts: What symptoms do you look out for? Would this differ across patients? Would it depend on any pre-existing conditions? What signs or symptoms do you focus on? (E.g. temperature, loss of appetite etc.) What would you do next? E.g. take temperature (how – oral/ear/rectal), speak to nursing staff? Is this information recorded anywhere? | Memory Attention Decision Making; Knowledge |
| 1. To what extent does the resident and their family influence how a suspected infection is managed in the care home?

Prompts: In what way? How? When?Is it affected by the residents/their families’ wishes including POA and care plans? How does the resident influence how it is managed? Does being familiar with the resident, and their previous history influence it? Does it depend on the co-morbidities involved?  | Social influence; Knowledge |
| 1. How does your care home work and communicate with the GPs about infections and using antibiotics?

Prompts: Is there one GPs allocated to the care home? Regular consulting times?Do different GPs differ on how they approach infections and prescribe antibiotics?Are there ever any instances where a GP is more likely to be contacted? Any instances in which you are less likely to contact the GP?Do GPs ever use delayed prescriptions? What are you views on these? | Social influenceEnvironment context and resources |
| 1. Which other members of the care home staff are involved in managing suspected infections?

Prompts: How do you work together? Would this differ across suspected infections? Would this differ across patients?  | Social professional role and identity;Social Influence |
| 1. How is information about suspected infections conveyed to other care home staff?

Prompts: Who do they communicate with? What information is given? To what extent is it recorded? Do you ever discuss antibiotic prescribing with your colleagues? | Behaviour RegulationSocial influence |
| 1. Do you have everything you need to manage suspected infections? (Resources includes time, staff, equipment, information)

Prompts: What else would be needed? Does it differ across conditions/residents? The types of antibiotics or alternatives are needed? To what extent to you use any tests? E.g. urine dips | Environment context and resources |
| 1. Do you know about any guidelines on how to manage infections (i.e. protocols, guidelines about using antibiotics, induction) Are they local or national guides?

Prompts: Do you think they are applicable to care home residents? If yes, which parts? Have you received any training on managing bacterial infections? What? | Knowledge;Behavioral regulation |
| 1. How confident are you in your ability to manage suspected infections?

Prompts: Does it differ across patients/conditions? What challenges are you likely to encounter? (Knowing when to contact a GP) How do you overcome them?  | Beliefs about capabilities;Skills;Behavior regulation |
| 1. Are you likely to worry or be anxious when a residents goes without an antibiotic?

Prompts: If yes, what would worry you and why?Would you worry about the consequences of giving an antibiotic? If yes, what would they be? | Emotion;Beliefs about consequences |
| 1. What is important for you when managing suspected infections?

Prompts: Is it a priority compared to others things you have to do?  | Intention;GoalSPRI |
| 1. What are pros/cons of giving antibiotics? (to the resident/for the staff)

What are the pros/cons of not giving antibiotics (to the resident/for the staff)To what extent does prescribing/not prescribing likely to benefits/disadvantage CH staff and other residents? Prompts: why, when and how?  | ReinforcementBeliefs about consequences |
| **In this second half of the interview, I would like to ask you some questions about antibiotic use in the care homes more broadly…..** |
| 1. To what extent do you think prescribing/not prescribing antibiotics helps contribute to good care of residents?
 | Optimism |
| 1. Do you happen to know about current levels of antibiotic use in this care home?
* Do you receive feedback on antibiotic use?
* Which antibiotics are most often used?
* What are the reasons residents are usually prescribed antibiotics?
* Are there certain types of residents who are more likely to be prescribed antibiotics?
* How do you feel antibiotic use in this care home compares to other care homes? (I.e. is it normal, higher use, lower, etc.)
 |  Knowledge |
| 1. Are you aware of other means of managing infections without using antibiotics?
* Can you talk me through these?
* Do you ever consider or use these? If so, how would you decide to use these instead of antibiotics?
* How confident are you in managing infections without using antibiotics?
* How effective do you think these are in treating infections compared to antibiotics?
 | Knowledge;Beliefs about capabilities; Beliefs about consequences;Memory, attention & decision making |
| 1. Are you aware of any local or national incentives (i.e. financial) and/or strategies in place to try and improve antibiotic use in care homes?

Prompts: If so can you talk me through these? To what extent have these been implemented successfully in this care home?If not, what would be needed? | KnowledgeReinforcement |
| 1. Are you familiar with the term antimicrobial or antibiotic resistance? Can you talk me through your understanding of it?
* If not: ‘Antimicrobial resistance’ may be too much of a technical term, are terms such as ‘superbugs’ or ‘MRSA’ more familiar to you? Tell me more about what you know about these.
* To what extent do you think this is a problem in care homes?
* Do you think antibiotic use in care homes contributes to antimicrobial resistance more broadly?
* Are you worried about this in your care home?
 | KnowledgeBeliefs about consequences;Emotion |
| 1. If you were asked to try and help reduce antibiotic use in the care home, how would this affect your work?

Prompts:  | Beliefs about consequences |
| 1. Can you think of any ways of improving antibiotic use in this care home?

Prompts: Is this something your care home intends to do? | Behavior Regulation;Intention |
| **Thanks – that concludes the questions I would like to ask. Is there anything you would like to add that has not been covered by my questions so far? Or is there anything you would like to revisit or expand upon?** **Thank you for taking the time to speak to me.** |

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| **Publication information** | **Study Design** | **Demographics and setting** | **Outcomes** | **Statistics** | **Specification of target behaviour**  | **Interventions** |
| Author | Study design | Number of sites | Primary outcome(s) | Type of analysis |  Action/ behaviour (what) | Intervention functions targetted |
| Year | Country | Type of sites | Secondary outcome(s) | Effective? (Yes/No) [Identified by reported statistic and 95% CI] | Target (whom) | Behaviour Change techniques targetted |
| Title | Data collection time points | Number of staff employed | Data collection method | Reported statistic | Whose behaviour (who) |  |
| Journal | Study duration  | Type of staff employed | Validated measures used (if applicable) | 95% CI (if reported) | Timeframe |  |
| Grey/peer reviewed | Length of follow up (if applicable- report longest where multiple)) | Number of residents/patients | Psychometric properties of measure (if applicable) | p-value (if reported) | Context (where) |  |
|  | Number who actually received intervention | Targeted infections |  | If cRCT - intracalss corellation | Control condition (provide details of what it was) |  |
|  | Number receiving control |  |  | Percentage of variance | Time points intervention delivered |  |
|  |  |  |  | Covariates controlled for [exract adjusted and non-adjusted where reported] |  |  |
|  |  |  |  | Other reported statistics |  |  |

**Data extraction fields for systematic review**