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ORIGINAL ARTICLE

Factors affecting physician implementation of hospital pharmacists' medication appropriateness recommendations in older adults

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Aims: Non-implementation of pharmacist recommendations by physician prescribers may prolong potentially inappropriate prescribing in hospitalised older adults, increasing the risk of adverse clinical outcomes. The aim of this study was to ascertain the key factors affecting physician prescriber implementation of pharmacists' medication appropriateness recommendations in hospitalised older adults.

Methods: Semi-structured interviews were conducted with hospital pharmacists and physicians who provided care to older adults (≥65 years) in 2 acute university teaching hospitals in Ireland. Content analysis was employed to identify the key themes that influence physician prescriber implementation of pharmacist recommendations.

Results: Fourteen interviews were conducted with 6 hospital pharmacists and 8 hospital physicians between August 2018 and August 2019. Five key factors were found to affect physician implementation of pharmacist recommendations: (i) the clinical relevance and complexity of the recommendation—recommendations of higher priority and those that do not require complex decision-making are implemented more readily; (ii) interprofessional communication—recommendations provided verbally, particularly those communicated face to face with confidence and assertion, are more likely to be implemented than written recommendations; (iii) physician role and identity—the grade, specialty, and personality of the physician significantly affect implementation; (iv) knowing each other and developing trusting relationships—personal acquaintance and the development of interprofessional trust and rapport greatly facilitate recommendation implementation; and (v) the hospital environment—organisational issues such as documentation in the patient notes, having the opportunity to intervene, and the clinical pharmacy model all affect implementation.

Conclusion: This study provides a deeper understanding of the underlying behavioural determinants affecting physician prescriber implementation of pharmacist recommendations and will aid in the development of theoretically-informed interventions to improve medication appropriateness in hospitalised older adults.

This study did not have a Principal Investigator as it did not involve performing any clinical investigations on human subjects. The primary author was the lead researcher on this study.

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KEYWORDS
hospital, pharmacist, prescribing, qualitative, theoretical domains framework

1 | INTRODUCTION

With their expertise in medications, pharmacists can play a vital role in recognising and resolving instances of potentially inappropriate prescribing (PIP) in multimorbid older patients with polypharmacy.[1] Hospital pharmacists' interventions to improve medication appropriateness in older adults have been shown in randomised controlled trial studies to significantly reduce PIP, adverse drug reactions (ADRs), and hospital attendances, including both emergency department visits and medication-related readmissions.[1–3] Pharmacist interventions to minimise PIP are often in the form of a recommendation, usually provided to the prescriber after reviewing patients' prescriptions. The prescriber implementation rate of these recommendations is commonly used as an indicator to measure the success of pharmacist interventions.[4] However, in order for process measures such as the rate of prescriber implementation to be clinically valid, it is essential that they correlate with positive patient outcomes.[5] As with reducing cost outcomes, pharmacist interventions with a high proportion of medication appropriateness recommendations implemented by prescribers are more likely to result in significant improvements in patient outcomes compared to those with lower rates of implementation, which typically result in non-significant patient outcomes.[3,6–8]

It has been shown previously that physician prescribers in an Irish hospital implemented a significantly greater proportion of physician-provided STOPP/START recommendations in comparison to those provided by a pharmacist (83.4 *versus* 37.8%; $P < 0.0001$).[9] The physician's intervention was also associated with a greater absolute risk reduction in ADRs (9.3 *versus* 6.8%). This suggests that physician non-implementation of pharmacist recommendations may be prolonging PIP in older adults and contributing to preventable ADRs and other adverse patient outcomes. Although previous qualitative research has investigated hospital pharmacist–physician interactions,[10–12] no study to date has explored in depth the underlying reasons for physician non-implementation of hospital pharmacist recommendations. Therefore, the aim of the present study was to conduct semi-structured interviews with pharmacists and physicians in order to determine the key factors affecting physician implementation of pharmacist recommendations that target medication appropriateness in hospitalised older adults.

What is already known about this subject

- Some pharmacist interventions have a lower proportion of recommendations implemented by physicians, which are more likely to result in non-significant patient outcomes compared to pharmacist interventions with high implementation rates.
- There is a paucity of qualitative research that has explored the underlying behavioural determinants of physician non-implementation of pharmacist recommendations.

What this study adds

- This study reveals the key factors affecting physician implementation of hospital pharmacist recommendations: the clinical relevance and complexity of recommendations; the method of interprofessional communication; the physician role and identity; the nature of the pharmacist–physician relationship; and the hospital environment. These factors must be considered in designing future pharmacist interventions.

2 | METHODS

2.1 | Context and study setting

The semi-structured interviews in this qualitative study were conducted in 2 acute university teaching hospitals in the Munster region of Ireland. At the time of the interviews, pharmacists in both hospitals worked primarily according to a ward-based clinical pharmacy model, with pharmacists based on 1 or more assigned wards, reviewing patients under the care of multiple consultant physicians. Clinical pharmacy services in both hospitals primarily involved pharmacists performing medication reconciliation at admission and conducting prescription review throughout patients' hospital stay, without routine involvement at the time of discharge. Pharmacists did not have prescribing authority within either hospital. Electronic health records were not used routinely—except in some units (e.g. intensive care); therefore, pharmacist recommendations were primarily provided either in person, over the telephone, or written in paper-based health records.

2.2 | Study design and recruitment

Ethical approval for this study was granted by the Clinical Research Ethics Committee of the Cork Teaching Hospitals, Cork, Ireland. This study is reported in accordance with the COREQ checklist (Appendix 1).[13] Semi-structured interviews were chosen as the preferred method of data collection in this study as they tend to evoke more in-depth accounts of participants' experiences and

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perspectives.[14] A sampling matrix was designed to ensure that semi-structured interviews were conducted with medical physicians and pharmacists with various levels of experience in both hospitals as previous studies have suggested that the level of experience of the pharmacist and the physician are important factors affecting physician implementation of pharmacist recommendations.[15,16] Physicians were ineligible for inclusion if they had a pharmacy degree or had previously trained to be a pharmacist. Participants were recruited using a combination of convenience sampling and snowballing, and the study's information sheet and consent form were both provided to participants via email in advance of the interview.

2.3 | Data collection

Separate topic guides with a similar line of questioning were formulated for pharmacists and physicians based on the Theoretical Domains Framework (TDF),[17] a literature review and the authors' knowledge of the research area (Appendices 2 and 3). Each topic guide was pilot tested with 1 participant each, and both were iteratively refined during the study where appropriate (i.e. minor changes to phrasing or prompts). All semi-structured interviews were conducted by the primary researcher (K.D.) between August 2018 and August 2019. One interview was conducted in a private room at the interviewer's workplace as this was the preference of the interviewee. However, all other interviews were conducted in a private room at the participants' respective hospital sites to minimise disruption to their work day. All participants provided written informed consent prior to participation. The interviews were audio-recorded and transcribed verbatim. Field notes were documented after each interview to inform data analysis and topic guide refinement. Data analysis was done in tandem with data collection. It was planned in advance that if no major new themes were identified in the additional 3 interviews after the 11th interview (i.e. to complete the 14-participant sampling matrix), then this would confirm that the topic had been thoroughly explored and that no further interviews were required.[18]

2.4 | Data analysis

All transcripts were entered into QSR NVivo Version 11 to facilitate data analysis, which consisted of 4 stages. In Phase 1, transcripts were repeatedly read to ensure familiarisation with the data. Phase 2 comprised conventional content analysis, whereby open coding was utilised to generate non-hierarchical codes.[19] Thereafter, these initial codes were categorised to develop the evolving themes. In Phase 3, the TDF was applied to deductively code the transcripts and identify the domains present as part of directed content analysis.[19] The predominant domains were determined by consensus agreement between 2 researchers (K.D. and A.F.), with 3 elements examined to decide this: (i) the frequency of beliefs in each domain; (ii) the existence of contrasting beliefs; and (iii) the perceived strengths of the beliefs affecting implementation.[20,21] Finally, the evolving themes (from Phase 2) and predominant TDF domains (from Phase 3) were evaluated further to subsequently identify the main themes, which indicate the key factors that influence prescriber implementation of pharmacists' medication appropriateness recommendations for hospitalised older adults. The primary researcher coded all transcripts, whilst 6 transcripts were coded by a second researcher (A.F.) to ensure validity and reliability in the data analysis. All authors were involved in refining the final themes presented.

3 | RESULTS

A total of 14 interviews were conducted, as per the sampling matrix (Table 1). Both pilot interviews were included in the data

TABLE 1 Sampling matrix

Interview participant type	Hospital 1	Hospital 2	Descriptors
Pharmacist			
- pharmacist < 3 years of hospital pharmacy experience	1	1	Pharmacists 1, 2
- pharmacist ≥ 3 years of hospital pharmacy experience	1	1	Pharmacists 3, 4
- pharmacist ≥ 5 years of experience with a postgraduate qualification in pharmacy	1	1	Pharmacists 5, 6
Physician			
- Intern[a]	1	1	Physicians 1, 7
- Senior house officer[b]	1	1	Physicians 2, 6
- Registrar[c]	1	1	Physicians 3, 5
- Consultant	1	1	Physicians 4, 8

[a]<1 year post-qualification experience.
[b]≥1 year post-qualification experience (usually 2 years in duration after internship).
[c]≥ 3 years post-qualification experience (the final stage of specialist training prior to eligibility for consultancy).

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analysis. With regard to hospital-based experience, half the participants had <5 years' experience, 4 participants had ≥5 years' experience but <10 years' experience and 3 participants had >10 years' experience. Ten participants were female, 4 were male and the mean interview length was 33 minutes (range 18–47 minutes).

3.1 | Main themes

Five main themes were generated as the key factors influencing physician prescriber implementation of hospital pharmacists' medication appropriateness recommendations, as described in detail below. Subthemes and quotations have been displayed under each main theme to help explain these findings, with supplementary quotations available in Appendix 4 to provide further evidence that the themes generated were representative of the interview content.

3.1.1 | Theme 1—Clinical relevance and complexity of the recommendation

Clinical relevance in the hospital setting

Put simply, if it is a relevant recommendation that either clearly benefits the patient or prevents patient harm, it will be implemented.

> "…if it's an implementation that's going to affect the patient's acute inpatient care, it'll be implemented." [Pharmacist 6]

Priority

Participants emphasised that physicians' priorities are primarily to manage patients' acute issues. Depending on how salient the pharmacist recommendation is, and the urgency with which it must be addressed, physicians will prioritise the recommendations relative to their other work commitments.

> "… it's probably something that might not be deemed particularly important or it's not going to cause any adverse effect, at least in the short term. You know, those kind of things would be slower to be acted upon, maybe because people would have graded it in their head as to how important that particular intervention is based on other jobs that they have to do that day." [Pharmacist 3]

Complexity of decision-making

Recommendations which are not straightforward or not supported by clear evidence-based guidelines require greater knowledge and decision-making, thus hindering implementation.

> "…maybe grey areas or where maybe more thought is needed, that's probably where the recommendations might not be followed." [Pharmacist 3]

3.1.2 | Theme 2—Interprofessional communication

Route of communication

Recommendations provided verbally, particularly those delivered face to face, are much more likely to be implemented than those that are written. In addition, verbal reminders are often required to reinforce the implementation of written recommendations, which may not be seen or could even be ignored on their own.

> "I think verbal is better, I think it's easier to ignore something that's in the chart, as opposed to if you are face to face with someone, I think you take it on board more …" [Physician 7]

Providing recommendations verbally allows for bidirectional discussion, affording both the pharmacist an opportunity to clearly explain the rationale for their recommendation, and for the physician to clarify their reason for implementation or not, facilitating closure of the communication loop.

> "I think the face-to-face stuff can be useful regarding again … because there might be a bit more rationalising around why something should be changed or not." [Physician 8]

Pharmacist manner and language

Implementation is facilitated by pharmacists displaying confidence, assertiveness, and a clear rationale for the recommendation.

> "…if they were to be more assertive in why they have made that recommendation or not then we on the medic side might be more inclined to take notice, like sit up and take notice of kind of what they are saying." [Physician 7]

Participants highlighted that pharmacists often play a '*corrective role*'. While most prescribers welcome this input, others may perceive this critiquing to be a challenge to their authority. For this assertiveness to not be misconstrued as arrogance, pharmacists often adjust their language to avoid conflict with or causing offence to physician prescribers, in order to facilitate implementation.

> "…we do not want to be arrogant either by coming in and saying 'you are wrong'. My recommendations are always 'consider doing this', because the recommendations I have made are based on this guideline." [Pharmacist 2]

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3.1.3 | Theme 3—Prescriber role and identity

Personality

Participants expressed that the physician's personality may be a factor affecting implementation, attesting that some may be open-minded and accepting of pharmacists' recommendations, while others are less receptive to pharmacist advice as it may be perceived as a challenge to their judgement or impingement on their prescribing role.

> "We have very supportive physicians, they are very supportive of pharmacy and are very happy to take your recommendations on board and would always thank us for flagging things. And then we would have physicians who do not like to be questioned on their treatment decisions." [Pharmacist 2]

Grade and experience of prescriber

Most interviewees asserted that junior prescribers would be more likely to implement pharmacists' recommendations. However, it was implied that this may be on the basis of blind trust if they are following the recommendation simply due to hierarchical influences.

> "I remember back when I was an intern and I would have trusted everybody more senior than me, which would have been everyone. So, I might have just done it without thinking about it too much…" [Physician 6]

Conversely, with more complex issues, participants emphasised that junior prescribers may be less likely to implement pharmacists' recommendations, either due to a lack of knowledge or skills, or because they are not in a position to decide on the patients' pharmacotherapy, thus deferring responsibility to their senior colleagues.

> "I feel like I do not have the power to make the pharmacy decisions really. So, really, I would have to talk to the registrar or the consultant on the service …" [Physician 7]

Participants indicated that senior physicians may be more likely to resist pharmacist input. Two participants highlighted that this viewpoint among some senior physicians may have a *trickle-down effect* influencing their junior colleagues to also be dismissive of pharmacist recommendations.

> "…there'll be a trickle-down effect as well, like if a top manager is going 'Oh, pharmacy who? What are they for?' Then the intern is going to think 'Oh well, I'm fine without them. I do not need an opinion from them at all'." [Pharmacist 4]

Specialty

There was no unanimous agreement on how physician specialty affected implementation. Interviewees stated that some physicians were more likely to implement such recommendations as they welcomed pharmacists' expertise concerning medications outside of their specialist knowledge. Conversely, it was outlined that other specialists felt less comfortable with implementing recommendations perceived to be beyond their scope of practice, particularly when this may encroach on other prescribers' areas of expertise.

> "I think they just do not want to step on people's toes, or it may be something they are not really familiar with and they do not want to meddle with it." [Pharmacist 4]

3.1.4 | Theme 4—Knowing each other and developing trusting relationships

Knowing each other

Participants indicated that although a physician knowing the pharmacist is not essential for implementation, it was strongly emphasised that familiarity enhances pharmacist–physician interactions, supports the development of collaborative relationships, and ultimately facilitates the routine implementation of pharmacist recommendations. However, it was clear from the interviews that pharmacists placed a greater importance on knowing each other than the physicians.

> "… it's definitely important that … they know you I suppose, that they have seen you around, they know who you are, they know that, you know … they have had positive interactions with you before definitely I think improves the likelihood that they'll take on board what you have to say." [Pharmacist 5]

> "I think it's not essential, but I think—like any bit when you are working as part of a team—if you know somebody, it probably makes interactions a little bit better." [Physician 8]

Relationship-building

Interviewees conveyed that greater rapport enhances the likelihood of pharmacist recommendations being implemented by physicians.

> "… when you have an interpersonal relationship with someone, you are more likely to take on board their opinion, and subsequently maybe implement their recommendations." [Physician 5]

However, the recurrent medical staff changeovers hinder the longevity of pharmacists' relationships, particularly with more junior physicians. This frequent change in personnel necessitates the continual establishment of new pharmacist–physician relationships.

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> "… the teams change then every 2 or 3 months, and you have a whole host of new interns and SHOs [senior house officers, i.e. those who have worked as doctors for <1 y and typically 1–3 y, respectively] and things like that but … you are kind of starting from scratch again then maybe with the medical teams a little bit …" [Pharmacist 5]

Trusting pharmacists' recommendations

It was indicated that physicians may not be that aware of pharmacists' training, skills, or roles in optimising older adults' medications, all of which influences trust in pharmacists' recommendations. Building trust usually takes substantial time; this can be achieved by pharmacists consistently providing high-quality recommendations.

> "I think once you prove yourself to them a bit, they warm to you a bit. I suppose it would be the same as any new doctor. They'd be slow to trust you until there's trust there." [Pharmacist 1]

In addition, participants affirmed that when trust has been established the physician may be more likely to approach pharmacists for advice and implement their recommendations.

> "… and then over time, I think, as you are there and you get to know people more that they come to you with questions …" [Pharmacist 6]

3.1.5 | Theme 5—The hospital environment

Timing and opportunity

Even though most participants expressed that face-to-face discussion was their preferred method of communication, this is not always possible in the busy hospital environment. There can be challenges with meeting physicians in person due to busy schedules, and there is not always a clear opportunity for pharmacists to discuss recommendations face to face, thus often relying on impromptu encounters. Furthermore, many pharmacists indicated that implementation would be facilitated by pharmacists having a prescheduled time to discuss their recommendations, such as a ward round or multidisciplinary team meeting.

> "… unless you are on a round with them, it's difficult to find [an opportunity to meet] afterwards. You're running around bleeping people, nosing into doctors' rooms to see if someone is in there … so it can be … it can make it difficult." [Pharmacist 4]

Documentation in health records

The health records may not always contain sufficient information about the physicians' plan for the patient—this can result in pharmacists making recommendations that are of lower relevance or not in line with the physicians' treatment plan.

> "… the pharmacist may be recommending or fairly concerned with things whereas we may not be concerned with things because our goal of care may have changed, and that sometimes does not come across that well in the chart. You know, it may not be clearly flagged as … we do not always write down that kind of stuff …" [Physician 5]

Working as a team

Participants indicated that the pharmacist may often be perceived as an *outsider*, and stated that pharmacists who work closely with physicians as part of a team would have more recommendations implemented as physicians know these pharmacists better and have had time to build trusting relationships.

> "You know it's so much better to work with the physicians as a team rather than work with them in isolation on the ward. They do not get to know you. They do not build a relationship." [Pharmacist 6]

Staffing levels and pharmacist presence

A common thread throughout the transcripts was pharmacist staffing levels; a greater pharmacist presence would increase accessibility to physicians and face-to-face discussions, and allow more time for collaborative teamwork.

> "Also, the fact that we are not fully resourced; if we had more presence on the wards and more presence with teams, I think the likelihood is that we would have … recommendations would be taken up probably much more quickly and much more easily because you would be more readily available to the team to discuss matters" [Pharmacist 3]

3.2 | Predominant TDF domains

Six domains were identified as predominant across both pharmacist and physician interviews (Table 2); these describe the behavioural determinants affecting physician prescriber implementation of pharmacist recommendations and aided in the generation of the 5 main themes depicted. Some of the supporting quotations may illustrate >1 TDF domain due to overlap between the constructs.

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TABLE 2 Behavioural determinants affecting implementation of pharmacist recommendations within the predominant TDF domains

Predominant TDF domain	Determinants of implementation	Illustrative quotations
Environmental context and resources	Urgency	*"But if it was a risk, so if there were an interaction that puts the patient at risk, they'd definitely change it more readily."* [Pharmacist 1]
	Opportunity and timing of the intervention	*"… I think meeting as opposed to opportunistically trying to find the team on the ward …"* [Physician 2] *"I think the fact that a lot of our recommendations are made retrospectively or they are very reactive, I think if you were there at the point of prescribing, the likelihood is that you would have more of an impact …"* [Pharmacist 3]
	Communication	*"Oh, face to face, they'll do it, they get your point. They'll do it straight away, and leaving a note—it can just fall by the wayside …"* [Pharmacist 4]
Social influences	Rapport and knowing each other	*"Good rapport always helps. If you know the same pharmacist and you are working with them all the time, I think that benefits, like that definitely helps."* [Physician 1]
	Alienation—'*Outsider*'	*"A lot of the time the team is not around when you are reviewing the chart so you are leaving notes and that kind of, the communication is not there, they might not actually recognise you when you do come up to them, so you are just, you are some outsider …"* [Pharmacist 4]
	Hierarchical influences	*"I think everything is like top-down approach like. If juniors do not see kind of their superior buying into it, if they almost see them ignoring it totally—'Oh we'll disregard that'. I'm sure that has a knock-on effect …"* [Physician 4] *"I think any of the consultants I have worked with have been very open to pharmacist intervention and discussion with them as well. So, I would have no problem ever discussing anything with the pharmacist."* [Physician 2]
Social/professional role and identity	Grade in the hierarchy	*"That may be around grade too often; a lot of this is consultant-driven. So, a registrar and SHO may not feel empowered to sort of follow a recommendation either."* [Physician 8]
	Professional boundaries	*"… it depends then individually, if they might be very willing to listen or they might just be a little bit like 'no, you do not, this is my patient, it's nothing to do with you' so yeah, you can see that a little bit."* [Pharmacist 4]
	Personality	*"I would imagine personality may come into it here and our self-belief may come into it a bit. And you know, look I've certainly worked with doctors who pay lip service to interdisciplinary working."* [Physician 8]
Memory, attention, and decision processes	Attention to optimising medication	*"I think physicians are so busy, they … it's not something that's on their radar when a patient presents to an acute hospital setting …"* [Pharmacist 6]
	Complexity of decision	*"So, I think the more straightforward 1s where the guidelines are very clear are acted on probably quicker and it's easier for people to make a decision around that …"* [Pharmacist 3]
	Decision-making based on prescriber experience	*"I think someone with experience would be more able to actually be making an informed decision"* [Physician 3] *"I think it's probably the lack of experience is 2-fold: They can take on recommendations quite readily, but other times with more difficult decisions that have to be made that may be a little bit more difficult, they might need to go back to senior members of the team.* [Pharmacist 3]
Knowledge	Knowledge affects decision-making	*"I think the more knowledge that you have, in terms of pharmacology, you'd be more likely to make your own decisions."* [Physician 3]
	Procedural knowledge	*"… the pharmacy had flagged it* [i.e. the potentially inappropriate medication] *and suggested maybe we start to wean her off it but I suppose I wasn't sure how to go about weaning* [the older patient] *off it. So, in that case I kind of held off until I had spoken to somebody more senior, that kind of thing."* [Physician 6]
	Knowledge outside specialty	*"I think that, say, if you were a cardiologist, they know lots and lots about cardiology drugs but outside of that, they would not really care as much."* [Pharmacist 1]
Goals	Goals of care	*"I think people are too busy, too busy to* [examine older patients' medications] *… just focusing on getting … treating the presenting complaint and getting the patient in and out."* [Pharmacist 6]
	Goal priority	*"… sometimes it's very minor discrepancies, like for example do you know like a half or a full dose PPI or something like that, that you might, you know, just put at the end of your to-do list because you are busy and you might … you know, so you do not prioritise it."* [Physician 3]

TDF: theoretical domains framework. SHO: senior house officer. PPI: proton-pump inhibitor.

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4 | DISCUSSION

Even though interprofessional relationships and communication between pharmacists and physicians have been widely investigated in previous studies,[10,22,23] limited qualitative research has been conducted in the hospital setting, particularly when it comes to investigating the behavioural determinants underlying physicians' implementation of pharmacist recommendations.[10–12] The present study is the first to explore the views of pharmacists and physicians regarding the key factors affecting physician implementation of pharmacists' medication appropriateness recommendations for hospitalised older adults.

These findings echo those of previous studies that have shown that face-to-face communication is a key facilitator to physician implementation of pharmacist recommendations.[7,24,25] Synchronous bidirectional discussion and face-to-face contact have been shown to be important components in developing collaborative working relationships between pharmacists and physicians.[11,26,27] Conversely, written communication lacks synchronicity, and is infrequently bidirectional between pharmacists and physicians, and may contribute to further ambiguity.[12,28] This study reiterates that written recommendations from pharmacists are less likely to be implemented by prescribers.[29] However, this may be confounded by the fact that less urgent recommendations or those of lower clinical relevance are often communicated in written form, and therefore may not be implemented as readily.[30,31]

In line with previous research, most participants expressed a preference for face-to-face delivery of pharmacist recommendations.[12] However, this method of communication is hampered by the difficulty in finding prescribers and speaking face to face in the busy hospital environment. It has been shown that interprofessional discussions in hospitals are most commonly brief, unstructured, and opportunistic interactions.[32–34] However, many of our participants emphasised the value of having scheduled times to meet (e.g. at ward rounds or multidisciplinary team meetings), rather than solely relying on spontaneous interactions, which may interrupt workflow and increase the risk of error.[12,35] Involvement with ward rounds affords pharmacists the opportunity to proactively minimise or prevent PIP rather than the traditional reactive role, whereby pharmacists retrospectively review patients' prescriptions after the initial prescribing decisions have been made.[36] Pharmacist involvement in ward rounds has been shown to increase medication appropriateness and reduce preventable adverse drug events.[37,38] However, even with face-to-face communication, implementation may be hindered if the receiver of the recommendation is not a *decision-maker* on the attending medical team.[39]

Previous research has suggested that pharmacists' grade significantly affects physician implementation of hospital pharmacist recommendations.[15] However, the present study did not find this to be a key determinant of implementation, but it was clear from the interviews that this may be influenced by physicians' lack of awareness of the specific aspects of pharmacist training and experience.[40] In contrast, these findings have reemphasised that a physician's experience and grade, as well as some physicians' ingrained sense of the traditional hierarchy, significantly affect the implementation of pharmacist recommendations.[16,27] Thus, it is not surprising that *social influences* appeared among the predominant TDF domains throughout the interviews. Senior physicians are less likely to be interested in developing collaborative relationships with others who they perceive to be subordinate or challenging their prescribing decisions.[10,22] To facilitate implementation, pharmacists often employ indirect communication strategies (e.g. gentle reminders, suggestions, questions) to avoid conflict or embarrassment and to prevent provoking defensive behaviour from physicians.[27] A hierarchical culture such as this impedes teamwork in healthcare.[41] Interprofessional education has been suggested as one strategy to enhance collaboration between healthcare professionals. However, further evidence is required to demonstrate its effectiveness in fostering the development of effective interprofessional healthcare teams with improved patient outcomes.[42–44]

Participants affirmed that pharmacists working in close collaboration with physicians as part of a team would facilitate implementation of pharmacist recommendations. Successful interventions of this nature commonly involve pharmacists working closely with medical staff.[2,45,46] A previous study in an Irish hospital has shown that a team-based pharmacist approach was associated with a significantly higher proportion of recommendations being implemented compared with standard ward-based pharmaceutical care (95.9 *versus* 69.3%), and the same study also resulted in a significant improvement in medication appropriateness for the team-based pharmacist interventions only.[47] Moreover, the team-based pharmacist recommendations were also implemented earlier compared to ward-based pharmacist recommendations, which may be vital in the prevention of ADRs.[47] However, team-based models can be less efficient with pharmacist time as in these models pharmacists may not be able to review the same number of patients, and also may affect collaboration with other healthcare professionals, such as nurses.[48]

Working together as a team allows for pharmacists and physicians to get to know each other and their professional roles, to develop rapport, and to build up mutual trust in clinical judgement.[49,50] Trust is fundamental to successful pharmacist–physician relationships.[51] The present findings reaffirm that physicians' trust in pharmacists may be developed through the consistent delivery of useful recommendations.[50] Evidence of this trust may be exhibited by physicians asking pharmacists for their particular input to patient management. However, this advice-seeking behaviour may also be facilitated by ready accessibility to pharmacists.[52]

In the present study, it was reemphasised that the recurrent staff changeover in hospitals can make it challenging to develop and maintain long-lasting relationships between pharmacists and physicians.[53] Therefore, it would seem prudent for pharmacists to develop strong relationships with senior physicians who usually have a long residence time in the hospital. Senior prescribers modelling trust with pharmacists should have a *trickle-down effect*, as two interviewees described, to influence junior prescribers to trust pharmacists and implement their recommendations.[53]

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5 | STRENGTHS AND LIMITATIONS

All interviews were conducted by the same researcher, which allowed for consistency in both data collection and analysis. The interviewer had no previous relationship or established rapport with any of the interviewees prior to study commencement. Participants were aware that the interviewer was a pharmacist, but it was emphasised to physician participants that they should strive to see the interviewer in his role as a researcher aiming to gain a greater understanding of their views. While the risk of social desirability bias must be acknowledged, it did not seem to appear as a significant issue given the honest views and opinions provided, describing both positive and negative experiences with hospital pharmacists.

The TDF was utilised in formulating the topic guides and in analysing the transcripts; it has been shown that interview studies based on this framework can reveal additional themes compared to those without a theoretical basis.[54,55] The main themes have been conveyed openly alongside the predominant TDF domains identified, which has not only provided a greater understanding of the underlying behavioural determinants related to physician implementation of pharmacist recommendations, but also facilitates mapping of the predominant TDF domains to the Behaviour Change Wheel to identify potentially suitable intervention types to enhance implementation rates in future.[56] The present study findings therefore pave the way for further research to establish which theoretically-informed interventions would be most appropriate to change the behaviour of pharmacists and physicians to enhance implementation of pharmacist recommendations to improve prescribing appropriateness.

The transferability of the study findings may be questioned given that the interviews were conducted in just two acute university teaching hospitals in one geographical area of Ireland. Given that different clinical pharmacy models or different practices exist, these findings may not necessarily reflect all the key factors affecting physician implementation of pharmacist recommendations in other hospital settings in Ireland or in other similar countries. Future work should aim to investigate this issue in settings with other clinical pharmacy models and, with the increasing prevalence of computerised systems in hospitals, further qualitative research is necessary to explore the factors affecting implementation of pharmacist recommendations communicated via electronic means.[57]

6 | CONCLUSION

There are a number of barriers to physician implementation of hospital pharmacist recommendations aiming to improve medication appropriateness in older adults. It is imperative that a high proportion of such recommendations is implemented in order to achieve better patient outcomes and reduce healthcare costs. This study has generated a greater understanding of the key factors affecting physician implementation of pharmacist recommendations, and will help inform both the design of future pharmacist interventions aimed at improving the appropriateness of prescribing in hospitalised older adults, as well as the delivery of clinical pharmacy practices in hospital settings.

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COMPETING INTEREST

The authors have no conflicts of interest that are pertinent to this research study, but note that Stephen Byrne and Denis O'Mahony have part ownership in a patent *A Prescription Decision Support System* (based on STOPP/START prescribing rules); the patent was registered with the European Patent Office (Munich); Patent no. 11757950.8–1952.

AUTHOR CONTRIBUTIONS

K.D. was responsible for project administration, performing the interviews, data curation, and prepared the original draft. K.D. and A.F. analysed the data. S.B. and D.O'M. were responsible for project supervision. All authors contributed to study conceptualisation, methodology, and final write-up (review and editing).

DATA AVAILABILITY STATEMENT

The interview transcripts have not been made publicly available with this manuscript, in line with the study's ethics committee approval. The authors have provided sufficient quotations from the interview data to demonstrate that the findings of the study are representative of the data collected.

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APPENDIX 1: COREQ CHECKLIST

Domain 1: Research team and reflexivity			
Personal characteristics			
1.	Interviewer/facilitator	Which author/s conducted the interview or focus group?	K.D. conducted the interviews.
2.	Credentials	What were the researcher's credentials (e.g. PhD, MD)?	At the time of undertaking the interviews, K.D.'s credentials were BPharm, MPharm, MPSI.
3.	Occupation	What was their occupation at the time of the study?	K.D. is an Irish registered pharmacist, who was undertaking a PhD in clinical pharmacy research when this study was conducted.
4.	Sex	Was the researcher male or female?	Male.
5.	Experience and training	What experience or training did the researcher have?	K.D. completed training in utilisation of NVivo software, and received training in analysis of qualitative interviews at Oxford University, United Kingdom.
Relationship with participants			
6.	Relationship established	Was a relationship established prior to study commencement?	The interviewer had no previous relationship or established rapport with any of the interviewees prior to study commencement.
7.	Participant knowledge of the interviewer	What did the participants know about the researcher (e.g. personal goals, reasons for doing the research)?	K.D. had disclosed to all participants that he was a pharmacist undertaking this study as part of his PhD, prior to conducting the interviews.
8.	Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? (e.g. bias, assumptions, reasons and interests in the research topic)	K.D. is a registered pharmacist who was conducting this study as part of his PhD exploring factors affecting physician prescriber implementation of medication appropriateness recommendations in hospitalised older adults. This information was disclosed to participants ahead of the interview.
Domain 2: Study design			
Theoretical framework			
9.	Methodological orientation and theory	What methodological orientation was stated to underpin the study (e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis)?	Content analysis was used in this study to analyse the data from the interview transcripts. Conventional content analysis was used to identify the conventional themes, which were attributed as factors that influence physician prescriber implementation of hospital pharmacist recommendations. The Theoretical Domains Framework (TDF) was used to structure the interview topic guides, and directed content analysis was used to identify the relevant TDF domains from the interview transcripts.
Participant selection			
10.	Sampling	How were participants selected (e.g. purposive, convenience, consecutive, snowball)?	Participants were identified and recruited through a combination of convenience sampling and purposive sampling. Of the pharmacists, the pilot participant was recruited face to face by K.D. at their place of work, 3 were identified via a colleague of K.D. and 2 were recruited via snowballing (i.e. identified from a pharmacist who had already participated in the study). Of the physicians, 2

(Continues)

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Domain 1: Research team and reflexivity			
Personal characteristics			
			were identified through a colleague of K.D., 3 via snowballing and 3 were identified via pharmacists who had not already participated in the study (note: these pharmacists were identified through a colleague of K.D.).
11.	Method of approach	How were participants approached (e.g. face-to-face, telephone, mail, email)?	Nine participants were recruited via email, 3 participants were approached face to face by K.D. at their place of work, and 2 were contacted via text message.
12.	Sample size	How many participants were in the study?	14.
13.	Nonparticipation	How many people refused to participate or dropped out? Reasons?	None.
Setting			
14.	Setting of data collection	Where were the data collected (e.g. home, clinic, workplace)?	One interview was conducted in a private room at the interviewer's workplace as this was the preference of the interviewee. However, all other interviews were conducted in a private room in the participant's respective hospital site to minimise disruption to their work day.
15.	Presence of nonparticipants	Was anyone else present besides the participants and researchers?	No.
16.	Description of sample	What are the important characteristics of the sample (e.g. demographic data, date)?	Ten participants were female and 4 male. With regard to hospital-based experience, half the participants had <5 years' experience, 4 participants had ≥5 years' experience but <10 years' experience, and 3 participants had >10 years' experience. The interviews took place between August 2018 and August 2019.
Data collection			
17.	Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	Two separate topic guides comprising a similar line of questioning (with prompts where appropriate) were formulated for the pharmacist and physician participants. The topic guides were based on a review of the literature, the TDF, and K.D.'s own and supervisors' knowledge of the research area. Each topic guide was pilot tested with 1 participant each, and both of these interviews were included in the study. The topic guides were iteratively refined during the study where appropriate to ensure that themes were explored in subsequent interviews.
18.	Repeat interviews	Were repeat interviews carried out? If yes, how many?	No.
19.	Audio/visual recording	Did the research use audio or visual recording to collect the data?	All interviews were audio-recorded. The recordings were stored securely and were subsequently deleted once the interviews were transcribed.
20.	Field notes	Were field notes made during and/or after the interview or focus group?	Field notes were recorded after each interview, and were used to refine topic guides and inform data analysis.
21.	Duration	What was the duration of the interviews or focus group?	The mean interview length was 33 minutes (range 18–47 minutes).
22.	Data saturation	Was data saturation discussed?	Data analysis coincided with data collection. It was as planned in advance that if no new themes were identified in the additional 3

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Domain 1: Research team and reflexivity			
Personal characteristics			
			interviews after the 11th interview (i.e. to complete the 14-participant sampling matrix), then this would confirm that the topics had been adequately explored.
23.	Transcripts returned	Were transcripts returned to participants for comment and/or correction?	No.
Domain 3: Analysis and findings			
Data analysis			
24.	Number of data coders	How many data coders coded the data?	Two (K.D. and A.F.).
25.	Description of the coding tree	Did authors provide a description of the coding tree?	A description of the process is provided, whereby initial, nonhierarchical codes were categorised, and subsequently developed to generate themes and subthemes as part of conventional content analysis. The TDF was the chosen framework for directed content analysis, and was used as the basis for a coding tree here.
26.	Derivation of themes	Were themes identified in advance or derived from the data?	Conventional content analysis comprised open coding to inductively create initial, non-hierarchical codes. These initial codes were subsequently categorised to generate the evolving themes and subthemes. Directed content analysis was then employed whereby the transcripts were deductively coded using the TDF to identify the domains present.
27.	Software	What software, if applicable, was used to manage the data?	QSR NVivo version 11.
28.	Participant checking	Did participants provide feedback on the findings?	No.
Reporting			
29.	Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	Yes.
30.	Data and findings consistent	Was there consistency between the data presented and the findings?	Quotations are presented in a manner consistent with findings.
31.	Clarity of major themes	Were major themes clearly presented in the findings?	Major themes are clearly presented in the results section.
32.	Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	Subthemes are presented under each of the major themes.

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APPENDIX 2: FINAL VERSION OF TOPIC GUIDE FOR PHARMACISTS

1. What do you see as the main roles that pharmacists have in the multidisciplinary care of older adults in the hospital setting?
2. How aware do you think physicians are of the pharmacist's role in the hospital setting?
- What do you think doctors' opinions are of hospital pharmacists' roles?
3. How would you compare your knowledge and skill set with that of a physician when it comes to medication appropriateness in hospitalised older adults?
- Are there any gaps in the knowledge or skill set of physicians that pharmacists can help with in particular?
- Are there any gaps in the knowledge or skill set of pharmacists?
4. To what extent do pharmacists and physicians share the same goals in terms of reducing potentially inappropriate prescribing in older adults?
5. How would you describe your day-to-day interactions with physicians?
6. How do you inform physicians of medication appropriateness issues in older adults?
- How do you decide what method of communication to use?
- Do you use different communication methods for different types of recommendations?
- Do you find any methods of communication more effective than others?
- If the most effective method is not the most commonly used, ask why.
7. What factors might make it more likely for a physician to implement recommendations from a pharmacist?
8. What factors might make it less likely for a physician to implement recommendations from a pharmacist?
9. Are there any specific types of recommendations that you think are more likely or less likely going to be implemented by physicians?
- e.g. recommendations regarding medication reconciliation, medication appropriateness, drug interactions, renal dose adjustment.
10. How does the experience of a pharmacist affect the number of recommendations implemented by physicians?
11. How do the characteristics of an individual pharmacist affect the implementation of recommendations?
- Personality? Knowledge? Mindset? Approach from pharmacist? Confidence?
12. How does the grade or experience of physician affect the number of recommendations implemented?
13. How does the specialty of physician affect the number of recommendations implemented?
- Are some specialties more likely or less likely to implement the recommendations?
- How do you feel about making a recommendation to a specialist concerning their area of expertise?
14. How do the characteristics of an individual physician affect the number of recommendations implemented?
- Personality? Knowledge? Mindset? Approach from doctor? Confidence?
15. How important do you think it is for the physician to know you or be familiar with you when it comes to implementing your recommendations?
16. On a scale of 1 to 10, how would you, as a pharmacist with (insert number) years of experience, rate your confidence in discussing medication appropriateness with physicians, 1 being not confident at all and 10 being very confident?
17. You identify that an older patient under the care of a hospital physician has been prescribed a potentially inappropriate medication long-term by another prescriber, and make a recommendation to stop this medication. How likely is it that this will be implemented?
18. What are the organisational barriers to pharmacists providing medication recommendations?
19. How does the hospital environment affect the implementation rate of pharmacist recommendations?
- Is there enough time/opportunity to address these issues?
20. Does the patient have any impact on the number of pharmacist recommendations implemented?
21. Are pharmacist recommendations audited or reviewed by your department? Any quality improvement initiatives?
22. Do you think that the culture within this particular hospital has any impact on: (i) the relationship between pharmacists and physicians; and/or (ii) physicians' implementation of pharmacist recommendations?
23. Do you have experience from another hospital that is relevant? Were the means of communicating with physicians different and what was the effect on the implementation of recommendations?
24. If you could change how pharmacists make recommendations or interventions for older adults in your hospital setting, what would you suggest?
25. In some jurisdictions, pharmacists prescribe as part of the hospital multidisciplinary team. How do you feel about pharmacists having some form of prescribing (or deprescribing) role in the care of older adults?
26. A study by our research group has suggested that physicians are more likely to implement recommendations from fellow physicians than from pharmacists when it comes to recommendations addressing older patients' medications. What are your thoughts on this?

That brings us to the end of the interview. Do you have any additional comments that you would like to make, or any points you would like to expand on?

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APPENDIX 3: FINAL VERSION OF TOPIC GUIDE FOR PHYSICIANS

1. What do you see as your role in identifying and addressing issues of potentially inappropriate prescribing in hospitalised older adults?
- How do you feel about making changes in older patients' medications?
2. What do you see as the main roles that pharmacists have in the multidisciplinary care of older adults in the hospital setting?
3. How would you compare your knowledge and skill set with that of a pharmacist when it comes to medication appropriateness in hospitalised older adults?
- Are there any gaps in your knowledge or skill set that pharmacists can help with?
- Are there any gaps in the knowledge or skill set of pharmacists?
4. To what extent do pharmacists and physicians share the same goals in terms of reducing potentially inappropriate prescribing in older adults?
5. How would you describe your relationship or day-to-day interactions with pharmacists?
6. At present, how do you receive recommendations from pharmacists in hospital?
- e.g. face to face, over the telephone, written, or a combination?
- How do you most commonly receive these recommendations?
- What method do you find most effective? Why?
- If the most effective method is not the most commonly used method, why do you think that is the case?
7. What factors might make it more likely for you implement a recommendation from a pharmacist?
8. What factors might make it less likely for you to implement a recommendation from a pharmacist?
9. Are there any specific types of recommendations from hospital pharmacists that you find most beneficial?
- e.g. recommendations regarding medication reconciliation, medication appropriateness, drug interactions, renal dose adjustment.
10. How does the experience of a pharmacist affect the number of their recommendations that you implement?
11. How do the characteristics of an individual pharmacist affect the implementation of pharmacist recommendations?
- Personality? Knowledge? Mindset? Approach from pharmacist? Confidence?
12. How does the grade or experience of physician affect the number of pharmacist recommendations implemented, do you think?
13. How does the specialty of physician affect the number of pharmacist recommendations implemented?
- Are some specialties more likely or less likely to implement the recommendations?
14. How do the characteristics of an individual physician affect the implementation of pharmacist recommendations?
- Personality? Knowledge? Mindset? Approach from doctor? Confidence?
15. How important is it for you to know or be familiar with the pharmacist you are receiving recommendations from?
16. On a scale of 1 to 10, how would you, as a(n) (insert grade of doctor) rate your confidence in discussing medication appropriateness with a hospital pharmacist, 1 being not confident at all and 10 being very confident? Why?
17. Can you describe an instance where a pharmacist made a recommendation that you did not implement.
- What are reasons you did not implement the recommendation?
18. How does the hospital environment affect the implementation rate of pharmacist recommendations?
- Is there enough time/opportunity to address these issues?
19. Does the patient have any impact on the number of pharmacist recommendations implemented?
20. A pharmacist makes a recommendation to you to stop a potentially inappropriate medication that an older patient has been taking long-term under the care of another physician. What would you do?
21. If pharmacist recommendations are not implemented, what clinical impact (if any) does this have on older patients?
22. If you could change how pharmacists make recommendations or interventions for older adults in your hospital setting, what would you suggest?
23. In some jurisdictions, pharmacists prescribe as part of the hospital multidisciplinary team. How do you feel about pharmacists having some form of prescribing (or deprescribing) role in the care of older adults?
24. A study by our research group has suggested that physicians are more likely to implement recommendations from fellow physicians than from pharmacists when it comes to recommendations addressing older patients' medications? What are your thoughts on this?

That brings us to the end of the interview. Do you have any additional comments that you would like to make, or any points you would like to expand on?

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APPENDIX 4: SUPPLEMENTARY QUOTATIONS

Theme	Descriptor	Illustrative quotations
1. Clinical relevance and complexity of the recommendation	Clinical relevance in the hospital setting	*"I do not think they'll really do much about long-term medicines because—Like here's an acute setting, so they might only have them for a week. But like tapering a person off like long-term benzos is a long-term project, so I do not think they have the time for it here to be honest."* **Pharmacist 1** *"I think physicians are so busy, they … it's not something that's on their radar when a patient presents to an acute hospital setting, and I suppose if you stand back and look at it—Is it the role of a hospital, an acute hospital, to optimise pharmacotherapy on a, on, on a … in older … is that the best time to do it? Is it not the best time for that to be done in primary care?"* **Pharmacist 6** *"… maybe if they press too hard on the what we would may consider the less important issues, you know that might kind of annoy you a little bit. You might feel like, you know, that's a minor issue compared to what's actually going with the patient. We need to focus on the bigger things."* **Physician 5** *"… I suppose is it relevant to the patient's clinical picture at the time of admission? So, for example, if it's something to do with a sleeping tablet and it's not relevant to the patient's admission at the moment, they might feel that the GP might be a better person, you know, to review those type of medications."* **Pharmacist 3** *"I suppose you would grade them in some sort of way, you would grade them on importance as well as to if something is very minor or very important. So like some absolute contra-indications or double-prescribing of anticoagulants like things that have potential serious side effects would be taken very seriously."* **Physician 3** *"I find that interactions, even especially if they are theoretical interactions and they are not going to affect the patient too much, I do not think they are really considered. They're not really intervened on too much."* **Pharmacist 2** *"I suppose it depends on what the recommendation is, like say if someone had A fib* [atrial fibrillation] *and a high CHA_2DS_2-VASc score, then if the pharmacist has recommended anticoagulation and they were not anticoagulated, that obviously has a big impact. I think the higher impact things tend to be implemented …"* **Physician 2** *"I suppose if it's more urgent. Like, if they saw a patient and the patient was on Calcichew D3 at home and they are on just Calcichew now, they might not think of that as a problem. But if it was a risk, so if there were an interaction that puts the patient at risk, they'd definitely change it more readily."* **Pharmacist 1**
	Priority	*"… maybe they are in a very stressful day or they are very busy and they are not that interested in hearing about medication for a particular patient or they might feel they have more pressing issues to deal with."* **Pharmacist 3** *"But if you are on a completely different ward dealing with an emergency and like you are going to say 'yeah, I'll do it at some point' and you might not actually do it. So, they are kind of smaller errors that you would not pay that much attention to and I think it's just how you prioritise the … like perceived problem with the prescription."* **Physician 3** *"… things like benzos not being stopped in your older people. Like you know that does have an effect for sure but it's not going to be a priority for a patient. You know it's not going to be 1 of the priorities for an inpatient during their stay here …"* **Pharmacist 6**

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Theme	Descriptor	Illustrative quotations
		"… it's an acute setting here. So, there's always someone more sick than the patient they are at. So, maybe towards the end of a patient's admission when you can actually have the time to sit down and review it, their medicines on discharge. There's always another 10 patients that are sicker than them. So, it even might fall through the cracks then towards the end." **Pharmacist 1**
	Complexity of decision-making	*"… it's the ease of doing it as well. So like if you take that example of a PPI: If someone tells you they are on 15 and not 30 at home and give you the kardex and it's in front of you, yeah that's easy to do."* **Physician 3** *"… someone comes in and they are on glaucoma eye drops—Yeah prescribe that. There's no thinking about it—it's black and white."* **Pharmacist 6** *"I would always, unless it was something very benign, like I do not know Chloromycetin eye drops or something and their eye is fine, then I would be happy to cancel that, but I would usually always call and ask the registrar if it was appropriate to stop or not."* **Physician 7** *"I think the experience part comes in when it's more grey areas …"* **Pharmacist 3** *"They probably interact more with the intern and the SHO on the team in person, you know, with recommendations or with issues, who in turn may have to pass it up to me then if they are not sure what to do."* **Physician 5** *"I think the most junior of doctors I'd say, the interns or the SHOs, I think are more likely to ask for advice regarding more complex stuff."* **Physician 8** *"So I think the more straightforward ones where the guidelines are very clear are acted on probably quicker and it's easier for people to make a decision around that because there's no 'oh maybe I need to check with a senior member of the team' or 'that needs to be discussed maybe with the GP' …"* **Pharmacist 3** *"More evidence-based things, they'd be more quick to change."* **Pharmacist 1** *"Well like if they tell us more information about why we should change it. Kind of like their back up info about why are they making that recommendation."* **Physician 1** *"But I think if you can present your case and give them good evidence, they'll do it. Like, do not just say that there's an interaction there. Tell them where you got the interaction and what kind of—Like, what it could cause if you do not change it. So, give them plenty of information."* **Pharmacist 1**
2. Interprofessional communication	Route of communication	*"… I think face-to-face communication of the changes is the easiest way to actually get them implemented …"* **Physician 3** *"I suppose to meet with the doctors is always easier, so if you can like face to face have a discussion when you have the information in front of you—so when you have the patient's kardex or the patient's notes, it's always easier to explain something rather than doing it through a phone call."* **Pharmacist 3** *"I think face-to-face when you are both there and you can look at the drug chart if necessary and you can pull the notes and you can say 'look, this is the issue', whereas I think if you are relying on … the least effective probably is like our notes that we leave on the drug chart, because I do not think that a lot of the time, you know, during a ward round, they do not look at the drug chart …"* **Pharmacist 5** *"… other methods of communication are not as effective as face-to-face and getting you to do it right in front of them …"* **Physician 1** *"Sometimes it could be acted upon incorrectly if you are not there to look at what, you know … so I think like definitely face-to-face communication on a ward is the most effective."* **Pharmacist 5**

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Theme	Descriptor	Illustrative quotations
		"I think for serious things, face-to-face is great. You can kind of talk back and forth sometimes you know. Written things—You know, you may … people may not understand the reason something's being prescribed or the reason for maybe going outside the license …" **Physician 5**
		"Oh, face to face, they'll do it, they kind of get your point. They'll do it straight away, and leaving a note—it can just fall by the wayside …" **Pharmacist 4**
		"… I guess 1 thing is the written recommendations on the front of the kardex, it's usually on the green piece of paper. We would follow their recommendations but a lot of the times it can get missed. So, I guess that's 1 factor that makes us less likely to implement it. If we just miss it." **Physician 1**
		"… if you talk to the person face to face, I think they'd do it. They're more inclined to take up your recommendations than if you left a note." **Pharmacist 1**
		"I think if it's not communicated well. Like definitely the best way of communicating it is by saying it, whereas sometimes you can look at what they have written especially if it is in the notes and say, as I said like, are they telling us just to use it with caution or are they telling us to absolutely stop it? So, I think verbal is better than written communication." **Physician 2**
		"… if I think it's an urgent issue, I will bleep them and talk to them verbally, because they'll just respond to it a lot quicker that way. If I leave a note, they might not see it till the next ward round or they might not be looked at at all." **Pharmacist 2**
		"… I suppose more pharmacy time would useful, because I think the sort of rather cold abstracts or the way we deal with a lot of it is, it's written in the notes, it's sort of vague almost anonymous green script …" **Physician 8**
		"If they just write a note in a book, in the notes, I'd say they'd be less likely to implement them. Possibly if they did not get (I suppose) the reasoning behind them …" **Pharmacist 4**
		"I find that a verbal communication is much more effective than a written communication regarding an intervention I want to make because you can explain it better verbally and I think they are more likely to take it on board. That's kind of just what I found. So I would be inclined to bleep them and talk to them through the issue and I think they are more inclined to take it on board then." **Pharmacist 2**
		"… I've worked in places where you get a phone call maybe after your ward round with the big list of recommendations verbally that you'd be trying to write down and like the serious potential for information to be lost there …" **Physician 5**
		"I do not really see much difference in over the phone or face-to-face in terms of them getting, them following through on the intervention I think. Yeah I think they would follow through just as much if I talk to them over the phone than I did face to face yeah." **Pharmacist 2**
	Combination of communication methods	*"… the most effective way of doing, getting stuff implemented is both by writing in the notes, and verbally contacting them. So, if you just write it in the notes, it may not happen. Em … you have to speak to somebody. It's really important that you speak to somebody."* **Pharmacist 6**
		"… and then both verbal and written communication because sometimes we need reminders." **Physician 3**
		"I could say well I also put it in writing on the intervention slip, just to kind of have a back-up there and just in case the SHO did not discuss it with the team, that somebody might see it then written as well." **Pharmacist 2**
		"You know, coming to meet somebody is much more difficult. So, I think the note is probably the most important but, like if you

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Theme	Descriptor	Illustrative quotations
		were to maybe make a verbal kind of reference to the fact that 'I have made a note on this person' that might be helpful as well." **Physician 7**
	Pharmacist manner, language and assertiveness	*"Definitely, I think if you have got a nice manner, and you approach in a less accusatory fashion, you'll get things I think a little bit easier, or explain better rather than going up and saying 'That's wrong, that's dangerous, do not do that'. But then I've also seen (I suppose) a couple of pharmacists who might be quite reluctant to counteract anything that a doctor has done. Like 'oh, they may know. So, I'm not saying anything', or 'I do not really write in the patients notes because the team might get offended', that kind of way. So, I think there is kind of that still hierarchy system—can still be there sometimes and can affect people. But definitely, the way you approach it will definitely affect it."* **Pharmacist 4** *"… we should not just go in and say 'you are wrong. This is what you should be doing'. I would always say 'maybe think about doing this instead'. So I suppose we should not be arrogant either."* **Pharmacist 2** *"I think experience … I think you … if you have a lot of experience, and you are confident in what you are saying to physicians, they are gonna trust you then, and they are gonna trust you. I think I can say confidently that the doctors trust me …"* **Pharmacist 6** *"I guess just being friendly to be honest. Nothing much to it. As long as they are friendly and nice and smile and are nice to you about it and not condescending, like you'd do anything for anyone who is nice to you."* **Physician 1** *"But most of the time I'll just say 'this is the guidance. Consider changing x to y' because the guidance states this. So, again, I'm not telling them what to do, but just what I know and what I have found and to maybe review it again."* **Pharmacist 2** *"I suppose if it's more direct, like 'please consider stopping', as opposed to 'the guidelines state …' if it's an actual like 'I think you should consider stopping it', as opposed to just this kind of abstract concept."* **Physician 2** *"They're making these decisions, but I feel like sometimes they think 'oh you know, I'm writing this as a kind of an FYI' but no 1 pushes it to say that you know you need to … can you have a look at my note or, what do you think about this? I feel like the individual pharmacist does not approach it kind of even verbally …"* **Physician 7** *"… you need to be assertive and confident, but not overly arrogant in what you are saying."* **Pharmacist 2**
3. Prescriber role and identity	Experience/grade	*"I feel my knowledge at intern level of pharmacology and therapeutics is so much less than it should be, and that pharmacists have this really in-depth knowledge and understanding of a lot of different drugs …"* **Physician 7** *"I find if you go to interns, they will not change things realistically, especially now. They're only about 4 months in now. They will not change—I will not really go to interns too often because they'll just bounce it back off their SHOs and registrars."* **Pharmacist 1** *"Well I suppose I'm at an SHO level, I might not always be sure whether this can be stopped …"* **Physician 6** *"I think usually their clinical experience plays a huge part in their decision to change* [referring to senior physicians]*."* **Physician 1** *"I suppose it's probably 2-fold: When they do not have that much experience, they are probably more likely to take on the advice that you are giving them sometimes, so you know they might not … like a lot of the time if I was making a recommendation on a patient's medications, they would probably take on face value what I was saying as correct because they might not have the experience behind them or they might not be familiar with the medication."* **Pharmacist 3**

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Theme	Descriptor	Illustrative quotations
		"I think you may find that as you get older you are more likely to say, I know it all and continue on. So I think the grade is you may find the lower the grade the more likely they are to take on board pharmacists recommendations and more open to it I think. Like lots of things as we get older, we are maybe a bit more sure of ourselves and less likely to take on advice." **Physician 8**
		"… if you take someone more experienced, while you might not always follow the recommendation, I think someone with experience would be more able to actually be making an informed decision and not following it for a reason …" **Physician 3**
		"… maybe the more old school consultants would've been more dismissive of pharmacist input …" **Pharmacist 5**
		"… senior doctors have kind of disregarded what the pharmacist's opinion has been and from like, for no valid reason that I could see at that point in time." **Physician 7**
		"I would kind of generalise and see that kind of the younger generation are a lot more accepting, a lot more encouraging of your involvement. I think personally that's because they, a lot of them would have been trained with us. The older generation would have been completely separate …" **Pharmacist 4**
		"I think when you first start off as an intern you would be scared of making changes by yourself even if the pharmacist tells you that it is the correct dose or that there's a kind of interaction—we would always go to our, let us say registrar first before we make any changes. But as you get more experienced you become more comfortable making the changes on your own." **Physician 1**
		"… it might be that the SHO or the registrar has charted that particular medication and, you know, a more junior member of the team might not feel confident in discontinuing it on the advice of pharmacy or they might feel that again, it might need further discussion before they discontinue it or amend the prescription." **Pharmacist 3**
	Less experienced physicians implementing on the basis of blind trust in their seniors	*"I suppose the lower … I suppose they would probably be more likely to accept their recommendations as kind of more gospel, whereas we might use our own experience to weigh up the pros and cons of taking the advice, and you know saying what are … and looking at the (kind of) goals, and make our own decision on whether we want to follow the advice …"* **Physician 5**
		"… when they do not have that much experience, they are probably more likely to take on the advice that you are giving them sometimes, so you know they might not … like a lot of the time if I was making a recommendation on a patient's medications, they would probably take on face value what I was saying as correct because they might not have the experience behind them or they might not be familiar with the medication." **Pharmacist 3**
		"I think we probably take on board what anyone senior would say. So, if it's a senior pharmacist you probably take it on board, whereas I do not know maybe the more senior physicians would have their own opinions on whether it's appropriate or not." **Physician 2**
		"I think that interns and SHOs, well especially interns, or less experienced doctors would be more likely to just do what they were told or what they are asked to do without taking the clinical context into account. So, I think they would be less able to know the importance of doing or not doing something." **Physician 3**
	Hierarchical influences	*"… because medicine is quite hierarchical, you are really … it's followed by a rigid structure, so maybe they feel like going to the more junior person and letting them pass on the message if needed is the appropriate way to do it."* **Physician 5**
		"That may be around grade too often, a lot of this is consultant-driven. So, a registrar and SHO may not feel empowered to sort of follow a recommendation either." **Physician 8**

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Theme	Descriptor	Illustrative quotations
		"… whereas if it's something that like their registrar has told them to do this or the SHO did it, and they are slower then to change the work that another member of their team has done, you know, without checking, without checking with them, or they just do not know." **Pharmacist 5**
		"… you are always going to go through your consultant or the senior registrar to make a kind of a medication prescribing decision." **Physician 7**
		"Maybe sometimes, they were just told 'oh prescribe this' or whatever, so they are not really sure do they … who is correct? Is it their registrar or is it you?" **Pharmacist 5**
		"… maybe junior doctors do not change immediately if someone else has told them to prescribe something, but they might question it with the rest of the team." **Physician 4**
		"I might approach maybe the SHO rather than the registrar because I think the SHO would be more willing to listen to me and would be likely to discuss it with the rest of the team, and would be grateful for the interaction. Whereas in my experience talking to registrars, if I query something, it's … the reply that I get is 'well that's what I want, so do not question it' basically. They might not say do not question it, but that's implied." **Pharmacist 2**
	Hierarchical culture and the '*trickle-down effect*'	*"I feel like there is probably a bit of a 'well the doctor knows best' kind of thing, you know."* ***Physician 7***
		"… there can be moments of conflict and it probably is to do with a personality clash or that they, maybe sometimes they perceive that they have got more important things to be dealing with than answering or talking about recommendations or answering a query from a pharmacist." **Pharmacist 3**
		"I think any of the consultants I have worked with have been very open to pharmacist intervention and discussion with them as well. So, I would have no problem ever discussing anything with the pharmacist." **Physician 2**
		"I kind of feel sometimes that the pharmacists make comments or write a note about potential you know, adverse effects or have you considered X, Y or Z but that the like senior doctors especially tend to just kind of fluff that off, and they say 'oh well, we are the doctor making the prescribing decision, we have already kind of considered what the pharmacist is saying' …" ***Physician 7***
		"I suppose there's a power thing. So, do you know, like someone telling you something … and maybe held in a position of power, I've no doubt maybe has an effect, do you know. Because that's quite sizeable really, and then that might be that kind of trickle-down effect too of ignoring …" **Physician 4**
	Personality	*"Like obviously you are gonna have surgeons or doctors who are way more abrupt and not as warm, or as friendly … but at the end of the day, it should not matter what their characteristics are, as long as the recommendation is sound from an experienced pharmacist, and is of benefit to the patient."* **Pharmacist 6**
		"I feel like some characters are probably more inclined to be kind of open-minded about most things." **Physician 7**
		"… the personality of the person will obviously dictate how well they take that advice up or how they perceive that or how helpful they perceive that advice to be." **Pharmacist 3**
		"… some would be more receptive to maybe perceived criticism or to a perceived challenge of their own prescribing." **Physician 3**
		"There are some people that would, you know, think they are always right and they do not want to take advice from other people." ***Physician 5***
		"… the reply that I got from the physician was 'I've prescribed it like that because that's how I want it done'. Rather than 'okay

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Theme	Descriptor	Illustrative quotations
		thanks for your query. This is why I'm doing this way and this is the evidence behind it'. It was just 'this is why I'm doing it because I want it this way'. So I suppose maybe arrogance might come into it a little bit." **Pharmacist 2**
		"Probably more arrogant physicians are less likely to take up recommendations." **Physician 1**
	Specialty	*"I think the specialty is hugely influential on taking up recommendations."* **Physician 7**
		"And then some would be, would not want to prescribe medicines that they aren't familiar with. So I think like knowledge of the drugs themselves would probably be the biggest factor as to what you do and you do not, and I think that some doctors will be fairly set in their ways of using certain medications only and then not deviating from that." ***Physician 3***
		"… if you take surgeons or like specialties that maybe aren't very medical and would have a lot less pharmacology knowledge, would be more likely to just take up anything. I'm not saying this is good or bad but would be more likely to just follow any recommendation made by someone else because they have less knowledge about the subject." **Pharmacist 6**
		"… especially medicines that might be outside the far, day-to-day prescribing practice, we may not know as much …" **Physician 5**
		"So, I feel like in the context of a specialty, that those physicians probably would be very protective of their specialty drugs whereas the other nonkind of specialty drugs, so noncardiac drugs for example in cardiology patients, I feel like recommendations would be both helpful and pretty well respected in that context really." **Physician 7**
		"If you were making a recommendation … maybe a recommendation about the specialty … so, a cardiology drug, the cardiologist, they might not listen to you as fast. But if it was about another type of drug, they'd probably take it up faster." **Pharmacist 1**
		"… you'd be more likely to agree with recommendations outside your specialty, and in your specialty, you may have more knowledge or more of that soft knowledge …" **Physician 5**
		"The pharmacist can kind of look at it as a whole, whereas you'll see now you go into a cardiac ward, a cardiologist will never touch a mental health drug, 'That's not—I did not prescribe it'." **Pharmacist 4**
		"So, we would normally not, unless you get psychiatry input, we would not have the background of the appropriateness of antipsychotics in particular." **Physician 4**
		"You might find cardiologists might be reluctant to fiddle around with respiratory drugs or respiratory physicians might be slow enough to fiddle around with psychiatry drugs. So I think geriatricians are probably a group that are sort of happy to fiddle around with most medications." **Physician 8**
		"I think it depends on the team, you know. We'll say your geriatricians probably would be quite welcoming of pharmacist involvement and quite aware of the roles that they play, say other teams, not as much …" **Pharmacist 5**
		"I think as geriatricians we would be more likely to want to make our own decisions about medication management and sort of taking the patient's own like context into account." **Physician 3**
		"I think the geriatric teams are probably very supportive of pharmacists and there does seem to be … you do you get the feeling that there is a shared care there between geriatricians and pharmacists. Em … and I think geriatricians are trained to be very aware of the patient as a whole and kind of a holistic view." **Pharmacist 2**

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Theme	Descriptor	Illustrative quotations
	Professional boundaries/encroachment	*"… he was involved with the patient initially, he saw me as coming in and almost interfering, and just being overly cautious."* ***Pharmacist 4***
		"… if they are confident in their own ability, they feel maybe that they do not need the advice of a pharmacist and that they have made their decision and that it's not our place to question their decision retrospectively." ***Pharmacist 3***
		"… if it's something that's very specialty-based—do you know like certain like, I do not know, rheumatological drugs or cardiac drugs that I do not use that frequently that they are under someone else's specialist care for, I would be a lot less likely to stop it." **Physician 3**
		"… some people would be I suppose less keen to stop medications that they felt if they have not started it, sometimes they'd be less keen to stop it. Whereas I think geriatricians would kind of take ownership for just stopping it." **Physician 2**
		"Again, it comes down to: does a doctor who might be only seeing the patient, you know, on this presentation stop the medication that was started by another colleague." **Pharmacist 3**
		"… what importance they do place on the role of the pharmacist because a lot of the role of the pharmacist would overlap with what they might have considered that they have done anyway …" **Pharmacist 5**
4. Knowing each other and developing trusting relationships	Knowing each other	*"I think definitely in terms of uptake of recommendations … it's more likely because they know you."* **Pharmacist 3**
		"I think it would be extremely beneficial if we knew them at a kind of a deeper level." **Physician 7**
		"I suppose like if you were just a random person coming up … because I think that's what happens a lot. They do not know … if you cannot put a face to the name, they do not know you really." **Pharmacist 1**
		"… if you do not know the team or you do not know the doctor you are kind of going 'oh god, I have to walk up there now and approach this', but yeah, I'd say I would not be meek about it anyway." **Pharmacist 4**
		"But I suppose if you are just leaving a note to a team that you do not know, how do they even know who you are?" **Pharmacist 1**
		"I think it's important like you kind of get to know your own ward pharmacist and when you build up a relationship it's easier then to in passing ask them a question, as opposed to if you do not know them you might not know how they will react if you have a question or not." **Physician 2**
		"… if they see an intervention from you, you know, because they know you, they are more likely to act on that intervention, which I suppose is natural." **Pharmacist 3**
		"Here, I suppose, they are always on the ward so you would just get to know them… But in general, I've often called down to pharmacy and I would not know them just to ask for advice, and I would not find that any different from knowing them." **Physician 6**
	Outsider	*"So you are kind of back in the mist."* ***Pharmacist 5***
		"Outside the loop sometime yeah. Certainly … that probably is 1 of the main sources of miscommunication, or not picking up recommendations in that they may not be … .Yeah inside the exact loop with the train of thought or the goal of care …" **Physician 5**
	Relationship-building	*"… when you have an interpersonal relationship with someone, you are more likely to take on board their opinion, and subsequently maybe implement their recommendations."* **Physician 5**
		"I suppose you build up a sort of relationship with some pharmacists too where you know that you have worked with them before and you know that their advice is very good and

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Theme	Descriptor	Illustrative quotations
		solid. So sometimes when maybe newer people or younger people are in the ward, you may be less sure as to what their sort of experience is …" **Physician 8**
		"I think I'd have a good relationship with the SHOs and registrars because the interns change every 3 months and the SHOs kind of change as well, but you kind of have more exposure to them because they'd actually be kind of the main people you see on the team, so they might get used to you more as well … a lot better relationship with them." **Pharmacist 1**
		"… if they mentioned something on the ward round, I think they would have built up a rapport with the consultants who were there obviously more long-term than we are, and it probably would be implemented easier, if they had already built up that rapport." ***Physician 2***
		"Good rapport always helps. If you know the same pharmacist and you are working with them all the time, I think that benefits, like that definitely helps. If the pharmacist was to change every single day, I do not think that should be a reason to not implement their recommendations anyway." **Physician 1**
		"I think, as you are there and you get to know people more that they come to you with questions and things like that. You do need to put in a bit of time and effort, I suppose, into building up those kinds of relationships." **Pharmacist 5**
	Trusting pharmacists' recommendations	*"… if you build up a relationship, a working relationship, then it helps massively and there's much more trust and you even get to know why 1 person is doing 1 thing and 1 person is doing another."* **Physician 5**
		"… like any relationship, like if you build up, if you make a few recommendations that were good, they kind of trust you more, so I think it's very important…" **Pharmacist 1**
		"Because you know the pharmacist, and you have a personal relationship with them, and you trust their opinion …" **physician 3**
		"… when you are working in a particular area, you get to know the different doctors that work in that particular area and they are more familiar with you, even just seeing your face kind of repeatedly then, I think you have more I suppose credence in their eyes or credibility in their eyes, because you know they have seen you at work and they have seen you, you know review patients' medications and review patients' charts." **Pharmacist 3**
		"I suppose they are less experienced [referring to more junior physicians] *and they have more trust in other healthcare professionals that might have more experience than them. So I suppose the less experienced they are … the more trust they would have that other people will guide them."* **Pharmacist 2**
5. Hospital environment	Opportunity for intervention	*"… I think meeting as opposed to kind of opportunistically trying to find the team on the ward …"* **Physician 2**
		"I suppose when I'm on the wards, it's probably more ad hoc *interactions …"* **Pharmacist 3**
		"… if you miss the team when they are around on a ward round, you are relying on, you know, if it's extremely urgent, you are bleeping and waiting for them to ring you back." **Pharmacist 5**
		"You know it was just easier when the pharmacist was there on the ward round to flag things with the consultant and then you'd get an answer straight away." ***Physician 2***
		"… the pharmacist went on a round once a week and that was very good and it helped the … again, the knowledge passing and for new doctors …" **Physician 4**
	Busy	*"At the same time, they could be very busy, so they might not think that doing them is important as well* [referring to pharmacist recommendations]*."* **Pharmacist 1**

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Theme	Descriptor	Illustrative quotations
		"I think when you are on a busy service you might not necessarily do it straight away [the pharmacist recommendation]. *So, I think that's probably 1 of the biggest factors is if you have a long patient list and if it's not something say particularly pressing, then you might not do it straight away."* **Physician 2**
		"… it is all a bit chaotic, and that does not lend to safe prescribing really and the overall hospital environment and workload could all impact on it certainly, and that will also then impact on following the guidance." **Physician 5**
		"I think time is a huge thing. I think all of the teams are very time-poor. They do not really have the time to look at the drug chart, they do not have the time to look up what it is the issue is or why it should be changed …" **Pharmacist 5**
	Timing	*"I suppose 1 of the issues is that when you do bleep an intern or bleep an SHO about a medication issue, you know, they could be having a really busy incident on another ward or they could be, I suppose dealing with something pressing on another ward and you are trying to explain to them about a patient on your particular ward."* **Pharmacist 3**
		"… get a bleep, find a phone, ring the number back … you know, maybe that's engaged and, you know, you can play what they call phone tag for all that—so that can be an issue." **Physician 5**
		"… at the moment we either leave a note or we bleep the team and we are always kind of going 'why have you done this?' And 'can you review it?', Rather than at the time of prescribing we could have discussed it and you'd already have your answers and you would not have to go querying it because you'd know why it has been done." **Pharmacist 2**
		"Ideally, at the point of prescribing or at the bedside or when the doctors have the kardex and the medication notes, that would be the time to raise any issues …" **Pharmacist 3**
	Documentation in health records	*"… the written notes can sometimes be a disaster, because even like the binding holes rip and the pages either are in the wrong position or they fall out or they are shoved into the back of the chart."* **Physician 7**
		"So if you are not on a ward round, I suppose some things can be omitted from the notes sometimes and so I suppose when I'm reviewing medication, I do not assume that I have all the information to hand." **Pharmacist 2**
		"… I suppose you have to take into consideration that there's other factors that might not be, you know, maybe particularly clear in the notes, so you know, from a pharmacist's point of view, I think it's always very prudent to, you know, to discuss any issue you have rather than just kind of dictating what you think the dose might be." **Pharmacist 3**
	Working as a team	*"… I think being on their team would make it* [would make implementation more likely]. *You are their team, you are kind of in their specialty, they know you—I think that's much better rather than random pharmacists kind of approaching them on the ward…"* **Pharmacist 4**
		"… well if you are part of the team then I feel like people know you at a kind of deeper, like behind the professional level you know, and you
		Get to know people …" **Physician 7**
		"I think you have a better relationship with the doctors if you have a team-based approach and I think if you are familiar with the team and you have maybe more easier methods of communication where you are seeing each other more frequently or you are catching up with each other at certain points of the day, then I think that makes the likelihood that interventions can be acted on much more likely …" **Pharmacist 3**

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Theme	Descriptor	Illustrative quotations
	Staffing levels	*"I think staffing levels is a big thing here, like we do not have enough pharmacists here to cover every ward, so like I said, if you have screened a drug in the dispensary and you have to go up to the ward that you are not familiar with—the team is not familiar with you. So, if we had more staff levels I think that, and that they actually see your face, they'd be more inclined to implement it …"* **Pharmacist 1** *"I think it may be as simple as sort of more face time, more pharmacists, more clearly a role and understood role among doctors …"* **Physician 8** *"I think we do not have sufficient staff to expand our roles and really develop relationships. It's all about developing relationships with the physicians, particularly the consultants and I do not think we are able to do that with what we have at the moment to develop relationships with the consultants."* **Pharmacist 6** *"It's really really variable depending on what hospital you are in. I really do not see a lot of them here* [referring to day-to-day interactions with pharmacists]*."* **Physician 3** *"… I suppose there is that thing there's so few of us, many of them* [physicians] *will not even know that we are around …"* **Pharmacist 4**

APPENDIX 5: FREQUENCY OF CODED DOMAINS FROM THE THEORETICAL DOMAINS FRAMEWORK

The table below shows the frequency of coding for each of the TDF domains by the primary researcher (K.D.), of which the first 6 domains were considered to be predominant in affecting the implementation of pharmacist recommendations. The predominant domains were determined by consensus agreement between 2 researchers (K.D. and A.F.), with 3 elements examined to decide this: (i) the frequency of beliefs in each domain; (ii) the existence of contrasting beliefs; and (iii) the perceived strengths of the beliefs affecting implementation.

Domain	Number of transcripts where domain was coded	Frequency of coding in transcripts
Environmental context and resources	14	198
Social influences	14	138
Social/professional role and identity	14	113
Memory, attention and decision processes	13	48
Knowledge	14	45
Goals	11	29
Skills	13	27
Beliefs about consequences	10	24
Beliefs about capabilities	9	23
Reinforcement	7	20
Intentions	9	18
Behavioural regulation	5	6
Emotion	3	4
Optimism	2	2

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