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Implementing best practice in infection prevention and control. A realist evaluation of the role of intermediaries

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Background

Understanding and influencing the processes of implementing best practice in healthcare is a challenge [1], [2]. Factors that support implementation include the use of facilitative and interactive approaches [3], which has led to an interest in the potential of certain individuals, collectively called 'intermediaries,' to contribute to this process [4], [5],[6]. It is known that interpersonal contact can facilitate knowledge exchange, especially through the use of the expertise and influence of certain individuals [5], [6]. 'Intermediary' is an umbrella term, representing a spectrum of interchangeable function which sit between those who produce and those who use evidence [7]. For example, 'opinion leaders' are described as individuals who may favorably and consistently influence another person's behaviour or attitudes [8]. Similarly, a 'champion' may have specialist knowledge, and can promote a new idea with enthusiasm and determination and passion [5]. Intermediaries are also described in the literature as third party, bridgers and brokers [9], and are used to bridge research and clinical practice [10]. There has been recent interest about 'knowledge brokers' in the knowledge translation literature as individuals who act as the human link between research and practice [11], [12] and 'boundary spanners' who facilitate communication across physical, cognitive or cultural barriers [13]. However, the terms used to describe intermediaries are often used interchangeably, for example, change agents are often described as opinion leaders [14], or opinion leaders described as product champions

[15] leading to lack of clarity about intermediaries' functions.

In healthcare, the term intermediary has been used to refer to individuals “within the practice environment who can influence nurses toward specific goals” [4], role-holders who are used as part of the overarching efforts to translate evidence into everyday practice [16], for example, clinical nurse educators, clinical nurse specialists (or advanced practice registered nurse), practice developers [10], champions, facilitators, opinion leaders, change agents, and linking agents [4].

Intermediary functions have been described as use of expertise, information source, education and teaching [5],[6],[17] and use of interpersonal skills to influence or change the behaviour of others [15],[6],[17]. Intermediary qualities range from trust, neutrality, transparency, collegiality and enthusiasm [18]; innovation, credibility, and proficiency [4], [19], [5] and technical competence and knowledge [20]. Intermediaries are thought to contribute to multifaceted approaches to promoting best practice [16], promote knowledge transfer in practice, and support practice change [7], [21]. However, there is a lack of common understanding about the exact contribution intermediaries make [18], what influences their role and function, and “it seems unlikely that a consistent evidence base on the effectiveness of intermediary interventions will emerge, given the breadth of the concept, its context-dependent and contingent nature, and the complexity of the social processes involved –all of which will confound experimental research approaches” [16]. Further research is needed to enable the development of evidence-based recommendations for healthcare practice about intermediaries [18]. This study was designed to help fill this gap.

The Infection prevention context

Infection prevention is the “science concerned with stopping patient harm and death” [22]. The prevention of infections is a current major international priority [23],[22], [24]. For example, the National Institute for Health and Care Excellence suggest that “patients have the right to expect that those who provide their care meet appropriate standards of hygiene and follow the correct procedures to minimise the risk of healthcare- associated infection” [23]. Therefore, advancing understanding of how to promote best practice (which is based on the best available evidence) is essential. Interventions using education, audit, guidance and feedback have been used to promote best practice in infection prevention [22], but changing individual behaviour is also required [25]. However, a range of factors can influence the success of implementing best practice in infection prevention and control, including the nature of leadership, managerial support, public reporting, structures, team stability, morale, workload and staffing [26], [27], [28]. Whilst contextual factors can influence the success/failure of best practice interventions they are rarely detailed in the literature [29].

In infection prevention, there is a current lack of clarity about intermediary functions and impacts, which may be because of the specific versus diffuse nature of different roles. Therefore, whilst some of the ways in which intermediaries promote best practice may become identifiable through detailed examination of their roles, other impacts to show their contribution may be as yet undisclosed. This study was designed to elicit an explanation about the role that intermediaries have in the promotion of best practice in infection prevention including the conditions that influence this.

Methods

A realist approach was used to evaluate the role of intermediaries to promote best practice in infection prevention and control using the question; what works, for whom, how, and in which circumstances. Realism is a school of philosophy which is situated between positivism and constructivism [30]. Realist evaluation is underpinned by critical realism, and promotes a theory-driven approach to programme evaluation, **which implies that** to explain what is happening, **it is important to understand the contingent theory behind it**. We defined programme as “any novel intervention or project aimed at improving the states of affairs” [31]. In healthcare, interventions are naturally complex due to the nature of the contexts they become embedded in, and the nature of the problems they are designed to address [32], which is why realist approaches to understanding programme contingencies are becoming increasingly appealing.

Evaluation research aims to “find out how and under what conditions a given measure will produce its impacts” [33]. In a realist evaluation, programmes are viewed as theories [34], and the intent is to test the programme components to build theory. Programme theory “describes the theory built into every programme” [35]. In other words, programme theories represent how programmes can/should lead to change. **Context is described as conditions which influence the success or failure of different interventions or programmes [37]. Mechanisms are what influence the reasoning and behaviour of people –“the agents of change” [37]. In realist terms, outcomes are patterns which explain the success (or failure) of the interplay between context and mechanism [49].** Uncovering mechanisms through opening the programme ‘black box’ should provide better clarity about what works within the programme [36]. Therefore, for realist evaluators, the challenge is to go beneath what is observable in complex programmes, to reveal the underlying mechanisms which lead to observed events [36]. “What is it about a measure which may lead to it to have a particular

outcome pattern in a given context” denotes the significance of understanding the true nature of mechanisms [33]. Initially developed as programme theories, context-mechanism-outcome propositions are then followed up by testing and refining [33].

The study’s objectives were:

- to identify the ways in which different intermediaries influence practice
- to understand the context within which intermediaries operate
- to develop context-mechanism-outcome configurations that explain the relationship between specific mechanisms and conditions (contexts) and how this leads to change or particular outcomes
- to build and refine the **context-mechanism-outcome configurations** through data collection

Design

Concept mining (**in realist terms, a process of searching through different evidence to root for theory-building information**) was undertaken to ‘reconstruct’ the programme theories [37]. Programme theories are developed through developing a range of initial theoretical hypotheses through evidence retrieval, extraction, analysis and synthesis. In this study, the process was then strengthened by a scrutiny of primary research [38],[39]. In realist evaluation studies, stakeholders are viewed as “key sources for eliciting programme theory and providing data on how the programme works” [40]. In this study, stakeholder engagement at different points contributed to formulating and refining the review questions and checking the study’s findings.

Concept mining of the existing literature led to the construction of a set of initial programme theories, **summarized below**;

- Intermediaries have the potential to promote and influence best practice in infection control through the provision of education, feeding back surveillance data, and implementing and monitoring guideline use
- The scope of influence by intermediaries might be dependent on operating clinically, being credible, their personal characteristics, and through relationships
- Intermediaries influence (through personal characteristics, credibility, and provision of education) and provide feedback
- Other broader contextual factors that influence intermediary role and function include geographical boundaries, organizational support, resources, and local leadership

Initial programme theories were then refined through data from two mixed qualitative methods case studies. The case study approach resonates with critical realism [41], [42] in its potential to reveal causal processes through an in-depth examination of programmes or interventions [43], and can support the uncovering of mechanisms through observing ‘in vivo’ processes in the field [44]. Additionally, mixed methods case studies complement realist evaluation by using a range of data, and a focus on understanding context [45]. Yin’s case study approach is appropriate for ‘how or ‘why’ research questions [46], **because it looks at phenomena within the real-life situation**, and can support the process of testing and refining theory. Therefore, this study’s embedded design followed Yin’s explanatory approach [47] and contained several units of analysis [48].

Settings

Two cases were purposively sampled for variation from within the United Kingdom.

Sampling criteria included geography and type of infection prevention strategy/approach. In case one, the infection prevention strategy and operational plan of the NHS organisation (e.g. the programme) was the case, with wards and clinical areas providing the embedded units. The site was an urban hospital which belonged to a group of hospitals forming an NHS Foundation Trust. As part of the Trust's response to implement the Saving Lives audits and raise performance levels, a clinical intermediary role had been developed and implemented across the hospital. The post holders were expected to contribute to the organisation's infection prevention agenda, to help reduce the rates of infections and support the Trust's strategy to implement policies and procedures for infection prevention.

Case two site was a single NHS organisation that employed three infection prevention and control teams, each based at one of the district general hospitals. The boundaries of case study two were the infection prevention strategy of the organisation. This site was selected to provide a different setting and context to case one, and to test the **context-mechanism-outcome** propositions. For each hospital, the teams comprised of a clinical specialist nurse **(or advanced practice registered nurse)** supported by a number of **registered** nurses and administration staff.

Sample

In both case studies data were collected from a purposive sample of participants who had professional or organizational responsibilities for infection prevention. In case one, participants who consented to taking part in the study included intermediary programme

role holders and others with clinical and/or managerial responsibilities for infection prevention and control. In case two, participants who consented to taking part had clinical and/or managerial responsibilities for infection prevention and control (see Table 1 for further details of the sample).

Data collection

Mixed methods were used to collect data using semi-structured interviews, observations and documentation review. Semi-structured interviews allowed for the uncovering of new or different data to inform the **context-mechanism-outcome** development. In case study two the 'teacher-learner' approach was used, whereby the interviewer explains the purpose of the interview, and 'teaches' the **context-mechanism-outcome** propositions to the participants [49]. The data from the interviews were therefore focused on building and refining the **context-mechanism-outcome configurations**. Examples and information provided by participants were "a way of accessing and then making explicit forms of theory which may not have been fully articulated previously" [49].

For non-participant observations, an observation guide based on Spradley's dimensions of observation was used to record data and record the participants' activities [50]. Using the dimensions ensured that the focus remained on the aims of the observations. Nine elements are described by as common but essential features within a given social situation [50]. For example, the observation guide was used to record settings, people, emotions and accomplishments. Observation data were collected as field notes in the observation guide, and recorded as the events occurred or soon afterwards [51]. Relevant documentation was also collected to build a picture of the backdrop for both cases [48].

Data analysis

Realist case studies provide an opportunity for the multiple sources of data to converge in the analysis process. The primary sources of data were the interviews and these were the data that were the starting point of analysis [52]. Data analysis was focused on coding interventions, contexts, mechanisms and outcomes [53]. Data from observations were initially analysed and coded as individual units, and together with documentary evidence were then compared and merged.

Configuration building is designed to support the 'if-then' proposition in realist evaluations [37]. In case one, the **context-mechanism-outcome** configurations were conjectured and were refined in case two. Whilst the focus of realist enquiry, the 'what works' approach, naturally lends itself to extrapolate and understand successful elements within programmes, it was also important to highlight factors which, by association, could impact on the success or failure of the **context-mechanism-outcome configurations**. In the second case, coding was more deductive, whereby previously developed knowledge (the conjectured **context-mechanism-outcome configurations**) framed the analysis structure, so that data was tested in a different context [54]. In case two, analysis was also similar to the pattern-matching technique, whereby evidence was collected to refine the conjectured **context-mechanism-outcome configurations**, as well as identify different patterns or other factors which warranted consideration [48].

Rigour

To ensure rigour, multiple methods of data collection were used, and an evidence trail was established through field notes, audio taping, and use of an observation criteria. To address

construct validity, multiple data collection methods were used and the case site report was sent back to the site to ensure accuracy. Credibility was addressed by spending sufficient time in the case study sites to fully understand the **context-mechanism-outcome** propositions and their subsequent testing and refining. Detail of time spent in each study site was reported in the overview of case studies and timelines. Stakeholder groups were formed to provide feedback on the study's findings and address member checking by discussing the constructs developed from the analysis process [55].

Ethical approval and consent

Ethical approval was sought and granted by the University research ethics committee and local site ethics committees (10/H1202/78). Local research governance processes were also adhered to.

Results

Insert Table 1 here

Across the two cases, four **context-mechanism-outcome configurations** emerged that offer insights into how intermediaries can promote best practice in infection prevention, providing detail about which circumstances, how and for whom. **In realist terms, findings hinge on observable conditions which are noticed at a particular point. Thus, case study findings were confined to the *there and then* of the specific data collection periods.** Whilst many elements within the **context-mechanism-outcome** patterns were similar and resonated with each other, some differences also emerged. For example, data emerged which helped to understand specific factors which could hinder or enable the success of different **context-mechanism-outcome configurations**. The final **context-mechanism-outcome configurations** are described below.

Context-Mechanism-Outcome 1

Context: Where programmes bring intermediaries in close proximity with clinical staff and there are high levels of clinical presence, this enables the intermediary to watch practice as it happens, through overt and covert visibility, and there is an enhanced sense of being watched on the part of clinical staff.

Mechanism: clinical staff fear being caught out or not being seen to play the right part in infection prevention.

Outcome: self-monitoring, and better adherence with best practice in infection prevention.

Where intermediaries show high levels of physical presence and close proximity to staff in clinical areas, this enabled the enactment of both overt and covert visibility. These conditions enhanced the sense of being watched on the part of clinical staff who feared being caught out, or not being seen to play the right part, triggering a more mindful approach to practice, in a form of self-monitoring, so that there was better adherence with best practice in infection prevention. Using proximity to practice, intermediaries associated themselves with being close to clinical staff, and participants' data resonated with this:

"I think initially it was almost, "Oh no Infection Control are here. I bet they're going to check the commodes. I bet they're only here to..., you know, and it was almost like they were

infringing on us and... "They're only here to find out the bad things", whereas actually now (Intermediary) wanders very freely through and it's "Oh (names intermediary), I'm glad you're here, I just need to ask you about so and so". So there's been a real culture change"

(Matron, Site 1)

Intermediaries with high levels of physical presence in clinical areas were considered to be important for raising awareness:

"I think they definitely make a difference either way don't they, cos their presence, at least then people know that they're around and there to help and stuff" (Registered Nurse, Site 2)

Programmes with high levels of presence and being able to work alongside clinical staff enabled intermediaries to enact visibility, providing them with opportunities to watch practice in different ways:

"but what we're doing quite often at the same time as reviewing a patient is that we're watching what people are doing" (Clinical Nurse Specialist, Site 2)

Data show that clinical staff were aware of the overt visibility of the intermediaries and conformed because they feared being caught out:

"I think them walking on the ward does help because it makes staff more aware, "oh my gosh, I haven't filled the stool chart, or I haven't done this or I haven't done that" so it's making sure things are done" (Registered Nurse, Site 2)

Observation data reflected the importance of the impact of overt visibility. In case one, field notes extracts from observational data illustrate how overt visibility triggered a change in the behaviour of clinical staff who conformed in fear of being caught out:

We walked onto a surgical unit and two members of nursing staff were standing behind the nurses' station as we entered. I observed one of the individuals had long hair which was untied –as soon as she saw Intermediary 2, she reached back to tie up her hair in an instinctive action –she recognised Intermediary 2 immediately (Field notes).

Intermediaries described themselves as being the eyes and the ears for infection prevention;

“because we’re always there to see these things, we’re always there to see if doctors are coming on, if they’re using the hand gel, if they are bare below the elbows, and nurses, if they’re wearing wrist watches, they’ve got jewellery on and ...so we’re sort of the eyes and ears on the wards really” (Intermediary, Site 1)

Across both cases, intermediary presence was important for increasing attention to individuals' own practice, because they were not aware they were being watched. As a result of the overt and covert nature of visibility enacted by intermediaries, clinical staff were more likely to monitor their own behaviours and adhere with best practice for fear of being exposed or caught out:

“because sometimes, you’ll be standing there, you know, looking, doing something with the notes or something, and somebody will come out of an isolation room with pinnies and gloves, they see you, and they go straight back in, now, to me, that’s made a difference isn’t it, they’ve seen me and they’ve gone back in and they’ve put them back in the correct clinical waste, then they’ve washed their hands, but if I hadn’t been there, they would have come out” (Infection Control Nurse, Site 2)

Data showed that where programmes bring intermediaries in close proximity with clinical staff and there are high levels of presence, this enabled the intermediary to watch

practice as it happened through overt and covert visibility. There was an enhanced sense of being watched on the part of clinical staff so that fear of being caught out or not being seen to play the right part in infection prevention practice promotes self-monitoring and better adherence with best practice.

Context-Mechanism-Outcome 2

Context: Intermediaries operate in clinical areas with individual approaches and style to build relationships, and use authority where required where there is non-compliance in infection prevention.

Mechanism: staff believe they are being individually supported through the pressures of clinical practice.

Outcome: clinical staff comply and are motivated to act according to policy and standards and there is an atmosphere of collegiality in clinical areas.

Data showed how intermediaries were keen to help clinical staff to find immediate solutions to problems in ways which did not increase their workloads and generally support them to manage day to day issues. Intermediaries considered as significant their chosen specific approaches and style to interact with clinical staff:

“you’ve got to build a relationship. It’s no good going into the areas and being aggressive, being nasty, because you only then build up this wall. You’ve got to go in and have a rapport with the staff. And by having a rapport with the staff, if your communication skills are good and you explain why they should be doing this or why they shouldn’t be doing that, and you give them good communication, and good, you know, feedback...yeah, sometimes you have to tell them, “No, you’re doing it wrong” but...”This

is why you're doing it wrong. This states that..."Usually the staff are great about it"

(Intermediary, Site 1)

Through data drawn across the case studies, intermediaries showed how they attempted to protect clinical staff by absorbing some of the infection prevention issues:

"we sort of cushion them by going out, seeing what's happening out there, are we nursing our infected patients in the right way, are they in barrier rooms, are the staff wearing PPE, why has that patient got that infection, we're finding out" (Intermediary, Site 1).

Intermediaries made concerted efforts to provide support for individuals.

Consequently, for clinical staff, this resulted in the belief that there was availability of personal support for infection prevention issues:

"it's not the same as an e-mail and then you have to wait a week, or until you're next back on shift or...and then that's the whole time then...it could be your next audit due then and nothing's changed and nothing's gone further, but to be visibly present there"

(Registered Nurse, Site 1)

Using constructive approaches to intervene where required, enabled different intermediaries to develop positive relationships with clinical staff. The ways in which intermediaries used specific personal approaches and styles was important to build a sense of collegiality:

"I think once they've seen your face a few times and that they realise that you're not there to beat them with a big stick, you're there to help, and offer advice and support them and the patient I think they begin to sort of, I think it's almost like melting, isn't it,

and warming to what you've got to do" (Infection Control Nurse, Site 2)

Intermediaries use of individual approaches and style triggered staff to believe they were being individually supported so that they were motivated and adhered to policy and standards, supporting an atmosphere of collegiality in clinical areas.

Context-Mechanism-Outcome 3:

Context: Infection control practices are known and seen as high organisational priority and intermediaries provide feedback in a sensitive way which is both positive and reinforcing.

Mechanism: individuals are stimulated to recall what they should be doing, and reflect on their own practice.

Outcome: Individuals are motivated to practice correctly and good habitual behaviours are promoted.

Where infection prevention practices are known and seen as high organisational priority and intermediaries provide feedback in a sensitive way which is both positive and reinforcing, individuals are prompted to reflect on their practice and are motivated to practice correctly. In case one, organisational policy and performance management for infection prevention showed how the intermediary post holders were expected to lead on the provision of feedback on performance for clinical staff to:

"collect and analyse data and feedback results of agreed audits to members of the multidisciplinary team in a timely manner in order for appropriate action to be taken to reduce the spread of infection"

Whilst there was little information in job descriptions about exactly how intermediaries

should provide feedback, the role-holders themselves reflected how the approach they chose was often in response to the situation, with the aim of increasing positive habitual behaviours. In interview data, the enactment of policy and strategy was noted to be a key aspect of the intermediary role:

“And it’s about really going out there and being a part of their team as well. We’re doing audits, like I say, we’ve been doing audits, we do spot checks, we go round on the environmental audits when the domestic supervisors go, and the Trust go round as well, we’ll be part of that so we can see what’s actually going on with the cleaning part. I mean you have people who come and approach you and don’t want to say anything to the ward so...we try and deal with that part of the job as well” (Intermediary, Site 1)

Performance feedback was reinforced to promote a greater sense of the organisation’s priorities to infection prevention, and motivate individuals to reflect and practice correctly:

“and you have to be able to say to them...you know, there’s ways of doing it, but you have to have the courage to go and say ‘actually, you shouldn’t be wearing that regardless of grade, because a policy is a policy regardless of what grade you are in the hospital” (Intermediary, Site 1)

Data showed that intermediaries agreed that feedback should reflect the positive aspects of practice, for example to include the use of praise. The impact of this approach on the part of individuals was to promote a sense that change for the better was feasible:

“ oh yeah, that is good, yeah, and I know that the Sisters are pleased, you know, with the results, cos they’ll say to me, oh you know we had a really good result last month, you

know, 99% on the cleaning and on the nursing issues, so yeah, it is good cos it makes you feel proud of the ward and that really” (Housekeeper, Site 2)

Where performance required feedback, this was reinforced in a challenging way to promote the organisation’s priority to infection prevention so that individuals were motivated to practice correctly:

“and also when we are challenging non-compliances, you know, the staff know that it’s to be done in a non-confrontational manner, so you know, they must take the person away from the clinical setting, and say, excuse me, can I have a word with you privately?” (Clinical Nurse Specialist, Site 2)

Data showed how different intermediaries made efforts to promote ‘good’ habitual behaviours through reinforcement and use of feedback:

“ keeping on top of making sure that everyone’s washing their hands, or, you know, if someone’s visiting a patient who’s in barrier room, don’t let them go in with no gown or gloves on, you know, just keeping on top of that really, but then that’s the hardest part to do” (Registered Nurse, Site 2)

The support worker obviously knows Intermediary 4 well, and they greet each other informally. Intermediary 4 discusses ward equipment issues with her in the treatment room, and gives feedback in a sensitive way, listening and taking time to talk to her.
(Field notes).

Organisational priority for infection prevention, together with how intermediaries provided feedback, both positive and reinforcing, stimulated staff to recall what they should be doing, and reflect on their own practice. Individuals were prompted to

practice correctly and good habitual behaviours were promoted.

Context-Mechanism-Outcome 4:

Context: Intermediaries provide practice based education for clinical staff, incorporating fundamental elements, to counteract lack of priority or time for formal training, and learning is made more real and meaningful for clinical staff.

Mechanism: staff are consistently reminded of the sense of relevance to their own practice.

Outcome: heightened awareness of infection prevention in clinical areas.

Where intermediaries provided practice based education for staff, incorporating fundamental principles of infection prevention so that learning is made more real, staff were consistently reminded of the sense of relevance to their own practice, leading to heightened awareness. How infection prevention teaching was incorporated in the practice setting enabled intermediaries to meet the educational needs of staff in ways which were relevant and timely for them and based around specific issues. Practice or ward based education was shown to be preferred by managers:

“She can show somebody a hundred times how to do and MRSA swab in the lab with a dummy, but if you...want to show them on a real life patient, it’s so much easier if you’re there working with that nurse” (Matron, Site 1)

In interview data, the practice-based ways in which the intermediaries provided training and education for clinical staff were made evident:

“it’s not always a formal based thing because somebody could ask you a question and you could quite happily go off on a tangent from what you’ve gone on there to do, and go and...end up doing something totally different that you hadn’t planned”

(Intermediary, Site 1)

The relationship between the practice-based approach to teaching and instilling a sense of relevance to individuals’ own practice was also reflected in the data. For example, intermediaries used practice-based teaching to make the most of the time available for short teaching sessions on the ward, which they believed contributed to making learning a more meaningful experience for clinical staff, reminding them and making infection prevention relevant to their own practice:

“when you’re actually in that environment with that patient, seeing what’s going on, and you’ve got everything in front of you to work with, it makes it more real, it makes it happen” (Registered Nurse, Site 2)

Where teaching was made relevant to the local context, this led to more meaningful learning for clinical staff. Through employing practice-based teaching, provided in a timely fashion, this promoted an enhanced sense of relevance for individuals. In turn, individuals were consistently reminded of the sense of relevance to their own practice, leading to heightened awareness of infection prevention.

Summary

Over two case studies, four **context-mechanism-outcome configurations** were identified. Data collected in case one was built upon and refined in case two to show the regularity of the **context-mechanism-outcome configurations**. High levels of physical presence of intermediaries and close proximity to staff in clinical areas contributed to

staff being more mindful of their practice and better adherence with infection prevention. Intermediaries operated in clinical areas using individual approaches and style and staff believed they were being personally supported. Where infection prevention were seen as high organisational priority and intermediaries provided feedback in a sensitive way which was both positive and reinforcing, this motivated staff to practice in the right way and good habitual behaviours were promoted. Practice based education, whereby learning was made more real for individuals, reminded staff of the relevance to their own practice.

Revisiting the findings in relation to the initial programme theories

The initial programme theory drawn from the literature review provided broad hypothetical statements what intermediaries and their role in implementing best practice. Data from the case studies, however, provided much more nuanced description about how intermediaries promote best practice. Where, in the literature review, we hypothesized that intermediaries have the potential to promote and influence best practice in infection control through the provision of education, the case study data outlined the detail about practice-based teaching that made this relevant. From the literature review, we understood that intermediaries' responsibilities for feeding back surveillance data to clinical areas, and implementing and monitoring guideline use. However, the case studies were much more illuminative, and showed how the ways in which feedback was given triggered changing behaviours. In addition, case study findings highlighted that more attention should be given to the influence of policy discourse. In case study data, we found that the scope of influence of intermediaries was more likely

to be successful where there was evidence of proximity and presence in clinical areas, and through the ways they employed to build relationships. Other contextual factors that influenced their role and function revolved around how intermediary roles were organised within their own organisations, and where efforts to foster collegiality among clinical colleagues were noted.

Discussion

Our findings show that the success of intermediaries is often dependent on their proximity to clinical areas. Proximity is most influential when people share space, or “proxemic norms”, whereby space between people is influenced by factors such as culture or behaviour [56]. This condition was noted in this study, whereby the physical presence of different intermediaries was often intertwined with the interactions between them and clinical staff. Examples were provided of intermediaries working closely together with clinical staff (described as “mucking in”), enhancing their shared experience of space and proxemics. Their presence and how they watched over practice was found not only to act as form of monitor, but also led to the potential to prompt individuals to be more attentive to their own practice. In this study, we found that intermediaries were acting out a form of human surveillance which was constructive and caring, as opposed to the more punitive form [57]. We argue that more evidence is required, to understand how different forms of surveillance can be used to promote best practice in healthcare. In particular, we consider that understanding how human surveillance can be integrated into established organisational systems should be explored. We suggest that surveillance needs to become humanised again [58].

Through examining how practice is monitored by intermediaries in this study, the potential impact of promoting self-surveillance amongst clinical staff is magnified. This is a significant development which, we suggest, can contribute to showing ways in which intermediaries can promote best practice. Self-surveillance implies that power rests with the individual, as opposed to that of the organization, and implies that; “people who are subject to the formal rules and regulations of the social institutions have simply internalised those rules, to the point that they have become normative” [59]. We suggest that we can learn more about how intermediaries contribute to how staff are mindful of their own work.

In this study, we found that clinical staff in both sites believed they were being personally supported, through the approaches and styles intermediaries used to build relationships. It is known that social learning theories show that liked and trusted individuals are more likely to be successful in triggering behavioural change amongst people [17]. We found the ways in which different intermediaries used specific approaches and styles to build relationships with clinical staff, and this triggered staff to feel personally supported, resonating with established theories about negotiator and conciliator [61]. In this way, the intermediaries and clinical staff were bound together in relationships in clinical areas.

In this study, the priority afforded to infection prevention by organisations and the language of policy was instrumental to how intermediaries made use of positive and reinforcing ways to provide performance feedback. That credence was given in this study to the use of feedback in infection prevention practice reflects the findings of previous evidence which highlights the importance of feedback [66], [1], [67]. However, in this study, it was a particular approach to feedback that was noted to be most significant for

staff to recall what they should be doing, and reflect on their own practice. Furthermore, we found that the relationship between policy discourse and provision of feedback by intermediaries linked to promoting “good” habitual patterns of behaviour. These are novel findings which elaborate on current understanding about reinforcement and promoting best practice [62]. Whilst provision of high levels of feedback for individuals and teams has previously been recognized as an important part of a context that enables successful implementation [65], there is a paucity of evidence to demonstrate how people form habitual behaviours, and the impact of reinforcement and rewards [63], [64].

Finally, learning from this study about how intermediaries used practice-based teaching to provide education that was timely and relevant for staff has magnified what is known, from social learning theories, ways in which to provide meaningful learning for staff. In this study, intermediaries were instrumental in making teaching relevant to different clinical areas, and staff preference for this approach reflect the findings of previous work that found that teaching is more beneficial when conducted in real life situations/clinical practice [68]. In infection prevention, this has implications to focus individuals’ attention on the gravity of the issues, and enables people to learn in an environment which is; “inclusive of the material resources within it, the formal requirements, the culture, procedures, practises and standards of particular clinical areas, the expectations and interactions of all the people who are in it, as well as the personal characteristics of individuals who are part of this environment” [69].

Some of the findings from the study resonate with the limited evidence base about intermediaries outlined in the background section, in particular to show their function as teachers and educators, or supporting the evidence which explains how intermediary

characteristics such as promoting collegiality and trust can support relationships with clinical staff [17], [18]. However, collectively, the findings are much more significant in that they signal the distinct conditions which allow intermediary functions or characteristics to trigger a change or response in individuals, and build understanding about what is really happening, for example, the human surveillance in 'Eyes and Ears' and promoting good habits in "Keeping on top of Practice". The findings contributed to the development of the study's revised programme theories (Table 2), a range of demi-regularities which have the potential to guide practice and policy in future intermediary programmes and role development. The formation of the revised programme theories was an important step to consolidate the findings, as well as provide guidance for future practice and research in different contexts.

Insert Table 2 here

Limitations

The choice of the realist evaluation approach and case study design for the study highlight the importance of being cognisant of "real world constraints" [70], so that time and resources had to be factored in the design and study process. In the real world, practical issues influence much of the researcher's decision-making [71]. Interviews were the main data collection method used in the case studies. Face to face interviews have the potential to be affected through social desirability of the participants, or interviewer bias [72]. However, to address these issues, observations and documentation review supplemented the interview data. It is methodologically incompatible to try and draw generalizations from realist studies. However, the findings provided insight into particular contextual conditions **for example, proximity and visibility, which should be paid**

attention to, in order to support the potential of intermediaries to promote best practice.

Conclusions

Our findings offer a new lens on the role of intermediaries in bridging the evidence to practice gap. In healthcare practice, understanding which interventions show potential to trigger behaviour or practice change and contribute to quality and safety for patients is an important and essential area of research. We suggest that new/existing roles that are set up to promote best practice can be improved if role holders are more aware of the mechanisms that can influence change. The uncovering of the context-mechanism-outcome configurations and the relationships with the theories of change which underpin them provides an explanatory narrative of the implementation of intermediary practice (for this study, in the context of infection prevention). In addition to providing a contribution to the evidence base, the study's process and findings also add to the methodological advancement of realist approaches. The continuous process of gathering data over two case studies contributes to cumulation, a process of shifting between abstract and specific context-mechanism-outcome configurations. Cumulation supports the development of middle-range theory which can "underpin the development of a range of program types" [49]. The study's findings have produced middle-range theory (through context-mechanism-outcome development and refinement), to help explain the potential of intermediaries to promote best practice. In the context of the broader purposes of cumulation, we believe the specific elements of the context-mechanism-outcome configurations uncovered here can be tested in different contexts. In this way, the findings can provide the foundation for better understanding of what works to promote best practice.

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