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Barriers and enablers of recognition and response to deteriorating patients in the acute hospital setting: A theory-driven interview study using the Theoretical Domains Framework

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ABSTRACT

Aim: To explore barriers and enablers of recognition and response to signs of patient deterioration by nursing staff in an acute hospital.**Design:** A theory-driven interview study underpinned by the Theoretical Domains Framework of behaviour change.**Methods:** Between 07/01/2019 and 18/12/2019 a purposive sample of registered nurses and healthcare assistants was recruited to participate in a semi-structured (audio-recorded) interview, to explore the determinants of seven specified behaviours of the afferent limb. Anonymised transcripts were deductively coded (using the 14 Theoretical Domains Framework domains as coding categories) and then extracts within each domain were inductively analysed to synthesise belief statements and themes. Prioritisation criteria from published literature were applied.**Results:** Thirty-two semi-structured interviews were conducted. From 1,888 quotes, 184 belief statements and 66 themes were synthesised. One hundred and forty-six belief statements, represented by 58 themes, met prioritisation criteria. Nine domains of the Theoretical Domains Framework were of high importance: *Knowledge; Social, Professional Role and Identity; Beliefs about Consequences; Reinforcement; Intentions; Goals; Memory, Attention and Decision Processes; Environment, Context and Resources and Social Influences.***Conclusions:** Barriers and enablers most likely to impact on nursing staff afferent limb behaviour were identified in nine domains of the Theoretical Domains Framework.

KEYWORDS

critical care, nurse roles, nursing observations, qualitative approaches, research implementation

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Impact

Rapid response systems have been implemented internationally including an afferent and efferent limb. Behaviours of the afferent limb include monitoring vital signs and escalating care. Despite global uptake of rapid response systems, there is evidence that nursing staff do not consistently enact afferent limb behaviours according to policy (afferent limb failure). New insights into the complex and pervasive problem of afferent limb failure have been offered. Use of theory will permit mapping of these identified domains of high importance to precisely targeted behavioural intervention strategies, and subsequent evaluation of how these strategies may best be operationalised in different clinical settings.

1 | INTRODUCTION

Hospitalised patients who deteriorate in a ward setting without recognition or an appropriate response are at risk of a serious adverse event (SAE) such as unplanned admission to the Intensive Care Unit (ICU), cardiac arrest or death (Tirkkonen et al., 2013; Trinkle & Flabouris, 2011). To optimise responses to deteriorating patients, rapid response systems (RRS) have been implemented internationally within acute hospitals (DeVita et al., 2006). While RRS broadly include an ‘afferent limb’ (the recognition arm) and an ‘efferent limb’ (the response arm; Figure 1), how RRS are implemented varies across providers (DeVita et al., 2006; Lyons et al., 2018).

Deleterious changes to vital signs (e.g. heart rate, respiratory rate, blood pressure) are frequently seen in patients preceding a SAE (Andersen et al., 2016; Kause et al., 2004). Consequently, track-and-trigger tools have been implemented as part of the afferent limb of the RRS. These tools, which may be paper based or electronic, allow healthcare professionals (typically nursing staff) to record routinely measured vital signs, providing a signal when the vital signs fall outside of acceptable parameters. In these circumstances, staff are prompted to increase the frequency of subsequent monitoring and to consult a practitioner with expertise in the management of acute/

critical illness (Grant, 2018). In some regions, including Australasia and North America, track-and-trigger tools typically include dichotomous criteria, that is, when any vital sign crosses a specific threshold (e.g. a respiratory rate >30 or <10 breaths/min) the patient is considered to be at risk and care should be escalated (Davies et al., 2014; Sprogis et al., 2017). Within the United Kingdom and parts of Europe, early warning scores are more common, particularly the National Early Warning Score (NEWS), which was developed to standardise practice between organisations (Royal College of Physicians, 2017). The NEWS signals patient risk based on six routinely recorded vital signs, each of which accrues a score (range 0–3) that is combined to produce the aggregate NEWS (range 0–20). The higher the aggregate score, the greater the risk to the patient and the more senior the practitioner to whom care should be escalated (Royal College of Physicians, 2017; supplementary file 1). The use of early warning scores and an accompanying escalation protocol are associated with improved patient outcomes (Credland et al., 2020).

Like the track-and-trigger tools themselves, the nomenclature and composition of efferent limb response teams also differ internationally, with nurse-led Critical Care Outreach Teams in the UK and more medically driven or multi-disciplinary Medical Emergency Teams and Rapid Response Teams common in

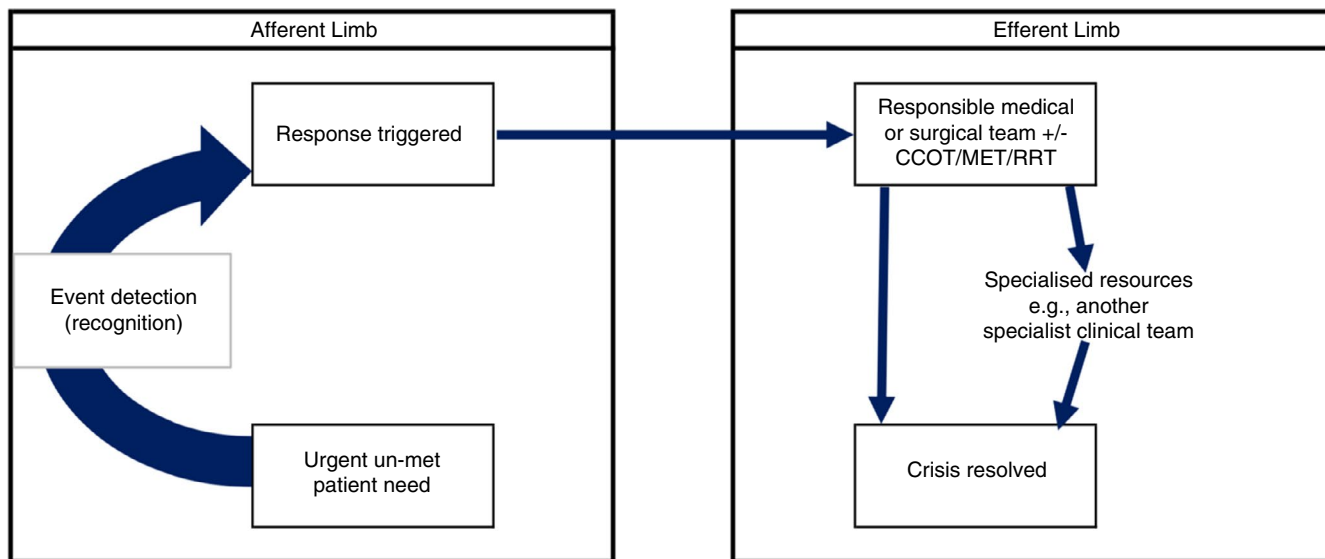


FIGURE 1 Conceptual model of the Rapid Response System (RRS). Adapted from: DeVita et al. (2006)

FIGURE 2 The domains of the Theoretical Domains Framework (TDF). Taken from: Atkins et al. (2017)

TDF domain	Content of the domain
1. Knowledge	An awareness of the existence of something
2. Skills	An ability or proficiency acquired through practice
3. Social/Professional role and identity	A coherent set of behaviours and displayed personal qualities of an individual in a social or work setting
4. Beliefs about Capabilities	Acceptance of the truth, reality or validity about an ability, talent or facility that a person can put to constructive use
5. Optimism	The confidence that things will happen for the best or that desired goals will be attained
6. Beliefs about Consequences	Acceptance of the truth, reality, or validity about outcomes of a behaviour in a given situation
7. Reinforcement	Increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus
8. Intentions	A conscious decision to perform a behaviour or a resolve to act in a certain way
9. Goals	Mental representations of outcomes or end states that an individual wants to achieve
10. Memory, Attention and Decision Processes	The ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives
11. Environment, Context and Resources	Any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence and adaptive behaviour
12. Social Influences	Those interpersonal processes that can cause individuals to change their thoughts, feelings, or behaviour
13. Emotion	A complex reaction pattern, involving experiential, behavioural, and physiological elements, by which the individual attempts to deal with a personally significant matter or event
14. Behavioural Regulation	Anything aimed at managing or changing objectively observed or measured actions

Australasia and North America respectively (Churpek et al., 2017; Hughes et al., 2014; Priestley et al., 2004). Actions common to all of these response teams include patient assessment, initiation of definitive treatment or supportive care and facilitation of transfer to a higher-care setting, for example, an ICU (Bannard-Smith et al., 2016). In the current research, the focus is on the behaviours of the afferent limb.

Review findings suggest that escalation to a designated response team is associated with reduced in-hospital cardiac arrest and mortality (Maharaj et al., 2015; Rocha et al., 2018). However, patients will only benefit from the additional expertise provided by these teams if they are activated and mobilised to the patient's location (Lyons et al., 2018). Consequently, patient benefit is contingent on the precursory afferent limb behaviours of the RRS being enacted. Despite the widespread implementation of RRS and availability of track-and-trigger tools, there is evidence that nursing staff do not consistently follow guidance (Credland et al., 2018). This lack of compliance has been termed 'afferent limb failure' (ALF; Johnston et al., 2014; Trinkle & Flabouris, 2011).

2 | BACKGROUND

The determinants (i.e. barriers and enablers) of nursing staff enacting best practice behaviours of the afferent limb have been broadly described in a number of published review papers (Massey et al., 2017; Olsen et al., 2019; Treacy & Stayt, 2019; Wood et al., 2019). Despite acknowledgement that ALF is a problem characterised by

inconsistent staff behaviour (Credland et al., 2018; Ede et al., 2019), no reports of studies were found where behaviour change theory had been applied to explore determinants. Furthermore, from the modest body of literature reporting interventions to address ALF (Bucknall et al., 2017; Connell et al., 2016; Duff et al., 2018; Liaw et al., 2016), no explicit reports of theory being applied during intervention development were identified. There is evidence that using theory to elucidate determinants and drive the selection of intervention content increases efficacy (Noar et al., 2007; Taylor et al., 2012; Webb et al., 2010) and replicability (Little et al., 2015; Michie et al., 2008) of the resultant intervention compared to pragmatic (i.e. intuition based) or non-theoretical approaches.

Theories of behaviour change attempt to understand the context in which desirable behaviours occur (or do not occur) as well as mechanisms of action and moderators of change along various causal pathways (Michie et al., 2016). There are numerous theories of behaviour and behaviour change available (Davis et al., 2015) making the selection of a suitable theory challenging for non-specialists (Francis et al., 2012). The Theoretical Domains Framework (TDF) was developed to overcome this challenge by identifying a parsimonious set of broad theoretical domains drawn from behavioural theories (Cane et al., 2012; Michie et al., 2005). The revised TDF (v2) specifies 14 theoretical domains (Figure 2) that each represent between 3 and 11 conceptually related constructs. The 84 constructs of the TDF were obtained from 33 different behaviour change theories (Atkins et al., 2017; Holdsworth et al., 2015). In addition to the accessibility of the framework, benefits of the TDF include its versatility, enabling its application to a range of behavioural problems and

extensive coverage of the determinants of behaviour change (Atkins et al., 2017; French et al., 2012).

3 | THE STUDY

3.1 | Study aim

The aim of this interview study was to explore determinants (barriers and enablers) of recognition and response to signs of patient deterioration by nursing staff in an acute hospital. Specific objectives were as follows:

1. To elucidate determinants of nursing staff enacting behaviours of the afferent limb, using a theoretical framework of behaviour change (the TDF)
2. To report TDF domains that represent the most important barriers and enablers to nursing staff enacting the specified behaviours, through the application of published prioritisation criteria.

3.2 | Design

This was a qualitative semi-structured interview study informed by the TDF. The research described here is one component of a multi-phase intervention development process modelled on the Medical Research Council's guidance for developing and evaluating complex interventions (Medical Research Council, 2006). A full protocol for the wider process within which this research is situated has already been published (Smith et al., 2019).

3.3 | Sample

A purposive sample based on seniority (employment grade or role) and experience (duration of time in role) of nursing staff was recruited from two acute floors (four wards) within a UK metropolitan teaching hospital. In the UK context, unregistered Healthcare Assistants (HCAs) are frequently involved in enacting behaviours of the afferent limb, particularly the monitoring of patients' vital signs (Ede et al., 2019; Smith et al., 2020). Consequently, both registered nurses (RNs) and HCAs were recruited.

In 2018, it was confirmed that the hospital would be switching from paper-based patient records to Electronic Health Records (EHR). Part of this process was migration from a paper-based NEWS chart to an electronic version. It was identified that this period of transition would provide a unique opportunity to explore determinants of afferent limb behaviour in both paper and EHR contexts. Consequently, participants were recruited pre- and post-EHR activation. An acclimation period of 3 months (Bedoya et al., 2019) was allowed following EHR implementation when no data were collected.

3.4 | Data collection

TDF topic guides (supplementary file 2) were developed to explore the determinants of seven specific behaviours of the afferent limb (referred to hereafter as the target behaviours). The target behaviours (Table 1) were shortlisted from a longer list of behaviours identified through an extensive period of focused ethnography in an earlier phase of this programme of work (Smith et al., 2020). A minimum of one question for each of the 14 TDF domains was included. Interviews were carried out by a single researcher [DS], in a room adjacent to, or away from, the ward in which the participants worked. Interviews were audio-recorded, transcribed verbatim, checked for accuracy and anonymised. DS, a clinical-academic nurse with 11 years of experience of working in critical care outreach roles, received specific training on in-depth/complex interviewing prior to data collection.

As the pre-EHR period of data collection was finite (a period of 3 months), sampling continued until the EHR was implemented. In the post-EHR period (an indefinite period), sampling continued until the point of theoretical saturation which was determined as follows: (1) an *initial analysis sample* of 10 interviews was conducted with nursing staff; (2) data from the *initial analysis sample* was deductively coded (into the 14 TDF domains) and within each domain the text inductively analysed; (3) a *stopping criterion* of three was used, meaning that theoretical saturation was achieved when no new themes (synthesised from inductive analysis of coded data) were identified from three subsequent consecutive interviews (Francis et al., 2010).

3.5 | Ethical considerations

Permission to conduct this research was granted by the National Health Service North of Scotland Research Ethics Committee (REC; reference: 18/NS/0118). Subsequently, favourable opinions to proceed with the research were granted by the Health Research Authority (reference as for REC) and the hospital's research and development department (reference: 18/0569). Participation in the study was voluntary. Those who agreed to participate in an audio-recorded semi-structured interview prospectively gave written consent including consent for de-identified quotes to be used in publications.

3.6 | Data analysis

First, using Framework method (Gale et al., 2013), interview data were systematically and deductively indexed and charted using the 14 TDF domains as the coding categories (Cane et al., 2012).

Second, inductive content analysis (Elo et al., 2014) was used to generate 'belief statements' reflecting participant-reported barriers and enablers. Beliefs about behaviours are important precursors of attitudes, intentions and behaviour (Ajzen, 1991; Francis et al., 2014; Michie et al., 2005; Pesseau et al., 2019). That is, beliefs about behaviour influence whether the behaviour is performed or not, and how consistently. Therefore, while

TABLE 1 Specific behaviours of the afferent limb targeted during data collection

Target behaviours (labelled according to action, actor, context, target & timing (Presseau et al., 2019))

Ward patients' (¹secondary target) respiratory rates should be counted (*action*) by HCAs and RNs (*actors*) for a full minute (*timing*), every time vital signs are measured (*context*)

All vital signs should be recorded directly on the NEWS chart/EHR (*action*) by HCAs (*actor*), every time a ward patient's (*secondary target*) vital signs are measured (*context*), within 5 min of measurement (*timing*). Information should not be recorded on handover sheets or other miscellaneous pieces of paper

HCAs (*actor*) should escalate (*action*) to a RN (*primary target*) whenever a ward patient's (*secondary target*) NEWS is ≥ 5 (*context*), after every episode of vital signs monitoring (*timing*) unless a reasonable variance has been agreed and documented

RNs (*actor*) should re-measure vital signs (*action*) of a ward patient (*secondary target*) if they are informed that said patient's NEWS is elevated (*context*) prior to further escalation (*timing*)

Escalation (*action*) to the parent medical team and/or CCOT and/or night nurse practitioners (*primary targets*) should be carried out by RNs (*actor*) when NEWS is ≥ 5 (*context*), in any ward patient (*secondary target*), after they have re-measured vital signs and/or completed an ABCDE assessment (*timing*) unless a reasonable variance has been agreed and documented

A ward patient's (*secondary target*) vital signs should be repeated (*action*) by HCAs/RNs (*actor*), when the NEWS ≥ 5 (*context*), every hour (at minimum; *timing*) unless a reasonable variance has been agreed and documented

Further escalation (*action*) to 2nd responder (e.g. a different doctor or CCOT nurse; *primary target*) should be carried out by a RN (*actor*), if the 1st practitioner they approached cannot attend or does not respond as policy states, during any episode of escalation to any responder (*context*) at any time of day or night (*timing*)

Abbreviations: ABCDE, Airway, Breathing, Circulation, Disability, Exposure; CCOT, Critical Care Outreach Team; HCA, Healthcare Assistant; EHR, Electronic Health Record; NEWS, National Early Warning Score; RN - Registered Nurse.

¹Note: the *primary target(s)* of the specified behaviour are the individual(s)/group(s) who must decide whether subsequent behaviours are required, while the *secondary target(s)* are the individual(s)/group(s) who benefit from the specified behaviour but are not required to enact anything themselves.

domain-level data are typically used in TDF studies to select intervention content (Cadogan et al., 2015; Patton et al., 2018), belief-level data are required in order to prioritise the most important determinants.

The approach used [by DS] to synthesise participants' beliefs was as follows: quotes from each of the charts developed during deductive coding were read and re-read to ensure familiarisation; quotes reflecting similar beliefs were grouped and categorised using a simple label (i.e. a brief description of content); quotes were scrutinised further and 'belief statements' were synthesised to represent beliefs held by (a minimum of two) participants (e.g. RNs and HCAs believe that their professional responsibility **ends/does not end**, when the next clinician along the escalation pathway is notified; (Islam et al., 2012; McBain et al., 2016; Roberts et al., 2017)). Where participant beliefs were discordant, that is, a barrier for some while an enabler for others, this was reflected in the wording of the statement (see bold text in example above). Belief statements representing overlapping or related content were grouped and a suitable theme heading synthesised (Patey et al., 2017; Presseau et al., 2017). In this study, theme-level data were used to establish theoretical saturation in keeping with reported methods (Francis et al., 2010).

To identify TDF domains of particular importance; first, four criteria (Table 2) with binary assessments were selected from the TDF literature (Atkins et al., 2017; Goddard et al., 2018; Islam et al., 2012; Patey et al., 2012) and applied at belief statement level. Second, these criteria were used to categorise the TDF domains as being of high, moderate or low importance based on the number of criteria met. Domains with any belief statement that meet 3 or 4 of the criteria were considered of high importance; 2 criteria of moderate importance and 1 or 0 criteria of low importance (Goddard et al., 2018).

3.7 | Rigour

To achieve trustworthy interpretation of the data, a number of recommended methods were applied. To ensure credibility of findings, audio-recordings of two pilot interviews were listened to by [DS] and other researchers not involved in the study, permitting self-reflection and peer debrief on both topic guide content and questioning approaches (Morse, 2015). Reflection continued throughout the period of data collection and analysis, facilitated by the recording of reflexive notes and regular debrief with other members of the research team (Forero et al., 2018; Koch & Harrington, 1998).

The interview data were collected over a period of 8 months as part of a bigger study that included direct observation of ward staff in situ (Smith et al., 2020) and brief, unrecorded interviews. This prolonged and varied engagement with participants increases the credibility of our data set (Forero et al., 2018); while the use of methodological triangulation increases confirmability (Morse, 2015).

To enhance dependability of the data, a codebook (supplementary file 3) was developed to ensure a clear audit trail and to enable reliable coding (Forero et al., 2018; Morse, 2015). During deductive coding, investigator triangulation was used (Cadogan et al.,

2015) as a sample of semi-structured interviews (10%, randomly selected) were coded independently by two researchers [DS and LMA] (Tracy, 2013). After independent coding, disagreements were reconciled through consensus discussion including a third impartial researcher [MC]. This process was repeated until the calculated level of overall inter-coder percentage agreement reached 60% (Atkins et al., 2017).

4 | FINDINGS

Data collection activities were conducted between 07/01/2019 and 18/12/2019. Between 07/01/2019 and 27/03/2019, data were collected pre-EHR implementation. Between 01/07/2019 and 18/12/2019, data were collected post-EHR implementation.

Thirty-two semi-structured interviews were conducted (16 RNs, 16 HCAs) across the period of data collection; 17 were conducted pre-EHR and 15 were conducted post-EHR. The denominator of potential participants (obtained from human resources data) was approximately 140 nursing staff including both RNs and HCAs. Across

the sample of participants (RNs and HCAs), median time in role was 2 years (range 3 months – 19 years). The median length of an interview was 54 min (range 28–74 min).

The entire corpus of data consisted of 1,888 quotes from which 184 belief statements and 66 themes were inductively synthesised (supplementary file 4). One hundred and forty-six belief statements, represented by 58 themes, met prioritisation criteria (Table 2). Based on the prioritised themes and belief statements, nine of the fourteen TDF domains were of high importance, four domains of moderate importance and one domain of low importance (Table 3). High importance domains are elaborated below.

4.1 | Knowledge

Participants' knowledge of local deteriorating patient policy and protocol was inconsistent. Some RNs and HCAs were aware of the existence of policy but had limited knowledge of its content; others believed that the NEWS tool was the local policy; while others were

TABLE 2 Prioritisation criteria applied (at the belief statement level) to identify Theoretical Domains Framework (TDF) domains of importance

Criterion	Description
Frequency ^a	The belief (a barrier or an enabler) was reported by more than a third of the sample
Personal importance	The belief was expressed using emphatic language in one or more illustrative quote/s
Direction of effect	There were discordant views between participants about the belief operating as a barrier or enabler
Professional discordance	The belief was held by RNs but not by HCAs or <i>vice versa</i>

^aFrequency, in this context, relates to the **number of different** participants who express a belief rather than the number of times it is mentioned.

TABLE 3 Summary of prioritisation criteria met, and level of importance for each of the 14 domains of the Theoretical Domains Framework (TDF; ranked by number of acriteria met)

TDF domain	Frequency of belief statements meeting at least 1 of the 4 prioritisation criteria	Number of different prioritisation criteria met by belief statements within the domain (denominator = 4)	Level of importance in determining the target behaviours
Beliefs about consequences	10	4	High
Environment, context & resources	33	4	High
Memory, attention & decision processes	14	4	High
Reinforcement	6	4	High
Social, professional role and identity	12	4	High
Goals	8	3	High
Intentions	13	3	High
Knowledge	22	3	High
Social influences	9	3	High
Behavioural regulation	4	2	Moderate
Beliefs about capabilities	7	2	Moderate
Emotions	4	2	Moderate
Skills	3	2	Moderate
Optimism	1	1	Low
Total	146	–	–

completely unaware of the existence of a policy document within the organisation.

There is the NEWS policy, for goals, and what I was saying about the timing, of how often you do the obs according to the NEWS score. I'm sure that is all the Trust's goals. Although I wasn't actually able to completely say them, I wasn't one hundred per cent. I didn't know the exact goal timings... (RN9)

Some participants lacked procedural knowledge of how a respiratory rate should be accurately measured; reporting that it need only be counted for 15 s or conflating the procedure for measuring respiratory rate with the procedure for assessing other vital signs.

I count from the heart right there to check [gesturing towards their chest]. I assess it is beating and working the time. At the end I am able to come up with what I think the respiration is. (HCA3)

Similarly, some RNs and HCAs demonstrated knowledge of the importance of an abnormal respiratory rate as an early signal of deterioration. Other participants did not demonstrate this knowledge and described de-emphasising the respiratory rate in favour of other measurements.

I think it's the blood pressure, as well as the oxygen saturation, even the heart rate as well. (RN11)

4.2 | Social, professional role & identity

Some RNs explicitly linked the action of measuring vital signs with their professional registration and accountability, reporting that they felt more secure when they had taken the vital signs measurements themselves. Despite this, RNs and HCAs frequently reported the action of measuring vital signs as being part of the HCAs role.

I feel like I'm a bit of a glorified healthcare assistant at the moment. I suppose if we are fully staffed, healthcare assistants are there...I feel like the skills I've got can be better put to use rather than me being stood there and doing a set of obs. (RN4)

Furthermore, numerous participants shared the belief that HCAs did not require any explicit instructions or direct delegation from a RN.

Oh, just automatically. We do the obs, you know. There's not even a discussion, it's just like we know that before ten o'clock we start our observations, and that's our role. (HCA5)

Some participants believed that they continued to be responsible for their patient even after they had escalated to another

practitioner. Other participants believed that the weight of responsibility was transferred to another practitioner after escalation.

...I feel a weight off my shoulders because I'm like, 'Right, I've told someone who's had this medical training [about] these obs, now I've handed over that responsibility'... (RN3)

4.2.1 | Beliefs about consequences

Participants held competing beliefs about the consequences of escalating to the nurse in charge of the ward. While some participants reported that this level of escalation would result in further support, others believed that the nurse in charge would not be in a position to support them and that this action was therefore futile.

...So, informing the person who is in charge, it doesn't make any difference. So, maybe on another ward, and the nurses in charge do not have patients, you inform them, and they might take over but, with me, when I tell my nurse in charge, it's not going to make any difference on X WARD. (RN8)

Similarly, HCAs reported mixed beliefs about that consequences of escalating subtle signs of deterioration to a RN. While some HCAs believed that RNs would be receptive and helpful, others anticipated that RNs would push back and even be dismissive.

Because you can't just run to the nurse every two seconds saying, 'Nurse!', you know, because they'll be like, 'Well, use your initiative. Use your common sense as well'. (HCA5)

4.3 | Reinforcement

A number of participants held the enabling belief that if they acted appropriately to escalate a deteriorating patient, then they would be praised and validated by senior nursing colleagues and/or medical staff. This was often based on previous experience of receiving positive validation from senior colleagues.

Yes, sometimes, the nurse will say 'X has saved a life today.' And I'm happy that I've saved a life because I take quick action. So next time I do more. I get in more. Because I'm so excited and so happy because I've been praised. (HCA4)

4.4 | Intentions

Numerous RNs and HCAs reported the intention to increase the frequency of vital signs monitoring in patients with an elevated NEWS.

Likewise, staff reported the intention to escalate in the event of an elevated NEWS.

I have to phone the CCOT quickly to let them know...
(RN7)

Some participants also expressed an intention to continue escalation, along the line of different responders, until the desired response occurred.

I'd still be really concerned, and I would make sure that the doctor came as a priority and a CCOT came as a priority and if the SHO [a junior doctor] wasn't going to come then I'd just ring the Registrar [a more senior doctor]. (RN4)

4.5 | Goals

Goals related to the measurement of vital signs were often described by participants as being of higher priority than other clinical tasks.

I think it's [measuring vital signs] extremely important because it gives us an idea of the state of being of the patient at any point in time... that helps us in making the clinical decisions as to the kind of care or interventions we need to basically give to the patient.
(RN14)

In the event of a patient deteriorating with an elevated NEWS, some RNs reported setting the personal goal of re-measuring the patient's vital signs themselves to ensure that the data recorded by the HCA were correct.

It affects how you manage the patient because if they're [referring to HCAs] doing it wrong, then you might think that the patient is suffering from something, that you have to make sure that you do it the right way. So, I have to check it by myself to make sure that what we get is correct. (RN11)

4.6 | Memory, attention and decision processes

A number of participants believed that when a patient's NEWS was persistently elevated, this became their normal (i.e. the patient's 'baseline') and reported taking the decision to disregard NEWS guidance in these circumstances.

If the patient's always having that kind of data and that kind of score, I feel it's not necessary to tell the nurse, because I have to find the nurse. She must be doing medication. It has to be something important I

want to tell her. When it's, like, a regular thing, I feel like there's no point walking all the way round and also telling her when she's doing something else.
(HCA14)

Likewise, several RNs and HCAs described searching for simple explanations to justify a patient's elevated NEWS and, when a simple explanation was found, reported disregarding escalation guidance.

I don't always tell the nurse straightaway, because if they've just had a shower, I just think, 'Okay, you've just had a shower. You know, your blood pressure might be up because you've been in a hot shower. Your pulse might be up because you've been walking about. You've been doing more than what you would normally do... (HCA5)

In the event of an elevated NEWS, both RNs and HCAs reported delivering first-line interventions to a deteriorating patient before assessing further. The patient's response, or lack of response, to these interventions was described as a factor in the decision making about subsequent escalation.

...ask the patient how they're feeling, ask them if they've drunk enough water during the day... if not, we encourage them, 'Try to drink more and in 30 minutes time, we do the blood pressure again'...maybe in 30 minutes time, it might be alright. (HCA 6)

4.7 | Environment, context and resources

Numerous participants reported a mismatch between human resource (i.e. the number of nursing staff on duty) and patient dependency as a barrier to staff reviewing NEWS charts or taking further timely measurements of vital signs. Similarly, some RNs and HCAs believed that they often did not have sufficient time to undertake these actions during the course of the shift due to unpredictable nature of the working environment.

I think I can do them [vital signs] if I want them. It's just that we don't have the time. Generally, to go around and do six obs and six sets of meds and six discharges or whatever you're doing that day is quite a heavy job. I think, in some wards, RNs do it and think it's great, but I think our ward is just too busy. (RN10)

When escalating to practitioners external to the ward-based team (e.g. medical staff or CCOT), using the hospital's pager system, some participants reported experiencing long delays before a response, particularly when enacting this behaviour at night.

Yes, well, sometimes when you call, and call, and call, and call, and no one is calling back. So, you get worried. (RN8)

RNs and HCAs reported mixed beliefs about the use of a hand-held electronic devices for recording vital signs within the EHR. Some participants reported finding these devices easy to use when recording vital signs at the patient's bedside, while other staff stated that the handheld devices were not user friendly and reported using paper and/or desktop computers instead.

I think it was just the simple thing...the screen vanished and went to another screen. That was annoying enough for me to go to the desktop...it's not like I have so much time to, for that, so it's a simple problem with the [names hand-held device] and I've stopped using it. (HCA14)

Participants held competing beliefs about the usefulness of the display format of vital signs in the electronic NEWS compared to the paper NEWS chart. Specifically, several participants reported finding it difficult to identify which individual parameters were contributing to the elevated score when using the electronic NEWS.

...But, because on the [names EHR] it's not thoroughly specified why we calculated the score this way... You just have to basically rely on your previous knowledge that, okay, this is why the NEWS score is like that... (RN12)

Some RNs and HCAs also reported the lack of colour on the display format of the electronic chart to be a barrier to its effective use, compared to the paper chart which incorporated different coloured zones associated with the different score ranges and degrees of patient risk.

...because it's [referring to the paper NEWS chart] really colourful. That's what helps as well. It's very bright and colourful, so once a value passes a line or it goes below a line, then you know that it's going to score [high]... (HCA8)

4.8 | Social Influence

Some RNs and HCAs believed that their peers were supportive and encouraging of them in diligently monitoring a patient's vital signs and, when appropriate, escalating deterioration. This was particularly influential when the colleague was perceived to be more senior and/or experienced. In contrast, other RNs and HCAs reported that their nursing colleagues could, at times, be discouraging and even dismissive about them enacting target behaviours.

...All of my colleagues, the healthcare assistants, they are saying it's between a joke and serious. 'Oh, X, you worry so much.' All the time I am complaining about the obs or they say, 'X, relax.' One said, 'Go to your break.' I said, 'I will finish my job and after I will go to my break.' ... (HCA2)

Some RNs reported that their behaviour in escalating to an external practitioner, specifically CCOT, was influenced by previous responses from the team when they escalated to them. Some RNs described positive interactions with the CCOT, while others reported less positive and even discouraging interactions.

I've had a few moments where CCOT have asked me, you know, 'Do you think this was an appropriate referral?' Then I don't know what to say after that. (RN5)

5 | DISCUSSION

From the corpus of data derived from 32 semi-structured interviews, 184 belief statements and 66 themes were synthesised. Four prioritisation criteria from the published literature were applied at the level of the belief statement. Five domains (*Social, Professional Role & Identity; Beliefs about Consequences; Reinforcement; Memory, Attention and Decision Processes; Environment, Context & Resources*) were underpinned by belief statements that met all four of the prioritisation criteria. In a further four domains (*Knowledge; Intentions; Goals; Social Influences*) underlying belief statements met three of the prioritisation criteria. These nine domains of the TDF were identified as highly important determinants of RNs and HCAs enacting seven specified target behaviours of the afferent limb of the RRS.

In our research, decisions to 'normalise the abnormal' and tolerate elevated NEWS were reported by both RNs and HCAs. These decisions were typically informed by the patient's medical history and how persistent the abnormality appeared, that is, how long the NEWS had been elevated. There is currently a paucity of research related to the adjustment of escalation criteria for deteriorating patients. In a retrospective cohort study conducted in Australia (Ganju et al., 2019), modifications in calling criteria were found to be relatively frequent (63% of the patients had modified criteria) but did not reduce the number of rapid response activations. Furthermore, an increased mortality was reported in patients who had modified calling criteria, specifically where the adjustments resulted in a more conservative approach than the standard guidance (Ganju et al., 2019). In a more recent study (also conducted in Australia) similar findings were reported, whereby patients with adjusted criteria more frequently triggered an efferent limb activation, more frequently had a cardiac arrest and more frequently died in hospital compared to patients with standard (i.e. unmodified) criteria (Crouch et al., 2020). These findings highlight the potential vulnerability of the sub-group of patients likely to have response criteria modified, the potential safety implications of reducing the level of response

and the complexity of the clinical decisions that underpin these adjustments. Consequently, it is concerning that nursing staff in our study reported making individualised adjustments to response thresholds without consulting senior personnel. It is plausible that there may be a 'spill over' effect (Michie et al., 2014) here, where the behaviour of nursing staff is influenced by the actions, or lack thereof, of their medical colleagues. Some documented adjustments to calling criteria (made by medical staff) have been found to be vague and ambiguous (Foley & Dowling, 2019; Ganju et al., 2019). In these circumstances, nursing staff may be required to make their own decisions about what specific abnormalities should be tolerated and which should be acted upon. However, this is currently unproven and further empirical work is required to better understand adjustments to calling criteria in the NEWS context.

The specific behaviours of monitoring vital signs and escalating initial signs of patient deterioration (i.e. an elevated NEWS) to more senior nursing staff, typically falls to unregistered HCAs in the UK context (Ede et al., 2019; Mackintosh et al., 2014). The authors of an ethnographic study reported how, through enacting behaviours of the afferent limb, HCAs exerted control over clinical care by taking ownership of vital signs data (Mackintosh et al., 2014). Similar to previous work, HCA participants in our study believed that they had a key role in detecting deterioration due to their frequent and often intimate contact with patients. Our results also expand upon previous findings, as several HCAs who participated reported making similar clinical decisions to the RNs. Specifically, HCAs reported making decisions to tolerate elevated NEWS in certain patients (therefore, disregarding NEWS escalation protocol), to delay escalation in favour of further monitoring and to deliver nursing interventions (e.g. patient repositioning and encouraging oral fluids) in an attempt to correct the abnormal vital signs/NEWS before deciding if further escalation was required. Given the potential complexity of these clinical decisions, and the degree of inconsistency in training and education that HCAs receive (Kessler et al., 2010), these beliefs are a notable finding and may explain why some HCAs do not consistently escalate immediately to an RN when the NEWS is elevated.

Participants from our research reported competing beliefs about the need for RNs to delegate monitoring of vital signs to HCAs. While some participants believed that it was the role of the RN to explicitly delegate and oversee HCAs when enacting this behaviour, more participants reported that delegation was not required and believed that HCAs should 'inherently know' when and where this behaviour should be enacted. This is worthy of note given that, in the UK context, RNs are accountable for the actions and omissions of their unregistered colleagues, and are required by their professional code of conduct to appropriately delegate care (Nursing & Midwifery Council, 2015). Notwithstanding the difference in context, similar discrepancies were reported in a qualitative study conducted in Singapore (Chua et al., 2019). Here, the researchers reported inadequate direction and supervision of Enrolled nurses (licensed practitioners who are educated at a lower level than a RN) by RNs, when vital signs were being monitored (Chua et al., 2019). The belief that RNs do not need to delegate to junior colleagues is

particularly problematic given the reported association between poor delegation and aspects of nursing care being delayed or missed entirely (Kalisch, 2006). On this basis, we echo the suggestions in other work (Chua et al., 2019; Kalisch, 2006), and recommend that attention be given to raising the importance of delegation as a safety critical aspect of the RN role. We also encourage educators to equip registrants with the necessary communication and leadership skills to delegate care effectively in increasingly complex clinical environments.

5.1 | Limitations

The semi-structured interviews that were conducted generated a large volume of data. Consequently, it was necessary to identify TDF domains with barriers and enablers most likely to impact on nursing staff afferent limb behaviour (i.e. the domains of high importance) to subsequently target for change. We used a number of reported criteria to identify the TDF domains of importance. However, there is currently no evidence that using these criteria will result in a more successful intervention (Goddard et al., 2018) reflecting a broader limitation of the methods employed.

The potential for social desirability bias is a limitation of our study. Participants were made aware that the researcher was a clinician with a background in acute/critical care, and a specific interest in the recognition and response to deteriorating patients. As such, it is plausible that participants may have answered questions in a way that they perceived would please the researcher. Interviews were conducted over a period of 8 months, during which time the researcher was frequently present on the clinical floors. This strong presence increased the likelihood of participants habituating to the researcher (Pope, 2005) and therefore may have mitigated the extent of social desirability bias.

A further limitation of the study is that our sample included only nursing staff and excluded all medical staff. Given the close working relationships between ward-based nurses and their medical colleagues (particularly, the primary medical teams responsible for the ward-based patients), we may have missed part of the picture by opting to focus only on nursing staff. Given the evidence that junior medical staff do not consistently escalate deteriorating patients to their senior colleagues (Callaghan et al., 2017), there is grounds for further theory-driven work to improve understanding of the determinants of medical staff behaviour in this space.

6 | CONCLUSION

Through the use of structured methods, and the systematic application of theory, we identified a range of determinants (i.e. barriers and enablers) to RNs and HCAs enacting specified behaviours of the afferent limb. Consistent with other published research, we identified barriers related to lack of knowledge, fear of reprimand, high workload and lack of physical resources needed to enact these

behaviours. We offer new insights into barriers and enablers relating to motivation and intentions, goals, professional role and responsibility, decision-making processes, social interactions with peers and colleagues and feedback received or anticipated from more senior staff. Having reported the TDF domains that appear to influence the target behaviours, further work is required to map determinants to intervention content as part of the development of a tailored behaviour change intervention (Baker et al., 2015).

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CONFLICT OF INTEREST

No conflict of interest has been declared by the author(s).

AUTHOR CONTRIBUTIONS

All authors have agreed on the final version and meet at least one of the following criteria (recommended by the ICMJE*): (1) substantial contributions to conception and design, acquisition of data or analysis and interpretation of data; (2) drafting the article or revising it critically for important intellectual content. * <http://www.icmje.org/recommendations/>

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Additional supporting information may be found online in the Supporting Information section.

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