Automaticity and Habit in Recognition and Responses to Clinical Deterioration Among Ward Nursing Staff: An International Cross-sectional Study

Abstract

Background: Rapid response systems aim to reduce preventable harm through early recognition and response to clinical deterioration. While most interventions target knowledge and skills, limited attention has been paid to the role of non-reflective cognitive processes, including habit and automaticity, in shaping nurses' recognition and escalation of care behaviours.

Objectives: To explore automaticity in recognition and escalation of care behaviours and to examine individual and contextual factors associated with behavioural automaticity.

Design: International, multicentre cross-sectional survey.

Setting: Four acute hospitals in the United Kingdom (n = 2), Singapore (n = 1), and Finland (n = 1), where the National Early Warning Score 2 (NEWS2) was implemented as part of the rapid response system.

Participants: Two hundred and twenty nursing staff working in adult acute wards including registered nurses, enrolled nurses, and healthcare assistants.

Methods: A questionnaire incorporating 22 recognition and response behaviours anchored on the Self-Report Behavioural Automaticity Index was administered. Behaviour enactment in the form of self-rated performance of each behaviour was examined descriptively and compared between countries using chi-square tests. Differences in automaticity were analysed using analysis of variance and general linear models.

Results: Most behaviours were widely enacted (70%–99%), although family-focused communication behaviours were reported less frequently. Mean automaticity scores ranged from 3.5 to 4.0 out of 5, indicating moderate to high automaticity. Automaticity was highest for assessing conscious level and recording vital signs in the health record, and lowest for asking family members how the patient appeared and speaking with family members about clinical deterioration. In general linear models, significant associations were identified for 12 of the 22 behaviours. Country was most consistently associated with automaticity, with participants from Singapore generally reporting lower automaticity than those from the United Kingdom. Job role was associated with measuring vital signs and assessing conscious level, with healthcare assistants reporting lower automaticity than registered nurses. Clinical area was associated with measuring respiratory rate and dialling the emergency number. Time in current role and

highest nursing qualification were not significantly associated with automaticity across behaviours.

Conclusions: Recognition and escalation of care behaviours are shaped not only by knowledge and protocol adherence, but also by habitual processes embedded in routine practice. Variation across behaviours and contexts suggests that implementation interventions to improve recognition and response to clinical deterioration should combine educational strategies with approaches that strengthen adaptive practice habits, while preserving reflective clinical judgement when patient presentations are complex or uncertain.

Keywords: Habits; Patient Deterioration; Decision Making; Early Warning Score; Nurses; Rapid Response Systems

Highlights

What is already known

- Rapid response systems aim to improve early recognition and escalation of care for clinically deteriorating patients in hospital wards.
- Delays in recognising and escalating care in the event of clinical deterioration remain persistent patient safety challenges in hospital wards.
- Research on the recognition and response to clinical deterioration has primarily focused on knowledge, protocol adherence, and organisational factors.

What this paper adds

- Recognition and escalation of care behaviours are frequently performed with moderate to high behavioural automaticity, reflecting habitual processes embedded within routine clinical workflows.
- Behavioural automaticity varies across contexts, including country, clinical area, and nursing job role.
- Strengthening responses to clinical deterioration may require interventions that address both automatic and reflective decision-making processes.

1 Introduction

Clinical deterioration refers to a change in a patient's condition towards a worse clinical state, accompanied by an increased risk of mortality and morbidity (Chung & Jung, 2024; Jones et al., 2013). Patients whose deterioration is not recognised and managed in a timely manner are at increased risk of adverse events, including unplanned intensive care admission, cardiac arrest, and death (Gonem et al., 2024; Xiong et al., 2025). Approximately 60% of patients who

deteriorate demonstrate abnormal vital signs prior to an adverse event (Andersen et al., 2016). Emerging evidence also suggests that patients' own perceptions of worsening condition may precede physiological abnormalities by up to 24 hours (Albutt et al., 2021). Accurate monitoring and interpretation of physiological parameters, alongside meaningful engagement with patients and families, are therefore central to early recognition and response to clinical deterioration.

Rapid response systems have been implemented internationally to support early recognition and timely management of deterioration (Azimirad et al., 2022; Haegdorens et al., 2018). These systems typically comprise two components: (i) an afferent limb, focused on recognising deterioration and escalating care, and (ii) an efferent limb, focused on clinical response by a critical care outreach, medical emergency, or rapid response team (DeVita et al., 2006; Olsen et al., 2019). Nurses play a pivotal role in the afferent limb by undertaking routine monitoring, recognising signs of deterioration, escalating care, and adapting care plans accordingly (Smith et al., 2020). In many healthcare settings, these behaviours are structured through track-and-trigger tools, such as the National Early Warning Score 2 (NEWS2), which generates an aggregate score (range 1-20) based on six physiological parameters to stratify patient acuity and guide escalation of care decisions (Royal College of Physicians, 2017). The NEWS2 has demonstrated predictive validity across multiple clinical contexts (Holland & Kellett, 2022), and has been widely implemented internationally (Azimirad et al., 2020; Chua et al., 2023; Haegdorens et al., 2018). Despite this, failures in recognising deterioration or escalating care persist, contributing to preventable patient harm (Azimirad et al., 2022; Considine et al., 2023; Eddahchouri et al., 2021). Consequently, optimising care of clinically deteriorating patients is a global patient safety priority (Burke et al., 2022).

Whilst tools such as NEWS2 are among the most widely used to support nurses' clinical judgement, they are not without limitations (Haegdorens et al., 2023). One important limitation is the high false-positive alert rate, where the tool signals potential clinical deterioration in patients who do not go on to experience an adverse event (Haegdorens et al., 2020). This is problematic because it may contribute to unnecessary escalation of care and overburden practitioners responsible for responding to clinically deteriorating patients (Sprogis & Smith, 2024). The importance of nurses integrating NEWS2 scores with broader clinical assessment findings, alongside patient and family perspectives, when making clinical judgements is therefore emphasised (Albutt et al., 2021; Haegdorens et al., 2023; Massey et al., 2025). As nurses must continuously interpret, prioritise, and integrate multiple sources of information under conditions of uncertainty (Connor et al., 2023; Ede et al., 2024), understanding the

cognitive processes driving nurses' recognition and escalation of care behaviours is important for strengthening the afferent limb of the rapid response system.

Across the psychology and clinical decision science literature, dual processing theories are among the most influential frameworks for explaining how individuals process information (Potthoff et al., 2022; Strack & Deutsch, 2004). Although these theories differ in their nuances, they share a broad conceptual premise: information processing occurs through two distinct cognitive pathways, one reflective and the other non-reflective (Caddick et al., 2023; Wood & Rünger, 2016). Reflective processing is typically characterised as slow, deliberate, analytical, and goal-directed, whereas non-reflective processing is fast and automatic (Caddick et al., 2023; De Neys, 2021; Potthoff et al., 2022). Behaviours arising from reflective processing are generally considered volitional and intentional, while those associated with the non-reflective pathway may occur automatically in response to environmental cues (Caddick et al., 2023; Potthoff et al., 2022). Habit represents one mechanism through which non-reflective processing operates (Gardner, 2015; Singh et al., 2024). Habits form when repeated enactment of behaviours in stable contexts strengthens cue-response associations. This is particularly relevant to routine clinical behaviours, where repeated exposure to familiar cues can increase the likelihood that actions occur automatically (Potthoff et al., 2019).

Within healthcare, reflective processing has traditionally been regarded as the superior mode of cognition for supporting well-reasoned clinical judgement and for mitigating bias and subsequent errors (Croskerry & Nimmo, 2011). More recently, theorists have argued that reflective and non-reflective processes play complementary roles in supporting safe clinical practice, with the relative contribution of each depending on contextual demands (Caddick et al., 2023). In time-sensitive situations, such as responding to clinically deteriorating patients, the speed and efficiency associated with non-reflective processing may be advantageous. This may be particularly relevant in high-acuity, demanding clinical environments where nurses carry substantial workloads and cognitive load is high (Ede et al., 2024). In such contexts, non-reflective forms of processing may provide a more cognitively economical means of responding rapidly to overt indicators of clinical deterioration, such as elevated NEWS2 scores (Potthoff et al., 2022; Wood & Rünger, 2016). Conversely, where deterioration presents in more subtle, uncertain, or atypical ways, reflective processing may be required to integrate NEWS2 scores with a broader range of clinical cues (Azimirad et al., 2022; Ede et al., 2024). In this way, strengthening afferent limb performance requires attention to both reflective and non-reflective cognitive processes.

In this study, automaticity is conceptualised as a defining feature of habit and is used as a proxy indicator of habit strength, consistent with established approaches in behavioural science (Gardner et al., 2012). To date, interventions designed to improve afferent limb performance have largely focused on enhancing clinicians' knowledge, skills, and intentions, thereby implicitly prioritising reflective processes (Azimirad et al., 2021; Squires et al., 2014). Comparatively little attention has been paid to the possibility that recognition and escalation of care behaviours may also arise through non-reflective processing and become automatic or habit based. This is an important oversight because behaviours strongly shaped by cue-response associations may be less responsive to interventions that target reflective motivation alone (Gardner, 2015; Lally et al., 2010).

Despite extensive research on clinical deterioration and escalation of care, little is known about the extent to which afferent limb behaviours are enacted automatically or habitually in routine ward practice. This represents a key gap because habitual responding may support timely action in high-pressure environments but may also contribute to delayed recognition when patient deterioration presents in subtle, uncertain, or atypical ways. Understanding the automaticity of these behaviours therefore has implications for the design of implementation strategies, educational interventions, and escalation protocols.

Aim

The aim of this study was to explore how non-reflective cognitive processes, including automaticity and habit, influence nurses' recognition and escalation of care behaviours within the afferent limb of the rapid response system, using a study-specific questionnaire adapted from the Self-Report Behavioural Automaticity Index. The specific objectives were to:

1. Identify and describe the behaviours underpinning the afferent limb of the rapid response system.
2. Examine the proportion of nursing staff who enact these behaviours and the degree of behavioural automaticity.
3. Explore individual and contextual predictors of behavioural automaticity.

2 Methods

2.1 Study design

This was an international, multicentre, cross-sectional study using an anonymous online questionnaire incorporating a validated measure of self-reported behavioural automaticity.

2.2 Setting

Four acute hospitals were included in this study, located in the United Kingdom (n = 2), Singapore (n = 1), and Finland (n = 1). Countries and hospitals were selected as they all have rapid response systems that have been established for a minimum of five years, but with variations in how the system has been operationalised. Contextual differences included variation in escalation thresholds and response team configurations. Details of these contextual variations are provided in Supplementary Table 1.

2.3 Participants

Registered nurses, enrolled nurses, nursing associates, and healthcare assistants working in adult general wards were eligible and recruited using convenience sampling. These nursing roles were included because recognition and escalation of clinical deterioration in general wards are team-based nursing processes. Although these roles differ in scope of practice and level of responsibility, each may contribute to detecting changes in patients' condition, communicating concerns, and escalating care within the boundaries of their role.

The study focused on adult general wards because the afferent limb of the rapid response system is primarily designed to support the recognition and escalation of clinical deterioration among ward patients. Nursing staff working in emergency departments, operating theatres, and critical care settings were excluded because these settings differ from general wards in patient acuity, monitoring intensity, workflow, staffing models, clinical decision-making processes, and escalation pathways. Healthcare professionals from non-nursing disciplines were also not eligible.

Sample size estimation was guided by Cochran's (1977) formula and reference tables (Bartlett et al., 2001), with additional calculations for multiple regression using an a priori sample size calculator (Soper, 2025). Assuming a significance level of $\alpha = 0.05$ and 80% power, a minimum of 200 participants was required to detect a small–medium effect ($f^2 = 0.07$) across five predictors. The achieved sample of 220 met requirements for planned regression analyses but was below conservative estimates for categorical subgroup comparisons.

2.4 Measures

The primary variable of interest in this study was behavioural automaticity in afferent limb behaviours of the rapid response system (i.e., recognising, communicating, and escalating care for clinically deteriorating ward patients). A study-specific questionnaire was developed to assess the automaticity of these behaviours. It was anchored on the Self-Report Behavioural Automaticity Index, a validated four-item subscale of the self-report habit index (Verplanken & Orbell, 2003) that captures the extent to which a behaviour is performed

automatically (Gardner et al., 2012). The index has demonstrated good reliability and sensitivity to habit–behaviour relationships, including in healthcare contexts (Gardner et al., 2012; Presseau et al., 2014).

A list of afferent limb-specific behaviours was developed from systematic reviews (Chua et al., 2018; Hong et al., 2023), empirical studies (Chua et al., 2020; Chua et al., 2019; Smith et al., 2020), and the clinical expertise of the multidisciplinary research team. Behaviour statements specified the action, context, target, and timing of each behaviour, consistent with published guidance on specifying healthcare professional behaviours (Presseau et al., 2019; Smith et al., 2019). The preliminary list of behaviours (Supplementary Table 2) was reviewed and refined by the research team, nursing staff from each participating country, and 13 subject matter experts from Belgium, Finland, Singapore, and the United Kingdom. After two rounds of expert review, the final questionnaire included 22 afferent limb behaviours. Further details on behaviour generation, content validation, translation, and pilot testing are provided in Supplementary File 1.

For each behaviour, respondents were first asked whether they enacted the behaviour as part of their professional role. Respondents who answered 'yes' were then asked to rate four Self-Report Behavioural Automaticity Index statements on a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. The four statements were: (1) *"<<behaviour>> is something I do automatically*"; (2) *"<<behaviour>> is something I do without thinking*"; (3) "*<<behaviour>> is something I do without having to consciously remember*"; and (4) *"<<behaviour>> is something I start doing before I realise I am doing it.*" Respondents who answered 'no' proceeded to the next behaviour without completing the automaticity items for that behaviour.

The questionnaire was developed in English for data collection in England and Singapore and translated into Finnish for use in Finland. Conceptual and linguistic equivalence was reviewed by bilingual research team members. The questionnaire was then pilot tested with nursing staff from acute medical and surgical wards in each participating country to assess clarity, ease of completion, and comprehensibility. Minor refinements were made before data collection.

Additional sections of the questionnaire collected demographic and professional characteristics, including country, age, job role, clinical area, years in practice, and highest qualification. The 11-item Attitudes Towards Recognising Early and Noticeable Deterioration scale (Chua et al., 2022) was included as a comparator measure to examine convergence with a theoretically related construct. The observed weak-to-moderate positive correlation

between automaticity scores and attitudes towards recognising deterioration scores (r = 0.36, $p < 0.01$) provided preliminary evidence of convergence with a theoretically related construct.

2.5 Data collection

Recruitment and data collection occurred between March and June 2025. A three-step recruitment strategy was used. First, an email invitation comprising a study information letter, an electronic recruitment poster, the survey hyperlink, and a quick response code was sent to the nursing leaders responsible for research activities at each hospital. Second, the nursing leaders disseminated the study invitation to the nursing officers (i.e., nurse managers and nurse clinicians) and/or senior nursing staff within their respective wards. Third, the nursing officers shared the study information directly with ward staff during handovers or roll calls and through virtual announcement portals and displayed hardcopy recruitment posters on ward noticeboards.

2.6 Data analysis

Data were analysed using IBM SPSS Statistics (Version 29). There were no missing data for key variables included in analyses. Participants' demographic and professional characteristics (age, job role, time in role, highest qualification, and area of practice), along with reported enactment of each behaviour, were summarised descriptively by country and for the total sample using frequencies and percentages. For each of the 22 afferent limb behaviours, behavioural enactment was treated as a binary variable (enacted vs not enacted). Between-country differences in the proportion of participants enacting each behaviour were examined using chi-square tests of independence.

In line with previous studies employing the Self-Report Behavioural Automaticity Index (Gardner et al., 2012; Raison & Harris, 2024), mean automaticity scores and standard deviations were calculated for each behaviour. Although no established cut-offs exist for defining 'habitual' behaviour using this index, mean scores above the scale midpoint of 3 indicate that behaviours were generally perceived as being performed with some degree of automaticity rather than entirely deliberatively. Preliminary univariate analyses were conducted to examine differences in automaticity scores across respondent characteristics using one-way analysis of variance for categorical independent variables (e.g., country, job role, time in role, highest qualification, and area of practice). The results of the one-way analysis of variance were used to identify respondent characteristics showing statistically significant group differences in automaticity scores across the 22 behaviours.

General linear models were used to examine factors associated with behaviour-specific automaticity scores. Separate models were fitted for each of the 22 behaviours, restricted to participants who reported enacting the corresponding behaviour. To support comparability

across behaviours, the same pre-specified predictors were entered into each full-cohort model: country, job role, time in current role, highest nursing qualification, and area of practice. Where an overall predictor effect was statistically significant, parameter estimates were examined to describe category-level comparisons. Regression coefficients (B), 95% confidence intervals, and *p*-values were reported, with negative coefficients indicating lower automaticity and positive coefficients indicating higher automaticity compared with the reference group.

To address sparse data in some categories, selected categories with small numbers were combined before regression analyses. For highest nursing qualification, participants with a master's degree or above were combined with those holding a bachelor's degree to form a "bachelor's degree or above category", while those with a care certificate were combined with participants reporting other or no formal qualifications to form "other or no formal qualification" category. For time in role, participants with less than six months in role were combined with those with six months to two years in role to form a "two years or below" category. For area of practice, participants working in short-stay or day-care wards were combined with the "other" category.

Sensitivity analyses were conducted among registered nurses only, as they formed the majority of the sample (176 out of 220) and their professional responsibilities were most closely aligned with afferent limb behaviours. The same modelling approach was used, excluding job role because the sensitivity sample was restricted to registered nurses. Models restricted to registered nurses therefore included country, time in role, highest nursing qualification, and area of practice. Consistency with full-cohort findings was assessed by comparing overall predictor effects and the direction, magnitude, and statistical significance of coefficients.

Statistical significance was set at $p < 0.05$. Given that separate models were fitted for 22 behaviours, analyses were considered exploratory and interpreted with emphasis on consistent patterns rather than isolated statistically significant findings.

2.7 Ethical considerations

Ethical approval for this study was obtained from the institutional review boards of the participating hospitals (Finland: Wellbeing Services County of North Savo [Ref No. 50HO203]; Singapore: National University of Singapore Institutional Review Board [Ref No.: NUS-IRB-2024-725]; United Kingdom: City St George's, University of London nursing proportionate review committee [Ref No. REF ETH2425-1746]). Participation in the study was entirely voluntary. Completion and submission of the online questionnaire implied informed consent.

No personally identifiable data were collected. Confidentiality and anonymity of responses were assured for all participants.

3 Results

3.1 Participant characteristics

A total of 220 participants completed the questionnaire from the United Kingdom (n = 82), Singapore (n = 73), and Finland (n = 65) (Table 1). Participants were relatively evenly distributed across age ranges, with the largest proportion aged 30–39 years (33%) and the smallest aged 40–49 years (19%). Most participants were registered nurses (80%). No healthcare assistants participated from Finland, as this role does not exist within the Finnish nursing workforce structure. A quarter of all participants had more than 15 years of experience in their current role, with Singapore having a higher proportion of early-career participants. Two-thirds of participants (66%) held a bachelor's degree, and only 3% held a master's degree. Overall, 14% held a diploma. Diploma-level qualifications were common in Singapore (33%) but absent in Finland, reflecting national education differences. Over half of participants across all countries worked in medical or surgical wards, with smaller numbers in cancer/haematology, day-care, or other specialty areas such as isolation or neurology wards. The total number of eligible nursing staff was not centrally recorded; response rates could therefore not be calculated.

3.2 Behaviour enactment across countries

Across all three countries, behaviours related to recognising and responding to deterioration were routinely enacted by the majority of participants (70%–99%) (Table 2). The main exceptions were family-focused communication behaviours (i.e., asking family how the patient appears and speaking with family about the patient's condition) which were enacted less frequently, particularly in Singapore. The behaviours most consistently enacted across the three countries were those associated with the initial recognition of deterioration. Measuring vital signs, assessing conscious level, and conducting further clinical assessment were enacted by over 93% of participants in each country.

Between-country differences in behavioural enactment were most evident for behaviours performed after the initial recognition of deterioration (Table 2). Examples included escalating care to the critical care outreach or medical emergency team by telephone (behaviour 14) and face-to-face (behaviour 15), notifying the responsible medical team that the critical care outreach or medical emergency team had been activated (behaviour 16), and speaking with the patient's family or next of kin about the clinical deterioration (behaviour 22) (all $p < .05$).

Escalation-related behaviours were generally enacted less frequently in Singapore and more frequently in Finland.

Sensitivity analyses comparing behaviour enactment in the full cohort and the registered nurse cohort showed a broadly similar overall pattern (Supplementary Table 3). Most behaviours differed by less than five percentage points between cohorts. Larger differences were observed for several escalation-related behaviours, which were more frequently enacted in the registered nurse cohort. No formal statistical tests were conducted because the registered nurse cohort was nested within the full cohort.

3.3 Automaticity of afferent limb behaviours

Across all behaviours, mean Self-Report Behavioural Automaticity Index scores ranged from 3.54 to 4.04, indicating moderate to high automaticity. The behaviours with the highest self-reported automaticity were assessing a patient's conscious level (behaviour 3, mean = 4.04 ± 1.00) and recording vital signs in the electronic health record (behaviour 7, mean = 4.03 ± 0.93). In contrast, the lowest automaticity scores were observed for behaviours related to communication with patients' families, specifically, asking the family how the patient appears (behaviour 6; mean = 3.54 ± 0.91) and speaking with the patient's family or next of kin about the clinical deterioration (behaviour 22; mean = 3.54 ± 1.01).

Sensitivity analyses comparing mean automaticity scores in the full cohort and the registered nurse cohort showed minimal differences across behaviours, ranging from −0.01 to 0.08 points, indicating that the descriptive automaticity findings were consistent after restricting the sample to registered nurses (Supplementary Table 4).

3.4 Differences in automaticity scores across nurse characteristics

Preliminary univariate analyses examined differences in automaticity scores across respondent characteristics among participants who enacted each behaviour (Table 3). Statistically significant differences in automaticity scores were observed for 13 of the 22 behaviours across three respondent characteristics: country, clinical area, and job role. The most consistent differences were observed between countries, spanning behaviours related to the monitoring and recording of vital signs (behaviours 2, 3, 7, and 10), broader clinical assessments (behaviours 4 and 11), and escalation of care (behaviours 8, 9, 14, 15, 17, and 18). Differences between clinical areas were observed for five behaviours, including respiratory rate measurement, repeated vital sign assessment, and escalation of care to the critical care outreach or medical emergency team (behaviours 2, 9, 11, 15, and 20). Two escalation of care-related behaviours (behaviours 14 and 17) also differed significantly by job

role. No statistically significant variation in automaticity was identified for time in role or highest qualification.

3.5 Factors associated with behavioural automaticity

Significant associations were identified for 12 of the 22 behaviours using general linear models (Table 4 and Supplementary Table 5). Country was the factor most consistently associated with automaticity, with significant overall associations observed for nine behaviours. These included behaviours related to clinical assessment and monitoring, such as assessing conscious level, conducting clinical assessment, asking the patient how they feel, recording vital signs, repeating vital signs when abnormal, and conducting further clinical assessment (behaviours 3, 4, 5, 7, 10, and 11). Country was also significantly associated with automaticity for selected escalation behaviours, including escalating care to the registered nurse caring for the patient, escalating care to a senior registered nurse or nurse-in-charge, and escalating care to the medical team over the telephone (behaviours 8, 9, and 17).

Where country was a significant factor, participants from Singapore generally reported lower automaticity scores than those from the United Kingdom. Finnish participants also reported lower automaticity than United Kingdom participants for selected escalation and reassessment behaviours, including escalating care to the registered nurse caring for the patient, escalating care to a senior registered nurse or nurse-in-charge, repeating vital signs when abnormal, and conducting further clinical assessment (behaviours 8, 9, 10, and 11).

Job role was significantly associated with automaticity for two behaviours: measuring vital signs and assessing conscious level. In both models, healthcare assistants reported lower automaticity scores than registered nurses. Clinical area was significantly associated with automaticity for measuring respiratory rate and dialling the emergency number. For measuring respiratory rate, participants in surgical wards reported higher automaticity than those in medical wards. For dialling the emergency number, the overall clinical area effect was significant, although no individual comparison reached statistical significance. No significant overall effects were observed for time in current role or highest nursing qualification across the behaviour-specific models.

Sensitivity analyses restricted to registered nurses showed broadly similar patterns to the full-cohort models (Supplementary Table 6). Most country-related associations were supported in the registered nurse cohort, either remaining statistically significant (behaviours 3, 4, 8, 9, 10, 11 for Finland versus United Kingdom) or showing the same direction of association with weaker statistical evidence (behaviours 2 and 11 for Singapore versus United Kingdom). For three behaviours (behaviour 5, 7, and 17), the category-level comparison remained significant,

but the overall country effect was no longer statistically significant. The clinical area association for measuring respiratory rate also showed the same direction of association with weaker statistical evidence, whereas the association for dialling the emergency number was not supported.

4 Discussion

In this international multicentre study, we explored how non-reflective cognitive processes, including automaticity and habit, shape nurses' recognition and escalation of care behaviours within the afferent limb of the rapid response system. Overall, behaviours associated with recognising and responding to clinical deterioration were widely enacted and generally reported with moderate to high automaticity. This suggests that many safety-critical actions may be shaped by habitual processes, rather than solely by deliberate decision-making. However, automaticity varied across behaviours and context. Routine recognition and monitoring behaviours generally demonstrated high automaticity, while family communication behaviours showed the lowest enactment and automaticity. Escalation-related behaviours were more variable, particularly in their enactment across countries. Country was the factor most consistently associated with automaticity, while job role and clinical area were associated with selected behaviours. In contrast, time in current role and highest nursing qualification were not significantly associated with automaticity across the behaviour-specific models. These findings extend existing understanding of afferent limb behaviours by highlighting that recognition and escalation of care behaviours are shaped not only by reflective cognitive processes but also by habitual processes embedded within daily ward workflows.

While automaticity represents one dimension of habit and does not capture all aspects of cue-dependent behavioural repetition, it provides a pragmatic and theoretically grounded indicator of the extent to which behaviours are enacted with limited conscious deliberation (Gardner et al., 2012). The presence of moderate to high automaticity across many afferent limb behaviours likely reflects adaptation to the demands of busy ward environments, where nurses and other healthcare practitioners must manage competing tasks while maintaining vigilance for patient deterioration (Onororemu & Anekwe, 2026; Smith et al., 2021). Whilst habit-driven behaviour within the afferent limb is not inherently problematic and may benefit staff because of its cognitively sparing nature (Potthoff et al., 2022), it may also introduce risk.

Although NEWS2 is widely recognised as a valuable patient safety adjunct, it has a propensity to overestimate or underestimate the severity of illness in some patients (Alhmoud et al., 2023; Goodacre et al., 2025). When patient presentations deviate from expected patterns, automatic responses anchored in routine NEWS2 cues may reduce engagement in critical thinking and clinical judgement (Azimirad et al., 2022; Massey et al., 2025). Findings from systematic

reviews and qualitative empirical studies support this assertion, suggesting that tools such as NEWS2 may sometimes constrain nurses' higher-order thinking and encourage adherence to rigid, standardised protocols, even when more nuanced clinical judgement is required (Flenady et al., 2024; Nadaf et al., 2025). Our findings add theoretically informed insight to this literature by suggesting that behaviours within the afferent limb may not be solely shaped by reflective processing and clinical judgement (Connor et al., 2023), but may also be influenced by habit, consistent with the automatic pathway described in dual-processing theories (Potthoff et al., 2022; Potthoff et al., 2019).

A growing body of literature suggests that staff adherence to NEWS2 protocols may be an overly simplistic measure of afferent limb and broader rapid response system effectiveness (Ede et al., 2024; Massey et al., 2025; Nadaf et al., 2025). Our findings suggest that adherence may partly reflect habitual responses to established workflows and NEWS2 cues. However, adherence may also arise from reflective processes, in which nurses interpret NEWS2 alongside other clinical cues. Further research combining measures of automaticity, clinical judgement, and direct observation of practice is therefore needed because protocol adherence alone cannot show whether the same observed behaviour reflects habitual enactment, clinical judgement, or some combination of both.

Among the behaviours examined, communication with patients' families was least frequently enacted and showed the lowest levels of automaticity across all three countries. Asking family members how the patient appears and updating them about clinical deterioration are not typically cued by track-and-trigger tools such as NEWS2 and may therefore depend more on situational judgement, interpersonal communication, and local ward practices than on automatic responding. This suggests that relational components of the afferent limb of rapid response systems may be less consistently embedded in everyday recognition and escalation of care practice. This is important because family members may notice subtle changes in a patient's condition that are not immediately captured by physiological signs (Haskell, 2024; Mills et al., 2025; Teo et al., 2025). However, this study did not examine formal patient or family escalation systems. Therefore, our findings should be interpreted as highlighting the need to better understand how family observations and communication are integrated into nurses' recognition of, and response to, clinical deterioration, rather than as direct evidence of how these processes operate in practice. Further research involving patients, families, and ward staff is needed to examine the determinants of these relational behaviours and how they may be supported within collaborative recognition and escalation pathways (Guinane et al., 2018; Hrisos & Thomson, 2013).

Cross-country differences were particularly notable, with nurses in Singapore and Finland reporting lower automaticity for several recognition and escalation of care behaviours compared with those in the United Kingdom. These findings align with previous research documenting international variation in recognition and escalation of care (Azimirad et al., 2021). Such differences likely reflect variation in how rapid response systems and clinical workflows are operationalised across healthcare systems, including differences in escalation pathways, efferent limb staffing models, organisational culture, and expectations surrounding escalation of care practices (McGaughey et al., 2017).

Clinical area was associated with automaticity for only two behaviours, suggesting that ward context may shape selected recognition and response practices. However, the pattern was not consistent across behaviours, and one association had no significant category-level comparison. These findings should therefore be interpreted cautiously as exploratory signals of contextual variation rather than definitive differences between clinical areas.

Job role was associated with behavioural automaticity for two recognition behaviours-measuring vital signs and assessing conscious level. For both behaviours, healthcare assistants reported lower automaticity than registered nurses. The finding for measuring vital signs is notable, given that this task is often embedded in healthcare assistants' routine work. However, respondents may have interpreted measuring vital signs not only as the technical act of taking observations, but as part of the broader process of recognising clinical deterioration. For healthcare assistants, vital-sign measurement may be experienced primarily as a delegated task, whereas for registered nurses it may be more closely connected to clinical interpretation, judgement, and decisions about escalation of care (Smith et al., 2021). Registered nurses' responsibility for interpreting clinical findings and initiating escalation of care may therefore mean that vital-sign measurement is more strongly linked to subsequent clinical action in their routine practice (Chua et al., 2021; Smith et al., 2020).

Viewed through a dual-processing lens, this suggests that automaticity may develop not only through repeated performance of a technical task, but also through repeated exposure to clinically meaningful cue-response patterns. Although healthcare assistants frequently measure vital signs, registered nurses may enact this behaviour as part of a broader sequence of recognition, interpretation, and escalation of care. Their higher automaticity may therefore reflect greater opportunity to develop rapid, non-reflective recognition of deterioration cues and their implications. This interpretation is consistent with established accounts of clinical expertise, in which expert practice is characterised by more intuitive, situation-based judgement, greater sensitivity to salient clinical cues, and the ability to grasp the significance

of changes in a patient's condition in ways that guide timely action (Benner, 1984; Benner et al., 2009). A similar principle is reflected in clinical and diagnostic reasoning theory, which suggests that increasing expertise is associated with the capacity to draw on rapid, non-reflective, and automatic cognitive pathways (Croskerry & Nimmo, 2011). The logic is that repeated exposure to, and analysis of, clinical cues gradually strengthen associations between cues and responses, enabling behaviours that initially require reflective reasoning to be enacted more automatically over time (Croskerry & Nimmo, 2011). However, in the context of patient deterioration, automatic processing should not be understood as replacing reflective reasoning. Rather, safe recognition and escalation are likely to depend on the interaction between rapid pattern recognition and more deliberate assessment of clinical context, uncertainty, and appropriate response (Caddick et al., 2023).

This interpretation has important patient safety implications. Healthcare assistants often spend substantial time at the bedside and may be among the first staff to notice subtle changes in a patient's condition (Smith et al., 2020). If recognition behaviours are less automatic in this group, early signs of deterioration may be less consistently connected to timely escalation unless there are clear role expectations, accessible escalation routes, and appropriate registered nurse supervision. The finding therefore suggests that staffing considerations should extend beyond staffing numbers alone to include skill mix, role clarity, supervision, and the distribution of responsibility for recognising and responding to deterioration. However, given the small number of healthcare assistants and the limited number of behaviours associated with job role, these interpretations should be treated cautiously. Further research with larger samples across nursing roles and settings is needed to examine how scope of practice, role expectations, supervision, and repeated exposure shape the development of automaticity in recognition and escalation of care behaviours.

Years of experience in job role was not a statistically significant predictor of automaticity. At first glance, this may appear to contrast with the theoretical proposition that repeated behaviour becomes more automatic over time. However, habit theory suggests that automaticity develops through repetition of a specific behaviour in response to stable cues, rather than through experience alone (Gardner, 2015; Singh et al., 2024). Years in role is therefore an indirect and relatively crude proxy for the kinds of repetition through which automaticity develops. Staff with similar lengths of experience may differ substantially in their exposure to particular deterioration events, escalation pathways, and opportunities to receive feedback on recognition and escalation decisions. This may also help explain why this finding contrasts with qualitative accounts suggesting that junior staff rely more heavily on track-and-trigger prompts when recognising and responding to deterioration (Flenady et al., 2024).

Overall, these findings suggest that reliance on automatic or reflective processes may be shaped more by role, clinical context, acuity, and opportunities for situated learning than by years of experience alone. Further hypothesis-driven research is required to examine these relationships.

4.1 Implications for clinical practice and research

Our findings suggest that strategies to strengthen recognition and response to clinical deterioration should target both reflective and non-reflective cognitive processes. Given that many afferent limb behaviours appeared to be enacted with moderate to high automaticity, we echo suggestions that greater attention should be paid to how healthcare practitioners coordinate automatic and reflective modes of thinking, particularly when faced with contradictory or discordant clinical information (Caddick et al., 2023). This interplay aligns with the conceptualisation of 'thinking-in-action' and 'reasoning-in-transition' proposed by Benner et al. (2011), whereby expert nurses combine pattern recognition with ongoing reassessment during unfolding clinical situations. This points to the potential value of strengthening ward staff's metacognitive awareness-that is, their ability to recognise and regulate their own thinking and decision-making processes (Miltenberger & Spieler, 2018; Wang et al., 2024). Educational strategies such as simulation, facilitated debriefing, reflective questioning, and case-based learning may support nurses to examine how clinical cues, prior experiences, workload pressures, and organisational routines shape escalation decisions in practice (Benner et al., 2011; Connor et al., 2023; Mendívil-Pérez et al., 2025). Importantly, the aim is not to eliminate automaticity, which remains essential in busy ward environments, but to help ward staff recognise when to pause, reassess, and make escalation decisions that reflect the broader clinical picture rather than relying solely on routine scoring thresholds.

Another potential strategy would be to embed implementation intention techniques within interventions designed to improve care for clinically deteriorating patients. By establishing explicit 'if-then' contingency plans, these techniques may help staff translate clinical cues into timely action, particularly in situations characterised by uncertainty, ambiguity, or competing demands (Adriaanse & Verhoeven, 2018; Gollwitzer & Sheeran, 2006). For example, when the NEWS2 score is not elevated but broader clinical assessment or the patient's own perception suggests deterioration, automatic responses cued primarily by NEWS2 may contribute to delayed recognition or response. Implementation intention techniques, such as structured 'if-then' action plans, could help nurses link early or subtle cues of deterioration with predetermined escalation responses (Gollwitzer & Sheeran, 2006). For instance, nurses might develop plans such as: "If the NEWS2 score is low but the patient reports feeling more unwell

than before, then I will conduct a more thorough clinical assessment." Such plans may support more consistent escalation when deterioration is not clearly signalled by scoring thresholds.

The findings also highlight the importance of context in shaping nurses' recognition and response behaviours. Country and, to a lesser extent, job role and clinical area were associated with differences in behavioural automaticity, suggesting that the cognitive processes underpinning afferent limb behaviours may be shaped by organisational structures, role expectations, staffing models, educational background, and clinical workflows. Context is therefore an important consideration when designing, delivering, and evaluating complex interventions, particularly in understanding how interventions interact with the settings in which they are implemented (Skivington et al., 2021). In this regard, 'hybrid' interventions that combine fixed core components (delivered in all settings) and flexible (adjusted for context-sensitive elements) components may offer a promising direction (Hampton et al., 2025). It is possible that interventions of this kind could be developed including techniques that support recognition and escalation behaviours, such as metacognitive training and implementation intention activities, while allowing adaptation to local staffing models, escalation pathways, and organisational cultures that shape behaviour. Such an approach may offer a pragmatic means of developing interventions that are both theoretically informed and responsive to the realities of diverse clinical environments.

Further research is needed to examine how automatic and reflective cognitive processes interact during the recognition and escalation of deterioration in clinical practice. Future studies could combine self-reported measures of behavioural automaticity with observational or ethnographic approaches to better understand how these processes develop and operate in real-world clinical environments. Further psychometric work is also needed to validate behaviour-specific automaticity measures across countries and professional groups. There is also scope for intervention research to test whether strategies targeting habit formation, metacognitive awareness, or cue–response restructuring can strengthen the reliability of afferent limb behaviours and reduce delays in escalation of care, while preserving reflective decision-making in complex or uncertain situations.

4.2 Strengths and Limitations

This study is among the first to examine the role of behavioural automaticity in nurses' recognition and escalation of clinical deterioration across multiple healthcare settings. The inclusion of participants from three countries and diverse ward contexts enhances the relevance of the findings and allows exploration of contextual variation in afferent limb behaviours. The study also applied a theoretically informed approach by using a validated

measure of behavioural automaticity to examine automaticity in specific behaviours related to recognising, communicating, and escalating care for clinical deterioration.

Nevertheless, several limitations should be acknowledged. First, convenience sampling may have introduced selection bias. Second, behavioural enactment and automaticity were self-reported and may be subject to recall and social desirability bias. Third, although the questionnaire was anchored on a validated measure and the behaviours were identified through a rigorous process, it was not a fully validated standalone instrument. Structural validity, cross-cultural measurement invariance, and broader psychometric validation were not established. Fourth, the behaviour-specific analyses were exploratory. Although the overall sample size met the estimated requirement for the planned full-cohort analyses, models were restricted to participants who reported enacting each behaviour. This resulted in smaller effective sample sizes for some behaviours and category-level comparisons. Findings relating to associations between country, job role, and clinical area and automaticity should therefore be interpreted as exploratory signals of contextual variation rather than definitive between-group differences. Finally, the cross-sectional design precludes causal inference regarding the factors associated with behavioural automaticity.

5 Conclusion

This study provides new insights into the role of behavioural automaticity in nurses' recognition and escalation of clinical deterioration within the afferent limb of rapid response systems. Recognition and monitoring behaviours were widely enacted and generally performed with moderate to high automaticity, whereas relational communication behaviours showed lower enactment and automaticity. Exploratory models suggested that automaticity varied by country, and to a lesser extent by job role and clinical area, for selected behaviours, indicating that habitual processes may be shaped in part by local workflows, escalation pathways, staffing models, and role expectations. These findings suggest that recognition and escalation practices are shaped not only by knowledge and protocols, but also by habitual processes embedded within routine clinical workflows. Interventions aimed at improving responses to clinical deterioration should therefore address both reflective and non-reflective cognitive processes. Further research is needed to examine how these processes interact in real-world clinical settings and how they may be leveraged to strengthen the recognition and response to clinically deteriorating patients.

Table 1. Participant characteristics

Participant characteristic		Frequency (column %)			
		United Kingdom *n*=82	Singapore *n*=73	Finland *n*=65	Total *N*=220
Age (years)	20-29	18 (22)	34 (47)	11 (17)	63 (28)
	30-39	24 (29)	31 (42)	17 (26)	72 (33)
	40-49	18 (22)	7 (10)	16 (25)	41 (19)
	≥50	22 (27)	1 (1)	21 (32)	44 (20)
Job role	Registered Nurse	57 (69)	64 (88)	55 (85)	176 (80)
	Enrolled Nurse / Licensed Practical Nurse / Nursing Associate	3 (4)	6 (8)	10 (15)	19 (9)
	Healthcare Assistant	22 (27)	3 (4)	0	25 (11)
Time in role	<6 months	4 (5)	2 (3)	1 (2)	7 (3)
	6 months – 2 years	14 (17)	33 (45)	4 (6)	51 (23)
	3 – 5 years	16 (20)	12 (16)	9 (14)	37 (17)
	6 -10 years	16 (20)	13 (18)	13 (20)	42 (20)
	11 – 15 years	11 (12)	6 (8)	10 (15)	27 (12)
	>15 years	21 (26)	7 (10)	28 (43)	56 (25)
Highest qualification	Master's degree or higher	3 (4)	1 (1)	3 (5)	7 (3)
	Bachelor's degree	52 (63)	43 (59)	51 (78)	146 (66)
	Diploma	6 (7)	24 (33)	0	30 (14)
	Care certificate	17 (21)	2 (3)	0	19 (9)
	Other (including no formal qualifications)	4 (5)	3 (4)	11 (17)	18 (8)
Clinical area	Surgical ward	26 (32)	30 (41)	33 (51)	89 (40)
	Medical ward	29 (35)	15 (21)	18 (28)	62 (28)
	Cancer or haematology ward	15 (18)	16 (22)	5 (8)	36 (16)
	Short-stay or day-care ward	5 (6)	0	2 (3)	7 (3)
	Other (including isolation ward, neurology)	7 (9)	12 (16)	7 (10)	26 (13)

Table 2. Behaviour enactment by country with chi-square test results for between country differences and mean Self-Report Behavioural Automaticity Index scores

Behaviour no. and brief description	% of participants who enact each behaviour by country			Total %	Chi-square test result		Mean SRBAI (SD)
	UK	SG	FI		χ^2 (*df*=2)	*p*-value	
1 Measuring BP, HR, SpO_2, Temperature	98	100	98	99	1.73	.42	3.69 (1.02)
2 Measure RR	95	79	83	86	8.90	.01*	3.73 (0.99)
3 Assess conscious level	98	93	95	95	1.73	.42	4.04 (1.00)
4 Conduct clinical assessment e.g. pain assessment	96	96	100	97	2.62	.27	3.96 (0.93)
5 Ask the patient how they feel	95	89	95	93	2.95	.23	3.90 (0.98)
6 Ask the family how the patient appears	72	58	58	63	4.33	.12	3.54 (0.91)
7 Record vital signs into the health record	91	84	98	91	9.29	.01*	4.03 (0.93)
8 Escalate care to the RN caring for the patient	85	96	100	93	13.48	.001*	3.97 (0.96)
9 Escalate care to a senior RN/nurse-in-charge	98	86	92	92	6.87	.03*	3.85 (1.00)
10 Repeat vital signs when abnormal	98	90	63	85	36.33	< .001*	3.92 (0.99)
11 Conduct clinical assessment e.g. assess skin temperature, colour	91	86	97	91	4.92	.09	3.83 (0.94)
12 Attempt initial interventions to stabilise the patient	85	96	100	93	13.48	.001*	4.00 (0.91)
13 Plan how to communicate when escalating care	76	77	71	75	0.72	.70	3.72 (0.97)
14 Escalate care to CCO/MET over the telephone	71	62	94	75	19.79	< .001*	3.77 (1.01)
15 Escalate care to CCO/MET face-to-face	74	63	95	77	20.67	< .001*	3.90 (0.93)
16 Notify the parent medical team that CCO/MET has been activated	66	57	89	70	17.91	< .001*	4.03 (0.90)
17 Escalate care to medical team over the telephone	71	75	92	79	10.75	.005*	3.96 (0.95)
18 Escalate care to the medical team face-to-face	78	75	91	81	5.99	.05*	3.97 (0.92)
19 Press the emergency buzzer at the patient's bedside	96	79	98	91	19.85	< .001*	3.97 (0.98)
20 Dial the emergency number on the telephone	82	75	100	85	17.51	< .001*	3.90 (1.02)
21 Record an escalation of care has taken place in the health record	73	74	92	79	9.76	.008*	3.98 (0.91)
22 Speak with the patient's family or next of kin	60	47	83	62	19.85	< .001*	3.54 (1.01)

SRBAI – Self-Report Behavioural Automaticity Index from 1 (low automaticity) to 5 (high automaticity), SD – Standard Deviation, *df* = degrees of freedom, test statistics with $p < .05$ are marked with an asterisk (*), UK – United Kingdom, SG – Singapore, FI – Finland, BP – blood pressure, HR – heart rate, SpO_2 – peripheral oxygen saturations, RR – respiratory rate, RN – registered nurse, CCO – critical care outreach, MET – medical emergency team.

Table 3. Statistically significant differences in automaticity scores across respondent characteristics from one-way ANOVA

Behaviour no.	Brief description of the behaviour	Respondent characteristic	One-way ANOVA results	
			F (df1, df2)	*p*-value
2	Measure RR	Clinical area	5.56 (4,185)	< .001
3	Assess conscious level	Country	3.52 (2,207)	.03
4	Conduct clinical assessment e.g. pain assessment	Country	3.06 (2,211)	.05
7	Record vital signs into the health record	Country	3.43 (2,197)	.03
8	Escalate care to the RN caring for the patient	Country	4.81 (2,202)	.009
9	Escalate care to a senior RN/nurse-in-charge	Country	5.88 (2,200)	.003
		Clinical area	2.72 (4,198)	.03
10	Repeat vital signs when abnormal	Country	5.22 (2,184)	.006
11	Conduct clinical assessment e.g. assess skin temperature, colour	Country	4.23 (2,198)	.01
		Clinical area	2.87 (4,196)	.02
14	Escalate care to CCO/MET over the telephone	Country	4.20 (2,161)	.02
		Job role	3.56 (2,161)	.03
15	Escalate care to CCO/MET face-to-face	Country	3.08 (2,166)	.05
		Clinical area	2.58 (4,164)	.04
17	Escalate care to medical team over the telephone	Country	3.79 (2,170)	.03
		Job role	3.19 (2,170)	.04
18	Escalate care to the medical team face-to-face	Country	3.26 (2,175)	.04
20	Dial the emergency number on the telephone	Clinical area	2.80 (4,182)	.03

F (df1, df2) – The *F*-statistic with associated degrees of freedom for between-groups (df1) and within-groups (df2).
p-value – Probability value for the ANOVA test. Values ≤ .05 were considered statistically significant.
CCO – critical care outreach, MET – medical emergency team, RN – registered nurse, RR – respiratory rate.

Table 4. General linear models examining factors associated with behaviour-specific automaticity scores

Behaviour no. and brief description / Predictor	n	Mean SRBAI (SD)	Country *p*-value	Job role *p*-value	Time in role *p*-value	Highest qualification *p*-value	Clinical area *p*-value	Adjusted R^2
1 Measuring BP, HR, SpO_2, Temperature	217	3.69 (1.02)	0.83	**0.025**	0.407	0.343	0.879	0.012
2 Measure RR	190	3.73 (0.99)	0.116	0.396	0.570	0.699	**0.002**	0.066
3 Assess conscious level	210	4.04 (1.00)	**0.003**	**0.005**	0.596	0.142	0.746	0.046
4 Conduct clinical assessment e.g. pain assessment	214	3.96 (0.93)	**0.009**	0.104	0.425	0.481	0.857	0.019
5 Ask the patient how they feel	205	3.90 (0.98)	**0.030**	0.116	0.625	0.191	0.730	0.004
6 Ask the family how the patient appears	139	3.54 (0.91)	0.180	0.740	0.310	0.827	0.664	-0.015
7 Record vital signs into the health record	200	4.03 (0.93)	**0.014**	0.148	0.574	0.612	0.388	0.035
8 Escalate care to the RN caring for the patient	205	3.97 (0.96)	**0.002**	0.145	0.186	0.497	0.359	0.050
9 Escalate care to a senior RN/nurse-in-charge	203	3.85 (1.00)	**<0.001**	0.051	0.485	0.396	0.149	0.068
10 Repeat vital signs when abnormal	187	3.92 (0.99)	**0.007**	0.090	0.940	0.318	0.107	0.052
11 Conduct clinical assessment e.g. assess skin temperature, colour	201	3.83 (0.94)	**0.004**	0.077	0.651	0.208	0.273	0.400
12 Attempt initial interventions to stabilise the patient	205	4.00 (0.91)	0.107	0.349	0.982	0.907	0.241	0.013
13 Plan how to communicate when escalating care	164	3.72 (0.97)	0.159	0.216	0.652	0.478	0.538	-0.006
14 Escalate care to CCO/MET over the telephone	164	3.77 (1.01)	0.067	0.107	0.591	0.425	0.562	0.043
15 Escalate care to CCO/MET face-to-face	169	3.90 (0.93)	0.215	0.618	0.865	0.820	0.171	0.002

16	Notify the parent medical team that CCO/MET has been activated	153	4.03 (0.90)	0.206	0.409	0.927	0.723	0.796	-0.035
17	Escalate care to medical team over the telephone	173	3.96 (0.95)	**0.027**	0.072	0.589	0.408	0.812	0.033
18	Escalate care to the medical team face-to-face	178	3.97 (0.92)	0.083	0.842	0.927	0.933	0.281	-0.007
19	Press the emergency buzzer at the patient's bedside	201	3.97 (0.98)	0.133	0.710	0.844	0.813	0.425	-0.019
20	Dial the emergency number on the telephone	187	3.90 (1.02)	0.988	0.326	0.953	0.506	**0.047**	-0.008
21	Record an escalation of care has taken place in the health record	174	3.98 (0.91)	0.168	0.586	0.843	0.659	0.425	-0.019
22	Speak with the patient's family or next of kin	137	3.54 (1.01)	0.521	0.387	0.214	0.809	0.329	0.009

BP – blood pressure, CCO – critical care outreach, HR – heart rate, MET – medical emergency team, RN – registered nurse, RR – respiratory rate, SpO_2 – peripheral oxygen saturations, SRBAI – Self-Report Behavioural Automaticity Index, SD – Standard Deviation.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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