



ORIGINAL ARTICLE

Optimising implementation of a patient-assessment framework for emergency nurses: A mixed-method study

Belinda Munroe PhD, RN, Clinical Senior Lecturer^{1,2}   | Kate Curtis PhD, RN, Professor^{1,2} | Thomas Buckley PhD, RN, Associate Professor¹ | Melinda Lewis BAppSc, MHLthSc Ed, PhD Candidate³ | Lou Atkins PhD, Psychologist⁴

¹Sydney Nursing School, University of Sydney, Camperdown, NSW, Australia

²Emergency Services, Illawarra Shoalhaven Local Health District, NSW, Australia

³Educational Innovation, University of Sydney, Camperdown, NSW, Australia

⁴Centre for Behaviour Change, University College London, London, UK

Correspondence

Belinda Munroe, Emergency Services, Illawarra Shoalhaven Local Health District, NSW, Australia.

Email: belinda.munroe@health.nsw.gov.au

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Aims and objectives: To determine potential facilitators and barriers and tailor interventions to optimise future implementation of a patient-assessment framework into emergency nursing practice.

Background: An evidence-informed patient-assessment framework HIRAID (History, Identify Red flags, Assessment, Interventions, Diagnostics, communication and reassessment) improves the quality of patient assessments performed by emergency nurses. Facilitators and barriers must be understood and tailored interventions selected to optimise implementation.

Design: A mixed-method convergent study design was used.

Methods: Thirty eight early career emergency nurses from five Australian hospitals participated in an education workshop on the HIRAID assessment framework. Simulated clinical scenarios enabled participants to experience conducting a patient assessment with and without using the framework. All participants completed surveys, interviews and focus groups to identify potential facilitators and barriers. Twenty three participants completed follow-up telephone surveys 4–6 months later. Quantitative and qualitative data were analysed separately using descriptive statistics and inductive content analysis, prior to integration. Implementation interventions were selected using the Behaviour Change Wheel.

Results: Nine facilitators and nine barriers were identified to potentially effect implementation of the HIRAID assessment framework. Twelve of the 23 participants (52.2%) who completed follow-up surveys reported using the framework in the clinical setting. To optimise future implementation, the education workshop needs refinement, and environmental restructuring, modelling and social support are required.

Conclusion: A multimodal strategy is needed to promote future successful implementation of the HIRAID assessment framework into emergency nursing practice.

Relevance for clinical practice: The successful implementation of the HIRAID assessment framework has the potential to improve nursing assessments of patients in emergency and other acute care settings. This study demonstrates how to

systematically identify facilitators and barriers to behaviour change and select interventions to optimise implementation of evidence-informed nursing practices.

KEYWORDS

behaviour change theory, emergency department, evidence-base practice, implementation science, nursing, nursing assessment, patient assessment

1 | INTRODUCTION

Patient assessment is a fundamental component of nursing practice, necessary to inform clinical decisions and direct patient care. Emergency nurses are responsible for the initial and ongoing assessment of patients who present to the ED. When a patient first presents, the triage nurse performs a brief assessment and allocates a triage category, indicating the urgency of the patients' condition and how long the patient can wait to see a medical officer (Department of Health and Ageing 2009). After triage, patients are normally located to a treatment area and the allocated nurse is responsible for performing a more comprehensive patient assessment and commencing nursing care. The urgency of the patient's condition and treatment needs during the initial stages of emergency care are often not immediately explicit and emergency nurses are frequently required to make rapid clinical decisions based on incomplete information (Wears, Woloshynowych, Brown, & Vincent, 2010). Emergency nurses must therefore be highly skilled in performing accurate clinical assessments.

The incidence of preventable adverse errors in ED is high, ranging from 36%–71% (Stang, Wingert, Hartling, & Plint, 2013). Nursing assessment in the ED is a recognised area of concern, due to the high frequency of preventable adverse events that occur with suboptimal nursing assessment (NSW Emergency Care Institute 2015), poor clinical management (Stang et al., 2013) and failure to identify and respond to clinical deterioration (Scott, Considine, & Botti, 2015).

Earlier recognition of and intervention for high-risk or already-compromised patients has been demonstrated to save lives and improve efficiency of care (Konrad et al., 2010). However, clinical deterioration has been reported to occur undetected by emergency clinicians in as many as one in seven patients in Australian hospital EDs (Scott et al., 2015). Failure to recognise and respond to clinical deterioration in a timely manner increases the incidence of high-mortality adverse events such as cardiac arrest and unplanned admissions to the intensive care unit (Dichtwald, Matot, & Einav, 2009; Haller et al., 2005; Hogan et al., 2012). Strategies are needed to improve nursing assessment, recognition and response to clinical deterioration and patient safety in the ED.

2 | BACKGROUND

To address this gap in clinical practice, an emergency nursing assessment framework "HIRAID" (History, Identify Red flags, Assessment, Interventions, Diagnostics, communication and reassessment)

(Figure 1) was developed in 2013, based on the best available research evidence to provide emergency nurses with an evidence-informed systematic approach to the comprehensive assessment of patients after triage (Munroe, Curtis, Murphy, Strachan, & Buckley, 2015). The HIRAID assessment framework is the first known system designed to teach emergency nurses how to systematically assess and manage patients who present to the ED (Munroe, Curtis, Considine, & Buckley, 2013).

This paper presents research conducted in parallel to the evaluation of HIRAID, which used full immersion simulation to evaluate the effect of HIRAID on emergency nursing practice (Munroe, Buckley et al., 2016; Munroe, Curtis et al., 2016). Education and application of the HIRAID assessment framework by early career emergency nurses was demonstrated to improve the quality of patient assessment (Munroe, Curtis et al., 2016), as well as reduce anxiety and increase self-efficacy in assessment performance (Munroe, Buckley et al., 2016) which are closely associated with clinical performance (Cheung & Au, 2011; Hollingsworth & Ford-Gilboe, 2006). These findings demonstrate the potential of this framework to improve the quality of emergency nursing assessments and subsequent patient care in the clinical setting. As findings from this research were

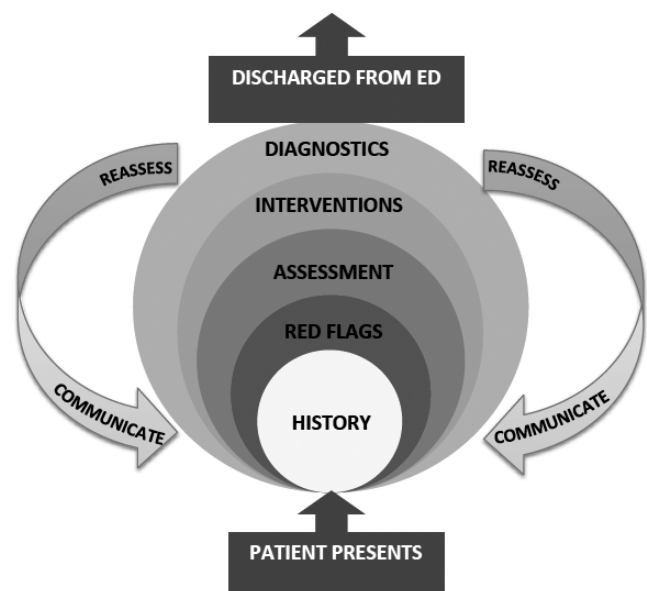


FIGURE 1 HIRAID: An evidence-informed emergency nursing assessment framework © Curtis, Munroe, Murphy, Strachan, Lewis & Buckley 2016

favourable, the objective of the research presented in this paper is to optimise future implementation of the framework into the clinical setting.

The successful implementation of any new evidence-informed practice is dependent on behaviour change (Michie, Van Stralen, & West, 2011). A broad range of interventions may be used to change behaviour such as educational workshops and meetings, audit and feedback, demonstration, use of prompts or cues, problem solving and social support (Grimshaw, Eccles, Lavis, Hill, & Squires, 2012; Michie, Atkins, & West, 2014). Whilst educational interventions have been reported to be effective in improving professional practice and health outcomes, without additional strategies, they are unlikely to be successful in changing complex behaviours (Forsetlund et al., 2009). Facilitators and barriers to behaviour change must be understood to select and tailor interventions which promote uptake and sustain use of evidence-informed practices (Graham et al., 2006).

This study aims to determine:

1. What facilitators and barriers could affect future implementation of the HIRAID assessment framework into emergency nursing practice?
2. What interventions additional and/or alternate to the education workshop are needed to address facilitators and barriers

identified, and optimise future implementation of the HIRAID assessment framework into emergency nursing practice?

3 | METHODS

3.1 | The Knowledge to Action Cycle

The Knowledge to Action (KTA) Cycle (Graham et al., 2006) informed researchers of the sequence of steps involved in translating research knowledge into practice. The KTA Cycle has two phases: Knowledge Creation and Action Cycle. The Knowledge Creation phase represents the creation of primary and secondary research knowledge. The Action Cycle, which surrounds the Knowledge Creation phase, refers to the application or implementation of knowledge, including the identification of barriers to implementation and selecting interventions to address these barriers. The application of the KTA Cycle in the present study is illustrated in Figure 2. The Knowledge Creation phase represents the development and testing of the HIRAID assessment framework in the simulated setting as previously reported (Munroe, Buckley et al., 2016; Munroe, Curtis et al., 2016). The Action Cycle displays how the HIRAID education workshop was devised to test the effects of the HIRAID assessment framework in the simulated setting and the methods used in this study to identify

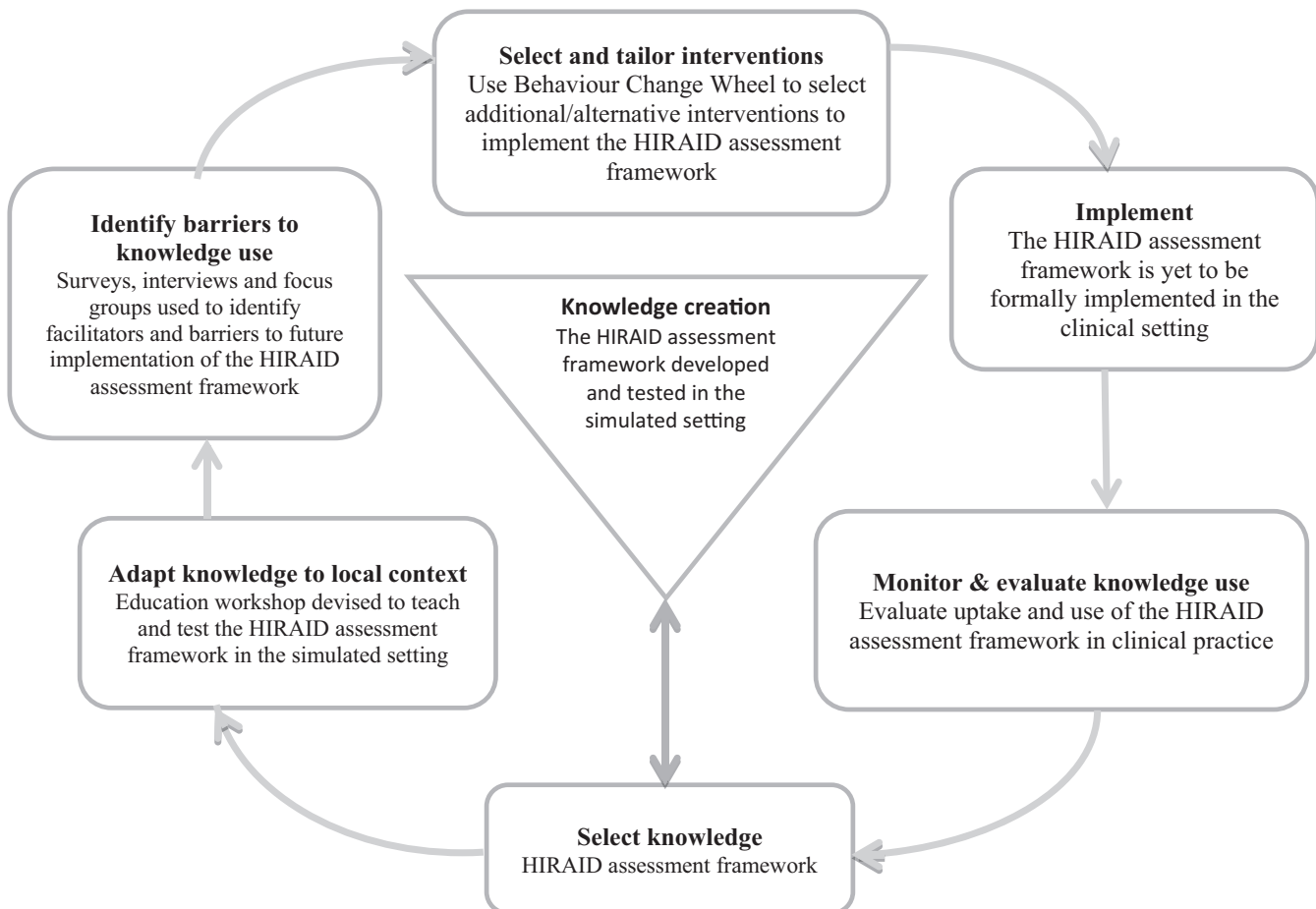


FIGURE 2 The application of the Knowledge-to-Action Cycle (Graham et al., 2006) informing translation of the HIRAID assessment framework into emergency nursing practice

facilitators and barriers and select additional and/or alternate interventions to optimise future implementation of the framework into emergency nursing practice. The importance of monitoring and evaluating use of the HIRAID assessment framework once implemented in clinical practice is also depicted.

3.2 | Study design

A convergent parallel mixed-method design (Creswell & Piano Clark, 2011) was used to identify potential facilitators and barriers to future implementation of the HIRAID assessment framework. Qualitative and quantitative data were collected concurrently, analysed separately and then integrated (Creswell & Piano Clark, 2011). A mixed methods approach enabled the use of both confirmative and exploratory questions which was necessary to identify and understand the range of possible influences of behaviour that may affect uptake of the framework.

3.3 | Sample and recruitment

Following ethics approval from the relevant Human Research and Ethics Committee (HREC approval: LNR/13/WMEAD/44), in December 2013 emergency nurses were invited to participate in the study through an expression of interest placed in six New South Wales (NSW) Hospital EDs in Australia. Sample size and participant inclusion criteria were determined by outcomes measured in the studies conducted parallel to this mixed methods study with a primary quantitative drive (Munroe, Buckley et al., 2016; Munroe, Curtis et al., 2016). As the HIRAID assessment framework was originally devised to provide new nurses to the ED with a structured approach to patient assessment, Registered Nurses with <3 years post-registration experience currently working in an emergency department were selected to participate. Nurse Managers, Educators and Clinical Nurse Consultants from study sites reviewed the post graduate experience of nursing staff employed in the ED and 86 eligible nurses from the six hospital sites were identified to meet the inclusion criteria. The researchers liaised with Nurse Managers of each site and eligible nurse volunteers who responded to the expression of interest were rostered an 8-hr working day to participate. A postal mail invitation was sent to participants who attended study days, inviting them to participate in a follow-up telephone survey 4–6 months later. Informed consent was obtained prior to commencing data collection.

3.4 | Data collection

During the 8-hr study days, all participants performed a clinical assessment of a simulated emergency patient, before and after completing the HIRAID education workshop (intervention). The two simulated clinical scenarios were developed based on real cases, tested and validated (Munroe, Buckley, Curtis, & Morris, 2016). This enabled participants to experience conducting a patient assessment with and without using the HIRAID assessment framework. Participants completed a

pre-intervention questionnaire prior to partaking in the study intervention. On the same day immediately following completion of the education and simulated scenarios, face-to-face interviews, post-intervention questionnaire and focus groups were used to assess participant's knowledge, beliefs and actions associated with the application of the HIRAID assessment framework. Knowledge, belief and actions were measured as these have been identified as key influences of behaviour (Cane, O'Connor, & Michie, 2012; Mezirow, 2000). Participants were also invited to participate in a follow-up telephone survey 4–6 months later after they had the opportunity to use the HIRAID assessment framework in the clinical setting. An overview of data collection process is provided in Figure 3.

3.4.1 | Survey instruments

Participants completed three different surveys: a pre-intervention pen and paper questionnaire (completed during study day, before partaking in the HIRAID education workshop), a post-intervention pen and paper questionnaire (completed during study day, after partaking in HIRAID education workshop and both simulated clinical scenarios) and a follow-up telephone survey (completed 4–6 months after partaking in HIRAID education). Pen and paper questionnaires were used as they are self-reporting, highly-flexible and therefore, cheap to administer. However, this method makes it difficult to obtain in-depth information about the topic being investigated (Polit & Beck, 2010). Telephone interviews were used to conduct follow-up surveys as this is a convenient way of collecting in-depth data and are less expensive than conducting face-to-face interviews (Polit & Beck, 2010). Surveys contained a combination of open- and closed-ended questions, as well as Likert scales.

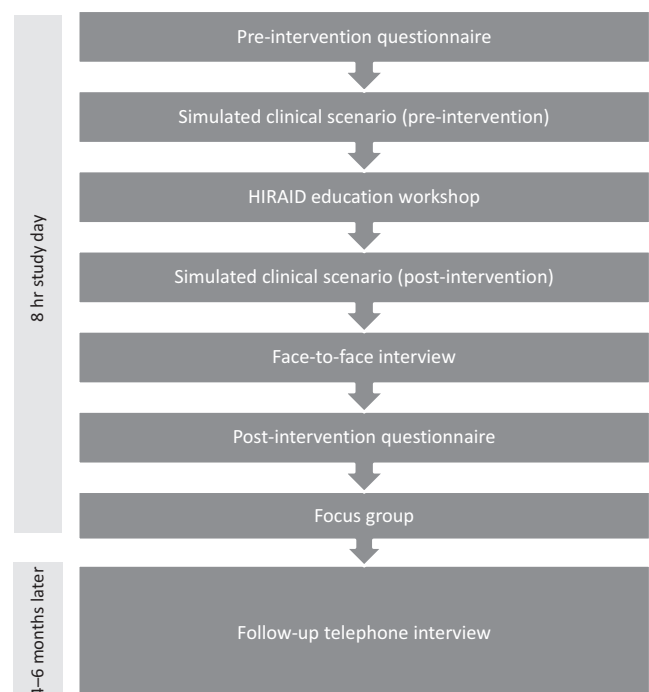


FIGURE 3 Data collection procedures

3.4.2 | Pre-intervention questionnaire

The pre-intervention questionnaire collected demographic information and inquired into participants' existing approach to patient assessment as well as challenges they experience conducting high quality patient assessments in the clinical setting. According to transformative learning theory, to change practice successfully, individuals must reflect on existing knowledge and skills to identify the need and be willing to change (Mezirow, 2000). Existing patient assessment practices were therefore explored to identify potential facilitators and barriers to implementing HIRAID specific to the clinical environment.

3.4.3 | Post-intervention questionnaire

The post-intervention questionnaire evaluated participants' beliefs about the usability and effectiveness of the HIRAID assessment framework after using it in the simulated setting. The beliefs of participants were measured to inform future practice, as beliefs about new knowledge must be developed to change thought processes and subsequent behaviour (Mezirow, 2000). On a 10-item instrument, participants were required to rate their satisfaction with the usefulness of the HIRAID assessment framework for clinical practice from "0" indicating "no satisfaction" to "10" indicating "complete satisfaction". Participants were asked to report at what time in emergency nurses' career should HIRAID be implemented. Ability to recall the HIRAID assessment components was also assessed, as acquisition and retention of new knowledge is critical to change learners' behaviour successfully (Cane et al., 2012; Mezirow, 2000).

3.4.4 | Follow-up telephone interview

The follow-up telephone interviews explored facilitators and barriers to the uptake of HIRAID assessment framework in the clinical setting 4–6 months after completed the HIRAID education. Participants' were asked if they were using the framework in their clinical practice. If not using the framework they were asked to explain why not. Alternatively, if participants reported to be using the framework they were asked to describe its strengths and weaknesses for clinical practice. Ability to recall the HIRAID assessment components was assessed for a second time, as it has been reported that nurses who undergo education are often successful in remembering new knowledge immediately after learning it; however knowledge begins to decline as early as 3–6 months following the time the knowledge was acquired (Tippett, 2004; Yang et al., 2012).

3.4.5 | Face to face interviews

All participants completed individual face-to-face interviews following completion of the HIRAID education workshop and clinical scenarios to further evaluate individual beliefs about their abilities and the effects of the HIRAID assessment framework. These interviews also enabled participants to diffuse any unpleasant emotions that can be triggered during the simulation experience (Gum, Greenhill, &

Dix, 2011). The interviews were unstructured as this enables more in-depth exploration into the topic being investigated (Mitchell, 2015). Interviews began with the facilitator asking the question "How was that experience for you?" referring to participants' experience using the HIRAID assessment framework in the simulated clinical scenario. Subsequent questions were guided by participant's responses. Face to face interviews were audio-recorded and transcribed verbatim.

3.4.6 | Focus groups

All participants also took part in focus groups at the end of the study day, to gain further insight into participant beliefs. Focus groups allow for greater freedom in dialogue and expression of ideas through interaction of participants not generated by surveys or individual interviews (Polit & Beck, 2010). Six focus groups were conducted in total. Three to eight participants were present in each focus group, (depending on how many participants were rostered to attend each day). A semi-structured interview guide was used to assist the researcher to remain focused on the study objective and ensure important information was not missed (Marshall & Rossman, 2010). The interview guide consisted of a set of predetermined open-ended questions, but also enabled the facilitator to ask additional questions that arose during the interviews. The interview guide comprised of three main questions:

1. What aspects of the HIRAID assessment framework were the most difficult, and why?
2. What aspects of the HIRAID assessment framework were the most rewarding, and why?
3. What barriers, tensions, opportunities or affordances can you perceive in applying the HIRAID assessment framework?

Focus groups were audio-recorded and transcribed verbatim. Data saturation was believed to be achieved after the 38 individual interviews and six focus groups conducted, as no new information or description of experiences was being obtained.

3.5 | Data analysis

Quantitative and qualitative data were analysed separately first prior to integration. An overview of data analysis procedures and selection of interventions to optimise future implementation of the HIRAID assessment framework is provided in Figure 4.

Quantitative data obtained from study surveys were imported into STATISTICS PACKAGE FOR SOCIAL SCIENCES (SPSS) version 22.0 (IBM Corp 2013) and analysed using descriptive statistics. Qualitative data obtained from surveys, individual interviews and focus groups were imported into NVivo™ v10 (QSR International Pty Ltd 2012) and analysed collectively using Graneheim and Lundman's (2004) method of inductive content analysis. Codes were derived directly from the text, grouped into categories and quantified to indicate how many participants commented on each category created in the surveys and interviews. As the focus group transcripts did not differentiate

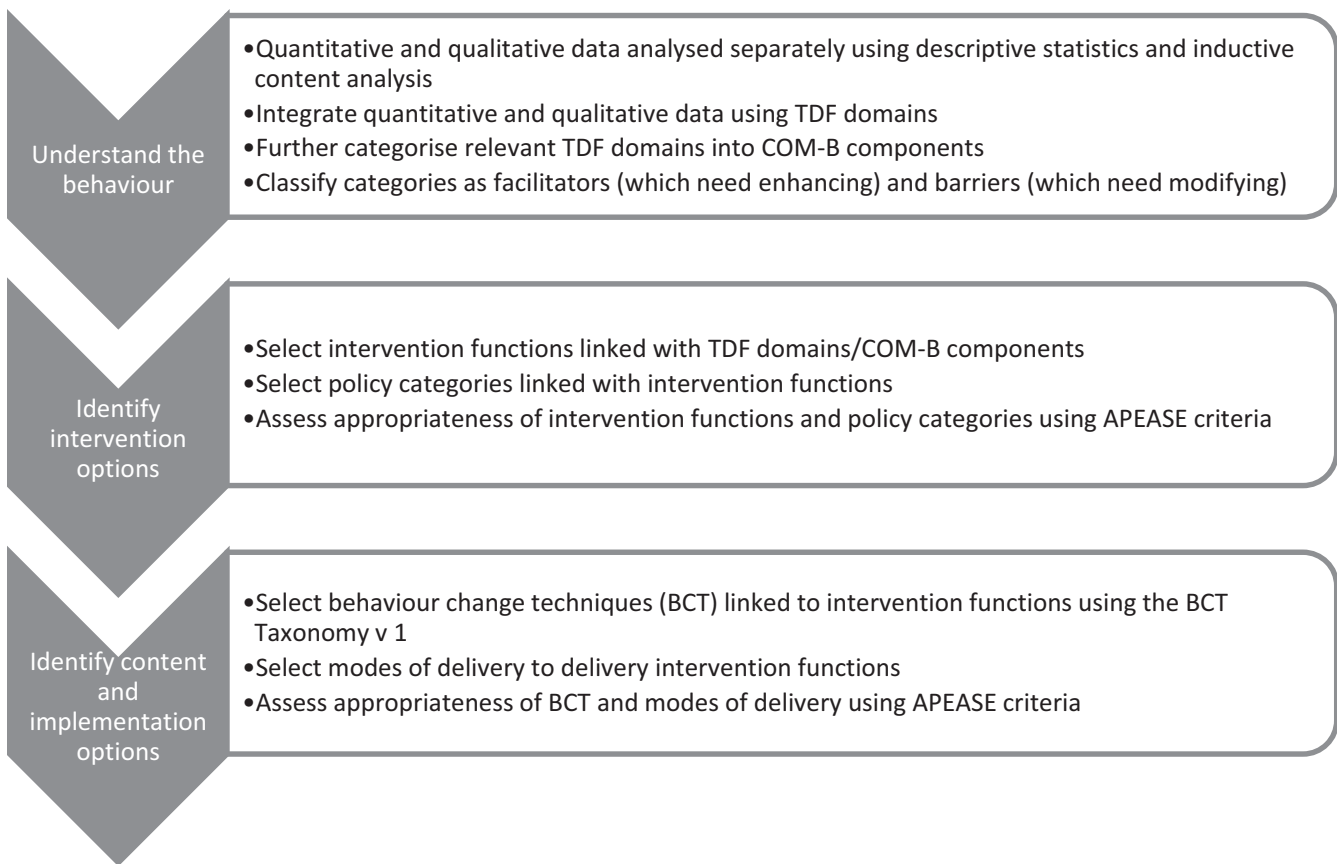


FIGURE 4 Data analysis procedures

between individual participants, the number of focus groups which categories were discussed in was also calculated.

Relevant quantitative and transformed qualitative findings were integrated by categorising relevant influences of behaviour identified from the different data sources using the domains of the Theoretical Domains Framework (TDF) (Cane et al., 2012). The TDF is a validated model of behaviour change which categorises the different possible influences of behaviour in 14 domains: “knowledge”; “skills”; “social/professional role and identity”; “beliefs about capabilities”; “optimism”; “beliefs about consequences”; “reinforcement”; “intentions”; “goals”; “memory, attention and decision making processes”; “environmental context and resources”; “social influences”; “emotions”; and “behaviour regulation” (Cane et al., 2012). Influences of behaviour identified were classified as either a potential facilitator (promote uptake in practice and therefore needing enhancing) or barrier (impede uptake and therefore need modifying) to the implementation of HIRAID in the clinical setting.

Data analysis was conducted by one researcher involved in the development of the study intervention, which assisted with interpretation. To reduce the possibility of researcher bias, the codes and categories created were checked by the facilitator responsible for conducting the interviews and focus groups, who confirmed the overall trustworthiness of the data. The classifications of facilitators/barriers assigned to each category was validated by an expert in

behaviour change and two doctoral trained Registered Nurses with experience in emergency and critical care. The Behaviour Change Wheel (BCW) (Michie et al., 2011, 2014) was then used to select appropriate interventions to target the identified facilitators and barriers.

3.5.1 | The Behaviour Change Wheel

The BCW (Figure 5) (Michie et al., 2011) is a framework for behaviour change intervention design which provides a systematic process to identify facilitators and barriers to behaviour change and select interventions that target facilitators and barriers identified. The model was devised through integrating 19 existing frameworks of behaviour change, as none of the existing frameworks covered the full range of interventions to address the different possible influences of behaviour. Facilitators and barriers to behaviour change are identified using the Capability Opportunity Motivation – Behaviour (COM-B) model, which sits at the “hub” of the Wheel, comprising of six components: “physical capability”, “psychological capability”, “physical opportunity”, “social opportunity”, “reflective motivation” and “automatic motivation” (Michie et al., 2011). The 14 domains of the TDF (Cane et al., 2012) may be grouped within the six component of the COM-B model. An analysis of the different influences of behaviour using the TDF domains and COM-B components help to understand what behaviours need enhancing or modifying.

In the BCW, the COM-B model is surrounded by nine intervention functions and seven policy categories (see Figure 3), each aimed at addressing one or more target behaviours identified within the COM-B model (Michie et al., 2011). The COM-B components and TDF domains are explicitly linked to intervention functions that may be used to enhance or modify the targeted behaviour. Policy categories are connected with the intervention functions to identify which policies may be used to deliver the intervention functions. The intervention functions are also connected with the Behaviour Change Techniques Taxonomy v1 (BCTTv1), which lists the various behaviour change techniques that may be used as part of the intervention to bring about change (Michie et al., 2014).

3.5.2 | Selecting interventions for implementation

Facilitators and barriers identified and grouped into the relevant TDF domains were further categorised into corresponding COM-B components. Intervention functions, policies and behaviour change techniques that may be used to target the facilitators and barriers identified were selected using the BCW (Michie et al., 2011). The possible modes of delivery to inform intervention components were also considered which are: content (what is to be delivered); provider (who is to delivered it); format (how was it delivered); setting (where is it to be delivered); recipient (to whom is it to be delivered); intensity (over how many contacts is it to be delivered) and duration (over what period of time) (Davidson et al., 2003). As not all recommended interventions, policies, behaviour change techniques and modes of delivery may be feasible or appropriate to deliver in different contexts, the APEASE criteria (Affordability, Practicability, Effectiveness and cost-effectiveness, Acceptability, Side-effects/safety and Equity) was used to guide intervention designers' judgement on which strategies would likely be most successful (Michie et al., 2014).

4 | RESULTS

4.1 | Sample characteristics

Thirty eight Registered Nurses from five hospital EDs attended study days. The mean age of participants was 29.45 years (range 21–49 years). A high proportion of participants (76.3%, $n = 29$) were female. English was the first language of 92.1% participants ($n = 35$) and 78.9% of participants ($n = 30$) were born in Australia. Twenty three participants (60.5% of initial study sample) responded and participated in the follow-up telephone interview. Only 12 of the 23 participants (52.2%) who completed the follow-up telephone interview reported using the HIRAID assessment framework in their clinical practice 4–6 months after participating in the intervention. There was no statistical difference in the demographics of participants who attended study days and completed follow-up surveys.

4.2 | Facilitators and barriers to implementation

Nine facilitators and nine barriers were identified to potentially influence future implementation of the HIRAID assessment framework in the clinical setting. Facilitators and barriers corresponded with 10 of the 14 TDF domains and were linked with five of the six components of the COM-B model, which are summarised in Table 1. Data sources of the identified factors are presented, and quantitative results and example quotes from surveys, interviews and focus groups are provided in Table 1.

Facilitators included participants' high satisfaction with the usefulness of the HIRAID assessment framework for clinical practice (mean [SD] = 7.37 [2.25]). Eighteen participants (47.4%) reported that they were willing to use the framework in their clinical practice. Further time and opportunity to practice was recommended to make

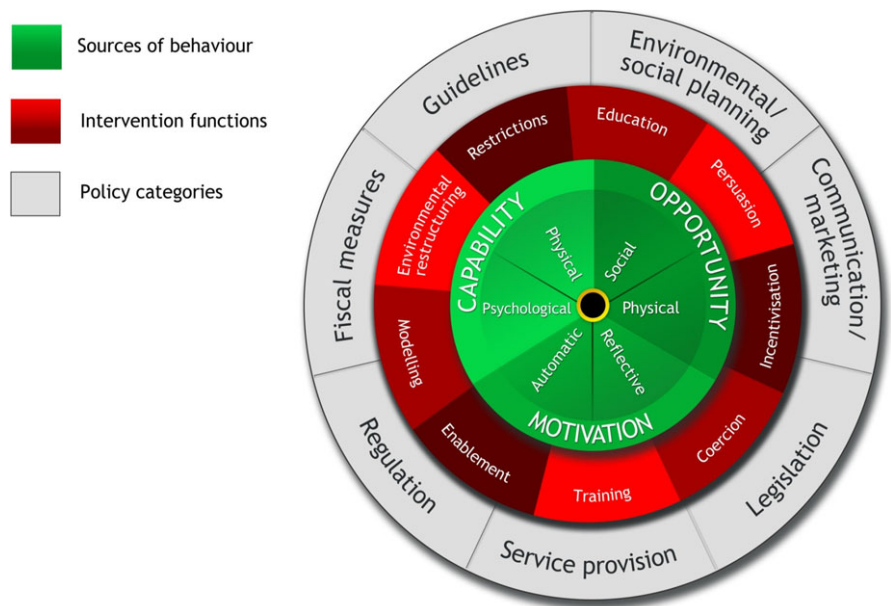


FIGURE 5 The Behaviour Change Wheel. Reproduced with permission (Michie et al., 2011)

TABLE 1 Potential facilitators and barriers to the future implementation of the HIRAID assessment framework into emergency nursing practice, categorised into relevant Capability Opportunity Motivation – Behaviour (COM-B) components and Theoretical Domains Framework (TDF) domains

Facilitator/ Barrier	Factors influencing implementation	Categories	Source	Frequencies ^a	Sample quote/ Quantitative findings
COM-B component: Physical capability					
TDF domain: Skills					
Intervention functions: Training					
Facilitator	Clinical experience	The HIRAID assessment framework is easier for less experienced nurses to apply	Survey Interview Focus groups	5 participants 4 focus groups	<i>because you're so ...used to doing the assessment your own way ... we'd find it more difficult to adjust to the framework than someone who's just fresh out. They like haven't got anything else to go by [murmurs of agreement]... (Focus group 2)</i>
Facilitator	Timing of introduction	The HIRAID assessment framework should be implemented early in emergency nurses' careers	Interviews Focus groups	3 participants 3 focus groups	<i>I think that this would be beneficial doing it like kind of three months out or something because you're used to, you've been exposed to everything in the Emergency Department and you're not set in your ways just yet. (Focus group 6)</i>
		The HIRAID assessment framework should be implemented before or within 3 months of commencing work in the ED	Surveys		34 participants (89.4%)
Barrier	Patient assessment skills	Competence in basic patient assessment skills are required to learn the HIRAID assessment framework	Surveys	2 participants	<i>You need to allow time for RNs to find the confidence to perform appropriate assessments. (RN 33)</i>
		Difficulty in conducting the following basic patient assessment skills in the clinical setting (pre-intervention) were reported:			
		Collecting a patient history	Surveys	12 participants	<i>Taking relevant history quickly. (RN40)</i>
		Conducting physical assessments	Surveys	3 participants	<i>Performing good initial assessment. (RN23)</i>
		Communication	Surveys	3 participants	<i>Answering doctors questions. (RN38)</i>
		Assessing patients with particular characteristics	Surveys	14 participants	<i>Assessing patients when in pain. (RN1)</i>
Barrier	Skill in applying the HIRAID assessment framework	The following difficulties when using the HIRAID assessment framework were reported:			
		Adapting to different patients	Surveys Focus groups	2 participants 3 focus groups	<i>I think it would be hard to do when patients are really sick. (Focus groups 2)</i>
		Communicating	Surveys Focus groups	5 participants 2 focus groups	<i>Communicating according to framework. (RN4)</i>

(Continues)

TABLE 1 (Continued)

Facilitator/ Barrier	Factors influencing implementation	Categories	Source	Frequencies ^a	Sample quote/ Quantitative findings
<i>COM-B component: Psychological capability</i>					
TDF domain: Knowledge					
Intervention functions: Education					
Facilitator	Existing knowledge	Understanding of ED processes is required to learn the HIRAID assessment framework	Surveys Focus groups	7 participant 1 focus groups	<i>Firstly [need a] fundamental understanding of how ED works.</i> (RN7)
		Understanding of initial patient assessment is required to learn the HIRAID assessment framework	Surveys Focus groups	2 participants 1 focus group	<i>Need understanding of initial assessment.</i> (RN2)
TDF domain: Memory, attention and decision processes					
Intervention functions: Training, environmental restructuring; and enablement					
Facilitator	Cognitive processes associated with using the HIRAID assessment framework	Stimulated thinking	Survey Interview Focus groups	5 participants 2 focus group	<i>It made me think more.</i> (RN6)
Barrier	Cognitive processes associated with using the HIRAID assessment framework	Distracted and confused thinking	Survey Interview Focus groups	13 participants 1 focus groups	<i>I felt I was concentrating on HIRAID too much. . .thinking about it, rather than doing it.</i> (RN27)
Barrier	Knowledge of the HIRAID assessment framework	Difficulty remembering the HIRAID assessment components and structure	Surveys Interview	16 participants 1 focus groups	<i>Not able to remember.</i> (RN17)
		Knowledge of the HIRAID assessment components declined over time	Surveys		Number of participants able to recall all seven components of the HIRAID assessment framework: Immediately post education in the HIRAID assessment framework: 22 participants (57.9%) 4–6 months later: 5 participants (21.7%)
<i>COM-B component: Physical opportunity</i>					
TDF domain: Environment, Context and resources					
Intervention functions: training, enablement, environmental restructuring					
Facilitator	Learning opportunities	Time and practice required to change practice and learn to apply the HIRAID assessment framework	Survey Interview Focus groups	14 participants 4 focus groups	<i>Basically the more you use it, the easier it's will become.</i> (Focus group 5)
Barrier	Workplace factors	Participants reported the following factors impede on their ability to conduct quality patient assessments:			
		Limited access to equipment and resources	Surveys	5 participants	<i>Equipment often not working, in repair or batteries flat.</i> (RN34)
		Inadequate staffing	Surveys	2 participants	<i>Limited staff.</i> (RN29)
		Time restrictions and workload	Surveys	15 participants 4 focus groups	<i>Having time to spend with patients asking questions, do</i>

(Continues)

TABLE 1 (Continued)

Facilitator/ Barrier	Factors influencing implementation	Categories	Source	Frequencies ^a	Sample quote/ Quantitative findings
<i>a thorough primary and secondary assessment on patients. Only have enough time to perform the basics. (RN22)</i>					
<i>Reflective motivation</i>					
TDF domain: Social/professional role/identity Intervention functions: education; persuasion; and modelling					
Facilitator	Existing practices	The HIRAID assessment framework supports existing practice	Surveys Interview Focus groups	13 participants 3 Focus groups	<i>We sort of do it now, but it consolidates all the other assessments that we're usually doing or how we're systematically trying to do it. It consolidates everything. (Focus group 5)</i>
Barrier	Changing practice	Changing existing practice difficult	Surveys Interviews Focus groups	11 participants 5 focus groups	<i>You can go oh yeah, I know that in theory but it's transferring it to practice and changing, like being conscious of your changing practice, that's going to be the big difficulty. (Focus group 6)</i>
		Already have existing assessment framework	Surveys		31 participants (81.6%) reported having an existing structured approach to patient assessment
		The HIRAID assessment framework conflicts with existing practice	Surveys Interview Focus groups	11 participants 4 focus groups	<i>I'm used to a framework where... I'm always doing a Doctor A B C D E first... whereas this... other framework um, HIRAID, is more taking the history down first. (Focus group 1)</i>
TDF domain: Intentions Intervention functions: education; persuasion; and modelling					
Facilitator	Willingness	Participants reported they were willing to use the HIRAID assessment framework in clinical practice	Survey	18 participants	<i>Definitely willing. I think this framework will ensure I have a systematic assessment. (RN20)</i>
TDF domain: belief in capabilities Intervention functions: education; persuasion; modelling; and enablement					
Barrier	Confidence in using the HIRAID assessment framework	Participants expressed the need to develop confidence in using the HIRAID assessment framework in their clinical practice	Surveys	13 participants	<i>It will take time for me to become confident in its use. (RN34)</i>
TDF domains: Beliefs about consequences Intervention functions: education; persuasion; modelling; and enablement					
Facilitator	Beliefs about the effects of the HIRAID assessment framework on clinical performance	Enhances history taking	Surveys Interviews Focus groups	11 participants 2 focus groups	<i>It prompts to ask more questions. (Focus group 1)</i>

(Continues)

TABLE 1 (Continued)

Facilitator/ Barrier	Factors influencing implementation	Categories	Source	Frequencies ^a	Sample quote/ Quantitative findings
		Improves recognition and reporting of red flags	Surveys Interviews Focus groups	11 participants 2 focus groups	<i>Red flags helps to advocate for [the] patient, prioritises care [and] ensures [the] nurse takes responsibility for patient.</i> (RN 43)
		Improves communication skills	Survey Interviews Focus groups	9 participants 3 focus groups	<i>[HIRAID] emphasised how to communicate the outcome of their assessment.</i> (RN20)
		Generates more comprehensive and structured assessment	Survey Interviews Focus groups	16 participants 6 focus groups	<i>[HIRAID] provides a structure which guides assessment and ensures nothing is missed.</i> (RN44)
Barrier	Beliefs about the effects of the HIRAID assessment framework on clinical performance	Delays practice	Surveys Interviews Focus groups	7 participants 1 focus group	<i>It slows me down because I have to try to remember, use it and then apply it.</i> (RN20)

TDF domain: Optimism

Intervention functions: education; persuasion; and modelling

Facilitator	Satisfaction	Participants were highly satisfied with the usefulness of the HIRAID assessment framework	Surveys		Satisfaction mean (SD) with the usefulness of the HIRAID assessment framework for: Collecting patient history: 7.40 (2.11) Identifying red flags: 7.71 (2.13) Conducting physical assessments: 7.21 (2.34) Performing interventions: 7.16 (2.48) Ordering, performing and reviewing diagnostics: 7.16 (2.37) Reassessing patient: 7.32 (2.47) Communicating with other clinicians: 7.68 (2.29) Communicating with patient: 7.08 (2.55) The overall assessment process: 7.37 (2.25) In clinical setting: 7.34 (2.07) (Each item measured on 10 point Likert scale '0' indicating no satisfaction and '10' indicating complete satisfaction)
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Automatic motivation

TDF domain: Reinforcement

Intervention functions: training and environmental restructuring

Barrier	Reinforcement in the workplace	The HIRAID assessment framework was not formally implemented in the workplace	Surveys	4 participants	<i>Not introduced into department as policy and therefore not accepted method of assessment.</i> (RN17)
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^aNumber of participants who commented on category in surveys and/or interviews and number of focus groups during which the category was discussed.

the tool easier to use. All six focus groups reported that applying the framework improved the quality of clinical assessment performed, specifically improving the quality of history taking, recognition and response to red flags as well as communication skills. Seven

participants (18.4%) did however feel that using HIRAID delayed practice somewhat.

HIRAID was reported to be most useful for less experienced nurses by five participants (13.1%) and in four focus groups, and 34

participants (89.4%) recommended that it be introduced within the first 3 months of nurses commencing work in the ED. However nine participants (18.4%) and one focus group discussed the need for some basic understanding of patient assessment and ED processes to successfully learn and apply the HIRAID assessment framework in their clinical practice.

The most frequently reported barrier was difficulty remembering the HIRAID assessment components. Sixteen participants (45.7%) stated they had difficulty remembering the HIRAID components. When asked to recall the HIRAID assessment frameworks, only 22 of the 38 participants (57.9%) were able to recall all seven HIRAID components immediately post participation in the education, and 5 of the 23 participants (21.7%) who responded to follow-up surveys 4–6 months later. Thirteen participants (34.2%) of participants reported that they lacked confidence in using the framework in their clinical practice which was primarily attributed to inability to remember what it stood for.

Whilst five participants (13.2%) and two focus groups reported applying the HIRAID assessment framework stimulated their thinking, 13 participants (34.2%) and one focus groups found it distracting and took their focus away from the patient. Changing practice was also a common theme, with 31 participants (81.6%) stating that they already use their own assessment framework in clinical practice. Although 13 participants (34.2%) and three focus groups discussed how the HIRAID assessment framework supports their existing practice, 11 participants (28.9%) and five focus groups discussed how HIRAID was different to their pre-existing approach and experienced “difficulty” adapting to the new structure. Environmental factors such as lack of reinforcement, time and resources were also identified to potentially hinder uptake of the framework in the clinical workplace.

4.3 | Implementation interventions

4.3.1 | Intervention functions

Six intervention functions were selected to target the facilitators and barriers and optimise future implementation of the HIRAID assessment framework: “training”; “education”; “environmental restructuring”; “enablement”; “persuasion”; and “modelling”. The intervention functions are listed in Table 1 to display which facilitators and/or barriers they were selected to target. Definitions of the selected interventions are presented in Table 2.

Additional education and training is recommended to target the knowledge and skill of emergency nurses and enhance their ability to use the HIRAID assessment framework in their clinical practice. Enablement and persuasion is needed to optimise nurses’ intentions to use the framework and change their existing practices. Environmental restructuring is required to prompt nurses to remember and use the HIRAID assessment framework in their workplace. In addition, modelling how to apply the framework by senior nurses is necessary to promote uptake by other nurses in the clinical setting.

4.3.2 | Behaviour change techniques and modes of delivery

Behaviour change techniques and modes of delivery selected to implement the six intervention functions are presented in Table 2. These include the use of additional instruction as part of the education intervention, as well as the use of feedback techniques, where nurse educators provide constructive criticism on the nurses’ clinical performance. This may be achieved through changing the existing education program into an online learning program and full day of practical training which uses simulation as an education modality. The introduction of cues within the workplace such as posters and reference cards was also identified as appropriate to prompt nurses to follow the structured approach whilst caring for patients.

4.3.3 | Policy categories

Five policy categories were selected to deliver intervention functions: “guidelines”; “regulation”; “service provision”; “communicating/marketing”; and “environmental/social planning”. Definitions and examples of how these policy categories may be used to deliver the chosen intervention functions are presented in Table 3. This recommends that the educational resources are made readily available to EDs to promote uptake of the HIRAID assessment framework. It is also suggested that the refined education program be integrated into ED orientation programs and specialty training programs to regulate and mandate use of the HIRAID assessment framework in emergency nursing practice. The use of reliable communication sources will assist to engage with key stakeholders such as Nurse Managers and Nurse Educators to persuade them to support the use of the HIRAID assessment framework in their clinical departments. The development of a documentation template based on the assessment structure should also be considered to further prompt nurses to apply the assessment framework in their workplace.

5 | DISCUSSION

The successful implementation of the HIRAID assessment framework has the potential to improve the quality of patient assessments performed by emergency nurses in the clinical setting. After participation in an education workshop devised to teach the framework, uptake of the framework in the clinical setting by early career emergency nurses was poor. The KTA Cycle recommends identifying barriers to knowledge use in order to tailor interventions to optimise implementation (Graham et al., 2006). A number of factors were identified that could facilitate or impede the future successful implementation of the HIRAID assessment framework into emergency nursing practice.

To address the facilitators and barriers the application of behaviour change theory recommends the existing education workshop be refined and additional strategies are used to optimise future implementation of the HIRAID assessment framework into clinical

TABLE 2 Summary of intervention functions and behaviour change techniques selected for implementing the HIRAID assessment framework into the clinical setting using the Behaviour Change Wheel (Michie et al., 2014)

Intervention functions	Behaviour change techniques	Modes of delivery
Training <i>"Imparting skills"</i>	Instructs how to perform behaviour	Provide instruction on the application of the HIRAID assessment framework through: <ul style="list-style-type: none"> • e-learning program completed when nurse first presents to the ED (during orientation) • Group practical training day using simulation exercises and workshop on communication strategies, completed 3 months after commencing work in the ED • Ongoing group in-services • Individual teaching at the bedside
	Demonstration of behaviour	Train senior clinicians to model using the HIRAID assessment framework in their clinical practice
	Behavioural practice/rehearsal	<ul style="list-style-type: none"> • Use case studies in e-learning program to provide opportunity to practice using the HIRAID assessment framework in clinical context • Conduct simulation training sessions at 3 months after commencing work in the ED to enable nurses to practice putting the HIRAID assessment framework into practice after developing understanding of ED processes, knowledge and skill in conducting patient assessments and knowledge of the HIRAID assessment framework
	Feedback on behaviour	<ul style="list-style-type: none"> • Nurse educators/preceptors to provide ongoing feedback on their clinical performance using the HIRAID assessment framework in the clinical setting until deemed competent • Nurse educators provide feedback to nurses on their assessment performance during simulation training in post-simulation debriefing sessions • Conduct random documentation audits of nursing documentation and provide feedback on quality of documentation using the HIRAID assessment framework
Education <i>"Increasing knowledge or understanding"</i>	Information about consequences	Include research evidence on the effectiveness of the HIRAID assessment framework in improving the quality of patient assessments performed by emergency nurses in the simulated setting, via e-learning program and practical training
	Feedback on behaviour	See above
	Prompts/cues	<ul style="list-style-type: none"> • Provide nurses with reference cards that may use as prompts whilst assessing patients • Attach posters of the HIRAID assessment framework figure in the clinical workplace to prompt nurses to use it in their clinical practice
Environmental restructuring <i>"Changing physical or social context"</i>	Adding objects to the environment	Create a documentation template structured using the HIRAID assessment framework to be completed on the patient's Electronic Medical Record to prompt accurate and complete documentation
	Prompts/cues	See above
Enablement <i>"increasing means/reducing barriers to increase capability"</i>	Social support	Senior nurses, educators and preceptors provide praise to nurses when seen to be using the HIRAID assessment framework in their clinical practice
	Action planning	Integrate e-learning program and practical training day into ED nursing orientation and specialty practice programs
	Problem solving	Use simulation to prompt nurses to analyse their own performance and performance of others when conducting patient assessments with and without applying the HIRAID assessment framework. Facilitate discussions of performance during post-simulation debriefing.
Persuasion <i>"Using communication to induce positive or negative feelings or stimulate action"</i>	Credible source	Advocate the use of the HIRAID assessment framework in emergency nursing practice on relevant governing organisations websites such as the College of Emergency Nursing Australasia
	Information about consequences	See above
	Feedback on behaviour	See above
Modelling <i>"Providing an example for people to aspire to or imitate"</i>	Demonstration of behaviour	See above

practice. The timing and delivery of the original education workshop must be modified to enhance emergency nurses' confidence and skill in applying the HIRAID assessment framework in their clinical practice. Restructuring the physical ED environment is needed to prompt nurses to use the HIRAID assessment framework in their clinical practice. Modelling and social support is also advised to promote sustained use of the HIRAID assessment framework in the clinical setting. Once implemented, further evaluation of the uptake of the HIRAID assessment framework in the clinical context and effect on clinical practice and patient outcomes is warranted.

5.1 | Timing and delivery of education

The existing educational intervention designed to teach the application of the HIRAID assessment framework needs refining to optimise skills, knowledge and beliefs of emergency nurses. The HIRAID assessment framework was recommended by participants in this study for less experienced emergency nurses and suggested that it be taught to nurses within the first 3 months of commencing work in the ED. To optimise their learning some participants did however feel that foundational knowledge of ED processes and fundamental patient assessment skills is needed prior to undertaking education in the HIRAID assessment framework. The intervention should be delivered at an appropriate time in the nurses' career to ensure nurses hold the prerequisite knowledge and skill required to optimise learning (Hailikari, Katajavuori, & Lindblom-Ylänne, 2008). If introduced early, additional teaching may be required to foster development of the recommended prerequisite knowledge and skills.

The duration and intensity of the education requires modification to optimise learning. Participants reported difficulty remembering and subsequently lacked confidence following the HIRAID assessment components and structure. This is likely due to the short duration and high intensity of the education delivered. The introduction of large amounts of new information at once can result in cognitive overload, which can impair learning (van Merriënboer & Sweller, 2010). The effects of cognitive load on learning stem from the cognitive load theory (Sweller, 1988). Cognitive load theory is based on the assumption that working memory must be used to learn new information and the human working memory has a limited capacity when dealing with novel information (van Merriënboer & Sweller, 2010). According to cognitive load theory, once learnt, knowledge is stored in long term memory which has no capacity limits and may be readily accessed (van Merriënboer & Sweller, 2010). It is therefore recommended that knowledge of the HIRAID assessment framework is taught in stages firstly via an e-learning program, followed by a practical day of simulation exercises and training in communication strategies, to prevent cognitive overload and optimise learning.

Additional strategies within the educational intervention are also needed to enhance emergency nurses' beliefs about the consequences of the intervention and their willingness to use it in their clinical practice. Emergency nurses may for example be persuaded to use the HIRAID assessment framework in their clinical practice, by informing them of existing evidence on the effectiveness of the HIRAID assessment

framework in improving emergency nursing assessment in the simulated setting (Munroe, Buckley et al., 2016; Munroe, Curtis et al., 2016). The idea of needing to change nurses' beliefs is supported by the transformative learning theory, which stipulates that to successfully engage clinicians and change their behaviours based on sound research knowledge, their attitudes and beliefs towards the proposed new knowledge must be learned, shaped and transformed (Matthew-Maich, Ploeg, Jack, & Dobbins, 2010).

5.2 | Environmental restructuring

Modifications to the physical ED environment are needed to achieve sustained implementation of the HIRAID assessment framework into emergency nursing practice. Participants identified that limited time, staffing and resources present in the ED hinder the opportunity emergency nurses have to learn and apply HIRAID in the clinical setting. Lack of time is commonly reported as a barrier to the uptake of research evidence into emergency nursing practice (Chan et al., 2011; Huckson & Davies, 2007). Whilst it may not be possible to change these restrictions within the ED clinical environment, a number of other strategies may be used to ensure nurses have sufficient support and opportunity to learn and apply the HIRAID assessment framework in their clinical practice. A documentation template may be devised and uploaded into the electronic medical record system to promote complete documentation of the HIRAID assessment components. The use of electronic documentation templates has been reported to help standardise clinical information in a structured way and improve communication between healthcare providers (Clark et al., 2012). Posters and reference cards may be used to assist in prompting nurses to recall the HIRAID assessment components and structure. However, the use of such prompts without the use of other strategies will likely not be successful in creating and sustaining change in the workplace (Ng, Johnson, Nguyen, & Groth, 2014). Mandating participation in HIRAID education and inclusion in ED orientation/specialty practice programs will likely assist to ensure all emergency nurses are trained in using HIRAID.

5.3 | Modelling and social support

For implementation to be successful and sustained, emergency nurses need to be using the HIRAID assessment framework collectively (Johnson & May, 2015). In this study a number of participants' reported they did not use the HIRAID assessment framework when they returned to the workplace as it was not reinforced in the clinical setting. Previous research has reported a lack of support from other clinicians as a barrier to implementation of research evidence into emergency nursing practice (Chan et al., 2011). Support from other clinicians may be achieved through the method of modelling, which involves the demonstration of a desired behaviour to promote others to adopt it (Michie et al., 2014). Senior nurses may be trained to demonstrate the application of the HIRAID assessment framework, to encourage other nurses to adopt it in their own practice.

TABLE 3 Summary of policy categories selected to deliver intervention functions and implement HIRAID into clinical practice using the Behaviour Change Wheel (Michie et al., 2014)

Intervention functions	Policy categories	Example
Training Education Environmental restructuring Enablement Persuasion	Guidelines <i>"Creating documents that recommend or mandate practice"</i>	Include e-learning and practical training day in ED nursing orientation and specialty practice programs
Training Environmental restructuring Enablement Persuasion	Regulation <i>"Establishing rules or principles of behaviour or practice"</i>	Mandate that all emergency nurses must complete education and training in the HIRAID assessment framework
Training Education Enablement Persuasion Modelling	Service provision <i>"Delivering a service"</i>	<ul style="list-style-type: none"> • Provide education, using the "train-the-trainer" model to teach ED nurse educators to train emergency nurses in the HIRAID assessment framework to patient assessment • Make educational resources freely available to EDs (including online learning package, facilitator manual, participant workbooks and simulated clinical scenarios)
Education Persuasion Modelling	Communicating/marketing <i>"Using print, electronic, telephonic or broadcast media"</i>	<ul style="list-style-type: none"> • Communicate with key stakeholders and emergency nurse clinicians via email e.g., to notify them of educational resources, train the trainer sessions and education sessions • Use posters to advertise education sessions and remind clinicians to use the HIRAID assessment framework in clinical practice • Make e-learning program accessible to clinicians online via relevant health organisation websites
Environmental restructuring	Environmental/social planning <i>"Designing and/or controlling the physical or social environment"</i>	Create a documentation template structured using the HIRAID assessment framework to be completed on the patient's Electronic Medical Record to prompt accurate and complete documentation

The idea of observing and adopting others' behaviour is supported by the Normalisation Process Theory which characterises implementation as a social process of collective action (May, 2013). It postulates that practices are promoted, embedded and sustained through the interaction of individuals and continuous investment of change agents within the group work environment (May et al., 2009).

Success of any new practice is reliant on senior clinician support (Bennetts, Campbell-Brophy, Huckson, & Doherty, 2012) and those that will be impacted by what is being implemented. It is important to identify key stake-holders and identify their expectations and needs with respect to the project outcomes. This will include engaging with nurse managers, consultants and educators who influence policy and are responsible for the delivery of nursing education. Involvement of senior nurse clinicians is also needed to effectively model the application of the HIRAID assessment framework, as well as monitor its use and provide feedback to those who are and are not using it appropriately. Roles and responsibilities for each person must then be determined, a communication strategy developed and a timeline to deliver the interventions selected to implement HIRAID into practice (Centre for Healthcare Redesign 2014).

5.4 | Implications for future research

Although the outcomes of this study are informative through instructing how to effectively implement HIRAID, it has not yet

been formally implemented or evaluated in the clinical setting. Monitoring and evaluation of knowledge use is a key component of the KTA Cycle, essential to determine if the implementation is successful and how to refine the implementation process (Graham et al., 2006). Research is needed to determine how effective the HIRAID implementation strategy is in modifying behaviour once executed into the clinical setting and to measure whether the intervention is cost-effective and improves patient and health service outcomes. In addition, this study only assessed the beliefs and behaviours of early career emergency nurses. Further investigation is needed to provide insight into the perspectives of experienced emergency nurses and nurse educators who may be expected to teach and model the use of the HIRAID assessment framework, in addition to emergency physicians and patients who are also likely to be affected by its implementation. The intent of the researcher team is to develop an e-learning and simulation training program to implement HIRAID into a select metropolitan and rural Australian EDs to evaluate the effects of HIRAID prior to widespread implementation. Engagement with the NSW Ministry of Health and other key stakeholders has commenced.

5.5 | Limitations

Whilst this study was founded on the theoretical underpinnings of the BCW and the expertise of experienced clinicians, the selection

of intervention strategies was subject to some interpretation and the effectiveness of the implementation strategy has yet to be evaluated. To reduce researcher bias, data analysis was validated by a group of investigators experienced in emergency nursing practice and behaviour change. Evaluation of the effectiveness of implementation strategies will overcome any subjectivity and generate empirical evidence on the effectiveness of the implementation strategy proposed. A loss of participants in the follow-up survey is also acknowledged to reduce the sample size and the representativeness of the data collected pertaining to use of the HIRAID assessment framework in the clinical setting. Evaluation of emergency nurses' perspectives on the framework when formally implemented in the clinical setting will provide greater insight into facilitators and barriers to implementation, and the effectiveness of the HIRAID intervention on patient care.

6 | CONCLUSION

Successful implementation of the HIRAID assessment framework has the potential to improve nursing assessment and the quality of patient care. A range of facilitators and barriers were identified to potentially enhance or hinder future implementation of HIRAID into the clinical setting. A multimodal implementation strategy is needed to address facilitators and barriers, achieve successful behaviour change and result in sustained translation into clinical practice. Implementation of the HIRAID assessment framework may be optimised through the refining the timing and delivery of education, training senior nurses to model the structured approach to patient assessment and through modifying the social and physical ED environment. Implementation and evaluation of the HIRAID assessment framework in the clinical setting is needed to determine the effectiveness of the implementation design and its impact on nursing practice and patient care.

7 | RELEVANCE FOR CLINICAL PRACTICE

The successful implementation of the HIRAID assessment framework has the potential to improve nursing assessment and the safety of patients presenting to the ED through improving the quality of clinical assessments and communication skills of nurses (Munroe, Curtis et al., 2016). A review of the literature was unable to identify any generic validated system to guide comprehensive patient assessment performed by emergency nurses or nurses across the acute care sector (Munroe et al., 2013). The HIRAID assessment framework therefore has the potential to be adapted into nursing practice in the ED as well as other acute care settings.

This study also contributes to the evidence-practice gap in nursing, by demonstrating how to systematically identify factors that support or hinder behaviour change in nurses and select interventions to optimise evidence-informed practice. Nurses form the largest global clinical workforce and have the most amount of contact with patients

compared with other healthcare professionals (Australian Institute of Health and Welfare 2015, Bureau of Labor Statistics & U.S. Department of Labor 2015, Canadian institute for Health Information Healthcare workforce 2014). Whilst nurses have a critical role in the quality of care delivered to hospitalised patients, they are reported to use research evidence least in their clinical practice (Weng, Yang, & Chen, 2013). Different models are available that may be used to help identify factors that prevent or enable improvements in healthcare practice and select interventions to address these factors, such as the checklist and worksheets developed by Flottorp et al. (Flottorp et al., 2013). This study demonstrates how to use the BCW to identify facilitators and barriers and select appropriate interventions to optimise implementation of evidence-informed practice in nursing.

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CONTRIBUTIONS

BM, KC & TB contributed to the conception and design of the study. BM, KC and ML contributed to data collection. All authors contributed to the analysis and interpretation of data, preparation of the manuscript and attest to the accuracy and integrity of the information presented.

CONFLICTS OF INTEREST

There were nil conflicts of interest.

ORCID

Belinda Munroe  <http://orcid.org/0000-0001-7874-7225>

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