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Identifying facilitators and barriers to develop implementation strategy for an ED to Ward handover tool using behaviour change theory (EDWHAT)

Kate Curtis^{1,2,3*}, Tiana-Lee Elphick¹ , Madeline Eyles¹ and Kate Ruperto¹

Abstract

Background: Effective clinical handover is fundamental to clinical practice and recognised as a global quality and safety priority. Problems with clinical handover from the emergency department (ED) to inpatient ward across four hospitals in the Illawarra Shoalhaven Local Health District (ISLHD) were identified in a number of reportable clinical incidents. To address this, an ED to inpatient ward electronic clinical handover tool was developed and implemented. However, site uptake of the tool varied from 45 to 90%.

Aim: To determine the facilitators and barriers of the ED to Ward Handover Tool (EDWHAT) implementation and design strategy to improve local compliance and inform wider implementation.

Methods: An exploratory convergent mixed-method approach was used. Data were collected via a 13-item electronic survey informed by the Theoretical Domains Framework (TDF) distributed to eligible nurses across the health district. Descriptive statistics for quantitative data and thematic analysis for qualitative data were conducted. The data were then integrated and mapped to the TDF and the Behaviour Change Wheel to identify specific behaviour change techniques to support implementation.

Results: There were 300 respondents. The majority of nurses knew where to locate the tool (91.26%), but 45.79% felt that it was not adequate to ensure safe handover. The most frequently reported factors that hindered nurses from using the tool were inability to access a phone near a computer (44.32%) (environmental domain), being told to transfer the patient before being able to complete the form (39.93%) (reinforcement) and the other nurse receiving (or giving) the handover not using the form (38.83%) (social influence). An implementation checklist to identify barriers and solutions to future uptake was developed.

Conclusion: To improve uptake, the functionality, content, and flow of the handover tool must be revised, alongside environmental restructuring. Nurses would benefit from an awareness of each speciality's needs to develop a shared mental model and monitoring, and enforcement of tool use should become part of a routine audit.

Keywords: Behaviour change, Implementation, Clinical handover, Emergency, Nursing, Patient safety

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Contributions to the literature

- This original research work presents the facilitators and barriers of the ED to Ward Handover Tool (EDWHAT) implementation and design strategy to improve local compliance and inform wider implementation.
- Behaviour change theory is applied to the emergency and acute care environment to find real-world practical solutions to improving clinical handover—a quality improvement priority.

Background

Effective clinical handover is fundamental to clinical practice and is recognised as a local [1], national [2], and global [3] quality and safety priority. Ineffective clinical handover increases the risk of patient-related errors as a result of poor communication and the lack of appropriate and timely transfer of critical information at the time of reporting. This creates inefficiencies in clinical practice leading to suboptimal patient care [2]. This is especially problematic at transitions of care, such as transfer from the ED to the ward, when communication errors are more likely and there is an increased risk of information being miscommunicated or lost. Ineffective communication at clinical handover is also associated with clinicians spending extensive time attempting to retrieve relevant and correct information [4]. This can result in inappropriate care, and the possibility of misuse or poor use of resources [5]. There remain multiple barriers to effective handover including a lack of systematic structure, including incomplete handovers, excessive reliance on memory without reference to written documentation and poor quality of written medical records [6]. These barriers are particularly prevalent in the complex and hectic emergency department (ED) context where more than 2.5 million ED to ward clinical handovers occur in Australian hospitals each year [7], and the work pattern is unpredictable making delivery of safe patient handover challenging [8]. Responses to this have included recommendations to standardise the structure of handover communication [9] and include the patient and their carers in the handover [2]. An effective standardised and structured clinical handover process enhances the reliability of information transfer by decreasing the reliance on memory and maintaining a focus on important aspects of care [10]. All relevant participants know the minimum information that needs to be communicated when handovers take place, the purpose of the handover, the structured format to aid communication, and how responsibility and accountability are transferred. Further, critical information is more likely to be accurately transferred and acted on. Standardised and structured clinical handover results

in greater levels of patient satisfaction [11], better understanding of diagnosis and treatment [12], and reduced errors [6, 13].

The clinical handover from the ED to inpatient ward across four hospitals in the Illawarra Shoalhaven Local Health District (ISLHD) was identified by incident management system reports to be inadequate. The clinical handover practice was not meeting key criteria of the local Ministry of Health policy Clinical Handover [1], particularly the requirement of a standardised process as different groups of clinicians were requiring different information resulting in varying quality of the information provided. This coincided with a number of reportable clinical incidents, and subsequent recommendations to improve the standard of ED to ward clinical handover practices.

To address this policy—practice gap, an ED to inpatient ward clinical handover tool (EDWHAT), was developed to comply with the Ministry of Health Clinical Handover policy and for the use in the digital platform used by the ISLHD (Fig. 1). EDWHAT was developed by an ED and ward nurse educator and nurse manager. The tool was reviewed by a small group of senior nurses and then implemented at all four hospital sites by local nurse educators using face to face education. A formal strategy was not developed. A local audit following the implementation of EDWHAT demonstrated that uptake of the tool was mixed between sites and wards. Compliance at the different sites ranged from 45 to 90% (mean 70.1%). The proposed research will determine the facilitators and barriers to the use of this newly implemented clinical handover tool by nursing staff at the study sites. Behaviour change theory will then be used to develop interventions to improve the target behaviour, that is, the use of the clinical handover tool.

Methods

This exploratory convergent mixed-method study [14] was designed using French et al.'s four-step implementation process model [15]; (a) clarifying who needs to do what differently (nursing staff), (b) identifying barriers and enablers (electronic survey of nursing staff, informed by the Theoretical Domains Framework), (c) selecting fit-for-purpose intervention strategies and components (mapping survey results using the behaviour change wheel) and (d) evaluating implementation interventions (comparing the original implementation with the findings of this study). The study process is outlined in Fig. 2. The study was conducted in a Local Health District (LHD) which has four geographically and casemix diverse EDs (rural, regional, metropolitan). The STROBE Statement was used as a checklist for reporting guidelines for cross-sectional studies and is provided as Additional file 1. Research conducted as part of this study adhered to the National Statement on the Conduct of Human Research by the

ED Handover - ED Nurse

Patient Information to go here.

INTRODUCTION ED Nurse: Handover: Bedside Telephone

SITUATION AMO & Ward:

Ceiling of Care: Yes No End Of Life Plan: Yes No

DIAGNOSIS: Enter or Edit Diagnosis: Enter/Edit Diagnosis Diagnosis already entered

BACKGROUND Presented With:

Relevant History:

Special Precautions: Nil Cardiac Monitoring Special Bariatric MRO Precautions Single Room

Allergies: No Known Allergies Display:

| D. | C. | Substance | Category | Reactions | Seve... | Type | Est. Onset | Reaction S... | Updated By |
|----|----|------------------|----------|-----------|---------|---------|------------|---------------|--------------|
| | | No Known Alle... | Drug | | | Allergy | | Active | 22/01/201... |

Valuables: Yes No Transfer Notification: Patient Family/Carer Present Family/Carer Other:

A **ASSESSMENT** Is the patient 'Between the Flags'? Review and Plan in place:

Review latest obs

Special Observations/Pathway:

Airway: Patent Protected Variance

Breathing: SOB: Yes No SOBOE: Yes No

Resp Distress: Severe Moderate Mild Nil

O2 Delivery: Room Air (no device) Partial Nonrebreather Mas T-Piece Non-Invasive Ventilation Nasal prongs Nonrebreather mask T-Bag Mechanical Ventilation Hudson mask High Flow Nasal Cannula Swedish Nose / HME Manual Ventilation Venturi Mask Nebulizer Tracheostomy mask Bag Valve Mask

O2 Flowrate:

Circulation: Rhythm: IV Access: Peripheral access IV Fluids Central Infusions/pumps

Disability: GCS: Freq of Obs: CAM: DRAT:

Pain Free: Yes No Analgesia Ordered: Yes N/A

Exposure: Temp: Afebrile Febrile

Mobility: Risk Assessments Completed in the ED: Yes No N/A Falls Risk Score: Waterlow Score: Mattress Ordered: Yes No

Fluid Status: Fluid Balance Chart: Yes No Diet: Full NBM Other: Diabetic NGT/PEG

Glucose: BGL: Frequency BGL:

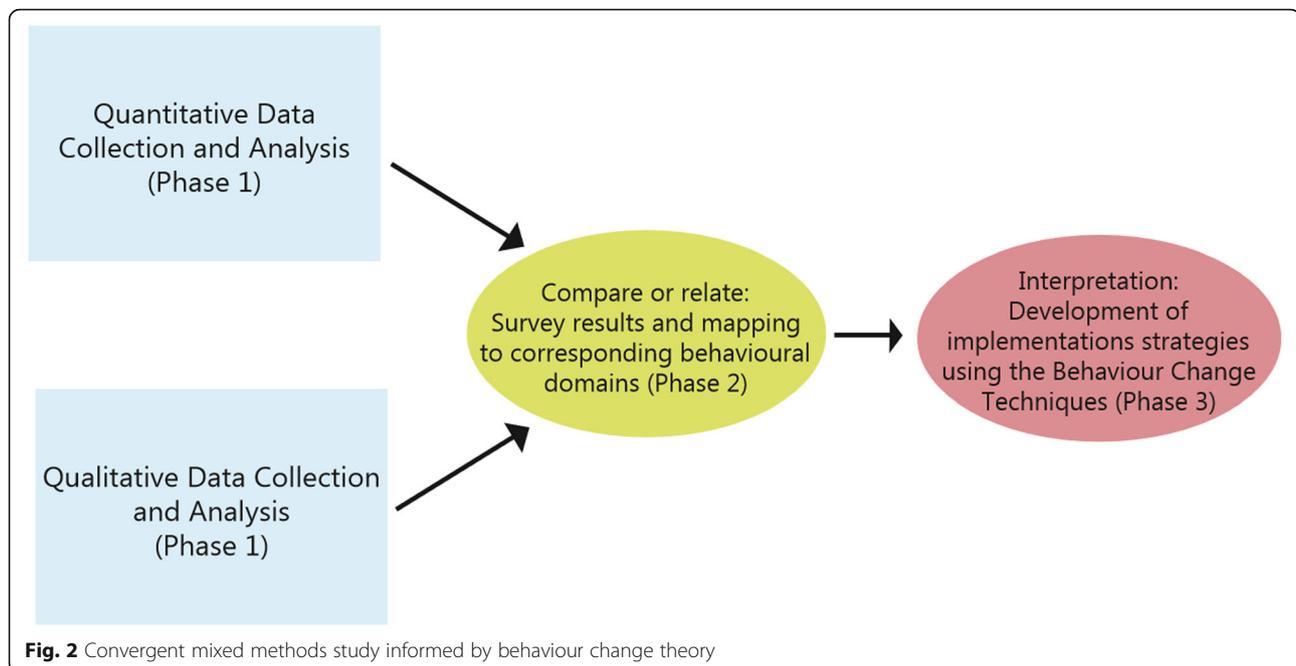
Diabetic Status: Medications:

Medications: Charted: Yes No N/A

RECOMMENDATION Plan & outstanding actions or Rems:

Nurse Receiving Handover:

Fig. 1 The ED to Ward electronic handover tool



Australian National Health and Medical Research Council and was approved by the University of Wollongong (UOW) and ISLHD Health and Medical Human Research Ethics Committee (LNR/18/WGONG/148).

Phase 1: staff survey

Instrument

The electronic survey was administered via REDCap (Research Data Capture), a secure Web-based application for data management and survey tool. The survey commenced with participant characteristics such as age, place of work (ward or ED) and level of experience. This was followed by 11 questions focussed on known barriers and enablers to uptake of new tools in the clinical environment generally [2] and specific to the study site [16, 17] that were then mapped to the domains of the Theoretical Domains Framework (TDF). The TDF is a synthesis of behavioural change theories presented as a framework to explore the science of intervention implementation in health care [18]. The TDF was selected to inform the survey to enable targeted questions related to practice within the clinical environment, classification of enablers and barriers using a broad range behavioural influences, as the investigators had previously successfully used the TDF to identify and design interventions in the ED/acute care context [16, 17, 19]. Each of the key influences on behaviour are listed in Table 1. The information gathered from the survey assisted in identifying the main factors influencing behaviour change in the clinical setting. Most questions had a 5-point Likert response, with the opportunity for free text/comment. The survey can be found in Additional file 2.

Participant recruitment and procedure

Eligible participants were registered or enrolled nurses, who as part of their role would be involved in the giving or receiving of handover on patients being transferred from an ISLHD ED to a participating inpatient unit within the ISLHD. Maternity and mental health units were excluded as at the time of the study, they did not use the handover tool. There were approximately 3000 nurses across ISLHD eligible to complete the survey.

The study was conducted over a 5-month period from November 2018 to March 2019. The data collection period was extended due to delays in distribution and the Christmas holiday period. Participants were emailed the survey link and a participant information sheet to their NSW Health staff email address via their managers. Time to complete the survey was allocated during education and other downtimes. Reminders were sent fortnightly.

Data analysis

Quantitative survey data were analysed using descriptive statistics. Preliminary analyses were run to check for missing data. Responses were presented as proportional data. Sub-analyses were conducted to identify specific barriers or facilitators by site, and/or by ward or ED location. Qualitative data from the free-text responses were analysed using inductive thematic analysis using Braun and Clark's 6-step process [21]. The responses were read through several times to get a sense of the data and allocated into thematic areas [22]. The meaning units were developed by condensing the text. Meaning units were classified into themes and sub-themes. This process was completed by two authors (KR and KC).

Table 1 The 14 behavioural influences of the Theoretical Domains Framework [20]**Domains included in the survey are italicised**

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

Phase 2: identification of facilitators and barriers and data integration

Quantitative items were considered facilitators if they were positively worded with greater or equal to 70% agreement with a statement. Items were considered barriers if they were positively worded with less than 70% agreement with a statement [23, 24]. Qualitative themes were considered facilitators or barriers based on the literature, and/or positively or negatively worded statement. The quantitative and qualitative results were then mapped to each of the TDF domains by two authors (KR and KC). Each item was reviewed to identify potential facilitators and barriers to implementation in each domain. If it was unclear if an item (survey response or theme) was a facilitator or barrier for the implementation, then the consensus was sought from a senior member of the study team with experience in the use of the TDF (BM). For any items that crossed multiple domains, for ease of presentation, we selected the domain we felt

most represented the item. However, if the secondary domain was not identified in any other items, we allocated that domain to prevent the omission of any relevant domains. Sub-analyses (cross-tabulation) of enablers and barriers were conducted to determine if there were any findings specific to the type of nurse (ED or ward) or hospital site.

Phase 3: development of implementation strategies

The facilitators and barriers from the survey were then mapped to intervention functions and behaviour change techniques guided by the Behaviour Change Wheel [25]. Firstly, the authors mapped the TDF domains identified in phase 2 to intervention functions. Intervention functions are "broad categories by means of which an intervention can change behaviour". Each intervention function was assessed to see if they were Affordable, Practical, Effective, Acceptable, had Side-effects and were safe and Equitable (APEASE criteria) [25], and prioritised [26]. Stakeholders (front line nurses, nurse managers, nurse educators) were involved in the assessment of intervention functions during a series of meetings where the initial concept was tabled at various departmental meetings to garner support for the intervention. Secondly, the authors chose behaviour change techniques (BCTs) from the Behaviour Change Technique Taxonomy (BCTTv1) based on the intervention functions. A BCT is a component of an intervention that will alter behaviour [25]. The taxonomy includes 93 techniques for behaviour change linked to the Behaviour Change Wheel. Each intervention function is associated with a list of BCTs that are relevant to that intervention function, which can be assessed for relevancy to the local context. For example, if the barriers and facilitators differed between the ward and emergency nurses, the intervention function and supporting BCTs were refined to that context. Each BCT was also assessed using the APEASE criteria for inclusion alongside the intervention functions. The resulting BCTs were collated and used as suggested techniques to support the selected modes of delivery specific to the context of the sites (wards vs EDs, or particular sites). The TDF domains were grouped using COM-B then developed to a logic map.

Results**Participant characteristics**

Of the 300 nurses (approximate 10% response rate from the whole of ISLHD) involved in the study, 80.41% were between 20 and 50 years of age, with just over one third (33.89%) between six and 15 years of experience. The responses were proportionally representative of the size of each site. Just over half of respondents were ward nurses (56.7%) (Table 2).

Table 2 Characteristics of nursing respondents

| Participant characteristic | Number (%) (N = 301) |
|--|----------------------|
| Hospital location* | |
| Wollongong Hospital (WH) | 142 (47.3) |
| Shoalhaven District Memorial Hospital (SDMH) | 96 (32.0) |
| Shellharbour Hospital (SHH) | 51 (17.0) |
| Milton Ulladulla Hospital (MUH) | 11 (3.7) |
| Nurse type* | |
| Ward | 158 (56.7) |
| ED | 123 (41.0) |
| Both | 19 (6.3) |
| Age group | |
| < 20 years | 1 (0.3) |
| 20–30 years | 77 (25.6) |
| 31–40 years | 86 (28.6) |
| 41–50 years | 70 (23.3) |
| 51–60 years | 57 (18.9) |
| 61–70 years | 10 (3.3) |
| > 70 years | 0 (0.0) |
| Years of experience | |
| < 5 years | 81 (26.9) |
| 6–10 yrs | 50 (16.6) |
| 11–15 years | 52 (17.3) |
| 16–20 years | 24 (8.0) |
| 21–25 years | 38 (12.6) |
| 26–30 years | 25 (8.3) |
| > 30 years | 31 (10.3) |

*n = 300

Reasons for not using the EDWHAT

The most common reasons for not using EDWHAT were uniform across nurse type and hospital site. However, within each reason, there was some variance. For example, the most frequently cited reason for not using the tool was the inability to locate a computer near a phone (44%, $n = 121$, but more so in the ward 47%, $n = 65$), being told to transfer the patient before being able to complete the form (particularly in ED 52.10%, $n = 62$), the other nurse receiving (or giving) the handover not using the form (38.83%, $n = 106$) and not having time (34%, $n = 94$) (Fig. 3). More than half of nurses from the two sites with the poorest uptake felt the tool did not support timely (60%, $n = 75$; 55%, $n = 50$) or easy handover (54%, $n = 68$ and 54%, $n = 49$). These two sites also had the largest proportions of nurses that reported being told to transfer the patient before being able to complete the form (33%, $n = 42$ and 55%, $n = 50$). The site who had the highest uptake also had the highest proportion of nurses reporting the tool was important (76%, $n = 38$).

Quantitative results presented within the corresponding behavioural domains**Knowledge**

Knowing where to locate the tool proved a facilitator to using the tool, with 91.26% ($n = 261$) of staff across all nursing types knowing where to locate the tool. All of the nurses in the ED knew where to locate the tool, whereas a small portion of ward nurses did not (16%, $n = 24$).

Skills

The majority of nurses (78.25%, $n = 223$) indicated they had a good understanding of how to use the tool. Some ward nurses however had little (23.13%, $n = 34$) or no (8.16%, $n = 12$) understanding of how to fill out the tool, which was considered a barrier.

Environment

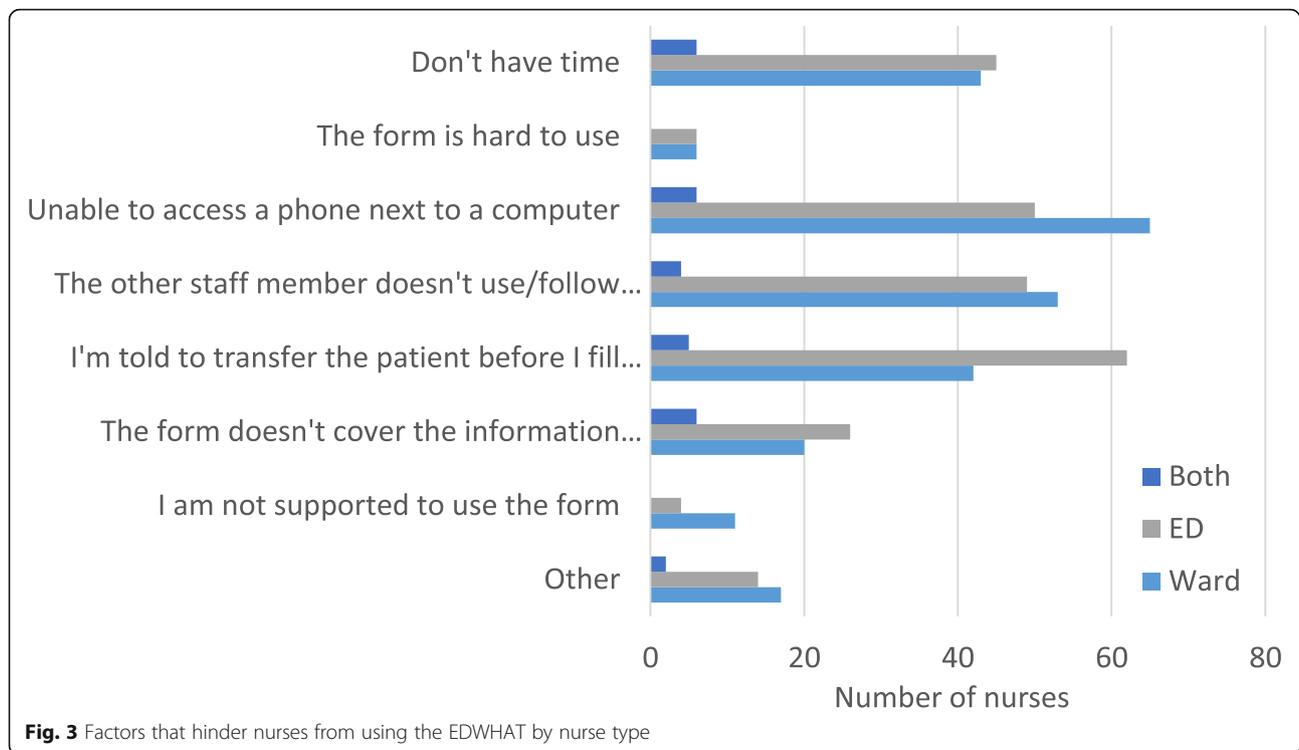
Environmental influences were a substantial barrier. The most frequently reported factor that hindered nurses from using the tool was the inability to access a phone near a computer (44.32%, $n = 121$).

Beliefs about capabilities

The majority of respondents reported they felt confident using the tool (77.39%, $n = 219$). However, more ward nurses reported not feeling confident with using the tool (33.10%, $n = 48$) compared to ED nurses (9.92%, $n = 12$). Overall, 68.27% ($n = 185$) of nurses agreed that the tool was easy to use. Within the ED setting, ease of use was a facilitator (78.99%, $n = 94$), whereas this was a barrier for ward nurses (60.74%, $n = 82$) and nurses who work in both contexts (52.94%, $n = 9$).

Beliefs about consequences

Beliefs about consequences were one of the largest barriers to use of the tool, as just over half of the respondents considering the tool important (59.30%), in particular those aged over 51 years. The age group with the largest proportion reporting that the tool was not important was the 31–40-year group (46.27%). There was a little difference between ED and ward nurses regarding the importance (59.86% and 57.85%) or how long nurses had been working. The information communicated within the tool was also a substantial barrier as nearly half of respondents felt it was inadequate to ensure safe handover (45.79%, $n = 125$). The majority of nurses considered the tool did not promote timely handover (54.91%, $n = 151$) or make the handover process easier (50.91%, $n = 140$). These beliefs trends are the same between nurses who work on the wards, in the ED, and who do both.



Memory

Overall, finding the tool easy to remember to use was a facilitator (83.15%, $n = 232$). However, this trend differed between nurse types, with this being a barrier for ward nurses (51.05%, $n = 73$) in contrast to ED nurses (81.51%, $n = 97$). The greatest factor for remembering to use the tool is having time to prepare for the handover (52%), which is similar between nurse types. In contrast, the factor contributing the least to remembering to use the tool is being reminded by a manager (6%) (Fig. 4).

Qualitative results

There were 399 free-text comments, resulting in 31 themes representing 22 barriers and nine facilitators (Table 3). These mapped to eight of the 14 TDF domains (Table 3). The most barriers were related to the environment in which the tool is required to be used, the content and usability of the form, and beliefs about the benefits (or lack thereof), particularly in relation to social influence. The most problematic behavioural influence was the environment with four sub-themes. Firstly, the functionality of the form within the electronic medical record system. This highlighted the technical difficulties of having the information in a “form” template within the electronic medical record, which means it cannot be minimised or open and shut, without losing information, to view other areas of the patient chart. Encapsulated by these respondents;

“Issue is that once in the tool you cannot revisit your notes which is a problem because you miss vital information” (ED nurse 16)

“Access to the form should be instant as ED/ward are very busy. Access to the handover form depends on computer availability, staff login time and form loading time, for a busy ward and at ED the wait is too long. Also some ED Nurses are happy to wait for form to be accessed, some ensure you hear their displeasure with sighs or statements of being too busy to wait.” (Ward nurse 301)

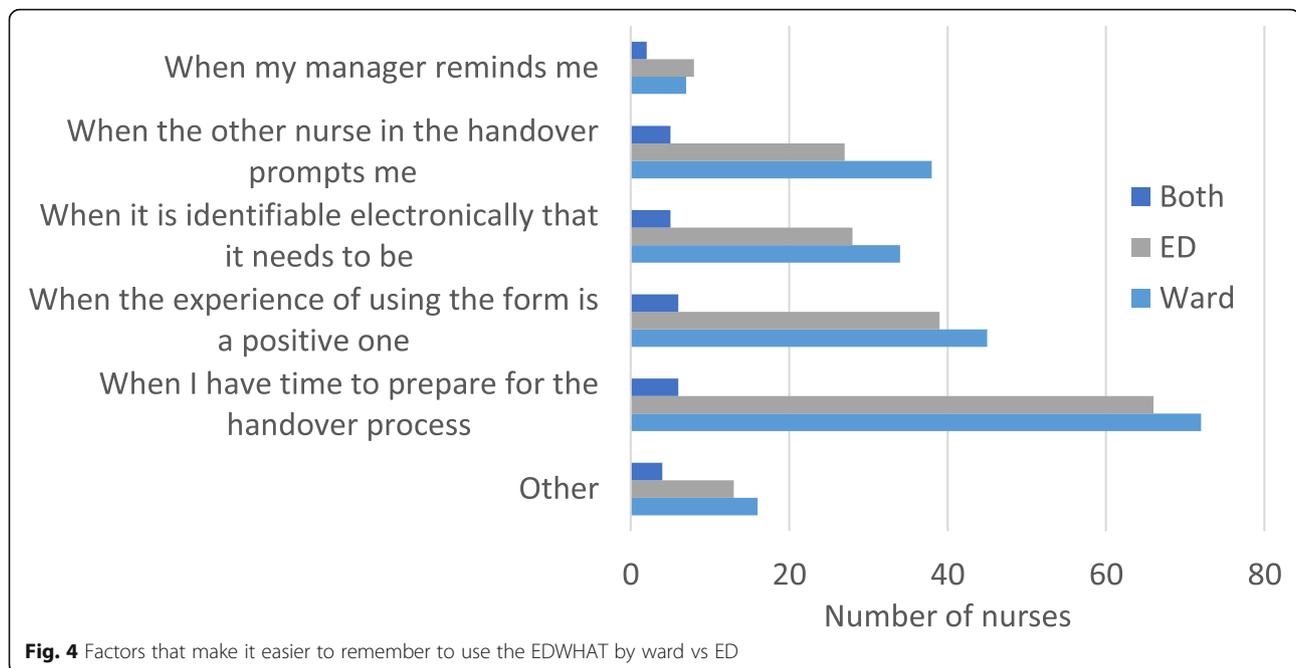
“...The form is hard to access, through 3 menu’s...” (Ward nurse 222)

Secondly, there were a number of responses related to the lack of phones and computers which impacted on staff ability to use the form to handover. For example,

“The only reason to not fill the form out is access to computers/ telephones” (ED nurse 204)

and;

“there have been times where all the computers have been used and there is no other option than to write on a piece of paper....buy more computers” (Ward nurse 78)



The third sub-theme identified concerns related to the structure of the form. The form has limited free-text sections, some auto-populated information, with the majority of information being tick boxes. A number of comments are related to the content of the form itself; however, this was often contradictory. For example, these respondents stated;

“I believe that the section where you tick that their obs are btf is important to ensure safe transfer as well as outstanding actions to ensure there is a record of what still needs to be done for the patient” (ED nurse 17)

“It is easy to use however it is useless as it does not provide enough information and the other staff member becomes complacent and just wants to tick boxes” (ED nurse 158)

And in contrast;

“sometimes important information is lost or importance negated by the volume of information asked for and given. often questions are mechanically asked with nil active listening involved...” (ED nurse 24)

“...Some nurses will ask all the questions in the tool and then they go to hang up, and you have to prompt them and say 'do you want to know what i have done since they have been here now?'” (ED nurse 249)

The other frequently reported domains were beliefs about consequences and social roles and influences.

Within these domains, staff reported feeling that the tool was useful in helping important patient safety information gets handed over and improving the patient continuity of care and the patient experience;

“The tool is useful in ensuring a holistic handover is covered” (ED nurse 204)

However, responses also highlighted a number of beliefs held by the nurse sending the patient (ED) and the nurse receiving the patient (ward) about the handover. These beliefs seem to indicate conflict which may have been present prior to the introduction of the form. This may indicate differences in the working environments of emergency departments and wards who have different functions and responsibilities. Responses from ward staff suggest a lack of knowledge about the patient by ED staff;

“most of the time handover was wrong and wasting time filling the form” (Ward nurse 280)

and;

“...The ED nurses most of the time do not know enough information about the patients to be able to complete all the questions, as they are taking over from another nurse who cared for that patient previously or it is another nurse bringing the patient to the ward. A telephone handover from the nurse who is caring for the patient, so I can access my computer and they can access their computer to complete the form and then the ward nurse collects the patient or

Table 3 The 32 themes identified that facilitate or hinder the use of the EDWHAT in the ISLHD

| Barriers | TDF domain |
|--|----------------------------|
| Not supported by manager to complete handover | Reinforcement |
| Not being face to face for handover means things get missed | Beliefs about consequences |
| Doesn't make a difference to the handover I get | Beliefs about consequences |
| ED staff don't use properly and don't like using it | Social influence |
| Ward staff don't want to use it | Social influence |
| Can't click out of the from to other part of the notes | Environment |
| Duplication of processes | Environment |
| Results in a focus on tick boxes and not the whole patient story | Environment |
| Irrelevant content within the form | Environment |
| Cumbersome | Environment |
| Difficult to locate form in eMR | Environment |
| Time restrictions—it takes too long | Environment |
| Pt in transfer before hand over starts | Environment |
| Unavailability or difficult location of computer | Environment |
| Structure/flow is not intuitive | Environment |
| More information is required than listed in the form | Environment |
| Time pressure to move patients does not support handover | Environment |
| Hard to remember to use | Memory |
| Usefulness is user dependent | Skills |
| Minimal use means unfamiliarity | Skills |
| Has to be mutual agreement between ward and ED to complete | Social/professional role |
| ED don't know their patient | Social influences |
| Facilitators | |
| Ensures completion of tasks | Beliefs about consequences |
| Important for patient safety | Optimism |
| Improves communication between ED and ward | Beliefs about consequences |
| Improves continuity of care | Beliefs about consequences |
| Provides evidence of handover | Beliefs about consequences |
| Good systematic tool that ensures everything completed | Beliefs about consequences |
| Prompts identification of issues | Beliefs about consequences |
| Prompts sharing of the information needed for handover | Beliefs about consequences |
| It's just part of what we do | Social/professional role |

the ED nurse brings the patient down would be MORE EFFECTIVE.” (Ward nurse 222)

Conversely, the ED nurse respondents felt the ward staff are focused on tasks and not the patient condition;

“Often ward nurses want to skip the brief hand-over (2 minutes). I would usually provide that tells them why the patient presented, what we've done and the plan. They only want to hear the answers to the questions prompted by the form” (ED nurse 97)

Within these themes, time pressure was raised as a strong influence on the ability to adequately handover,

“Being told to hurry a handover does not respect the value of handover” (Ward nurse 10)

and;

“I don't have any objection to using the handover form. However I have found time constraints sometimes prevent me using it. Also at times we are directed to transfer the patient prior to having handover” (Ward nurse 81)

Table 4 TDF domains identified to contain facilitators and barriers mapped to nine intervention functions and BCTs with APEASE

| | Education | Persuasion | Incentivisation | Coercion | Training | Restriction | Environmental restructuring | Modelling | Enablement | BCTTv1 selected |
|--|-----------|------------|-----------------|----------|----------|-------------|-----------------------------|-----------|------------|--|
| Knowledge | ✓ | | | | | | | | | 2.2, 5.1, 5.3, 7.1 |
| Skills | | | | | ✓ | | | | | 2.2, 4.1, 6.1 |
| Beliefs about capabilities | ✓ | ✓ | | | ✓ | | | ✓ | | 2.2, 4.1, 5.1, 5.2, 5.3, 6.1, 6.2, 9.1, 13.1, 15.1 |
| Social/ Professional Role and Identity | ✓ | ✓ | | | | | | ✓ | | 2.2, 5.1, 5.2, 5.3, 6.1, 6.2, 9.1, 13.1, 15.1 |
| Optimism | ✓ | ✓ | | | | | | ✓ | ✓ | 2.2, 3.1, 5.1, 5.2, 5.3, 6.1, 6.2, 9.1, 12.1, 12.5, 13.1, 15.1 |
| Beliefs about Consequences | ✓ | ✓ | | | | | | ✓ | | 2.2, 5.1, 5.2, 5.3, 6.1, 6.2, 9.1, 13.1, 15.1 |
| Memory, Attention Decision Processes | | | | | ✓ | | ✓ | | ✓ | 2.2, 3.1, 4.1, 5.1, 6.1, 7.1, 12.1, 12.5, 13.1, 15.1 |
| Environmental Context Resources | | | | | ✓ | ✓ | ✓ | | ✓ | 2.2, 3.1, 4.1, 6.1, 12.1, 12.5, 13.1, 15.1 |
| Social Influences | | | | | | ✓ | ✓ | ✓ | ✓ | 2.2, 3.1, 4.1, 5.1, 6.1, 7.1, 12.1, 12.5, 13.1, 15.1 |
| Reinforcement | | | ✓ | ✓ | ✓ | | ✓ | | | 2.1, 2.2, 4.1, 5.1, 6.1, 10.4, 10.5, 12.1, 12.5 |

Intervention Functions and comments around APEASE criteria

| | |
|------------------------------------|---|
| Education | Education is affordable and practical within existing roles and orientation processes, however Excessive educational focus may lead to neglect in other domains. Educational meetings alone are unlikely to effectively change complex behaviours [26]. This was the main intervention in initial implementation that had suboptimal uptake |
| Persuasion | Using persuasive communication to induce positive feelings to stimulate use of EDWHAT by senior staff, managers and peers all existing roles. But need to consider method of persuasion not to be construed as “pushy”. Needs to be conducted equitably – not single out particular staff |
| Incentivisation | Creating an expectation of award (incentive) is a crucial characteristic for the intervention, given the competing demands on nurse time, and the lack of existing recognition for use of the tool. Financial incentives are not affordable or practical, however awards, recognition and positive feedback may be effective. Can be seen as “core business so shouldn’t need incentive”. Care must be taken that the incentive chosen must be widely available – all staff have opportunity for acknowledgement |
| Coercion | Creating expectation of punishment or cost through coercion while affordable and possible within existing roles, is not appropriate |
| Training | Imparting skills is affordable and practical within existing roles and orientation processes but staff need opportunity and motivation to use them |
| Restriction | Using rules to increase staff using the tool by reducing competing behaviours is possible within existing resources and structure. Particular care to be taken to ensure equitable reinforcement for all staff |
| Environmental restructuring | Changing the physical context is crucial. It can be conducted with existing IT and senior nursing staff roles. Additional computers are not an onerous budget item and a priority |
| Modelling | Providing an example for people to aspire to or imitate by modelling is affordable, practical, effective, acceptable and equitable within existing roles and orientation processes. |
| Enablement | Increasing the means and reducing barriers to increase capability and opportunity for staff to use the tool through enablement Affordable, practical, effective, acceptable and equitable within existing roles and orientation processes. |
| Selected BCTs | 2.1 monitoring of behaviour by others without evidence of feedback; 2.2 feedback on behaviour; 3.1 social support (unspecified); 4.1 instruction on how to perform a behaviour; 5.1 information about health consequences; 5.2 salience of consequences; 5.3 information about social and environmental consequences; 6.1 demonstration of the behaviour; 6.2 social comparison; 7.1 prompts/cues; 9.1 credible source; 10.4 social reward; 10.5 social incentive; 12.1 restructuring the physical environment; 12.5 adding objects to the environment; 13.1 identification of self as role model; 15.1 verbal persuasion about capability. |

“The information is only as good as what is handed over from ED. It can vary from thorough, to vague, to someone who doesn't know the patient. An experienced clinician knows the questions to ask, a novice clinician may take all information on face value” (Ward nurse 36)

Phase 3: development of implementation strategies

The TDF domains identified in phase 2 were mapped to the nine corresponding intervention functions (Table 4). Each intervention function [27] and selected BCT [28] was assessed using the APEASE criteria. Seven of the nine intervention functions and 18 BCTs were considered appropriate for use in future implementation, and the commentary from key stakeholders regarding each intervention function is listed in Table 4.

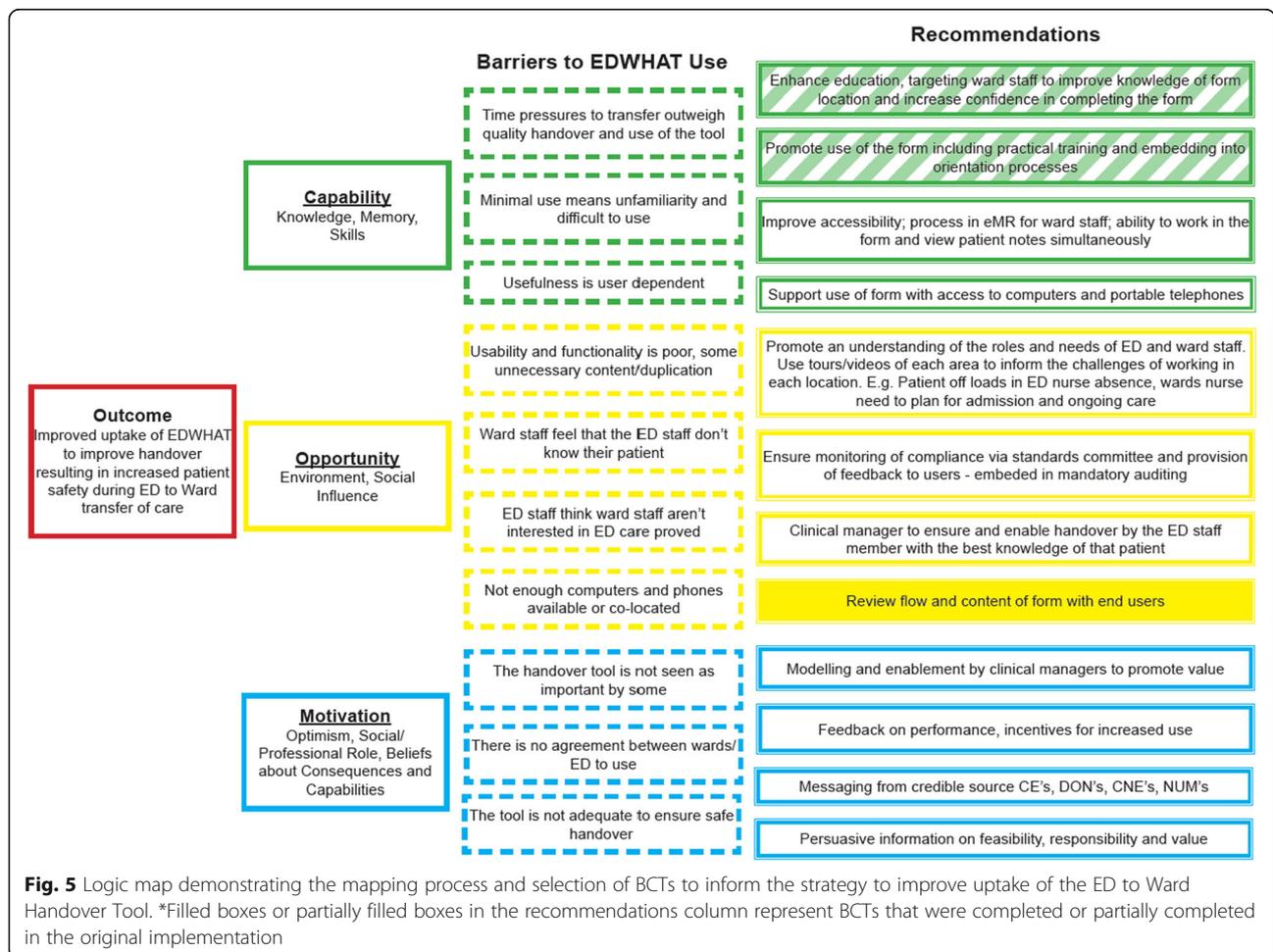
The agreed-upon BCTs were collated and were used to develop implementation strategies (modes of delivery) specific to the context of the sites (wards vs EDs, or particular sites). These were then developed into a logic map (Fig. 5). The logic map demonstrates the mapping process and selection of BCTs to inform the strategy to

improve uptake of the EDWHAT. Filled boxes or partially filled boxes in the recommendation column represent interventions/BCTs that were completed or partially completed in the original implementation. An implementation checklist for future use was developed based on the behavioural influences most prominent in the survey responses and themes, the intervention functions selected through the APEASE process and gaps highlighted by the logic map (Fig. 6).

Discussion

This study demonstrated the numerous barriers and facilitators to uptake of a new intervention designed to improve ED to Ward Handover across a local health district, in particular, the influence of the working environment, social influence and beliefs about consequences.

Implementation of new interventions needs planning and strategy that address the complexity of healthcare systems and individual practitioners [29] and strong organisational support [30]. There are multiple models available on which to develop and plan an implementation strategy [31], the most well known in health is



Prior to implementation

- Development of a working group with representation from management, handover practice standards committee members, wards and emergency department. Consider the inclusion of specialist areas such as paediatrics mental health, maternity and critical care areas
- Review the content of the tool to ensure compliance with local policy, variants can be created within the tool, such as paediatric specific information.
- Identify any potential infrastructure gaps such as availability of phones and computers
- Consult with local eMR support team to generate within eMR and ensure functionality that includes the ability to view multiple screens during the handover process
- Develop an education role out plan to capture staff from all areas. Education should include:
 - why the form is important, such as critical incident numbers related to hand over
 - the people who will support the implementation, such as managers and clinical specialists
 - what information can be expected to be handed over
 - how to escalate concerns if problems occur during implementation
 - the needs and expectations of the giver and receiver of handover
 - considerations from the logic map / recommendations of the EDWHAT study
 - Train the trainer to ensure fidelity of messaging
- Set “go live” date
- Provide training prior to implementation and develop support process for both ED and ward staff for the initial period of go live
- Review at regular intervals during roll out, feedback to staff
- Review implementation, make any changes to tool and process if required
- Embed into normal practice through orientation processes

Ongoing monitoring and feedback to ensure sustainability

- Incidents related to handover continue to be reviewed and reported to standards committee
- Standard committee to monitor use of form and provide feedback to teams as required
- Tool updates available at regular intervals to accommodate changes to practice and improvements in technology
- Bimonthly compliance audit and feedback to relevant stakeholders

Fig. 6 Implementation checklist

perhaps the Promoting Action on Research Implementation in Health Services Framework or PARIHS Framework [32]; however, human behaviour, which is central to the sustainable success of any change, must also be incorporated. Using a systematic four-step approach as the principal framework to inform intervention development process such as that proposed by French et al. [15] is ideal and is known to be effective in the acute care context [19]. Colquhoun et al.’s [33] systematic review of papers focussing on methods for designing interventions to change health care professionals’ behaviour reported

that designing an intervention for individual-level change includes identifying barriers, selecting intervention components, using theory and engaging end-users. Developing interventions systematically based on evidence and theory enhances implementation success and sustainable worthwhile effect. Further, clear presentation of the methods of theory use progresses theory development by helping to understand why interventions have failed or succeeded [34].

All intervention functions, with the exception of environmental restructuring and financial incentives, were

assessed as affordable and practical within existing roles and orientation processes. Environmental restructuring was ranked as one of the most important interventions required, and while some investment will be required, the majority can be achieved with existing IT and senior nursing staff roles. Additional computers are not an onerous budget item and a priority. When operationalising the reinforcement and persuasive interventions, particular care must be taken to ensure an equitable approach to all staff to ensure no staff feel “singled out” and the intervention is not misconstrued as too authoritarian. A transformational leadership approach is preferred [35]. The success of the interventions would also be enhanced by nursing staff from different areas having a shared mental model, that is, a common understanding of the task (handover process) and the clinical and logistical needs to conduct handover for their colleague [36]. It would also ensure that nursing staff from different areas of the hospital are familiar with one another’s roles and responsibilities, could anticipate each other’s needs and be flexible [37].

In relation to education as a method to influence change, the excessive educational focus may lead to neglect in other domains and in isolation is unlikely to be effective in increasing uptake of the EDWHAT [38]. This is reinforced by the fact that education was the main intervention in initial implementation that had suboptimal uptake. The study process also highlights the importance of using a structured, evidence-informed process to diagnose implementation problems and solutions that are likely acceptable and practical to the organisation to enable success. This is demonstrated in the logic map (Fig. 5). The initial implementation of the EDWHAT partially considered only three aspects of human behaviour (knowledge, skills and beliefs about capability). The poor uptake of the tool is a clear indication that for interventions to succeed in the clinical environment, influences on human behaviour must be addressed. A re-implementation strategy is now under consideration by the organisation; however, it must be adequately resourced and take into consideration the findings of this study for optimal implementation. It will be necessary to evaluate the re-implementation of the tool in the future.

Limitations

There were some limitations to this study. Firstly, the survey response rate was much lower than expected (10%) despite allowing time during work hours to complete the survey, although data saturation was reached. The overall estimate of staff obtained from departmental managers included part-time, casual and visiting staff, as well as those on maternity, annual and long service leave which may have exaggerated the

actual numbers of staff available to participate. Staff from all departments and levels of seniority completed the survey, resulting in a representative sample.

The theoretical frameworks provided a systematic method for the identification of facilitators and barriers; however, our experience was of crossover between domains. These were resolved with a discussion between the authors. The authors agreed to categorise barriers or facilitators in one domain over another to aid in the integration and interpretation of the results while appreciating the potential interaction between TDF domains.

Conclusions

To improve uptake, the functionality, content, and flow of the handover tool must be revised, alongside environmental restructuring. Modelling and enabling of effective handover by nursing management is also required. Nurses need increased awareness of each other’s needs to develop a shared mental model, and monitoring and enforcement of tool use should become part of a routine audit.

Supplementary information

Supplementary information accompanies this paper at <https://doi.org/10.1186/s43058-020-00045-1>.

Additional file 1. Supplementary Material 1. STROBE Statement—Checklist of items that should be included in reports of cross-sectional studies

Additional file 2. Supplementary Material 2. Questionnaire used for EDWHAT.

Abbreviations

APEASE: Affordable, Practical, Effective, Acceptable, had Side-effects and were safe and Equitable; BCTs: Behaviour change techniques; BCTTv1: Behaviour Change Technique Taxonomy; btf: Between the flags; ED: Emergency department; EDWHAT: ED to Ward Handover Tool; eMR: Electronic medical record; ISLHD : Illawarra Shoalhaven Local Health District; obs: Observations; PARIHS Framework: Promoting Action on Research Implementation in Health Services Framework; REDCap: Research Data Capture; TDF: Theoretical Domains Framework; UOW: University of Wollongong

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Authors’ contributions

KR and KC conceived and designed the study. KC secured funding. KC, KR, and TE developed the study protocol. TE built the study instruments. KR supervised data collection. TE and ME analysed the quantitative data. KC and KR performed qualitative analysis and integration. All authors prepared the manuscript. The authors read and approved the final manuscript.

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Availability of data and materials

Questionnaire used, qualitative analysis and mapping are available as supplementary files (please see additional files).

Ethics approval and consent to participate

Research conducted as part of this study adhered to the National Statement on the Conduct of Human Research by the Australian National Health and Medical Research Council and was approved by the University of

Wollongong (UOW) and ISLHD Health and Medical Human Research Ethics Committee (LNR/18/WGONG/148). Participants were invited to participate via email forwarded on from their relevant department manager. The email sent included the participant information and consent form clearly stating the voluntary nature of the study, risks and confidentiality. Participation in the survey was voluntary and anonymous.

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

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