

ORIGINAL ARTICLE

Nursing handover of vital signs at the transition of care from the emergency department to the inpatient ward: An integrative review

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Abstract

Aim: To examine nursing handover of vital signs during patient care transition from the emergency department (ED) to inpatient wards.

Background: Communication failures are a leading cause of patient harm making communication through clinical handover an international healthcare priority. The transition of care from ED to ward settings is informed by nursing handover. Vital sign abnormalities in the ED are associated with clinical deterioration following hospital admission. Understanding the role and perceived value of vital sign content in clinical handover is important for patient safety.

Methods: An integrative design was used. A search of electronic databases was undertaken using MEDLINE, CINAHL, EMBASE, Cochrane, Web of Science and SCOPUS. Identified records were screened to elicit further studies for inclusion. A comprehensive peer-review screening process was performed. Studies were included that described the surrounding issues of handover, vital signs, ED, transition of care and ward.

Results: Five studies were included in the final review, one specific to nursing and four specific to emergency medicine. Vital signs were perceived to be an important inclusion in clinical handover, and the communication of vital signs in handover was perceived to be indicators for patient safety and risk factors for future clinical deterioration. The ED environment had an influence on effective communication within handover.

Conclusions: Vital signs were an important inclusion for clinical handover. Deficiencies in vital sign content were perceived to be risk factors for patient adverse events following hospital admission. The quality of vital sign information in clinical handover may be important for accurate decision-making.

Relevance to clinical practice: Vital signs are an important component of clinical handover and are perceived to be indicators for patient safety and risk of future adverse events.

KEYWORDS

emergency department, literature review, nurse, nursing handover, transfer, vital signs

1 | INTRODUCTION

Internationally, communication failures in health care are a leading cause of adverse events and patient harm (World Health Organisation, 2007). From 1995 to 2006, communication failures were the leading root cause of sentinel events reported to The Joint Commission in the United States (Joint Commission Centre for Transforming Healthcare, 2010). Communication failures have been consistently listed in the top 10 factors contributing to sentinel events in Australian public hospitals (Australian Institute of Health and Welfare (AIHW), 2007). One form of communication to be explored is clinical handover.

Clinical handover refers to the exchange of patient information between clinicians and the subsequent transfer of professional responsibility for, or control over, ongoing care of the patient (Cohen & Hilligoss, 2009). Clinical handover is also called “handoff” in some regions of the world. For the purpose of this paper, the term clinical handover will be used. The process of information exchange by clinicians during handover is complex, and there are multifactorial influences that can impact the way handover plays out (Buus, Hoeck, & Hamilton, 2016; Ernst, McComb, & Ley, 2018). An effective clinical handover can reduce the risk of communication failures between healthcare clinicians (World Health Organisation, 2007). Clinical handover is a frequent occurrence in hospitals, with Australian data reporting that approximately 7,068,000 handovers occur annually (Australian Commission on Safety and Quality in Health Care, 2010). The requirement for clinicians to communicate effectively through clinical handover is crucial for safe, quality care delivery (Sasso et al., 2015).

Effective clinical handover is essential for safe patient care transitions. Patient care transitions are the movement of patients in, and between, clinical areas. In the emergency department (ED), patient care transitions requiring a clinical handover are frequent events (de Lange, van Eeden, & Heyns, 2018) commonly facilitated by nurses. One example is the transition of patient care from the ED to the inpatient ward following hospital admission. During this care transition, ED nurses will handover to ward nursing staff. Accurate clinical handover of a patient's physiological status during their ED care to ward staff can guide risk stratification and inform nurses' clinical decision-making regarding ongoing surveillance and patient care within ward settings (Considine, Jones, Pilcher, & Currey, 2016a).

2 | BACKGROUND

Internationally, ED demand is increasing (Australian Institute of Health and Welfare (AIHW), 2017; National Health Service, 2016; Niska, Bhuiya, & Xu, 2010). Increasing ED attendances combined with ED length of stay performance targets makes the delivery of quality, timely ED care inherently challenging (Nugus & Braithwaite, 2010). In Australia, 31% of patients who present to an ED require a hospital admission (AIHW, 2017). As there are 7.8 million ED presentations each year in Australia, just over 2 million patients will

What does this paper contribute to the wider global clinical community?

- Currently, it is not known how vital sign data are used by ED and ward nurses to guide clinical decision-making for ongoing nursing care following the transition of the patient between the ED and the ward.
- Vital signs are perceived to be indicators for patient risk following ED transfer to ward settings. Deficiencies in vital sign handover may compromise clinical decision-making in the continuation of care in the ED ward transfer.
- Vital signs are an important inclusion in clinical handover in patient transfer from ED to wards. Current processes and focused content for transferring accountability of nursing care from nurses in ED to the ward setting remain unknown.

require a hospital admission from the ED (AIHW, 2017). For each hospital admission, clinical handover of patient information is undertaken by both ED nursing and medical staff to staff on inpatient wards.

Internationally, government and healthcare initiatives have attempted to improve and standardise clinical handover through the use of structured mnemonic tools and clinician checklists (Anderson, Malone, Shanahan, & Manning, 2014; Bakon, Wirihana, Christensen, & Craft, 2016; Nasarwanji, Badir, & Gurses, 2016). Despite implementation of handover support tools, there remains insufficient evidence for an association between standardisation of handover and reductions in adverse events. There also remains uncertainty about the most effective handover practice to ensure continuity of information transfer for patient care (Smeulders, Lucas, & Vermeulen, 2014). Current handover tools which have largely been designed in the context of hospital wards may not be suitable for the ED environment. The transition of care between ED and the wards has a number of unique and challenging features that increase handover complexity. ED staff work under time pressure and ED length of stay targets that can result in rushed care transitions and handovers (Nugus & Braithwaite, 2010). High patient turnover and ED overcrowding further increase the pressure on ED clinicians to move patients from the ED to the ward once admission is deemed necessary (Hwang et al., 2011). Finally, patient movement from the ED to the wards is a frequent occurrence (Sujan et al., 2015) involving multiple interactions between different clinicians across different disciplines and specialties (Hilligoss, Mansfield, Patterson, & Moffatt-Bruce, 2015).

Communication of vital signs within patient care transitions from ED to ward staff is important for managing risk of clinical deterioration. Nurses are the healthcare professionals who most commonly assess and document patient vital signs and accurate assessment and interpretation of vital signs is integral to the recognition of

physiological instability and underpins escalation of care decisions (Considine & Currey, 2015). Within the ED, derangements in vital signs occur in 9.5%–14.5% of patients (Considine, Rawet, & Currey, 2015; Lambe, Currey, & Considine, 2016). Vital sign derangements during a patient's ED stay can have significant implications following admission to hospital wards given their association with adverse events such as unplanned intensive care admissions, in-hospital mortality and rapid response team (RRT) activations (Considine, Charlesworth, & Currey, 2014; Considine et al., 2016a; Farley et al., 2010; Jones, Yiannibas, Johnson, & Kline, 2006; Kennedy, Joyce, Howell, Lawrence Mottley, & Shapiro, 2010; Mora et al., 2015; Walston et al., 2016). Identifying patients at risk for clinical deterioration following care transition from ED to wards should be a key feature of clinical handover given that handover itself poses an inherent threat to patient safety (Robertson, Morgan, Bird, Catchpole, & McCulloch, 2014). An understanding of current literature to guide nursing handover of vital signs in this context is essential to inform practice and improve patient outcomes.

3 | AIM

The aim of this integrative review was to examine nursing handover of vital signs during patient care transition from the ED to inpatient wards.

4 | METHODS

An integrative review was conducted using the four stages of integration: (a) problem identification; (b) literature search; (c) data evaluation; and (d) data analysis (Whittemore & Knafl, 2005). An integrative review can be used when there is limited research available about an area of research interest and when the inclusion of diverse methods (qualitative and quantitative) is required to investigate a phenomenon (Whittemore & Knafl, 2005). The key concept of interest for this review was nursing handover of vital signs in the transition of care from the ED to the ward.

4.1 | Search strategy

A comprehensive search of the following databases was conducted as follows: MEDLINE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), EMBASE and Cochrane. Additional searches were undertaken in both Web of Science and SCOPUS to identify any additional studies for inclusion. The author (RC), assisted by a librarian, conducted the search. EndNote software was used as the data management system for all located papers.

The following keywords were used in the search: nurs*, emergency department (emergency department, accident and emergency, emergency room, emergency care, ED, A&E, ER); handover (handover, hand over, handoff, hand off, reporting, shift, sign out, communicat*); transition of care (transition of care, transition, transfer of

care, continuity of care, disposition, discharge, intershift, transfer, inter hospital, interhospital, intrahospital, intra hospital, admission); ward (ward, in patient, inpatient, unit; in hospital, hospitalized, hospitalised); and vital signs (vital sign*, vitals, observations, blood pressure, heart rate, respiratory rate, oxygen saturation, oxygen flow, oxygen rate, temperature). These keywords were used in combination with “OR” or “AND” to identify all relevant studies. Additional record searches were also undertaken to elicit as many papers as possible. A keyword search strategy including review (literature review; systematic review; integrative review) and tool (scale, measure, framework, survey, tool, checklist) was also undertaken. These keywords were used in combination with “OR” or “AND.” References of located records were also screened to identify any other studies for inclusion.

Inclusion and exclusion criteria for this review are presented in Table 1. Studies were limited to those that were peer-reviewed, published as full-text papers in English and related to adult patients. Abstracts from conference presentations, opinion and discussion papers were excluded. No predetermined time frames were set to enable as many studies as possible for inclusion. Studies examining handover from and between pre-hospital or community-based services and between the ED and high dependency/critical care areas were excluded. These high dependency and critical care areas were excluded from the review due to the complexity of patient illness within these areas. This complexity requires additional nursing resources to provide care, which may influence the process for clinical handover.

TABLE 1 Inclusion and exclusion criteria for search

Inclusion	Exclusion
Adult patients	Paediatric patients (<16 years)
Full text available and peer-reviewed	Conference presentations
Primary research papers	Opinion pieces, discussion and review papers
Published in English	
Studies examining handover between the ED and the inpatient ward setting (medical, surgical wards)	Studies examining handover between the ED and high dependency areas: <ul style="list-style-type: none"> • Intensive care unit • High dependency unit • Operating room Studies examining handover from and between pre-hospital or community-based services and the ED: <ul style="list-style-type: none"> • Pre-hospital services (i.e., ambulance) • Primary health care services (i.e., general practitioner, aged care facilities)

4.2 | Quality assessment

The Centre for Evidence-Based Management "Appraisal of a Survey" tool, available for public use (Center for Evidence-based Management, 2018), was used for quality assessment of the included articles. Critical appraisal of all papers was independently conducted by two reviewers (RC, JCu). Consensus was reached for appraisal. The quality assessment of included studies is shown in Table 2.

5 | RESULTS

This integrative review sought to examine nursing handover of vital signs during patient care transition from the ED to inpatient wards. In this results section, the search outcomes will be presented, followed by an overview of the methodological characteristics of the included studies. Finally, how the role of vital signs played out in practice during handover from the ED to wards will be presented. A preliminary search revealed 144 papers. Following duplicate removal, 130 papers underwent screening by title and abstract. None of these 130 papers met all the review inclusion criteria; thus, there were no relevant studies specifically examining handover of vital

signs in a nursing context during the transition of care from ED to ward.

After a comparison of keywords, the search term *nurs** was removed from further searches to enable a broader inclusion of studies that examined handover between ED and the wards without requiring the mention of *nurs** in the text. Five papers were identified for final analysis. The results of the final search, with the removal of *nurs**, and the papers included for final synthesis are shown in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) diagram in Figure 1.

A summary of the five studies included in the final review (Bakon & Millichamp, 2017; Gonzalo et al., 2014; Horwitz et al., 2009; Kessler et al., 2014; Smith et al., 2015) is presented in Table 3. Four studies were specific to medicine with participants in three of these studies including both emergency medicine and internal medicine doctors (Horwitz et al., 2009; Kessler et al., 2014; Smith et al., 2015), and the fourth study included only internal medicine doctors who admitted patients from the ED (Gonzalo et al., 2014). All four medical studies were conducted in the United States. One study was conducted in Australia and was specific to nursing handover from ED to the ward (Bakon & Millichamp, 2017). This fifth paper (Bakon & Millichamp, 2017) was not identified using the search strategies

Quality assessment question	Smith et al.	Gonzalo et al.	Horwitz et al.	Kessler et al.	Bakon & Millichamp
1. Did the study address a clearly focused question/issue?	√	√	√	√	√
2. Is the research method (study design) appropriate for answering the research question?	√	√	√	√	√
3. Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described?	√	√	√	√	√
4. Could the way the sample was obtained introduce (selection) bias?	√	√	√	√	√
5. Was the sample of subjects representative with regard to the population to which the findings will be referred?	√	√	√	√	Not reported
6. Was the sample size based on pre-study considerations of statistical power?	X	X	X	X	X
7. Was a satisfactory response rate achieved?	√	√	√	√	Not reported
8. Are the measurements (questionnaires) likely to be valid and reliable?	X	X	X	X	X
9. Was the statistical significance assessed?	√	√	X	X	X
10. Are confidence intervals given for the main results?	X	X	X	X	X
11. Could there be confounding factors that haven't been accounted for?	√	√	√	√	√
12. Can the results be applied to your organization?	√	X	√	X	X

TABLE 2 Quality assessment of included studies

Note.. X = No, √ = Yes.

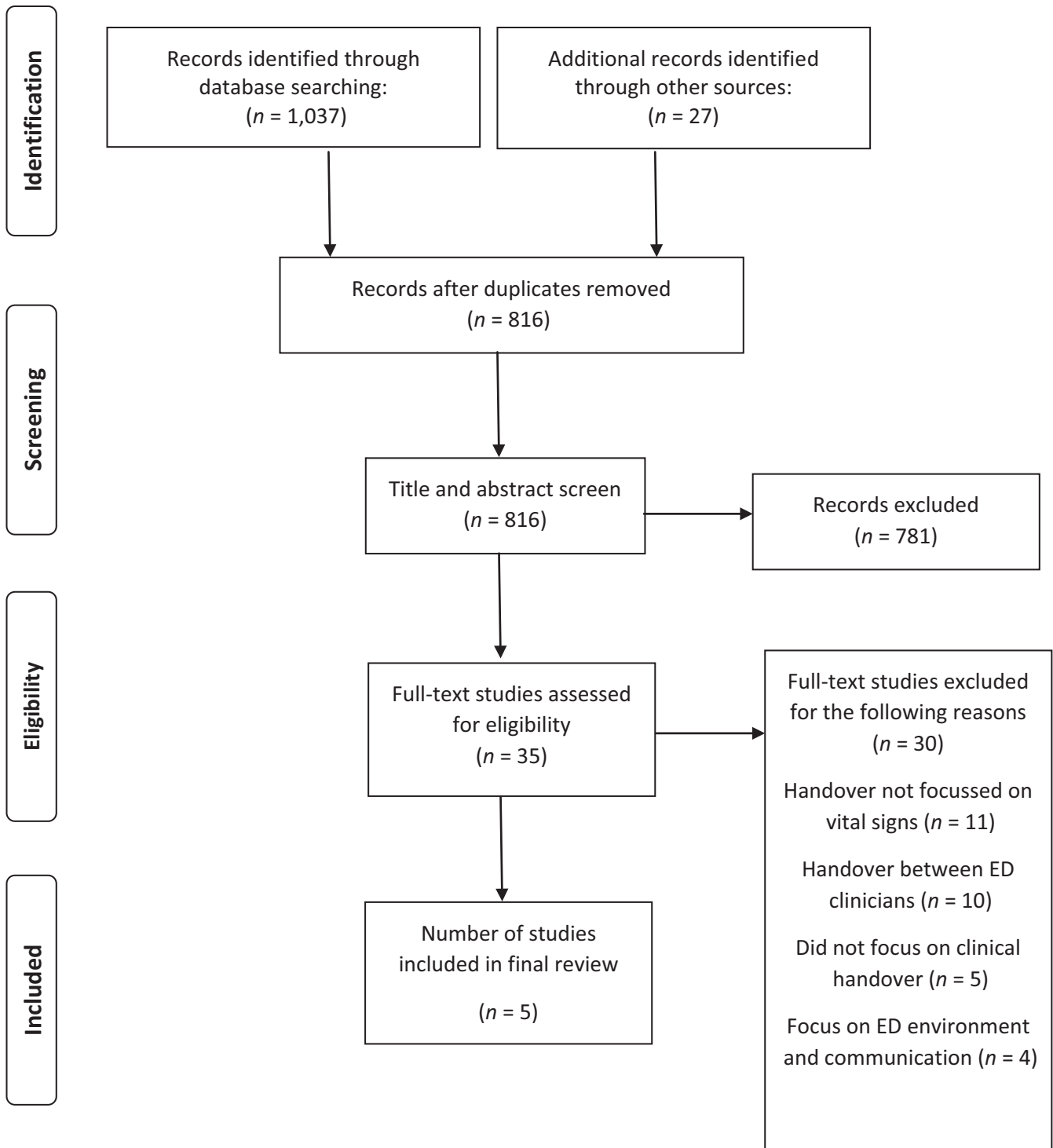


FIGURE 1 PRISMA diagram identifying literature search method

detailed above; however, the study was identified via a conference presentation which then prompted the researchers to source the published paper. This paper was not identified in the original search due to the specificity of search terms chosen (ED, ward, handover, transition of care, vital signs).

Three studies (Gonzalo et al., 2014; Horwitz et al., 2009; Smith et al., 2015) used quantitative cross-sectional survey research designs with the addition of open-ended questions, with one study

surveying participants pre and post a handover tool intervention (Gonzalo et al., 2014). Focus groups were also used by Kessler et al. (2014) to triangulate survey data. A mixed method design using survey development and focus groups was used by Bakon and Millichamp (2017). All studies used convenience sampling. Four studies were conducted in a single site (Bakon & Millichamp, 2017; Gonzalo et al., 2014; Horwitz et al., 2009; Smith et al., 2015); the multisite study was conducted across 10 institutions (Kessler et al.,

TABLE 3 Summary of selected studies for analysis

First author, Year, Country	Aim	Design, Method	Setting, Sample size, Participants	Results	Limitations
Horwitz et al. (2009), United States	To identify, describe and categorise vulnerabilities in ED to internal medicine patient transfers	Cross-sectional survey design using Likert scale and open-ended questions	944 bed urban academic medical centre, Convenience sampling: 139/264 (53%) responses: -Emergency medicine (39/60, 65%) -Hospitalists (21/37, 57%) -Internal medicine (79/167, 47%)	Access to and communication of vital signs were categorised as a vulnerable component for adverse events and near misses following ED-in patient ward transfer 40/139 (29%) participants reported a near miss/adverse event in the ED ward transfer; 40 respondents discussed 36 specific incidents relating to diagnosis ($n = 13$) treatment ($n = 14$) and disposition ($n = 13$); Of the 36 incidents failure to communicate the most recent set of vital signs was the most commonly described reason causing transfer-related problems (cited in 10 of 36 incidents, 28%); The use of an electronic platform for documentation of vital signs caused out of date or inaccurate vital signs being handed over and was perceived to be major contributors to incorrect assessment(s) of the patients' clinical condition	Respondents' self-reported adverse events using recall. Overall incidence of events was not observed or counted This is a single site study and results may not be generalisable Convenience sample design was used
Gonzalo et al. (2014), United States of America	To evaluate the impact of an electronic (eSignout) handoff tool for emergency department to internal medicine ward patient transfers and on adverse events and near misses	Pre- and postcross-sectional survey design using open-ended questions; Prospective embedded mixed-methods sequential explanatory design conducted pre- and posthandoff tool implementation	University-based tertiary care hospital, Convenience sampling, Pre: 78/80 (98%) responses: Post: 1,058/1,388 (756%) responses: -Ward-based admitting medicine residents	Pre- and postimplementation, there was no statistical difference in the perceived incidence of near miss/adverse events (10.3% vs. 7.8%, $p = 0.27$) 82 (7.8%) respondents provided descriptions of 61 separate events that caused a near miss/adverse event. Perceived contributing factors were as follows: 1. Insufficient information in vital signs data on arrival to the ED and upon transfer to the ward ($n = 54$, 61%) 2. Insufficient information relating to trigger criteria at the time of transfer ($n = 43$, 49%)	Data collection periods for pre- and postdata differed (20 days prior vs. 365 days (1 year) after) Vital signs as contributing factors for error were perceived and self-reported from participants. Accuracy of the incidence was not collected Findings of the study were from one site and may not be transferable to other settings Convenience sample design was used Participants sampled only included ward-based admitting residents, perceptions of ED staff were not included

(Continues)

TABLE 3 (Continued)

First author, Year, Country	Aim	Design, Method	Setting, Sample size, Participants	Results	Limitations
Kessler et al. (2014), United States of America	To describe the current ED-inpatient handoffs and assess best practice between ED physicians and admitting physicians	Multiple method design using: 1. Cross-sectional survey using Likert scales 2. Focus group to triangulate themes identified in survey	Multisite: 10 institutions, Convenience sampling, 760/1,799 (42%) responses: -Emergency medicine (175/343, 51%) -Internal medicine (192/343, 56%) -Dual ^a (combined roles) (406/759, 55%)	Vital signs' content was considered an important content item for ED ward handovers: 1. 90% agreed that current vital signs were important/very important 2. 80% agreed that initial vital signs were important/very important to include	The focus group did not analyse vital sign inclusion or importance; its focus instead was for structure of the sign out process Perception of importance of vital sign inclusion was via 2 self-reporting Likert scale items Convenience sample design was used
Smith et al. (2015), United States of America	To describe perceptions of the ED ward admission handoff process	Cross-sectional survey examining six domains via a Likert scale and the addition of one open-ended question related to adverse events/near misses	627 bed tertiary care academic medical centre, Convenience sampling, 126/187 (67%) responses: -Emergency medicine (32/37, 86%) -Internal medicine (5 inpatient services) (94/150, 63%)	34% (n = 30) of Internal medicine doctors and 19% of emergency medicine doctors reported that a patient had been harmed or suffered a near miss in the past 3/12 due to an ineffective handoff Large discrepancies existed for how often physical exam findings (including abnormal vital signs) were included in the handoff: Internal medicine vs. ED respectively <ul style="list-style-type: none"> • Rarely (3.2% vs. 0%); • Sometimes (27.1% vs. 15.6%); • Often (44.5% vs. 6.2%); • Very often (22.8% vs. 46.8%); • Always (2.1% vs. 31.2%) 	Inclusion of vital sign data in the handoff process was only specific for abnormal vital signs This study was conducted in one medical centre. There may be a lack of generalisability of findings Convenience sample design was used
Bakon and Millichamp (2017), Australia	Improve the handover consistency, by developing and evaluating a structured handover form for use in handover from the ED to the ward	Mixed-methods design: -Focus groups and stakeholder consultation for form development -Cross-sectional survey using quantitative and qualitative questions -Audit data	One regional emergency department, Convenience sampling, -Survey: 28 responses from 6 hospital areas (ED and 5 ward areas) -Audit data: 626 patients	The structured form was perceived to provide a clear depiction of the patients' current clinical condition (60%) Audit data revealed current patient observations were completed in 53.6% of occasions (n = 324)	How patients were selected for audit or audit duration was not reported. Available sample size for the cross-sectional study not reported This was single site study. Findings may not be transferable to other settings Convenience sample design used

Notes. ED, emergency department.

^aParticipants could choose more than one answer (i.e., currently working a dual role; Internal Medicine and Emergency Medicine).

2014). As shown in Table 3, the sample sizes reported were 1,136 (Gonzalo et al., 2014), 760 (Kessler et al., 2014), 139 (Horwitz et al., 2009), 126 (Smith et al., 2015) and 28 (Bakon & Millichamp, 2017). Collectively, all five papers provided a limited understanding into the phenomenon of handover of vital signs in the transition of care from ED to ward settings.

The ways in which vital signs were featured during handover from ED to inpatient wards will be described in the sections to follow. First, clinician perceptions of the value and frequency of including vital signs in handover are provided, both from the provider and receiver perspectives. Second, participant perceptions of the impact of neglecting to handover all vital signs due to system and human error, omission or inaccuracy are reported. Finally, participant perceptions of environmental factors present during handover and the potential impact of such will conclude the results section.

Participants reported that it was important to include vital signs in ED to ward handovers. Handing over both initial and current vital signs in the ED (80% vs. 90% respectively) was considered to be *important/very important* by both internal medicine and ED doctors (Kessler et al., 2014). As data for ED and internal medicine respondents were aggregated in study findings, and comparative data were not presented, whether ED or internal medicine doctors perceived the importance of vital signs differently remains unknown. Despite considering vital sign inclusion very important, the frequency with which vital signs were included in handover (Gonzalo et al., 2014; Smith et al., 2015) was perceived quite differently between ED and internal medicine doctors. Emergency doctors reported that they *always* (31.2%) or *very often* (46.8%) provided information about abnormal vital signs during clinical handover. By contrast, internal medicine doctors reported that abnormal vital signs were *often* (44.5%) or *only sometimes* (27.1%) included by ED doctors in clinical handover ($p < 0.05$) (Smith et al., 2015). Thus, what was remembered to be said by ED doctors and what was heard by the inpatient unit doctors differed significantly.

Both human and system factors were considered by participants to impact on the accurate handover of vital signs. Omitted, inaccurate and or insufficient vital sign data provided by ED doctors during handover from ED to wards were considered a contributing factor to adverse events (Gonzalo et al., 2014) which, in turn, could threaten patient safety. During the ED to ward medical handover, internal medicine doctors were only *usually* aware of patient's vital signs recorded on arrival to the ED and upon transfer to the ward (Gonzalo et al., 2014). Receiving full sets of vital signs can provide an indication of the trajectory of a patient's condition and responsiveness to various treatments provided during their ED care. Insufficient information about patient vital signs on arrival to the ED and upon transfer to the ward was considered contributing factors in 61% ($n = 54$) of occasions when adverse events, including near misses, occurred (Gonzalo et al., 2014). In almost half ($n = 43$, 49%) of occasions involving an adverse event subsequent to a patient care transition, insufficient information specifically relating to vital sign trigger criteria to call for medical assistance at the time of the transition was reported as a contributing factor (Gonzalo et al., 2014).

Clinicians not being able to view electronic vital sign data were perceived to contribute to problems with out of date or inaccurate vital signs. Both ED and internal medicine doctors reported that lack of access to vital sign data led to transfer-related issues and incorrect assessments of patients' clinical conditions (Horwitz et al., 2009). Differences in the perceived incidence of adverse events following ED to ward transition varied according to medical disciplines. That is, 13.5% of ED doctors, 38.1% of hospitalists and 38.6% of internal medicine house staff perceived that following an ED to ward transfer an adverse event occurred (Horwitz et al., 2009). Of participants who reported that an adverse event occurred following patient transfer from the ED to the ward, failure to communicate the most recent set of vital signs recorded in the ED prior to ward transfer was the most commonly described contributing factor (cited in 10 of 36 incidents, 28%) (Horwitz et al., 2009).

The use of handover tools was variable. Medical participants in one study reported using a handover tool on only 18% of occasions despite having tools available to use (Kessler et al., 2014). By contrast, nurses used a structured handover tool in 97% of handovers (Bakon & Millichamp, 2017). Despite handover tool compliance, documentation of vital signs was completed in only 53.6% of handovers (Bakon & Millichamp, 2017). These results suggest system and human factors contribute to handovers with incomplete vital sign inclusion.

Environmental factors that contributed to communication breakdowns during handover were described by participants in three of the research papers. Although these findings were not specific to vital sign inclusion, any communication breakdown can impact any aspect of the handover. Over half of ED and internal medicine doctors reported they were distracted during handovers by competing clinical duties more than 50% of the time; and for ED doctors, noise was reported as the largest distractor ($p = 0.001$) (Smith et al., 2015). The busyness of the ED was also perceived to cause rushed handovers which impacted on the ability to clarify information (Horwitz et al., 2009). Dedicated time for handover was also perceived to influence quality of the handover. Having dedicated time to perform handover was thought to be *important/very important* by most (77%) participants (Kessler et al., 2014). Time also enabled clarification of information, answering/responding to questioning and re-evaluation of treatment (Horwitz et al., 2009); thus, all these processes could be omitted if insufficient time was available. Although not empirically studied, an inability to provide an effective handover was reported by 34% of study respondents as a contributing factor for patient harm and or suffering a near miss (Smith et al., 2015). Combined, these results suggest we have little limited understanding of the role and perceived value of vital signs in ED to ward handover, and the impact of system and human factors on handover processes, particularly in relation to vital signs and patient safety.

6 | DISCUSSION

This integrative review identified five studies that examined handover of vital signs in the transition of care from ED to inpatient

wards. One study examined the introduction of a structured tool for ED to ward handover, and four were specific for the handover process between the ED and wards for emergency and internal medicine doctors. The lack of nursing literature for this important area of practice is surprising given that vital sign measurement, assessment and interpretation and escalation of care when required are primarily the responsibility of nurses. Indeed, Gonzalo et al. (2014) and Horwitz et al. (2009) acknowledged a limitation of their studies was the omission of nurses as participants.

In this study, communication of vital signs during ED to ward handover was perceived to be crucial for patient safety and to minimise risk. Although empirical data substantiating the incidence of adverse events and near misses reported by study respondents were not described in the review papers, the frequency of omitted, inaccurate and or insufficient vital sign handover within ED shift change is supported by other literature. In an Australian observational study of ED to ED medical handovers, 15.4% of these handovers were perceived as lacking information (Ye, Taylor, Knott, Dent, & MacBean, 2007) with insufficient detail in the clinical handover, specific for patient management, investigation and discharge information, resulting in adverse events that included repetition of patient assessment, time delays, delay for inpatient transfers and confusion regarding patient care needs. Over half of the participants (60%) also provided qualitative comments stating that inaccurate or incomplete information was inherent in ED to ED handovers (Ye et al., 2007). Omission of vital sign abnormalities has also been reported in ED medical handover literature. Venkatesh, Curley, Chang, and Liu (2015) in an observational study of emergency physician handovers during shift changes within the ED observed that 1 in 17 episodes of hypotension (SBP < 90 mmHg) and 1 in 10 episodes of hypoxia (SpO₂ < 92%) were omitted from the handover (Venkatesh et al. (2015). It is unknown, however, if any adverse events occurred due to the omission of vital sign data in handover.

The communication and interpretation of vital sign data by nurses at the transition of patient care between the ED and the wards remain unknown despite there being emerging evidence that abnormal vital signs in the ED are predictive of clinical deterioration in the early stages of hospital admission (Considine et al., 2014; Mora et al., 2015; Walston et al., 2016). Tachypnoea or hypotension in the ED is associated with increased hospital mortality, unplanned intensive care (ICU) admissions, longer hospital length of stay and RRT activations in the first 72 hr following hospital admission (Considine, Jones, Pilcher, & Currey, 2016b). It is reported that 73% of all unplanned intensive care admissions occur in patients following an ED admission to a general ward (Tam, Frost, Hillman, & Salamonsen, 2008). Features associated with unplanned intensive care admission in the first 24–48 hr of hospital admission in patients admitted to wards via the ED are tachypnoea (>24 breaths/minute) (Farley et al., 2010) and hypoxaemia (<90%) (Kennedy et al., 2010). Intermittent unsustained episodes of hypotension (systolic blood pressure <100 mmHg) in the ED have also been associated with an increased risk of in-hospital mortality (8% vs. 3%, $p = 0.05$) in non-surgical patients admitted from the ED (Jones et al., 2006). Vital sign data are an

indicator of a patients' physiological stability and can be used to inform clinical decision-making for patient care (Churpek, Adhikari, & Edelson, 2015). The inclusion of vital sign data in nursing handover is therefore important for patient safety and ongoing continuity of patient care.

In this review, although not empirically studied, vital sign data were perceived to be an important and frequently used component of clinical handover within ED to ward transitions. The inclusion of vital signs in handover as an integral part of ED shift change is also perceived by ED nurses to be important. In a UK study examining priorities for handover inclusion between ED nurses at shift change, the inclusion of patient vital signs was ranked 7th of 12 most important content items and perceived important by 87% of nurse respondents (Currie, 2002). In an Australian study exploring ED nurse perceptions of current handover in the ED, nurses ranked vital signs as the 5th most important aspect of patient care that should be handed over at shift change in the ED (Klim, Kelly, Kerr, Wood, & McCann, 2013). The four top priorities for inclusion, over vital sign data, were patient details, presenting problem, the plan of care and treatment given (Klim et al., 2013). Although vital sign data inclusion is advocated by ED nurses, the role and perceived value of vital sign data during handover to ward nurses remains unknown.

Results showed system factors impacted handover of vital signs, but that human factors were also influential both individually and in combination with system factors. Although the one nursing study identified in this review did not examine communication of vital signs in the handover process, audit data revealed that despite a 97% compliance following the introduction of a structured handover tool, in only half of occasions vital sign data were documented (Bakon & Millichamp, 2017). This is despite nursing handover tools and mnemonics being developed to include vital signs. There are multiple tools used by nurses in ward settings such as: PACE (patient/problem, assessment/actions, continuing/changes, evaluation) (Schroeder, 2006), ISOBAR (identification of patient, situation and status, observations of patient and call to MET, background and history, action/agreed plan/accountability, responsibility and risk management) (Yee, Wong, & Turner, 2009), iSOBAR (identify, situation, observations, background, agreed plan, read back) (Porteous, Stewart-Wynne, Connolly, & Crommelin, 2009), ISBAR (identify of patient, situation, background, assessment and action, response and rationale) (Thompson et al., 2011) and SBAR (situation, background, assessment, recommendation) (Haig, Sutton, & Whittington, 2006). Specific for the ED context, three handover tools using mnemonics exist; all of which advocate vital sign inclusion: ISBAN PLAN CHECK ACT (introduction, situation/problem, background, assessment and progress, nursing needs, Plan, Check, Act) (Kerr, Klim, Kelly, & McCann, 2016), P-Vital (present, vital signs, input and output, treatment and diagnosis, admission or discharge, legal issues) (Wilson, 2011) and SBART (situation, background, assessment, recommendation, thank you) (Baker, 2010). Clearly, for these handover tools to be effective and inclusive of full and accurate vital sign data, human factors must be considered and behavioural change management addressed for their desired outcomes to be achieved.

A limitation of the current handover tools and mnemonics is that they are not specific for ED to ward handover. These types of handovers are unique as they involve multiple providers within a changing environment. In this review, participants revealed that the complexity of the ED environment such as time pressure and distractions contributed to ward communication breakdowns during handover. Understanding the context in which handover occurs is important, and future safety initiatives for tool and mnemonic design and implementation for ED to ward handovers must examine environmental factors.

The findings from this review suggest that communication of vital signs is an important inclusion in clinical handover, and discrepancies in vital sign data may be predictive of adverse events. These studies included self-reports from ED and internal medicine medical staff, and only one published study included nurses despite the measurement of vital signs being a widely accepted key nursing responsibility. Currently, it is not known whether vital signs are perceived to be important and or to what extent they are included in nursing handover between ED and the wards. Inclusion of, and detail about, vital sign information in clinical handover may be important for accurate decision-making. Communication of patient vital signs may inform nursing clinical decision-making for ongoing continuity of patient care and risk stratification. To inform processes for handover, including handover tools, and strategies to optimise patient safety in this important care transition, a better understanding of the role and perceived value of vital sign data in nursing clinical handover and its influence upon nursing care delivery and outcomes is needed.

7 | LIMITATIONS

This review was specifically focused on nursing handover of vital signs in the transition of care from the ED to the inpatient wards. The desired specific focus on vital signs may have excluded papers that had a broader focus on clinical handover or processes of handover for patients transitioning from the ED to wards, thus rendering so few papers for inclusion. Research findings arising from data collection methods of the included papers were focused on qualitative descriptions of self-reporting items by participants; none explored outcomes as a consequence of handover practices. As a result of the low quality of study designs used in published included studies, no substantial empirical findings could be reported to substantiate relationships between handover of vital signs and the incidence of adverse events. Thus, for this review, there are no rigorous randomised controlled trials or cohort studies conducted, and subsequently no systematic reviews or meta-analyses published for inclusion.

8 | CONCLUSIONS

Clinical handover is a frequent occurrence, and nurses have a major role in the measurement and interpretation of vital signs and escalation of care when required. In this review, vital signs were

considered an important inclusion in handover and inaccurate or missing vital sign data during ED to ward handover was perceived to be a threat to patient safety. Handover was also influenced by the environmental context in which it occurred. Despite the inclusion of one nursing study in this review, the role and perceived value of vital sign inclusion in ED to ward nursing handover remains unknown. Future research is required to examine communication of vital signs on ED discharge particularly by nurses, given their critical role in clinical handover during patient care transitions. As current research suggests vital sign abnormalities in the ED may be predictive of adverse events following hospital admission, the inclusion of full and accurate vital sign data during the ED to ward nursing handover is pivotal to patient safety.

9 | RELEVANCE TO CLINICAL PRACTICE

Communication failures are a leading cause of adverse events and patient harm. Patient transitions from the ED to inpatient wards require complete and accurate communication of patient information through clinical handover to ensure continuity of care and future care planning. Vital signs are representative of a patient's physiological status; thus, their inclusion in clinical handover is essential for patient safety. An understanding of the system and human factors impacting nursing handover of vital signs by ED to ward nurses requires further research given the potential predictive value of vital signs for patient safety. It is likely that complete vital sign data related to a patient's ED stay are required for planning care and should be included in all forms of handover to ward clinicians to prevent adverse events and improve patient safety.

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