

Systematic Review

Clinical handover and handoff in healthcare: a systematic review of systematic reviews

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Abstract

Purpose: The purpose of this systematic review is to appraise and summarize existing literature on clinical handover.

Data sources: We searched EMBASE, MEDLINE, Database of Abstracts of Reviews of Effects and Cochrane Database of Systematic Reviews.

Study selection: Included articles were reviewed independently by the review team.

Data extraction: The review team extracted data under the following headers: author(s), year of publication, journal, scope, search strategy, number of studies included, type of studies included, study quality assessment, used definition of handover, healthcare setting, outcomes measured, findings and finally some comments or remarks.

Results of data synthesis: First, research indicates that poor handover is associated with multiple potential hazards such as lack of availability of required equipment for patients, information omissions, diagnosis errors, treatment errors, disposition errors and treatment delays. Second, our systematic review indicates that no single tool arises as best for any particular specialty or use to evaluate the handover process. Third, there is little evidence delineating what constitutes best handoff practices. Most efforts facilitated the coordination of care and communication between healthcare professionals using electronic tools or a standardized form. Fourth, our review indicates that the principal teaching methods are role-playing and simulation, which may result in better knowledge transfer to the work environment, better health and patients' well-being.

Conclusions: This review emphasizes the importance of staff education (including simulation-based and team training), non-technical skills and the implementation process of clinical handover in healthcare settings.

Key words: patient handoff, communication, review

Introduction

In recent years, patient safety has picked up momentum. Within the field of patient safety research, there is a focus on the incidence of adverse events. Patient harm is not only estimated to be the 14th

leading cause of the global disease burden, but it is also associated with negative repercussions for healthcare professionals and increasing healthcare costs for the hospital and society [1]. Handover is a process central to the delivery of high-quality and safe care. It

is defined as ‘the transfer of professional responsibility and liability for some or all aspects of care for a patient or patient group, to another person or a professional group on a temporary or permanent basis’ [2]. The transfer of essential information from one healthcare provider to another is an integral component of healthcare [3].

Handover has been recognized internationally as a high-risk area for patient safety, and the call for interventions to improve the handover process has increased. For example, patient handover is one of the World Health Organization’s top five priorities [4], and it is furthermore included as a patient safety parameter by the Joint Commission on Accreditation of Healthcare [5] and the Australian Medical Association [2]. Consequently, several interventions to improve the handover process have been launched. These interventions usually target process standardization (e.g. SBAR, P-VITAL, SURPASS and SHARED), training or education, changes to the physical environment and technology [6].

The importance of patient handover becomes evident from the number of preventable incidents and adverse events resulting from poor communication between healthcare professionals [7, 8]. Moreover, suboptimal handover quality is a persisting deficit in safety culture evaluations [9, 10]. Several factors contribute to ineffective handover, including an increase in workload [11], lack of policies and standard protocols [12], team awareness [13], communication breakdowns [14], lack of training [15], infrastructure [13], attitude and organizational culture [16].

Despite the importance of the handover process and the clear need for improvement, the availability of effective interventions is limited [17, 18]. This systematic review aims to appraise and summarize existing literature on this topic and give a comprehensive, thorough and objective picture of ‘clinical handover’.

Methods

We performed a systematic review of systematic reviews on clinical handover in healthcare settings. We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines to identify, screen, select and include papers [19]. We also carefully read Smith *et al.*’s (2011) article on methods in conducting a systematic review of systematic reviews of healthcare interventions [20].

Search strategy

We searched EMBASE, MEDLINE, Cochrane Database of Systematic Reviews and the Database of Abstracts of Reviews of Effects, using a search strategy (see Appendix A). The search strategy was initially created for MEDLINE (see Appendix A) and subsequently adapted for the other databases. No review protocol exists. We decided on the eligibility criteria a priori. We only included systematic literature reviews regarding the handover process. We considered studies of handover in all healthcare settings. There were no restrictions based on publication date or language. We only included articles with English abstracts.

Study selection

The identified studies in the searches were de-duplicated. The first author (M.D.) reviewed the abstracts for compliance with the eligibility criteria and their relevance for inclusion. In consultation with a third reviewer, the review team (M.D. and D.U.) independently reviewed the resulting full-text articles. The review team included one person with methodological experience and one person with expertise on the topic. If there were differences in opinion about eligibility, these were resolved by mutual agreement, and if this was

not reached, an external opinion was sought (J.B.). We also conducted a manual search of the reference lists of reviews captured by the initial inquiry to minimize the risk of missing relevant reviews.

Data extraction

We extracted data out of the included articles using a predefined form in Microsoft Excel under the following headers: author(s), year of publication, journal, scope of review, search strategy, number of studies included, type of studies included, study quality assessment, used definition of handover, healthcare setting/context, outcomes measured, findings and finally some comments or remarks. To conceptualize and evaluate the success of the various implementation strategies to improve handover, we used the model of Proctor *et al.* (2011) to categorize the type of outcomes by implementation (e.g. acceptability), service (e.g. effectiveness) or client (e.g. satisfaction) outcomes [21]. The second author (D.U.) then cross-checked and confirmed all abstracted data after an independent review. In case of disagreement, we reached a consensus through discussion. We descriptively analysed all data extracted from the reviews. We could not conduct a meta-analysis due to the heterogeneity of the reviews and their included studies.

Quality assessment

Two reviewers (M.D. and D.U.) independently assessed the quality of included reviews using the (Assessing the Methodological Quality of Systematic Reviews (AMSTAR 2) Checklist.

Results

We retained 168 potentially relevant articles. After a critical assessment of title and abstract, we selected 22 papers for full-text evaluation, of which 6 were excluded. A hand search of the reference lists resulted in the addition of three publications. Finally, we considered 19 papers for further analysis [22–40]. See PRISMA flow chart (Figure 1) for a detailed overview of the study selection. The majority of excluded studies were narrative reviews or had no relevance to this systematic review’s scope (see Table 1).

Quality assessment

Table 2 represents the results of the critical appraisal using the AMSTAR 2 tool. The high risk of bias rating was due to no adequate investigation of publication bias [17, 22, 24–30, 32–39, 41], no satisfactory technique for assessing the risk of bias in individual studies [17, 22, 24–30, 32–39, 41], no list of excluded studies and justification of exclusion [17, 22, 24–30, 32–39, 41], no explanation for the selection of the study designs [17, 22, 24–30, 32, 34–38, 41] and, finally, no protocol establishing the review method prior to the conduct [17, 22, 24–30, 33, 34, 37–39, 41]. All reviews indicated a relatively poor methodological quality of their included studies.

Review characteristics

We present the review characteristics in Table 3. The reviews were published between 2009 [25] and 2018 [30, 34]. The total number of studies included in the reviews ranged from 10 [25, 29] to 95 [39]. One review did not include any studies [31]. Most reviews included various study designs such as pre-/post-test interventions [17, 25, 27, 29, 30, 32, 34–37], Randomized controlled trials RCTs [17, 25, 30, 32, 34–37] and cross-sectional designs [17, 33, 39]. Only one review included only RCTs [41].

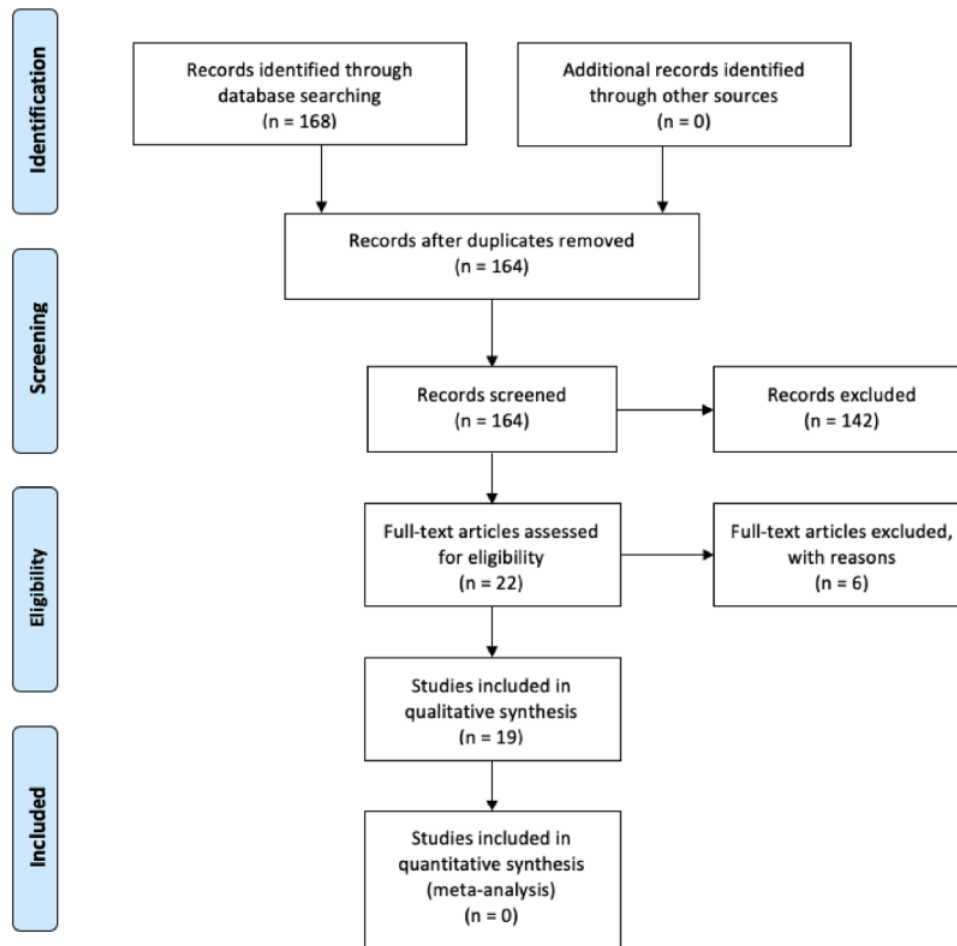


Figure 1 PRISMA flow chart.

We included various healthcare settings: primary care and/or the interface with secondary care [34, 38, 39, 41] and hospital-based care [17, 25–37, 39], including postoperative handovers [28, 33], surgical handovers [27], handover between clinical departments [37], handover between paramedics and the emergency department [17], and handover between the intensive care unit and general wards [32]. Only one review included a variety of healthcare environments [39]. Four studies focused on trainees to evaluate specific educational interventions targeting the handover process [22, 24, 29, 30].

The reviews included various outcomes (see Table 4), which we organized—according to the model of Proctor *et al.* (2011)—in implementation, service and patient outcomes [21]. Two articles included implementation outcomes and, more specifically, the perception among stakeholders that a given intervention is satisfactory [26, 39]. Several patient outcomes were also measured: satisfaction, empowerment, adverse events, length of stay, unplanned readmissions and mortality [17, 25–32, 34, 35, 39, 41]. However, most outcomes referred to the service level of the improvement interventions (e.g. information transfer, technical errors, teamwork, handover duration, hospital use and continuity of care).

Characteristics of handover and potential hazards

The most commonly used definition of ‘clinical handover’ was the one of the British Medical Association (2004): ‘the transfer of professional responsibility and accountability for some or all aspects of care for a patient, or group of patients, to another person or professional group on a temporary or permanent basis’ [2].

Lack of active listening, lack of attention or divided attention of the receiving healthcare professional(s), workload and lack of time were the leading causes of poor handover [38]. Handover effectiveness was associated with the availability of appropriate personnel to receive the handover and a positive relation between healthcare professionals [38]. Most frequently cited barriers to effective handovers were communication barriers, problems associated with standardization, environmental issues, equipment issues, a lack or misuse of time, lack of training or education, human factors and difficulties related to the complexity of cases or high caseloads [39].

Poor handover is associated with multiple potential hazards such as lack of availability required equipment for patients, information omissions, diagnosis errors, treatment errors, disposition errors, treatment delays, delays in pending tests and diagnostic results, and failure to verify that the correct patient was transported [26].

Table 1 Article characteristics

Author(s)	Year	Title	Reason	Phase
Bost <i>et al.</i>	2010	Clinical handover of patients arriving by ambulance to the emergency department—a literature review	No systematic review	Abstract review
Jensen <i>et al.</i>	2013	Handover of patients: a topical review of ambulance crew to emergency department handover	No systematic review	Abstract review
Anderson <i>et al.</i>	2014	Nursing bedside clinical handover—an integrated review of issues and tools	No systematic review	Abstract review
Manser and Foster	2011	Effective handover communication: an overview of research and improvement efforts	No systematic review	Abstract review
Bakon <i>et al.</i>	2016	Nursing handovers: an integrative review of the different models and processes available	No systematic review	Abstract review
Bressan <i>et al.</i>	2019	Patient's experiences of bedside handover: findings from a meta-synthesis	Patient's experiences bedside shift-to-shift	Abstract review
Tobiano <i>et al.</i>	2018	Patient participation in nursing bedside handover: a systematic mixed methods review	Patients' experiences bedside shift-to-shift	Abstract review
Flynn <i>et al.</i>	2017	A review of enhanced paramedic roles during and after hospital handover of stroke, myocardial infarction and trauma patients	Paramedic's role in the handover process	Abstract review
Wong <i>et al.</i>	2008	A structured evidence-based literature review regarding the effectiveness of improvement interventions in clinical handover	No systematic review	Abstract review
Flemming and Hübner	2013	How to improve change of shift handovers and collaborative grounding and what role does the electronic patient record system play? Results of a systematic review	Focus on electronic patient records	Full-text review
Lockwood, C.	2016	What is the best nursing handover style to ensure continuity of information for hospital patients?	Summary of Smeulers <i>et al.</i> (2014) [31]	Full-text review
Mardis <i>et al.</i>	2016	Bedside shift-to-shift sandoffs: a systematic review of the literature	No full-text available	Full-text review
Poletick and Holly	2010	A systematic review of nurses' inter-shift handoff reports in acute care hospitals	No full-text available	Full-text review
Riesenberg <i>et al.</i>	2009	Systematic review of handoff mnemonics literature	See Riesenberg <i>et al.</i> (2010) [39]	Full-text review
Riesenberg <i>et al.</i>	2009	Residents' and attending physicians handoffs: a systematic review of the literature	See Riesenberg <i>et al.</i> (2010) [39]	Full-text review

Feedback or assessment tools

Research indicated that feedback or assessment improves the content or organization measures of handover, while process and professionalism measures are less reliably improved [36]. The most commonly described method to provide feedback on the handover process was the one-on-one approach, often accompanied by significant reductions in medical errors and better documentation of diagnostic tests/results [36].

All existing evaluation tools on handover quality were used in an inpatient setting [36, 37] and mainly focused on information transfer. Some also assessed clinical task performance, non-technical skills and nursing satisfaction with handover quality [33]. Most tools were observational, and the extent to which their validity and reliability have been evaluated was variable [33]. No single tool arises as best for any particular specialty or use, but the Handoff CEX—or tools based on it—was the most widely studied tool [36]. The most frequently used handover activity-related outcome measures were information gaps, handover duration, number of patients handed off, interruptions, care quality, frequency of tool use, handoff efficiency, user satisfaction metrics and length of shift-report [37].

Interventions to improve handover

If possible, we detailed the effects of interventions in Table 5 by linking specific improvement strategies to specific results. Often-cited strategies to improve the handover process were liaison nurses

[26, 32], standardization strategies [17, 25–27, 32, 34, 35, 38, 39], technological solutions [27, 35, 41], training and education [35] and staff involvement [41]. Improvements in information transfer were the most commonly reported successes, being found in more than half of the studies. Staff satisfaction was the next most commonly improved [35]. Additionally, interventions such as handover protocols, checklists and team training improved metrics of effectiveness (i.e. decreased technical errors and information omissions), efficiency (i.e. reduced handover duration, or time to complete specific tasks) and perceived teamwork [33].

Mnemonics—an alphabetical listing technique that aids information retention—were mostly used to standardize the handover process [28]. In a review of handover mnemonics, 14 different mnemonics were identified, of which SBAR was most frequently described [39]. In general, the use of standardized written reports resulted in greater accuracy and consistency of information transfer, increased necessary elements communicated during handover, decreased numbers of dropped tasks, saved nursing time, increased healthcare professionals' and patients' satisfaction, improved teamwork and nursing knowledge and increased patient empowerment [17, 25–28, 32, 38, 39]. Although Müller *et al.* (2018) concluded some evidence of the effectiveness of SBAR implementation on patient outcomes, this evidence is limited to specific circumstances such as communication over the phone. Only half of the studies found significant improvements in eight patient outcomes: international normalized ratio values, critical incident reporting system

Table 2 Results on the critical appraisal of the included reviews using AMSTAR 2

	Paper																			
	Wood <i>et al.</i> (2015)	Abraham <i>et al.</i> (2014)	Davis <i>et al.</i> (2017)	Robertson <i>et al.</i> (2014)	Müller <i>et al.</i> (2018)	Segall <i>et al.</i> (2012)	van Sluiveld <i>et al.</i> (2015)	Smeulers <i>et al.</i> (2014)	Gordon & Findley (2011)	Gordon <i>et al.</i> (2018)	Möller <i>et al.</i> (2013)	Pucher <i>et al.</i> (2015)	Ong & Cotera (2011)	Arora <i>et al.</i> (2009)	Buchanan & Besdine (2011)	Riesenber <i>et al.</i> (2010)	Foster & Manser (2012)	Masterson <i>et al.</i> (2013)	Hesselink <i>et al.</i> (2012)	
Did the research questions and inclusion criteria for the review include the components of PICO?	No	No	No	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	No	No	Yes	Yes	Yes
Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?	No	No	Yes	Yes	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No
Did the review authors explain their selection of the study designs for inclusion in the review?	Partial yes	Partial yes	No	Partial yes	Partial yes	Partial yes	Partial yes	Partial yes	Partial yes	Partial yes	Partial yes	Partial yes	No	No	Yes	Partial yes	Partial yes	Partial yes	Partial yes	Partial yes
Did the review authors use a comprehensive literature search strategy?	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Did the review authors perform study selection in duplicate?	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes
Did the review authors perform data extraction in duplicate?	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes

Continued.

Table 2 (Continued)

	Paper																			
	Wood <i>et al.</i> (2015)	Abraham <i>et al.</i> (2014)	Davis <i>et al.</i> (2017)	Robertson <i>et al.</i> (2014)	Müller <i>et al.</i> (2018)	Segall <i>et al.</i> (2012)	van Sludiveld <i>et al.</i> (2015)	Smeulers <i>et al.</i> (2014)	Gordon & Findley (2011)	Gordon <i>et al.</i> (2018)	Möller <i>et al.</i> (2013)	Pucher <i>et al.</i> (2015)	Ong & Coiera (2011)	Arora <i>et al.</i> (2009)	Buchanan & Besdine (2011)	Riesenberg <i>et al.</i> (2010)	Foster & Manser (2012)	Masterson <i>et al.</i> (2013)	Hesselink <i>et al.</i> (2012)	
Did the review authors provide a list of excluded studies and justify the exclusions?	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No
Did the review authors describe the included studies in adequate detail?	No	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes
Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No
Did the review authors report on the sources of funding for the studies included in the review?	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	No	No	Yes
If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?	N/A																			

Continued.

Table 2 (Continued)

	Paper																		
	Wood <i>et al.</i> (2015)	Abraham <i>et al.</i> (2014)	Davis <i>et al.</i> (2017)	Robertson <i>et al.</i> (2014)	Müller <i>et al.</i> (2018)	Segall <i>et al.</i> (2012)	van Sluiveld <i>et al.</i> (2015)	Smeulers <i>et al.</i> (2014)	Gordon & Findley (2011)	Gordon <i>et al.</i> (2018)	Moller <i>et al.</i> (2013)	Pucher <i>et al.</i> (2015)	Ong & Coiera (2011)	Arora <i>et al.</i> (2009)	Buchanan & Besdine (2011)	Riesenber <i>et al.</i> (2010)	Foster & Manser (2012)	Masterson <i>et al.</i> (2013)	Hesselink <i>et al.</i> (2012)
If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes
Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No
If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	No	Yes	Yes	No	Yes
Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes

Table 3 Review characteristics

Author(s)	Year of publication	Journal	Scope of review	Search strategy	Number of studies included	Type of studies included	Study quality assessment	Definition of clinical handover	Healthcare setting/context	Outcomes measured	Major findings	Comments/Remarks
Wood <i>et al.</i>	2015	Emergency Medical Journal	To identify research about the quality and effectiveness of handover.	EMBASE, MEDLINE and CINAHL. Between 2000 and 2014. Search terms were provided.	21 studies	11 quantitative studies, 8 qualitative studies and 4 mixed method designs.	Greenhalgh and CASP rating tool. Five studies received scores below 4 due to lack of details about ethical approval and/or discussions of reliability. Studies were assessed as at least providing moderate quality evidence.	Prehospital settings (work undertaken outside the hospital and at the interface between emergency and secondary care).	Communication, context, inter-professional relationships and standardization of handover.	Lack of active listening, lack of attention and the receiving teams' divided attention lead to poorer handover. Handover effectiveness was associated with the availability of appropriate personnel to receive the handover. Workload and lack of time were identified as problems for handovers. Studies also show that handover is frequently repeated or duplicated. A positive relation between healthcare professionals involved in handover is a key facilitator of successful handover (shared understanding and working atmosphere). The use of mnemonics was observed to improve handover consistency, increase the frequency of necessary information transfer and reduce questioning by personnel and to increase in elements communicated during handover. Studies indicated there is a lack of training in handover and in the use of mnemonics.	The quality of existing research in this area is relatively poor and further high-quality research is required.	
Abraham <i>et al.</i>	2014	Journal of the American Medical Association	To identify studies on the evaluation of handoff tools designed for healthcare practice (characteristics of the evaluation studies).	PUBMED, COCHRANE and CINAHL. Between 1983 and 2012. Search terms were provided.	36 studies	3 RCT's, 15 non-randomized pre-post design and 18 observational approaches.	Risenberg <i>et al.</i> 's quality scoring system for comparison across studies. Quality scores ranged from 4 to 14, with a median score of 8.6.	<i>'The transfer of care involving a transfer of information, responsibility and authority between clinicians'</i> (Arora <i>et al.</i> , 2008).	Clinical departments	Handoff tool characteristics, standardization initiatives, methodological frameworks, and theoretical perspectives underlying handoff tool evaluations.	13 handoff tools were paper-based, 10 were electronic stand alone tools and 13 were EMR-integrated. 17 studies reported on handoff tools for physicians (often electronic-based or EMR-integrated), 12 on handoff tools for nurses (often electronic-based or EMR-integrated) and 7 on tools for both healthcare professionals. Most articles were on tools for intra-departmental handoffs and utilized at least one of the considered standardization measures. Most common method for data collection was surveys/questionnaires. Majority of studies used handoff activity-related outcome measures such as information gaps, handover duration, number of patient handed off, interruptions, care quality, frequency of tool use, handoff efficiency, user satisfaction metrics, and length of shift-report. Only two studies reported on patient outcomes: patient length of stay and patient fall rate.	Future research should utilize rigorous, multi-method qualitative and quantitative approaches that capture the context of handoffs, and evaluate and evaluate patient-related outcomes.

Continued.

Table 3 (Continued)

Author(s)	Year of publication	Journal	Scope of review	Search strategy	Number of studies included	Type of studies included	Study quality assessment	Definition of clinical handover	Healthcare setting/context	Outcomes measured	Major findings	Comments/Remarks
Davis <i>et al.</i>	2017	Journal of Graduate Medical Education	To identify and assess published research on handoff feedback or assessment tools used in undergraduate or graduate medical education.	MEDLINE, CINAHL and PUBMED. Between 2008 and 2015. Search terms were undergraduate or graduate medical education.	26 studies	11 pre-post intervention, 6 validity evidence only, 2 RCTs, 2 posttest study, 2 observational study, and 1 matched group design with random assignment to control and trained groups.	Medical Education Research Study Quality Instrument. The mean quality score was 12.2 (range = 7–16.5). Lowest-scoring domains were study design, outcome and sampling.	<i>The process of transferring primary authority and responsibility for providing clinical care to a patient from 1 departing caregiver to 1 oncoming caregiver</i> (Patterson & Wears, 2010).	Hospitals	Content, process, handoff organization and professionalism.	The most commonly used method to provide feedback was the 1-on-1; once or during one session. There were often significant improvements in medications, anticipatory guidance and diagnostic test/results. All tools were used in an inpatient setting. Feedback and/or assessment improved the content or organization measures of handoff, while process and professionalism measures were less reliably improved. No single tool arose as best for any particular speciality or use. The Handoff CEX or tools based on it are the most widely studied tools. Assessment and ongoing feedback (once a month) are important components for improving physician handoffs.	heterogeneity of the studies both in methodology and interventions limits the conclusions that can be drawn.
Robertson <i>et al.</i>	2014	BMJ Quality and Safety	Evaluate the effectiveness of interventions to improve the quality and safety of the handover process (monocomponent, 2 or more components, SIGNOUT mnemonic, and SBAR and mnemonic).	EMBASE, MEDLINE, HMIC, and CINAHL. Between 2002 and 2021. Search terms were provided.	29 studies	2 RCTs, 1 preintervention/postintervention controlled trials, 25 preintervention/postintervention uncontrolled trials, and 1 PDCA design	Modified Downs & Black. The quality score ranged from 1 to 17, with a median score of 9.	<i>The transfer of professional responsibility and accountability for some or all aspects of care for a patient, or group of patients, to another person or professional group on a temporary or permanent basis</i> (British Medical Association, 2004).	Intrahospital handover	Related to information transfer; staff satisfaction, handover duration, clinical outcomes, and compliance with handover protocol.	Improvements in information transfer were the most commonly reported successes, being found in more than half of the studies. Staff satisfaction was the next most commonly improved in 35% of studies. One study reported a 12% decrease in adverse events ($P < 0.001$). One study reported a significant reduction in length of stay ($P = 0.047$).	Although information transfer may increase, better study designs and consistency of the terminology used to describe handover and its improvement are urgently required.

Continued.

Table 3 (Continued)

Author(s)	Year of publication	Journal	Scope of review	Search strategy	Number of studies included	Type of studies included	Study quality assessment	Definition of clinical handover	Healthcare setting/context	Outcomes measured	Major findings	Comments/Remarks
Müller <i>et al.</i>	2018	BMJ Open	To identify research on the impact of the implementation of SBAR (mnemonic) in clinical setting on patient safety as measured by the incidence of adverse events.	PUBMED, EMBASE, CINAHL, Cochrane Library, and PsycINFO.	11 studies	8 before-after intervention design, 2 non-RCT's and 1 RCT.	Quality Assessment Tool for Quantitative Studies developed by the Effective Public Health Practice Project Canada. Blinding was not described in any but one of the studies. Overall, there was a lack of reporting on statistical tests and number of persons that were trained. Sample size calculations to ensure sufficient power were not reported in any of the studies.	Hospitals, a rehabilitation centre and nursing homes.	General patient outcomes such as adverse patient/drug events, anticoagulation-related and patient fall-related adverse events, ICU admissions, death/cardiac arrests, and transfer to the hospital.	There is some evidence of the effectiveness of SBAR implementation on patient outcome, but this evidence is limited to specific circumstances such as communication over the phone. Only 5 studies found significantly improvements in 8 patient outcomes: international normalized ratio values, critical incident reporting system events (communication errors), unexpected death and ICU admission, patient falls, and 30-day readmissions, transfers to hospital and avoidable hospitalizations.	Although there is moderate evidence for improved patient safety through SBAR implementation, there is still a lack of high-quality research on this widely used communication tool.	
Segall <i>et al.</i>	2012	Anesthesia & Analgesia	To characterize current practices in handovers and to identify evidence-based methods to improve them.	PUBMED and ProQuest databases.	31 studies	9 (comprehensive) intervention-based studies, 18 cross-sectional studies and 4 published opinions or reviews.		<i>The transfer of information and professional responsibility and accountability between individuals and teams</i> (Jeffcott <i>et al.</i> , 2009).	Postoperative handovers.	All interventions (including handover protocols, checklists and team training) improved metrics of effectiveness (decreased technical errors and information omissions), efficiency (reduced handover duration or time to complete specific tasks), and perceived teamwork. However, the interventions did not significantly reduce high-risk events or realized errors. Their effects on patient outcomes were not evaluated. Common barriers to safe, effective postoperative handovers include the incomplete transfer of information, other communication issues (e.g. inaccurate information, lack of consistency and organization, information overload), distractions (including performing clinical activities during the transfer of information), inconsistent or incomplete teams, absent or inefficient execution of clinical tasks, and poor standardization. Measurement tools on handover quality are largely focused on information transfer, but some also assess clinical task performance, nontechnical skills, and nursing satisfaction with handover quality. Most tools are observational and the extent to which their validity and reliability have been evaluated is variable.	Rigorous study designs, adequate sample sizes, diverse study sites, and assessments of patient outcomes are needed to effectively evaluate approaches to improving postoperative handovers.	

Continued.

Table 3 (Continued)

Author(s)	Year of publication	Journal	Scope of review	Search strategy	Number of studies included	Type of studies included	Study quality assessment	Definition of clinical handover	Healthcare setting/context	Outcomes measured	Major findings	Comments/Remarks
van Sluisveld <i>et al.</i>	2015	Intensive Care Medicine	To evaluate the overall effects of interventions that aim to improve the quality of patient handover.	PUBMED, CINAHL, PsycINFO, EMBASE, Web of Science, and Cochrane Library. Search terms were not provided.	11 studies	(cluster) randomized controlled trials, cohort studies and non-controlled before-after studies.	Cochrane Effective Practice and Organization of Care Group's Risk of Bias Criteria. The overall methodological quality was relatively low, with an average score of 4.5 out of 11 possible.		Patient handover between ICU and general ward healthcare professionals.	Use of care, continuity of care, adverse events, and mortality.	A statistically significant effect on quality of handover was observed in six of these studies (55%). Effective interventions included: implementation of liaison nurses to improve the communication and coordination of care and handover forms to facilitate the timely handover of complete and accurate clinical information. These interventions were effective in improving continuity of care and reducing preventable adverse events.	Due to limited number of studies identified and the weak methodological quality of the included studies, more robust evidence is needed.
Smeulers <i>et al.</i>	2014	Cochrane Collaboration	To determine the effectiveness of interventions designed to improve handovers.	Cochrane Databases, MEDLINE, EMBASE, CINAHL, and ISI Knowledge.	0 studies. No randomized controlled trials were available for inclusion in the review.		Cochrane Risk of Bias, EPOC Criteria for RCT's and GRADE approach. No studies included in the review.	<i>'The exchange of specific information about a patient from one health professional to another, or from one team of health professionals to another, accompanied by the transfer of responsibility for that patient with the purpose of ensuring the continuity and safety of the patient's care'</i> (Cohen, 2010; Jeffcott, 2009).	Nurses for hospitalized patients.	Patient outcomes (objective measure for preventable adverse events), process of care outcomes (any objective measure for the transfer of accurate essential information) and efficiency outcomes (time required for handover, reduction of time spent resolving issues from incomplete communication and reduction of preventable nursing actions).	Main reason for exclusion was that the studies did not meet the RCT study design.	

Continued.

Table 3 (Continued)

Author(s)	Year of publication	Journal	Scope of review	Search strategy	Number of studies included	Type of studies included	Study quality assessment	Definition of clinical handover	Healthcare setting/context	Outcomes measured	Major findings	Comments/Remarks
Gordon & Findley	2011	Medical Education	To determine the characteristics of educational interventions employed to enhance handover amongst health professionals and to establish the effectiveness of these interventions.	MEDLINE, EMBASE, CINAHL, BNI, PsycINFO, ERIC, and Cochrane Trials Database. Search terms were not provided.	10 studies	6 before-and-after studies, 3 action-based studies and 1 non-RCT.	Best Evidence Medical Education. No detailed results were provided.	<i>The accurate, reliable communication of task-relevant information across shift changes</i> (Lardner, 1996).	In-patient medical establishments and nursing staff (including undergraduates).	Reaction to an intervention, attitudes, confidence, knowledge and skills, changed behaviour, and patient outcomes.	The main teaching methods employed were simulation or role-play. Common features were the use of observation, evaluation and feedback. Group lectures and online materials were also used in several of the interventions. The common content of the educational interventions was mnemonics, checklists, technology, the recognition of error, teamwork, and communication. No study demonstrated that handover education could improve patient outcomes.	Some evidence exists to demonstrate that skills can be transferred to the workplace, but none demonstrate that interventions improve patient safety.
Gordon et al.	2018	Academic Medicine	To review the latest evidence regarding handover education	Cochrane Trials Database, MEDLINE, EMBASE, CINAHL, PsycINFO, ERIC, and Proquest Health. Search terms were not provided.	18 studies	9 pre-post studies, 6 prospective studies, 1 randomized controlled trial, and 2 observational studies.	Best Evidence Medical Education. Study methodologies were generally poor. A majority of the reports did not mention and educational theory, and fewer than a fourth named a particular pedagogical approach.	<i>The transfer of both information about a patient or patients between healthcare professionals and settings</i> (Gordon & Findley, 2011).	Acute (hospital-based) healthcare settings.	Outcomes of Kirkpatrick's adapted hierarchy.	The principal teaching method were role-play and simulation. Three content themes were identified: facilitating information management (specific handover techniques such as mnemonics and electronic tools), reducing the potential for errors (identifying the components of effective and ineffective handovers) and improving provider confidence (ensuring that participants felt comfortable challenging or requesting additional information from others). Results on the outcomes indicated that knowledge and skills acquired by learners had transferred to the work environment and that the health and well-being of patients had improved.	The conclusion of Gordon & Findley's 2011 review remains generally valid.

Continued.

Table 3 (Continued)

Author(s)	Year of publication	Journal	Scope of review	Search strategy	Number of studies included	Type of studies included	Study quality assessment	Definition of clinical handover	Healthcare setting/context	Outcomes measured	Major findings	Comments/Remarks
Moller <i>et al.</i>	2013	European Journal of Anaesthesiology	To describe the characteristics and potential hazards to quality and safety during handover.	MEDLINE, EMBASE and Cochrane Library.	28 studies	13 descriptive studies, 9 interventional studies and 1 descriptive study on the development and implementation of the intervention	Newcastle-Ottawa Scale and Jadad Score for RCT. The quality of included studies was poor; with a score range from 3–6 out of 9.	<i>The transfer of professional accountability for a patient's care to another professional</i> (Nagpal <i>et al.</i> , 2010).	Postoperative handovers.	Information omissions, technical errors, quality of teamwork, handover duration, and some patient outcomes (length of stay, in-hospital mortality and unplanned admissions).	Handover is prone to rapidly changing environments, time pressure, interruptions/distractions, and the need to perform clinical tasks while transferring information. Often used interventions were a standardizing handover tool in combination with adherent environmental changes. There were significantly fewer information omissions found. Teamwork has significantly improved. No significant changes in technical errors and handover duration were found. Only one study found a significant reduction in length of stay, in-hospital mortality and unplanned admission.	Methodological quality is poor and to date meaningful assessment of clinical outcomes are lacking.
Pucher <i>et al.</i>	2015	Surgery	To review best evidence regarding handover interventions.	OvidSP, MEDLINE, EMBASE, and Psych-Info databases.	19 studies	1 single randomized cross-over trial (2 publications) and 17 pre-/post intervention cohort studies.	Newcastle-Ottawa Scale and Jadad Score for RCT. The quality of included studies was poor; with a score range from 3–6 out of 9. Studies suffered from a lack of description of the assessed staff and patient cohorts, failed to report demographic details and introduced a risk of observer expectancy bias. The RCT lacked blinding, description of group demographics or dropouts.	<i>The transfer of professional accountability for a patient's care to another professional</i> (Nagpal <i>et al.</i> , 2010).	Surgical handover	Primary outcome was accuracy of information transfer, measured by either the number of handover errors or adherence to a handover checklist.	The use of proformas or checklist was the most commonly cited intervention (84%). All studies reported improvements in the handover process, with improved completeness of handover or reduces error rate. Computerized tools were also associated with a reduction of pre-rounding time and frequency of missed patients. Only one study reported any patient outcomes: a reduction in length of stay from 5 to 4 days ($P = 0.047$) after implementation of a computerized template. Six Sigma methodology and TeamSTEPPS resulted in reduced handover time and time required to access lab study results. The 'pit-stop' model resulted in a significant decrease in handover omissions.	Methodological quality is poor and to date meaningful assessment of clinical outcomes are lacking.

Continued.

Table 3 (Continued)

Author(s)	Year of publication	Journal	Scope of review	Search strategy	Number of studies included	Type of studies included	Study quality assessment	Definition of clinical handover	Healthcare setting/context	Outcomes measured	Major findings	Comments/Remarks
Ong & Cotera	2011	The Joint Commission Quality and Patient Safety	To examine the nature of handover failures, the factors affecting handover and the effectiveness of interventions.	MEDLINE	24 studies	19 primary studies (observations, interviews, surveys, ...) and 5 interventional studies		<i>The transfer of professional responsibility and accountability for some or all aspects of care for a patient, or group of patients, to another person or professional group on a temporary or permanent basis</i> (British Medical Association, 2004).	Intrahospital handover	Characteristics of handover, adverse events, factors affecting handover, participants' perceptions, communication breakdowns, near misses, readmission rates, technical errors, hand-off duration, information omissions	Poor handover was associated with unnecessary delays, required equipment for patients not readily available, information omission, diagnosis errors, treatment errors, disposition errors, treatment delays, delays in pending test and diagnostic results, and failure verify that the correct patient was transported. The role of an ICU liaison nurse improved communication and coordination, was perceived as a conduit and patient care was also enhanced. Safety procedures from aviation and the Formula 1 pit-stop process reduced technical errors and the mean number of information omissions. Teamwork also improved. A protocol/form was associated with a significant reduction in errors and omissions in prescribing or administration of drug therapy after transfer.	There is a lack of robust evidence on best handoff practices and the current knowledge on the nature of handover failures is scanty. The review is limited by the quality of this body of evidence.
Arora <i>et al.</i>	2009	Journal of Hospital Medicine	To develop handoff recommendations.	MEDLINE	10 studies	9 pre-post studies and 1 RCT			Shift change and service change in the hospital	Patient outcomes, staff outcomes and system outcomes	The literature presented support the use of a verbal handoff supplemented with written documentation in a structured format or technology solution: the number of patient missed on rounds decreased, a decrease in rounding time by 3 hours per week, a higher quality of sign-outs, an overall improvement in continuity of care, a drop in preventable adverse events by 1.2%, improved provider identification and staff communication, improved transfer of information, improved nursing knowledge and greater patient empowerment.	Studies suffered from small sample size, poor description of methods and paucity of controlled interventions. In addition, there are no multicentre studies.

Continued.

Table 3 (Continued)

Author(s)	Year of publication	Journal	Scope of review	Search strategy	Number of studies included	Type of studies included	Study quality assessment	Definition of clinical handover	Healthcare setting/context	Outcomes measured	Major findings	Comments/Remarks
Buchanan & Besdine	2011	Academic Medicine	To present and outline the characteristics and trends in educational strategies.	MEDLINE, ISI, Web of Science, Educational Resources Information Center, Association of American Medical Colleges, MED-PORAL, and Portal of Geriatric Online Education	25 studies	19 mixed-methods educational interventions and 6 stand-alone tools		'A set of actions designed to ensure the coordination and continuity of health-care as a patients transfer between locations or different levels of care within the same location (Coleman & Boulton, 2003)'	Physician-trainees and physicians	Learner, temporal and content characteristics	The majority of interventions were designed for clinical learners. Large-group (>15) learning dominated. Brief, self-limited encounters with interventions requiring 1 h to complete favored. Didactic sessions were the most common strategy employed, followed by handout-based reference documents and web-based curricular element. The most common objectives were increasing learner communication skills and a general topical introduction to transitional care. Pre-posttesting is the most common method of assessment.	This subject has been un-der-represented in curricula. The interventions included in this review were heterogeneous in all categories of data abstracted.
Riesenberg <i>et al.</i>	2010	American Journal of Nursing	To identify all articles on nursing handoffs; including all mnemonics used, barriers to and strategies for effective handover.	Ovid, MEDLINE, CINAHL, and HealthSTAR	95 studies	20 described research studies, 15 interventional studies, 4 cross-sectional studies, and 1 qualitative study. The review also included commentaries, anecdotes, reviews, editorials, letters, ...	A self-developed quality scoring system based on Downs & Black with scores ranging from 1 to 16. Scores ranged from 2 to 12 with only 3 studies that achieved quality scores above 10.	'A process in which patient/client/resident care is communicated in a consistent manner' (Joint Commission, 2008).	Nursing handoffs in the United States in a variety of healthcare environments		35% of articles included the use of handoffs mnemonics; with 14 different mnemonics of which SBAR was most frequently described. It was noted that bedside shift reports or walking rounds were viewed positively by patients and decreased overtime. The use of a standardized written report resulted in greater accuracy; increased nurses' and patients' satisfaction and saved nurses time. Barriers to effective handoffs were communication barriers, problems associated with standardization, environmental issues, equipment issues, a lack or misuse of time, lack of training or education, human factors, and difficulties related to complexity of cases or high caseloads. Strategies for effective handoffs were communication skills, standardization, technological solutions, environmental strategies, trainings, and education, staff involvement, and leadership.	High-quality outcomes studies that focus on systems factors, human performance, and the effectiveness of protocols and interventions are urgently needed.

Continued.

Table 3 (Continued)

Author(s)	Year of publication	Journal	Scope of review	Search strategy	Number of studies included	Type of studies included	Study quality assessment	Definition of clinical handover	Healthcare setting/context	Outcomes measured	Major findings	Comments/Remarks
Foster & Manser	2012	Academic Medicine	To assess the empirical evidence on the relationship between handoff characteristics and outcomes.	Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, CINAHL, PsycINFO, ERIC, and ISI Web of Science	18 studies	4 RCT's, 1 case-control, 1 cohort, 11 pre-/posttest, and 1 cross-sectional study	No specific tool used. Studies were heterogeneous, idiosyncratic and not very well developed in methodological quality. In particular, controlling for confounding was poorly developed and data collection methods varied highly.	Handoffs within hospital; including those between paramedics and the emergency department	Anything that occur after completion of the handoff and is related to the patients who are handed off or their treatment (eg, preventable adverse events, ...)	Statistically significant improvements were found with standardized handoff sheets; as decreases in the number of dropped tasks, patient care items lost within 24 h of the handoff, and patient information lost across consecutive handoffs; increases in the retention of information by receiving clinicians and prevention of adverse events; and a change in the number of transfer interventions required after handoff and in the number of first doses of medication administered in a timely fashion. These improvements were found in a variety of handoff situations.	Handoff research is highly diverse, so drawing general conclusions from the published literature is a difficult endeavor.	
Masterston <i>et al.</i>	2013	Canadian Medical Education Journal	To review the literature regarding education models available to tech handover skills to healthcare professionals	MEDLINE, EMBASE, HaPI, CINAHL, Science/Social Science Citation Index, and PsycINFO databases	12 studies	1 descriptive, 4 surveys, 1 focus groups, 1 review/opinion, 3 (prospective) case series, 1 prospective interventional study, and 1 interviews	Rating scale by Core & Turgeon with a score between 1 and 12. The overall quality of the included studies was relatively low.	Healthcare professional; including physicians, nurses, medical students, and paramedic personnel	Primary outcome was a change in handover skill of efficiency. Secondary outcomes were identification of strengths and weaknesses of current handover skills and healthcare satisfaction	The most common educational method was simulation or role-playing, which is better received by learners than didactic sessions. Teaching handover practices makes residents feel more confident in their handover and often results in improved reporting of patient information and reduced errors of omission.	Although data are limited, effective training models for handover skills have been described in the literature.	

Continued.

Table 3 (Continued)

Author(s)	Year of publication	Journal	Scope of review	Search strategy	Number of studies included	Type of studies included	Study quality assessment	Definition of clinical handover	Healthcare setting/context	Outcomes measured	Major findings	Comments/Remarks
Hesselink <i>et al.</i>	2012	Annals of Internal Medicine	To review interventions that were tested in RCTs and that aimed to improve patient handover	MEDLINE, CINAHL, PsycINFO, the Cochrane Library, and EMBASE	36 studies	RCTs	<p>Cochrane Risk of Bias. Scores ranged from 2 to 9 (mean is 6.8). Often assessors were not blinding to outcome or blinding status was unclear. In 10 studies (27.8%), the intervention and control groups were not similar at baseline. Ten studies (27.8%) did not report the characteristics of participants lost to follow-up. Nearly half of the studies (44.4%; 16 studies) involved an intervention group of fewer than 100 participants.</p>	From hospital to primary care	At least 1 outcome addressing the quality and safety of the handover process or outcomes of handover within the first 3 months after discharge from the hospital	25 (69.4%) studies had statistically significant effects in favor of the intervention group and 34 (94.4%) described multicomponent interventions. Effective interventions included medication reconciliation; electronic tools to facilitate quick, clear, and structured summary generation; discharge planning; shared involvement in follow-up by hospital and community care providers; use of electronic discharge notifications; and Web-based access to discharge information for general practitioners. Statistically significant effects were mostly found in reducing hospital use (for example, rehospitalizations), improvement of continuity of care (for example, accurate discharge information), and improvement of patient status after discharge (for example, satisfaction).	Given the complexity of interventions and outcome measures, the literature does not permit firm conclusions about which interventions have these effects.	

Table 4 Outcomes organized according to the model of Proctor *et al.* (2011)

Author(s)	Implementation outcomes	Service outcomes	Client outcomes
Wood <i>et al.</i> (2015)		Improved handover consistency Increased frequency of necessary information transfer Reduced questioning by personnel Increased number of elements communicated	
Masterson <i>et al.</i> (2013)		Improved reporting of patient information	Improved physiologic parameters
		Improved physicians' understanding of what information was required for handover to be completed effectively Greater confidence and comfort with handover A reduction in technical errors and omitted information	Decrease in medication events from 5.42 to 3.15
Ong and Coiera (2011)	Perceived as easier compared to verbal handoff	Improved rates of checks on critical machinery A non-significant decrease in the length of time for handover Improved communication and coordination between ICU and speciality ward Reduced numbers of technical errors from 5.42 to 3.15 Reduced mean number of information omissions from 2.09 to 1.07	
		Significant reduction in errors and omissions in prescribing or administration of drug therapy after transfer The mean number of errors or omissions per transfer was reduced from 3.97 to 0.45	Patients requiring intervention because of errors or omissions were reduced from 100 to 68%
Segall <i>et al.</i> (2012)		Decreased technical errors and information omissions Reduced handover duration or time to complete specific tasks Better perceived teamwork	
Pucher <i>et al.</i> (2015)		A reduction of pre-rounding time (62.7 vs. 51.9 min) A reduction in frequency of missed patients	A reduction in length of stay from 5 to 4 days
		Reduced handover time (15.3 vs. 9.6 minutes) Reduced time required to access lab study results A significant decrease in handover omissions (5.42 ± 1.24 vs. 3.15 ± 0.71)	
Arora <i>et al.</i> (2009)		Decreased number of patients missed by 50% Increased available time for pre-round by 40% Decreased rounding time by 3 h per week Overall improvement in continuity of care	Drop in preventable adverse events from 1.7 to 1.2%
		Improved identification Improved staff communication Improved transfer of information	Patient empowerment
Müller <i>et al.</i> (2018)		Improved nursing knowledge	Reduction of adverse patient events Reduction of drug events Reduction of patient falls Decreased restrained patients rate and catheter-associated urinary tract infection rate Improved patient safety-related outcomes

Continued.

Table 4 (Continued)

Author(s)	Implementation outcomes	Service outcomes	Client outcomes
van Sluisveld <i>et al.</i> (2015)		Decreased critical incidence reporting system events due to communication breakdowns in the department of anaesthesiology of two clinics decreased significantly from 31 to 11%	A reduction in hospital mortality (−11%) A reduction in MRSA bacteraemias (−83%) A reduction in adverse events (−65%) A reduction in and cardiac arrests (−8%)
		Improvement in the management of anti-coagulated patients in nursing centres	A reduction in 30-day readmissions (0.12 vs 0.04) A reduction in avoidable hospitalizations (0.15 vs 0.05) Improvement in the reduction of adverse events
		Improvement in continuity of care	Reduced preventable adverse events from 65 to 42%
		Perceived as more accurate in terms of improving the transfer of information Reduction in the median time to finalize the discharge letter from 23 to 4 days Reduction in the proportion of patients with a discharge delay of >2 h from 49 to 22% Reduction in the proportion with a discharge delay of >4 h decreased significantly from 29 to 14%	Reduction in mean step-down unit Length of stay LOS from 71 to 37 days
Riesenberg <i>et al.</i> (2010)	Increased staff satisfaction	Decreased overtime A 95% success rate for process completion and accuracy in the first year Improved compliance with documentation of essential information Saved nurse time Improved physician–nurse communication Increased knowledge of essential patient data (such as reason for admission, known drug allergies, and active clinical problems) Improved nurses' ability to identify anticipated clinical status changes	Increased patient satisfaction
Moller <i>et al.</i> (2013)			Shorter length of stay Decreased in-hospital mortality Decreased unplanned admissions on ICU
Foster & Manser (2012)		Decreased number of dropped tasks Decreased patient care items lost within 24 h of the handoff	

Continued.

Table 4 (Continued)

Author(s)	Implementation outcomes	Service outcomes	Client outcomes
		Decreased patient information lost across consecutive handoffs Increased retention of information by receiving clinicians	Increased prevention of adverse events
		A change in the number of transferrer interventions required after handoff A change in the number of first doses of medication administered in a timely fashion Decreased number of dropped tasks	Decreased patient length of stay

Table 5 Results of possible handover interventions implemented

Author(s)	Intervention	Effects
Wood <i>et al.</i> (2015)	Mnemonics	Improved handover consistency Increased frequency of necessary information transfer Reduced questioning by personnel Increased number of elements communicated
Masterson <i>et al.</i> (2013)	Simulation-based communication workshop	Improved reporting of patient information
	Role-playing	Improved physiologic parameters Improved physicians' understanding of what information was required for handover to be completed effectively
	Curriculum mnemonics	Greater confidence and comfort with handover
	Handover protocol based on Formula 1	A reduction in technical errors and omitted information
	Workshop + Handover protocol	Improved rates of checks on critical machinery and medications with a decrease from 5.42 to 3.15 events per handover A non-significant decrease in the length of time for handover
Ong and Coiera (2011)	ICU liaison nurse	Improved communication and coordination between ICU and speciality ward
	Handover protocol based on aviation and Formula 1	Reduced numbers of technical errors from 5.42 to 3.15
	Voice-mail handoff	Reduced mean number of information omissions from 2.09 to 1.07 Perceived as easier compared to verbal handoff
	Pharmacist-initiated handoff	Significant reduction in errors and omissions in prescribing or administration of drug therapy after transfer. The mean number of errors or omissions per transfer was reduced from 3.97 to 0.45 Patients requiring intervention because of errors or omissions were reduced from 100 to 68%
Segall <i>et al.</i> (2012)	Handover protocols, checklists and team training	Decreased technical errors and information omissions Reduced handover duration or time to complete specific tasks Better perceived teamwork
Pucher <i>et al.</i> (2015)	Proformas and checklists	A reduction of pre-rounding time (62.7 vs. 51.9 min) A reduction in frequency of missed patients A reduction in length of stay from 5 to 4 days
	TeamSTEPPS	Reduced handover time (15.3 vs. 9.6 minutes) Reduced time required to access lab study results
	Handover protocol based on Formula 1	A significant decrease in handover omissions (5.42 ± 1.24 vs. 3.15 ± 0.71)
Arora <i>et al.</i> (2009)	Digital handover template	Decreased number of patients missed by 50% Increased available time for pre-round by 40% Decreased rounding time by 3 hours per week Overall improvement in continuity of care
	Computerized sign-out Technological solutions	Drop in preventable adverse events from 1.7 to 1.2% Improved identification Improved staff communication

Continued.

Table 5 (Continued)

Author(s)	Intervention	Effects
	Verbal exchange with written information	Improved transfer of information
	Patient involvement in the handover process	Patient empowerment
Müller <i>et al.</i> (2018)	Mnemonics (SBAR)	Improved nursing knowledge Reduction of adverse patient events Reduction of drug events Reduction of patient falls Decreased restrained patients rate and catheter-associated urinary tract infection rate Improved patient safety-related outcomes Decreased critical incidence reporting system events due to communication breakdowns in the department of anaesthesiology of two clinics decreased significantly from 31 to 11% A reduction in hospital mortality (−11%) A reduction in MRSA bacteraemias (−83%) A reduction in adverse events (−65%) A reduction in and cardiac arrests (−8%) Improvement in the management of anti-coagulated patients in nursing centres A reduction in 30-day readmissions (0.12 vs 0.04) A reduction in avoidable hospitalizations (0.15 vs 0.05)
van Sluisveld <i>et al.</i> (2015)	Handover forms Multidisciplinary form Printed sign-out document Electronic discharge letter ICU liaison nurse	Improvement in the reduction of adverse events Improvement in continuity of care Reduced preventable adverse events from 65 to 42% Perceived as more accurate in terms of improving the transfer of information Reduction in the median time to finalize the discharge letter from 23 to 4 days Reduction in the proportion of patients with a discharge delay of >2 h from 49 to 22% Reduction in the proportion with a discharge delay of >4 h decreased significantly from 29 to 14% Reduction in mean step-down unit LOS from 71 to 37 days
Riesenberg <i>et al.</i> (2010)	Walking rounds Bedside shift reports Customized telephone-based system Written report	Decreased overtime Decreased overtime Decreased overtime A 95% success rate for process completion and accuracy in the first year Increased staff and patient satisfaction Improved compliance with documentation of essential information Saved nurse time Improved physician–nurse communication Increased knowledge of essential patient data (such as reason for admission, known drug allergies, and active clinical problems)
Moller <i>et al.</i> (2013)	Surgical two track clinical pathway	Improved nurses' ability to identify anticipated clinical status changes Shorter length of stay Decreased in-hospital mortality
Foster and Manser (2012)	Standardized handoff sheets	Decreased unplanned admissions on ICU Decreased number of dropped tasks Decreased patient care items lost within 24 hours of the handoff Decreased patient information lost across consecutive handoffs Increased retention of information by receiving clinicians Increased prevention of adverse events A change in the number of transferrer interventions required after handoff A change in the number of first doses of medication administered in a timely fashion Decreased number of dropped tasks Decreased patient length of stay

events (communication errors), unexpected death and ICU admission, patient falls and 30-day readmissions, transfers to hospital and avoidable hospitalizations [34].

The included reviews evaluated several other strategies to improve handover. The implementation of a liaison nurse was found to

improve communication and coordination of care [26, 32], and computerized tools were associated with a reduction of pre-rounding time and frequency of missed patients [27]. The Six Sigma methodology and TeamSTEPPS resulted in reduced handover time and time required to access lab study results. The 'pit-stop' model was

associated with a significant decrease in handover omissions [26, 27]. Precisely at the interface between primary and secondary care, medication reconciliation, electronic tools, discharge planning, shared involvement in follow-up by hospital and community care providers, use of electronic discharge notifications and web-based access to discharge information for general practitioners had a significant effect in reducing hospital use, in improving continuity of care (e.g. accurate discharge information) and in enhancing patient status after discharge (e.g. satisfaction) [41].

Only a few studies found positive effects of handover interventions on patient outcomes. Robertson *et al.* (2014) found only one study (out of 29) that reported a 12% decrease in adverse events due to standardization. Another study reported a significant reduction in the length of stay due to implementation of an electronic handover system [35]. Moller *et al.* (2013) also found one study (out of 28) that demonstrated a significant reduction in the length of stay, in-hospital mortality, and unplanned admission as a result of a structured handover form included in the clinical pathway [28]. Pucher *et al.* (2015) found only one study (out of 19) that reported a reduction in the length of stay from 5 to 4 days after the implementation of a computerized template [27]. Arora *et al.* (2009) found that a structured format or a technology solution resulted in a drop in preventable adverse events by 1.2% [25]. Finally, van Sluiseveld *et al.* (2015) found that liaison nurses and handover forms effectively reduced preventable adverse events [32].

Educational interventions to improve handover

The principal teaching methods were role-play and simulation, which were better received by learners than in didactic sessions [24, 29, 30]. Popular content themes were facilitating information management and communication skills (i.e. specific handover techniques such as mnemonics and electronic tools), reducing the potential for errors (i.e. identifying the components of effective and ineffective handovers) and improving provider confidence (i.e. ensuring that participants felt comfortable challenging or requesting additional information from others) [22, 29, 30].

Results on educational interventions' outcomes indicated that learners' knowledge and skills had transferred to the work environment. The health and well-being of patients had improved, and residents felt more confident in their handover. The latter often resulted in improved reporting of patient information and reduced errors of omission [29, 30].

Discussion

Effective communication is essential to ensure patient safety. Research linked poor handover to inaccurate diagnoses, delayed treatments, medical incidents, patient falls, more extended hospital stays, lower satisfaction rates for patients and healthcare staff and increased costs [42–45]. We aimed to appraise and summarize existing literature on 'clinical handover'.

First, research indicated that poor handover is associated with multiple potential hazards such as lack of availability of required equipment for patients, information omissions, diagnosis errors, treatment errors, disposition errors, treatment delays, delays in pending tests and diagnostic results and failure in verifying that the correct patient was transported. Identified problems for handover were lack of active listening, lack of attention, divided attention of the receiving healthcare professional(s), workload and lack of time. A significant challenge that healthcare systems face is an increase in patients with chronic conditions, which leads to more healthcare transitions.

A review of 21 clinical handover studies from Wood *et al.* (2015) raised concerns about the quality of communication and information exchange between prehospital and hospital staff [38]. Handover outside the hospital is becoming increasingly important due to an increase in number of chronic patients, a decrease of the length of hospital stay and an increase in proportion of outpatient care. As a result, more and more patients experience multiple transitions during their trajectory, and discontinuity in their care may threaten patient safety. An additional challenge is the different perspectives among healthcare providers in differing settings regarding the most crucial information to be exchanged in handover [46].

Second, most evaluation tools measured handoff activity-related outcomes such as information gaps, handover duration, number of patients handed off, interruptions, care quality, frequency of tool use, handoff efficiency, user satisfaction metrics and length of shift-report. Our systematic review indicates that no single tool arises as best to evaluate the handover process. In their review of the handoff literature, Patterson and Wears (2010) were also not able to make recommendations for using any particular standardized, reliable measurement tool suitable for all clinical areas [43].

Third, there is little evidence delineating what constitutes the best handover practices. Most efforts primarily aim to facilitate care coordination and communication between healthcare professionals by using electronic tools or a standardized form. Reported success in handover improvements seems to be limited to specific projects and is mostly limited to efficiency outcomes or surrogate patient safety measures such as saved nursing time, increased healthcare professionals' and patients' satisfaction, improved teamwork, improved nursing knowledge and greater patient empowerment. Only a few individual studies found positive effects on patient outcomes such as adverse events, readmissions and mortality. One hopeful prospective intervention study of a resident handoff-improvement program in nine hospitals (including a mnemonic to standardize verbal and written handovers, handoff and communication training, faculty development and observation program and a sustainability campaign) showed a decrease of 23% in medical-error rate and a 30% reduction in the number of preventable adverse events in 10.740 patient admissions [47].

The SBAR model and its adaptations remain the only model employed across various specialties. While many reviews continue to advocate using mnemonics in the handover process, the evidence for their usefulness is inconclusive. Local modifications to improve acceptance and adoption by healthcare professionals are always required. One additional challenge of standardizing handoff information is the variation in clinical practice between disciplines and settings. Therefore, a common ground between disciplines is necessary to improve interdisciplinary communication, including practical information (e.g. bed location), background information (e.g. the reason for admission), planning information (e.g. discharge plan) and safety information (e.g. allergies) in an electronic health record [48].

Although research is inconclusive about interventions to improve handover, studies showed that good handover is essential to reduce potential hazards. Therefore, all healthcare professionals must learn and maintain excellent handover skills as poor handover is associated with multiple potential risks. Our systematic review indicates that the principal teaching methods are role-playing and simulation, which are better received by learners than didactic sessions and which may result in better knowledge transfer to the work environment, better health and well-being of patients, increased confidence of healthcare professionals in their handover, which again results in improved reporting of patient information and reduced errors of

omission. Handover education is often non-existent or inadequate, and frameworks often lack or vary greatly [49, 50].

Based on the results of our systematic review, we formulate several recommendations. We recommend harmonizing terminology and definitions for describing handover, improvement methods or types of outcomes. Second, our review has demonstrated that there is a limited amount of good-quality research on handover. Failure to show effects may be that the included studies are of little quality and yield heterogeneous results. We suggest implementing more feasible study designs such as pragmatic trials and high-fidelity simulation studies, large-scale studies with comparison groups and no simultaneous implementation of multiple interventions for outcome measures. Finally, assessment, ongoing feedback and training or education are essential components for improving handover [36]. We recommend curricular interventions designed for mixed audiences as handover is a rather heterogeneous activity and requires a multidisciplinary approach. We emphasize on a combination of lectures, simulation-based workshops and case-based discussions, with a move towards more competency-based training.

Our review has a few limitations. First, there may be primary studies in the field that are not included by existing reviews. Second, as with all systematic reviews, publication bias may be present. Finally, studies' heterogeneity—both in methodology and interventions—limits the conclusions drawn.

Conclusions

Clinical handover is an essential element of healthcare, ensuring continuity of care for the patient. Our systematic review found that poor handover is associated with multiple potential hazards. No single tool arises as best to evaluate the handover process. There is little empirical evidence delineating what constitutes best handover practices. Finally, our review found that healthcare professionals receive little formal training in this critical responsibility. The interpretation of our findings is tempered by a profound lack of methodological quality in current published evidence. We recommend emphasizing staff education (including simulation-based and team training), non-technical skills and the implementation process.

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Data availability statement

Data and research materials supporting the results in the article are available.

Appendix A. MEDLINE search strategy

1. (hand over? or handing over or handover? or hand-over?)
2. (shift to shift?)
3. (inter shift?)
4. (shift report? or shift-report?)
5. (handoff? or handing off or hand off?)
6. (signout? or sign out? or sign off?)
7. (patient transfer?)

8. Or/1–7
9. (systematic review or literature review)
10. 8 and 9

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