Review

How to improve change of shift handovers and collaborative grounding and what role does the electronic patient record system play? Results of a systematic literature review

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ABSTRACT

Introduction: Establishing continuity of care in handovers at changes of shift is a challenging endeavor that is jeopardized by time pressure and errors typically occurring during synchronous communication. Only if the outgoing and incoming persons manage to collaboratively build a common ground for the next steps of care is it possible to ensure a proper continuation. Electronic systems, in particular electronic patient record systems, are powerful providers of information but their actual use might threaten achieving a common understanding of the patient if they force clinicians to work asynchronously. In order to gain a deeper understanding of communication failures and how to overcome them, we performed a systematic review of the literature, aiming to answer the following four research questions: (1a) What are typical errors and (1b) their consequences in handovers? (2) How can they be overcome by conventional strategies and instruments? (3) Electronic systems? (4) Are there any instruments to support collaborative grounding?

Methods: We searched the databases MEDLINE, CINAHL, and COCHRANE for articles on handovers in general and in combination with the terms electronic record systems and grounding that covered the time period of January 2000 to May 2012.

Results: The search led to 519 articles of which 60 were then finally included into the review. We found a sharp increase in the number of relevant studies starting with 2008. As could be documented by 20 studies that addressed communication errors, omission of detailed patient information including anticipatory guidance during handovers was the greatest problem. This deficiency could be partly overcome by structuring and systematizing the information, e.g. according to Situation, Background, Assessment and Recommendation schema (SBAR), and by employing electronic tools integrated in electronic records systems as 23 studies on conventional and 22 articles on electronic systems showed. Despite the increase in quantity and quality of the information achieved, it also became clear that there was still the unsolved problem of anticipatory guidance and presenting “the full story” of the patient. Only a small number of studies actually addressed how to establish common ground with the help of electronic tools.

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Discussion: The increase in studies manifests the rise of great interest in the handover scenario. Electronic patient record systems proved to be excellent information feeders to handover tools, but their role in collaborative grounding is unclear. Concepts of how to move to joint information processing and IT-enabled social interaction have to be implemented and tested.

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1. Introduction

Today, patient care in modern healthcare institutions is very much shaped by a condensed workload in a highly dynamic working environment in which health professionals focus on their specialized field. Continuity of care can only be achieved by the continuous, well-coordinated interaction of the different health professionals within and across shifts. Change of shifts does not compromise continuity from an organizational point of view as long as the actors who take over from their colleagues entirely replace their function [1]. However, continuity may only be ensured if the actors work in a coordinated manner and cooperate across shifts [2]. Due to their asynchronous nature, shifts obstruct an interactive exchange on demand between the different shift teams. Therefore, shifts possess
a high risk for jeopardizing continuous coverage [3]. In order to partly overcome this dilemma, information has to be communicated at the shift change in handovers, in a consistent manner [4]. Handovers are, therefore, communication scenarios that are often ritualized [e.g. 5]. They are very similar across countries with regard to their content and structure [e.g. 6]. Very often they take place verbally in face-to-face situations [e.g. 7].

Cooperation enabled by handovers requires agreements on how to proceed and should lead to a joint understanding of the care process. This understanding is possible due to a shared knowledge background, which is defined by Clark as “the sum of the partners’ mutual, common or joint knowledge, beliefs and suppositions” [8]. Having such knowledge means that all actors know about a proposition, e.g. a fact about a patient, and at the same time also know that the others know it as well [8]. In order to achieve this level of comprehensive and effective understanding, mutual efforts among all the participants are needed, for which Clark coined the term “grounding” [9]. Hertzum refined this concept speaking of collaborative information seeking that consisted of information seeking, a primarily individual effort, as well as of collaborative grounding, which summarizes the joint efforts. The role of collaborative information seeking hereby was to balance individual and shared understanding [10].

In the context of handovers this highly interactive process of information and knowledge synchronization via questions and answers was called dance of reports [11], which lays the groundwork for detecting information needs [12] and proper decision-making [13]. The process of grounding also leads to awareness among all stakeholders. According to Kuziemsky and Varpio collaborative care delivery builds on awareness at various levels, namely patient status and goal awareness, team member awareness, deliberation awareness and rationale awareness, and finally environment awareness [14].

Grounding may utilize different communication mechanisms, which vary on a continuum between synchronous, e.g. face-to-face or phone communication, and asynchronous forms of communication. The method of choice for establishing common ground is synchronous communication – preferably in face-to-face situations – because it decreases the costs of establishing common ground [9]. It is also the method preferred by health professionals [e.g. 15]. However, synchronous communication was found to be prone to interruptions that may lead to treatment errors [e.g. 16, 17]. In order to avoid these drawbacks, one could in principle rely on asynchronous communication methods. The effects are less positive than they may seem. It could be demonstrated that building shared knowledge on the goals and activities of patient care could not be supported by asynchronous means, such as a computer-based order entry system [18].

Based on these studies, it remains unclear as to what is the most appropriate approach to effectively support the grounding process in typical synchronous scenarios such as handovers. Existing literature reviews which explored – among others – the current use of electronic handover systems provided only a first insight into the topic due to a lack of proper previous studies [4,6,19]. However, they

- demonstrated the importance of handovers,
- showed that handovers are error prone,
- yielded an overview of the problems and barriers including the omission of important information, e.g. rationale of decision, anticipated problems,
- listed strategies including structuring the information according to certain schemata.

By providing an exploratory overview they triggered the need for a new comprehensive and detailed review. This need holds true in general but specifically for integrated electronic systems supporting the communication and grounding process in handovers and their evaluation.

Against this background, the aim of this study is to answer the following research questions:

1. Given the fact that collaborative grounding is prone to errors in synchronous communication scenarios, (1a) what are the specific types of errors and gaps in handovers performed by nurses and physicians? (1b) What are their consequences?
2. What strategies and instruments for systematizing information and communication in handovers are described in the literature and how are they evaluated?
3. What type are the electronic handover instruments that are reported in the literature and what is the role of electronic patient record systems?
4. Are any of the strategies and instruments specifically addressing the grounding process?

The combination of answers provided by the literature to these four questions should help identifying the appropriate strategies for building an electronic handover system that helps overcoming the problems of the current practice.

2. Method

2.1. Identification of studies

In order to answer these questions, a systematic literature review was performed in the period from May 2011 to May 2012 searching the MEDLINE, CINAHL, and COCHRANE. MEDLINE was accessed via PubMed.

We employed a similar procedure for identifying and evaluating the studies as Uslu and Stausberg [20] chose for a review on the added value of electronic patient records. The entire process is depicted in Fig. 1.

In a first step, we searched for titles and abstracts of the database entries for the global keywords ‘handover’, ‘shift-report’, ‘handoff’ or ‘sign-out’ in order to cover the most common terms denoting the process of passing information from an outgoing shift to an incoming shift within a department of a healthcare institution. We also focussed the search adding

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1. We will use the term handover interchangeably with other terms denoting the transmission of information at the change of shift, particularly with handoff and sign-out. By handover we understand a process that is performed by physicians as well as nurses separately or by clinical multi-professional teams.
'electronic medical record', ‘electronic patient record’ or ‘electronic health record’ in order to be sure not to miss a relevant study. Similarly, we searched for the combination of the global keywords and ‘common ground’ or ‘grounding’.

The search was automatically limited by considering only hits in English or German, articles with abstracts and with a publication date between January 2000 and May 2012. The hits in MEDLINE, CINAHL and COCHRANE databases were pooled and doubles were manually eliminated. A total of 519 articles resulted from the global search, including the articles found by the restricted researches (13 hits and 1 hit, respectively), the titles of which were checked for relevance to the subject by the two authors.

2.2. Selection of studies

Three doctoral theses, five articles without naming an author and seven publications with fewer than 3 pages were excluded from the 519 publications. Furthermore, 266 studies were found to have no relevance to the topic and were, therefore, discarded. This resulted in 238 potentially relevant articles for the further inspection of the abstracts pertaining to the research questions. Among these, there were 61 publications that addressed handovers in the context of patient transfers between different health care settings, institutions or departments. They did not correspond to the focus of this review on intra-departmental transitions at shift-changes. Among the remaining 177 studies, 89 were identified as potentially relevant. In addition, five more studies were retrieved via a manual search so that 94 publications were selected for further analysis. One of 94 studies was not available so that 93 were matched with the four research questions.

2.3. Evaluation of studies

The full text version of these 93 studies was read and evaluated by the two authors with regard to (1) study design, (2) formal quality und (3) description of the sample in accordance with the criteria used by Uslu and Stausberg [20].

2.3.1. Study design

Theoretical research papers, opinion and position papers and systematic literature reviews were excluded on the ground of lacking an empirical base. Based on the research questions, we included different empirical designs ranging from descriptive, non-experimental studies to randomized controlled trials or experiments including qualitative and quantitative studies. These studies were classified according to Uslu and Stausberg’s quality indicators [20] and Evans’ hierarchy of evidence [21]. Thus anecdotes, case reports/case studies and studies with poor methodological quality, in particular evaluation studies using a post-test-only design were excluded from further analysis. All other study types, i.e. observational studies, single-group pre-, post-test, non-randomized controlled trials, experimental trials and randomized controlled trials were included.

2.3.2. Formal quality of the studies

Only studies structured explicitly according to the scheme abstract – introduction – method and material – results – discussion – conclusion – references or those that incorporated
3. Results

3.1. Statistics

Out of the 60 relevant articles, 25 were published in medical, 11 in nursing, 11 in quality management, 9 in medical informatics and 3 in healthcare journals, and 1 paper in a social sciences journal. Nine papers appeared in the years between 2000 and 2007, 51 papers since the beginning of 2008 (Fig. 2). More than half of the publications originated from the US (31), 11 from the UK, 8 from Australia, 3 from Canada and the remaining 7 from other European countries.

All studies were conducted in hospitals – except of one experimental study which took place at an educational center of a professional association and another study at an aged care facility. Nearly 40% of the studies were performed in university or teaching hospitals and about 20% in other types of hospitals (40% of the studies did not mention the hospital type). A large variety of medical specialties/departments were involved including internal and general medicine, surgery, pediatrics, intensive-care, emergency and trauma medicine, neurology and psychiatry. The studies also related to different handover situations and changes in staff.

In the following, the results of the literature review are presented along the research questions.

3.2. First research question

Given the fact that collaborative grounding is prone to errors in synchronous communication scenarios, (1a) what are the specific types of errors and gaps in handovers performed by physicians and nurses? (1b) What are their consequences?

3.2.1. Study statistics

These questions led to 20 studies (Appendix A), of which 7 studies addressed the consequences of failed communication. Sixty-five percent of the 20 studies analyzed physician sign-outs, 25% nursing handovers, and the remaining studies either used handovers of the multidisciplinary team or did not specify the profession concerned (clinicians).

3.2.2. Types of errors

Omissions were the type of errors mostly reported, which could be detected in handover artifacts as well as in medical records [23,31]. Often too much irrelevant and too little clinically necessary information was found in shift reports [41]. “Charting” type information was regarded as irrelevant in verbal handovers [38]. Many studies addressed specific items that were missing in handovers, i.e. reason for admission [30,33], clinical condition/active medical problem [22,28,30,40], medication and other treatments [22,23], to-dos and care plan [27-29,40], in particular initiated but not yet completed tasks [30,33,35], the rationale of the task or the plan [27] and knowledge items [26]. Other studies summarized these items under “factual patient information” [27] or “detailed personal information” [33], which had to be up-to-date at the time of transmission [35]. However, it was also criticized that handovers were dominated by retrospective facts [33], lacked information on disagreement [27] and particularly lacked anticipatory guidance or recommendations [25,28-30,35].

Other types of communication failure were contradictory information between handover artifacts and the medical record [31], the misperception of the importance of a piece of information [26] and failures as the “phenotype” of what went wrong [40].

Studies identified multiple sources for errors, i.e. barriers to access up-to-date and resident-specific information, duplication of information, no clear pathway of gathering information and a lack of standardized procedures during handovers [32] and insufficient preparation during the pre-handover process [37].

3.2.3. Consequences

Several studies mentioned severe negative consequences for the patients due to failed communication during the handover, i.e. transfer of a patient to the intensive care unit caused by delayed diagnoses and treatment [28], medication errors, inaccurate patient plans, repetitive tests, delayed discharge, missed one-on-one time with patient [34] and other major harms [30]. In four studies, the oncoming shift members remarked that they felt uncertain about the decisions to be made and about the care plan or were not prepared for the events that actually happened [22,24,27,34]. Low handover scores were associated with low clinical judgment scores of the oncoming shift [36].

3.3. Second research question

What strategies and instruments for systematizing information and communication in handovers are described in the literature and how are they evaluated?
3.3.1. Study statistics
A total of 23 studies addressed such strategies and instruments (Appendix B). The studies provided recommendations based on empirical findings from observations or experiments (R), described the development of an instrument (D) and/or evaluated an instrument (E).

Handovers within each of the two main professional groups, nurses and physician, were studied equally often (43.5% for each of the two professions). Thirteen percent of the 23 studies concerned the combined perspective of physicians and nurses.

Only 5 out of the 23 studies were based on a strategy or instrument used for daily routine, in 8 studies they were tested in a pilot phase, in 3 studies they were evaluated in an experimental setting and in 5 studies they were not yet tested. Two studies did not mention the stage of routinization.

3.3.2. Mode and structure of communication
Neither verbal only handovers [43,53] nor written handovers without face-to-face communication [25,35] were regarded desirable. Duplication of information was deemed necessary in some cases [34], others recommended to avoid redundancy [38]. Depending on what information needed to be transmitted communication should be either verbal [51] or in writing [24] as free text or structured forms [41]. Four of the structured forms described in detail were derived from the SBAR method or modified it [45,55,56,58], but also other generic mnemonics [42,47,54], specific checklists [48,57] or minimum data sets [49,52] were used.

3.3.3. Evaluation
Effects of structured handover forms and checklists were measured by subjective and objective criteria in pre-post test evaluation designs [44,45,48,50,54–57]. Data completeness and accuracy as judged by clinicians increased significantly, i.e. more data and less incorrect data were transmitted according to the clinicians [44,54,55,57]. They felt that they had received pertinent information [45], that preventable adverse events decreased [54], overall communication during handover was supported [50], perceived time to organize and prioritize the work was shortened [44]. Objective measures replicated the subjective impressions, i.e. significant increase in crucial medical information and organizational information [48,56], improved structure [45,56], consistency [56] and overall quality [55] of the report. Findings regarding the total handover time were ambiguous [54,56]. One study reported that structured forms detracted the clinicians’ attention from critical care issues and that data sheet based handovers were also more vulnerable to errors and surprises [35]. Balancing the need for global information, consisting of “forceful features” [46,51], and the need for numbers Sharit and colleagues argue that the integration of both were essential for providing the full “story” of the clinical case [39].

3.4. Third research question
What type are the electronic handover instruments that are reported in the literature and what is the role of electronic patient record systems?

3.4.1. Study statistics
The studies (Appendix C) were categorized in an almost similar fashion as for the second question. We distinguished between the following categories: development of an instrument (D) and/or evaluation of an instrument (E) and observations that often resulted in recommendations (O).

The majority of the 22 studies addressed physician signouts (about 59%), and nursing handovers were investigated in only in about 9%. The remaining studies either concerned handovers of the multidisciplinary team (approximately 18%) or physicians and nurses together (approximately 14%).

Five out of the 22 studies reported electronic systems of any kind that were used in daily routine, one system was tested in a pilot phase and was re-tested after the system was used on a regular basis and in 14 studies the systems were piloted. The remaining two studies either did not specify the degree of routinization or compared systems used in an experimental setting.
3.4.2. Technical integration

Electronically supported handovers either utilized a dedicated handover application [36,59–63,65,66–70,72–78] or employed the electronic medical/patient record system to support the clinicians in handing over patients [64,67]. The first type of tools could be further subdivided into those that imported data from the electronic medical/patient record system and other information systems [59–62,65,66,69,72,73,75–78] and those that were mere stand-alone solutions [36,63,66,70,74] or an electronic presentation tool [79]. In the vast majority of the cases described above, the handover process was associated with information kept in a central system for documentation purposes. In one case, the handover systems imported data from a central IT-system, but stored the specific handover data separately to ensure privacy in personal handover communication [62].

3.4.3. Information content and use

Most systems made use of structured information and provided an overall scheme for information to be communicated, such as patient history, clinical course, “to do” list [59]. One study reported that physicians explicitly suggested the inclusion of anticipated problems and “if then” recommendations which were not included in their system [65]. Despite the electronic environment supporting the handover process the electronic tool was used to replicate conventional procedures in the majority of the studies, i.e. users still printed out the electronic handover report or wished to do so to allow the use of information in places without computer access or to make personal notes [36,59,62,65,66–70,73,75,77]. Only two studies described a totally different approach to handing over patients. In these cases, relevant patient information was projected on a screen [73] or on a wall [67] during handover so that the participants could read and go over the information together. As a consequence, handovers shifted “from oral presentation to collective reading and interpretation of patient records” [67].

3.4.4. Evaluation

The evaluation methodologies employed ranged from randomizing and using a control group [72,78] to performing post-tests at different points of time after the implementation of an electronic tool [61,63]. Most of the studies followed a pre- vs. post-implementation design [36,59,60,66–70,72–74]. Ten of the sixteen pure evaluation studies resulted in findings supporting the superiority of electronic handover mechanisms compared to paper-based approaches in subjective or objective measures, one study demonstrated the positive effect of an integrated in comparison to a standalone electronic system [69] and one RCT study demonstrated that there was no deterioration from expected care, medical errors and adverse drug events [78]. The most salient finding was the increase of the quantity of crucial information [59], e.g. less missing data [70], more completed fields [73], and the quality of information, i.e. more accurate and up-to-date information [63]. This not only had consequences for handovers as such but also for subsequent processes such as for ward rounds [77]. The electronic system was reported to have a stabilizing effect on the retention of information [36]. Finally, a group of researchers measured a significant decrease in the length of stay after the implementation of an electronic handover tool [74]. These results of objective parameters were reflected by those of subjective measures: significantly increased perceived quality, safety and completeness [59], fewer missing pieces and fewer messages to pass on [67], less incorrect and inadequate information [68], significantly decreased time needed for entering data [61]. This was added by findings about greater user satisfaction with the handover process [61,70,77], with the quality of information [68], with the system [70], also in terms of increased usability [59]. Furthermore, clinicians were convinced that physician communication was significantly improved [59] and ultimately also continuity of care [77].

However, not every electronic system could live up to the expectations of its users: Because the system did not contain up-to-date information and because it caused duplication of work users abandoned utilizing it [72]. In another case users refrained from using the system because it yielded incomplete, limited personalized information that was not portable, not consistent with human information processing and memorizing and not presented in a way to grasp the main issues at a glance [75]. Documentation systems used for handovers, e.g. electronic patient records, were found problematic because they did not provide reader customized information [64]. When different modes of communication were compared “computerized and discussed” ranked first [71], employing “technology only” approaches proved inferior to in person handovers [79].

3.5. Fourth research question

Do any of the strategies and instruments specifically address the grounding process?

3.5.1. Study statistics

There were only two studies (Appendix D) addressing grounding as a particular challenge and goal in handovers. The aim of these studies was to identify, categorize and model overlapping information items in nurse and physician handovers and rounds. Common ground was defined as the overlap of themes and items in an interdisciplinary or multi-professional environment.

The two studies belonged both to the group “observations resulting in recommendations” (O).

3.5.2. Results

Both studies provided evidence for a substantial amount of patient related information that was shared by nurses and physicians [80,81]. The observations and artifact analyses gave further insight into the mechanisms of handovers [81]. They demonstrated that existing electronic health records were not sufficiently supportive in handovers, partly due to the structured nature of these records, which was a particular problem when summarizing the clinical case [81].

4. Discussion

4.1. Summary

The increasing numbers of publications on intra-institutional information transfer since 2008 reflect the growing awareness
about the importance of, and interest in, handovers in recent years. This interest was probably triggered by national initiatives foremost the initiative “Safe Handover: Safe Patient” of the British Medical Association from 2004 [82], which was followed by an initiative in Australia three years later [83]. In the year 2006 “effective handoffs” became part of a list of national goals to improved patient safety in the US [84]. These initiatives seem to have triggered scientific work on handovers significantly and are mirrored by the articles on handovers in this review, especially those that cover the period starting from 2008. They constitute 85% of all articles in the review and concern a time span that had not yet been investigated in previous reviews on handovers [5,7,85,86].

Also the countries where these articles originated from indicate a strong association between the national initiatives and the publication rate: 52% stems from the US, 18% from the UK and finally 13% from Australia, all three countries with efforts at national level.

Most of the studies addressed handovers as a process that takes place within a single professional group, either within the group of physicians or nurses separately. But there were also studies that looked at a combination of various professions and two studies explicitly asked whether there was a common set of information items transferred within each group.

4.2. Common ground

Despite the fact that the term common ground is not used in all the other studies, some hint at issues associated with building a common understanding of the patients and ensuring continuity of care.

Common ground inherently embraces all relevant aspects of knowing the patient, it thus includes both retrospective information, i.e. what has been done, as well as prospective information, i.e. what is planned, what is pending and what might happen. In the best case, this amalgamation of data flows from the outgoing to the oncoming team and bridges the physical gap created by changing the persons responsible for the patient. This line of thinking is supported by many studies in our review, in terms of

- identifying the absolute imperative of anticipatory guidance and recommendations during handovers,
- showing the importance of the traceability of decisions made to enable understanding the case,
- allowing space for subjective issues to be communicated,
- demanding the “full story” of the patient to be taken into consideration.

They clearly lay down the elements and (electronic) structures of a good and complete transfer of patient issues to the oncoming shift team. They also demonstrate the positive effect of this approach regarding information quantity and quality, which is a prerequisite for building a common ground.

Common ground can also be interpreted as the environment that furthers a common understanding of the clinical cases by allowing interaction and collaboration. The number of studies supporting the notion of handovers as an exchange platform was significantly smaller compared to those addressing information completeness and accuracy and information transfer. The scenario that was tested by Hertzum and Simonsen [67] stressed the option of electronic health records to free the communication partners from information transfer and to concentrate on discussion. This comes close to what collaborative grounding means.

It is surprising that so few studies look at grounding phenomena explicitly [80,81], and implicitly [67,73]. It seems as if only few researchers have recognized the importance of this concept although it is well known that handovers are highly interactive. Many studies in this review definitely reject written handovers only. Staggers and Jennings reported only about 30% of the content in nursing handovers to consist of hard facts that needed no further discussions [12].

In conclusion to the question put in the title of this review, it must be summarized that the current literature answers this question only partly. We know how to achieve grounding in the sense of a sound information base via structured instruments but we know little about how to support the collaborative nature of grounding in terms of good and useful instruments.

4.3. Electronic health record systems

Electronic handover tools either integrated into an electronic health records system or stand-alone solutions have been studied extensively in recent years. They prove the power of such systems in enhancing quality and quantity of facts exchanged at handovers. In this sense, electronic tools are more advanced versions of structured sheets and their impact resembles that of the sheets. In the best case, their marginal value compared to paper forms is the up-to-dateness of the information. However, their usage is rather restricted to information input, transfer and access. This is not surprising, as many EHR systems, which are built to optimize documenting and record keeping, represent the world of facts and how to retrieve them. Thus, electronic handover systems allow for a maximum of access to a wealth of details about the patient.

They are less helpful when it comes to amalgamating these single pieces of data to the “full story of the patient”, highlighting important features and providing anticipatory guidance. Another issue not yet solved by current EHR based tools is the wish to shape the presentation of the information ad hoc and at run time by the user. Sharing opinions, warnings and other subjective information, directing and customizing information to the receiver and supporting visualization and interaction are applications yet not targeted by many EHR systems. However, they are the ones needed to establish a common ground and to build and sustain the necessary level of awareness.

Based on the limitations of the current use of EHRs for handovers, several models and concepts emerged to improve handovers and the employment of technologies. Staggers et al. suggested three views of the electronic handover tool: the patient summary screen, the personally tailored view and the problem oriented view [87]. Randell and colleagues propose a model that centers on the transfer and acceptance of responsibilities and information sharing and looks at the desirable outcomes, i.e. continuity, safety, education and training, organization of work and relationships [88]. Abraham et al. put
forward a collective information-push model that integrates standardized and structured information and a well prepared and coordinated pre-handover phase [89].

Lessons can also be learned from the experience with systems that were gained outside clinical handover scenarios, e.g. from results utilizing conventional and electronic whiteboards for collaborative work [90,91]. The size of the screen was found essential when a group wanted to gather in front of the system.

To ultimately decide on the practical use of these approaches, they must be put into practice and evaluated. There was only a small number of RCT studies or experimental approaches to underpin the results and provide hard facts. More studies employing rigorous methods are needed and a broad range of outcome measures has to be implemented and analyzed. The appropriate measures are best defined by what the electronic systems is intended to achieve. Examples of added value produced by an electronic handover tool that can be derived from the literature are

- access to up-to-date and complete data, i.e. patient details,
- visualization of the pertinent data, i.e. the full clinical case,
- presentation of the information to give support to cognitive processes (e.g. perception, memory, clinical decision making), or
- stimulation of social interaction including communication in order to achieve a common understanding and thereby establish continuity of care.

Furthermore, it has to be made clear as to how the electronic handover tool aims to optimize the different phases of handovers: pre-handover, handover and/or post-handover, which are intertwined and depend on each other.

4.4. Physician sign-outs vs. nurse handovers

This review deliberately includes both professional groups in order to gain a full understanding of continuity of care between shifts. There are more studies in this review addressing physician than nurse handovers in particular with regard to communication failures and their consequences (research question 1) and the use of electronic tools (research question 3). However, there were no major differences between the two professional groups regarding general deficiencies and the evidence on how to mitigate them. In particular, both groups employed SBAR based or similar strategies to structure and standardize the information. Even at the information item level, where one would expect most differences, it could be demonstrated that there is great overlap of what information physicians and nurses transport during handover communication. Against this background, it seems more worthwhile looking at universal structures, concepts and schemes when designing electronic tools that fit both professional groups than at information details which would have to come later once the overall principles are defined.

5. Limitations

This literature review concerns a particular clinical communication scenario, namely handovers. Some of the studies made clear that handovers and ward rounds have much in common and depend on each other. We did not go into the details of this interaction but rather focused on the handover scenario as an example of a highly demanding instance of clinical communication to ensure continuity of care. How to possibly exploit these results for other communication scenarios has to be analyzed in a separate study.

Furthermore, we concentrated on intra-departmental handovers excluding the transfer of patients between clinical units and also between organizations (discharge). We thus may have missed studies that defined handovers more broadly. Though similar, the two types of handovers serve different purposes. Discontinuity due to shift change is not automatically associated with a change in therapy or care, discontinuity due to transfer between units or between organizations and/or settings entails a greater break and, therefore, may lead to a deliberate modification of the therapy or care. Often handover, transfer and discharge processes are quite different and also require different information support [92]. However, it would be very interesting to investigate the commonalities between the three types of interface processes and their information needs.

Handovers integrate a variety of different types of behavior, among others teaching, learning and recovering from emotional stress. In particular, teaching and learning could be supported by electronic tools for handovers and by the electronic patient record in general. We did not address this area of research because it would need a review of its own to cover this topic.

6. Conclusion

This review gives insight into the high priority topics currently investigated by handover studies and those topics not yet or scarcely discussed. While we know much about communication failures, how to avoid them in terms of better structures and how to make use of electronic patient records and related handover tools to improve information quality and quantity, little is known still about the more advanced employment of IT in pre-handover, handover and post-handover situations. Grounding as shared activity to reach a common understanding, to enable similar clinical decisions across teams and ultimately to reduce variance in patient care is not yet explicitly investigated. However, some studies give hints about how electronic systems might aid different issues of social interaction and collaboration via large display.

Electronic patient record systems play an important role in providing structured, up-to-date patient details. Designed for documenting the facts, i.e. mostly retrospective information, they lack additional important pieces of information and act rather one-dimensional. A new approach to handovers, therefore, must extend electronic patient record systems to capture, manage and process prospective and subjective information and to embrace and to support communicating the “the full story” of the patient.

Collaborative grounding can be only achieved when shifting the paradigm to joint information processing and IT-enabled social interaction so that in the end the oncoming
team is immersed in the work of the outgoing team. Then, they are in a position to replace their function as care providers and establish continuity of care.

Author contributions

Both authors qualify for authorship by their substantial contributions to the research and production of the manuscript. DF and UH provided substantial input in the conception and design of the review. DF collected the majority of the studies and UH contributed. DF drafted the manuscript and UH critically revised it and provided the final version of the manuscript.

Competing interest

All of the authors declare that they have no conflicts of interest, financial or otherwise, to disclose.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.ijmedinf.2013.03.004.

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