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Effectiveness of different nursing handover styles for ensuring continuity of information in hospitalised patients

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ABSTRACT

Background

An accurate handover of clinical information is of great importance to continuity and safety of care. If clinically relevant information is not shared accurately and in a timely manner it may lead to adverse events, delays in treatment and diagnosis, inappropriate treatment and omission of care. During the last decade the call for interventions to improve handovers has increased. These interventions aim to reduce the risk of miscommunication, misunderstanding and the omission of critical information.

Objectives

To determine the effectiveness of interventions designed to improve hospital nursing handover, specifically:

to identify which nursing handover style(s) are associated with improved outcomes for patients in the hospital setting and which nursing handover style(s) are associated with improved nursing process outcomes.

Search methods

We searched the following electronic databases for primary studies: Cochrane EPOC Group specialised register (to 19 September 2012), Cochrane Central Register of Controlled Trials (CENTRAL) (to 1 March 2013), MEDLINE (1950 to 1 March 2013) OvidSP, EMBASE (1947 to 1 March 2013) OvidSP, CINAHL (Cumulative Index to Nursing and Allied Health Literature) (1980 to 1 March 2013) EbscoHost and ISI Web of Knowledge (Science Citation Index and Social Sciences Citation Index) (to 9 July 2012). The Database of Abstracts of Reviews (DARE) was searched for related reviews. We screened the reference lists of included studies and relevant reviews. We also searched the WHO International Clinical Trials Registry Platform (ICTRP) <http://www.who.int/ictcp/en/> and Current Controlled Trials www.controlled-trials.com/mrct and we conducted a search of grey literature web sites.

Selection criteria

Randomised controlled trials (RCTs or cluster-RCTs) evaluating any nursing handover style between nurses in a hospital setting with the aim of preventing adverse events or optimising the transfer of accurate essential information required for continuity of care, or both.

Data collection and analysis

Two review authors independently assessed trial quality and extracted data.

Main results

The search identified 2178 citations, 28 of which were considered potentially relevant. After independent review of the full text of these studies, no eligible studies were identified for inclusion in this review due to the absence of studies with a randomised controlled study design.

Authors' conclusions

There was no evidence available to support conclusions about the effectiveness of nursing handover styles for ensuring continuity of information in hospitalised patients because we found no studies that fulfilled the methodological criteria for this review. As a consequence, uncertainty about the most effective practice remains. Research efforts should focus on strengthening the evidence about the effectiveness of nursing handover styles using well designed, rigorous studies. According to current knowledge, the following guiding principles can be applied when redesigning the nursing handover process: face-to-face communication, structured documentation, patient involvement and use of IT technology to support the process.

PLAIN LANGUAGE SUMMARY

What is the best nursing handover style to ensure continuity of information for hospital patients?

What is a nursing handover?

A nursing handover occurs when one nurse hands over the responsibility of care for a patient to another nurse, for example, at the end of a nursing shift. On average, nursing handovers occur three times a day for each patient.

What styles of nursing handover exist?

In daily practice handovers are done in various ways, some handovers are done through nurses talking to each other (verbal handovers). Others are done through nurses reading the patient's medical notes or through a combination of reading and talking to each other. In some cases they are done at the patient's bedside, so that the patient can contribute, if desired.

Why does the style of nursing handovers need to be investigated?

When a nurse hands over responsibility of care to another nurse there is an opportunity for error if all the important medical information is not shared thoroughly and efficiently. Failing to mention - or grasp - information may result in delays in treatment or diagnosis for the patient, inappropriate treatment, or failure to provide appropriate care. Consequently, an accurate handover of clinical information is essential to ensure continuity of care and patients' safety.

The purpose and findings of this review

This review tried to find out which nursing handover style works best.

In March 2013 the review authors conducted a wide search for suitable relevant studies (randomised controlled studies) that compared different styles of nursing handover. However, they were not able to identify any randomised controlled studies that investigated the question, and so could draw no conclusions. Further research in this area is urgently needed.

BACKGROUND

In its 2001 report, 'Crossing the Quality Chasm' the Institute of Medicine (IOM) stated that handovers provide an opportunity for

error and that "in a safe system, information is not lost, inaccessible, or forgotten in transitions" (IOM 2001). In a 2009 hospital survey on patient safety-culture, hospital staff respondents re-

ported that “important patient care information is often lost during shift changes and patient transfers” (AHRQ 2009). Inadequate and ineffective interpersonal communication between healthcare professionals is an often-cited key factor contributing to errors and procedural mistakes, which may lead to adverse events (AEs). Breakdowns in communication were implicated as one of the main causes of AEs reported to the Joint Commission in the USA between 2004 and 2010 (Joint Commission 2011). In an Australian study of more than 14,000 admissions, 17% were associated with an AE; in 11% of these communication problems were found to be a contributing factor (Wilson 1995).

Handovers of patient care thus introduce a ‘vulnerable gap’ that may result in AEs if clinically relevant information is not shared accurately and in a timely manner (Bhabra 2007; Handover Europe 2011; Pothier 2005). Other consequences of a poor handover might be delays in diagnosis or treatment (Joint Commission 2002), inappropriate treatment and omission of care. However, inefficiency due to rework, redundant communications and activities, may result in lower satisfaction for both healthcare provider and patient, increased costs, increased length of hospital stay and more readmissions (Patterson 2010). As a result, it is now well recognised that an accurate handover of clinical information is of great importance to continuity and safety of care.

This review will focus on the nursing handover as an instrument for ensuring continuity of care for hospitalised patients. This specific scope is chosen as nurses are pivotal in ensuring continuity of care in a 24-hour seven-days-a-week environment, not only since they are present both day and night (Messam 2009), but also because they are seen as a communication partner for all healthcare professionals and are often the (in)formal co-ordinators of the increasingly complex care that is given within hospitals (IOM 2010). To fulfil this role a complete and up to date picture of the patient’s care plan has to be handed over frequently - on average three times a day and two times during each nurse’s shift - and, due to frequent part-time working among nurses, handovers occur between many different nurses. Usually handovers are time-consuming, lack consistency and are varied in style (Clark 2009; Kerr 2011; Sexton 2004), and nursing handovers are no different. Furthermore, nurses, just like most healthcare professionals, may receive no formal training in the handover process other than by modelling from peers and superiors (Van Eaton 2010). As a consequence, the nursing handover is a vulnerable process with potential to result in AEs, unnecessary duplication of work or sub-optimal care.

Although the literature so far has not provided a thorough or agreed definition of the concept of handover and its scope, continuity of patient care is its primary function (Sherlock 1995; Thurgood 1995). The distinctive feature that distinguishes a handover from other (in)formal communication about patients is the transfer of professional responsibility for the patient (Cohen 2010). Responsibility deals with the transfer of accountability for the quality,

safety and satisfaction of the patient. Within this review we define a handover as 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 (Cohen 2010; Jeffcott 2009). The scope of this review covers the exchange of information about content (the ‘what’ aspect), as well as the way, or method, in which it is communicated (the ‘how’ aspect) (Murphy 2009). Content can be structured (e.g. templates, mnemonics, checklists, or a combination of these) or unstructured. Method refers to the communication methods, e.g. verbal, written or taped. In addition to the content and method, the location (the ‘where’ aspect) of the handover may also differ. Location can be either bedside or office-based. We define a handover style as any combination of the above-mentioned characteristics, that is, content (‘what’), method (‘how’) and location (‘where’) (Kerr 2002; Sexton 2004).

Literature frequently identifies the following nursing handover styles: bedside, verbal, nonverbal and taped (Messam 2009).

- Bedside: located at the patient’s bedside, which promotes patient and nurse face-to-face interaction and encourages patients’ verbal participation, thus making the patient central to the information exchange process (Greaves 1999; Kassean 2005).
- Verbal: located in an office setting, the nurse responsible for a group of patients exchanges relevant documented information (Bourne 2000; Lally 1999).
- Non-verbal: located in an office setting, nurses inform themselves by reading the patient health record, involving progress notes, medication charts, observation charts and nursing care plans (Taylor 2002).
- Taped: located in an office setting, the nurse in charge collects the relevant information and records this onto an audiotape so that the oncoming shift can listen at a convenient time (Dowding 2001).

During the last decade the call for interventions to improve handovers has increased (AMA 2006; AHRQ 2009; BMA 2005; IOM 2001; Joint Commission 2002; WHO 2006). These interventions aim to reduce the risk of miscommunication, misunderstanding and the omission of critical information, therefore, it is important to find out what constitutes an effective nursing handover style (Patterson 2010; Riesenberg 2010).

Description of the condition

As mentioned above, handovers of patient care may result in AEs if clinically relevant information is not shared accurately and in a timely manner. Other consequences of a less than perfect handover might be delays in treatment and diagnosis, inappropriate

treatment and omission of care. However, inefficiency due to re-work, redundant communications and redundant activities may also result in lower satisfaction for both healthcare provider and patient, increased costs, increased length of hospital stay and more readmissions.

Description of the intervention

We considered any nursing handover style ('what', 'how' and 'where') between nurses in a hospital setting with the aim of preventing AEs or optimising the transfer of accurate essential information required for continuity of care, or both. This includes:

- nurses' shift changes on nursing wards providing different levels of care, such as: regular ward-based care, high-dependency care and intensive care unit (ICU);
- nurse-to-nurse transfers during a shift to balance workload;
- nurse-to-nurse interdepartmental transfers, such as between nursing wards, from the emergency department (ED) to the nursing ward, from the recovery unit to the nursing ward, from the ICU to the nursing ward or the other way round.

The review does not include:

- handover from a primary care setting to a hospital setting by a primary care physician or from the ambulance to the ED;
- handovers across different health professional groups, such as from a physician to a nurse;
- handovers from hospital to home or to another healthcare facility upon discharge.

How the intervention might work

Generally handover interventions aim to incorporate a tool or routine into practice that implements a standardised approach to the handover, including written information and standardised communication patterns allowing for questions or for information to be read back. Use of the tool or routine is intended to support the exchange or availability of information about the patient (or both) for the next caregiver, resulting in improved continuity of care through:

- improved recall of information provided;
- improved compliance with the plan of care;
- improved patient involvement;
- timely delivery of the care;
- a decrease in incongruent information (information given at handover that is different from the actual condition);
- a decrease in omissions (information that if left out of the handover that could increase inefficiency);
- a reduction of time spent resolving issues from incomplete communication at handover.

Therefore, an effective and efficient handover style may reduce the number of AEs and inefficiencies resulting from an ineffective

handover, and also reduce the amount of time spent on handovers, thereby freeing-up time that can be spent in direct patient care (Sexton 2004).

Why it is important to do this review

Since handovers have been identified as a primary communication moment, many organisations, institutions and hospitals have initiated quality projects to improve handovers. In the 'High 5s Project', launched by the World Health Organization (WHO) in 2006, one of the five patient safety problems targeted was 'Communication failures during patient handovers' (WHO 2006). Literature on handovers is accumulating and thus it is important to understand the effectiveness of interventions aimed at improving nursing handovers and consequently ensuring continuity of care, as well as preventing AEs. Since the WHO and national government agencies are promoting handover interventions to improve patient safety (WHO 2007), these policy decisions should be based on evidence of the effectiveness of these interventions. There are risks involved in implementing interventions for which evidence of effectiveness is lacking: valuable resources can be wasted and clinicians might become reluctant to implement other measures. The aim of this review is to synthesise the evidence from high-quality studies in order to determine the most effective nursing handover style.

OBJECTIVES

To determine the effectiveness of interventions designed to improve hospital nursing handover, specifically:

to identify which nursing handover style(s) are associated with improved outcomes for patients in the hospital setting and which nursing handover style(s) are associated with improved nursing process outcomes.

METHODS

Criteria for considering studies for this review

Types of studies

We considered randomised controlled trials (RCTs or cluster-RCTs) to be eligible for inclusion (according to the definition of the Cochrane Effective Practice and Organisation of Care (EPOC) Group). We considered published and unpublished studies to be eligible and we imposed no language restrictions.

Types of participants

All patients irrespective of age, gender or condition; and nurses in either general, teaching or university hospitals.

Types of interventions

Any intervention designed to improve nursing handover in a hospital setting compared with a previous or existing hospital nursing handover practice or an alternative intervention as defined by the study. Interventions could target a combination of the content ('what'), communication method ('how') and location ('where') aspects of the handover.

Content could be structured (e.g. including templates, mnemonics or checklists, or a combination of these) or unstructured.

Communication method refers to verbal, written or taped handovers - used individually or in a combination - possibly combined with standardised communication patterns allowing for questions or for information to be read back. Written handovers can be facilitated by either paper-based or electronic systems.

Location could be either bedside- or office-based.

If at least one of the above-mentioned characteristics constituted part of a handover style it could be included.

We decided to include comparisons such as:

- non-verbal handover in an office setting versus a verbal handover in an office setting;
- non-verbal handover based on a structured summary versus non-verbal handover as in common practice;
- verbal handover at the bedside versus verbal handover in the office;
- verbal handover in an office setting based on a structured format versus verbal handover in an office setting based on an unstructured format;
- verbal handover at the bedside with a standardised communication approach versus verbal handover at the bedside without a standardised communication approach;
- verbal handover in an office setting using the read back communication principle versus verbal handover in an office setting as in common practice.

If different comparisons were found, these would be taken into account, as long as the intervention targeted one or more of the following characteristics: content (structured, semi-structured or unstructured), method (e.g. verbal, written and taped) or location of the handover (e.g. bedside or office-based).

Types of outcome measures

Primary outcomes

- Patient outcomes: any objective measure for preventable AE (patient safety) measured by, for example:
 - medication errors;

- complications;
- sentinel events; or
- mortality (Patterson 2010).
- Process of care outcomes (nurse-related): any objective measure for the transfer of accurate essential information required for continuity of care (Patterson 2010), such as:

- improved recall of information provided (measured, for example, by number of data points: number correct, number omitted, number incorrect);
- improved compliance with the plan of care (measured, for example, by adherence indicators);
- timely delivery of the care (measured, for example, by time difference between planned delivery and actual delivery of care);
- a decrease in incongruent information (information given at handover that is different from the actual condition);
- a decrease in omissions (information that could increase inefficiency if left out of the handover).

Secondary outcomes

Efficiency outcomes

- Time required for handover (either increase or decrease) in relation to the effectiveness of the handover
- Reduction of time spent resolving issues from incomplete communication at handover
- Reduction of preventable nursing actions: measured by, for example, double ordering or unnecessary telephone calls

We included any study that reported data for either primary or secondary outcomes.

Search methods for identification of studies

Search strategies for CENTRAL, MEDLINE, EMBASE and CINAHL were developed by a clinical librarian, in consultation with the authors and under the supervision of the Information Specialist and Trials Search Co-ordinator for the EPOC group. The Database of Abstracts of Reviews (DARE) was searched for related reviews. Searches of CENTRAL, MEDLINE, EMBASE and CINAHL were conducted initially in April 2012. Searches for the Cochrane EPOC Group Specialised Register and ISI web of Knowledge were developed and conducted in July and September 2012 by the Information Specialist and Trials Search Co-ordinator for the EPOC group. The searches of CENTRAL, MEDLINE, EMBASE and CINAHL were updated through a re-run in March 2013. All search strategies are provided in Appendices one to six.

Databases

- Cochrane EPOC Group specialised register (to 19 September 2012) ([Appendix 1](#))
- Cochrane Central Register of Controlled Trials (CENTRAL) (Issue 2, 2013) (to 1 March 2013) ([Appendix 2](#))
- MEDLINE (1950 to 1 March 2013) OvidSP ([Appendix 3](#))
- EMBASE (1947 to 1 March 2013) OvidSP ([Appendix 4](#))
- CINAHL (Cumulative Index to Nursing and Allied Health Literature) (1980 to 1 March 2013) EbscoHost ([Appendix 5](#))
- ISI Web of Knowledge (Science Citation Index and Social Sciences Citation Index) (to 9 July 2012) ([Appendix 6](#))

The search strategies were comprised of keywords and, when available, controlled vocabulary such as MeSH (Medical Subject Headings). Keywords used included: handover, handoff, change of shift, sign out, and MeSH terms: patient transfer, patient care planning and patient care management. Neither date nor language restrictions were used. All databases were searched from their start dates forward.

Two methodological search filters were used to limit retrieval to appropriate study designs: namely, the Cochrane Highly Sensitive Search Strategy (sensitivity- and precision-maximizing version, 2008 revision) to identify randomised trials ([Higgins 2011](#); section 6.4d); and an EPOC methodology filter to identify non-RCT designs.

Searching other resources

Grey literature

We conducted a search of the grey literature to identify studies that are not indexed in the databases listed above using the following sources:

- European handover initiative (www.handover.eu/);
- International WHO Collaborating Centre for Patient Safety Solutions (www.ccforspatientsafety.org/).

The search terms used were: handover, handoff, sign out, shift change, inter shift, transfer.

Trial registries

- International Clinical Trials Registry Platform (ICTRP), World Health Organization (WHO) <http://www.who.int/ictpr/en/>.
- Current Controlled Trials <http://www.controlled-trials.com/>

The search terms used were: handover, handoff, sign out, shift change, inter shift, transfer.

We also:

- Reviewed reference lists of relevant systematic reviews ([Appendix 7](#)).

Data collection and analysis

Selection of studies

We downloaded all titles and abstracts retrieved by the electronic searching to the reference managing database Reference Manager12. Two review authors (MS and HV) independently screened all titles and abstracts identified through the search strategies to assess which studies met the inclusion criteria. We retrieved and assessed full-text copies of all papers that were potentially relevant for inclusion. Any disagreement was resolved through discussion between the review authors.

Data extraction and management

We had planned to have two authors independently extract appropriate information regarding the characteristics of each included study, using a data abstraction form based on the EPOC Group template. We intended to extract the following data.

- Study reference: author name, publication year
- Study design: RCT or cluster-RCT
- Participants: number of participating nurses, age, level of training and years in practice
- Setting: country, type of hospital, type of department/speciality
- Intervention: description of the nursing handover intervention, classified according to whether the intervention targets any or a combination of content, method and location of the handover
- Control: description of control group used
- Outcomes: measures used to assess patient outcome, process and efficiency outcomes
- Results: main results of all outcome(s)

Where needed, we planned to contact study authors (if possible) to obtain missing information.

Assessment of risk of bias in included studies

We had planned that eligible studies would be independently assessed on methodological quality using the Cochrane 'Risk of bias' tool, the EPOC Group criteria for randomised controlled trials and the GRADE approach ([EPOC 2009](#); [GRADEpro 2010](#); [Higgins 2011](#)). These checklists assess the validity of study design (method of randomisation; allocation concealment; imbalance of outcome measures at baseline; blinding of participants, personnel and outcome assessors; incomplete outcome data; method of data collection; appropriate statistical methods) and the effect and applicability of the results (magnitude of effect; imprecision; inconsistency; indirectness).

Measures of treatment effect

We planned to report pre- and post-intervention proportions (dichotomous outcomes) and means or medians (continuous outcomes) separately. For dichotomous outcomes, such as AEs, we intended to calculate the risk ratio (RR) and the risk difference (RD) together with their respective 95% confidence intervals (CI). For studies reporting continuous outcomes, such as time, we planned to calculate the mean difference (MD) together with a 95% CI. When necessary we intended to contact the first or corresponding author for clarification or additional information. Had authors not reported or supplied data in sufficient detail after we had contacted them, we would have reported the point estimates with 95% CI or a P value, as stated by the author. We would have annotated this with 'as stated by the author'. Where studies reported more than one measure for each endpoint, we planned to abstract the primary measure (as defined in the methods section by the authors of the study) or the median measure identified.

Unit of analysis issues

Clustered studies, where clusters of individuals are randomised (cluster-RCTs) to intervention groups, but where inference is intended at the level of the individual, need to be analysed appropriately to account for correlation of observations within clusters. Standard statistical methods assume independence of observations, and their use in these types of studies will generally result in artificially small P values and overly narrow 95% CI for the effect estimates (Ukoumunne 1999). We planned to attempt to reanalyse studies with potential unit of analysis errors if information was available about the size/number of clusters and the value of the intra-cluster correlation coefficient (ICC). If a comparison had been reanalysed, we would have quoted the P value and annotated it as 'reanalysed'. If the ICC was not available we intended to attempt to obtain it by contacting trial authors, or by imputing it using external estimates from similar studies (Ukoumunne 1999), or using general recommendations from empirical research (Campbell 2000). If this had not been possible we would have reported the effect estimate and annotated it with the phrase 'unit of analysis error'.

Dealing with missing data

We intended to contact the authors of included studies for missing data and incorporate this information into the analysis. We would have annotated this information as 'as provided after contact with the author'.

Assessment of heterogeneity

We expected to find both clinical and statistical heterogeneity due to differences in the types of intervention, types of setting, definition of outcome measures and study design. This made it unlikely

that statistical pooling would be feasible, but if there appeared to be a body of studies amenable to meta-analysis, then we planned to display the results graphically to assess heterogeneity. We would have considered I^2 statistic values of 50% or greater as indicative of significant heterogeneity. If this had been the case, we would have refrained from pooling and restricted the analysis to a qualitative overview. If there had been sufficient homogeneity in populations, study design and outcome measures (i.e. where $I^2 < 50\%$) (Higgins 2003), we would have pooled results.

Assessment of reporting biases

We had planned to construct a funnel plot analysis to assess publication bias if there were 10 or more studies included in an analysis. We would have judged that publication bias existed when we detected asymmetry in the funnel plot. We also intended to use the Egger test to assess funnel plot asymmetry (Egger 1997). A thorough search for unpublished studies through searches of the grey literature and contact with known experts in the field would also have assisted in reducing the risk of publication bias. Finally we would have assessed selective outcome reporting bias by comparing either the study protocol (if available) or the methods section (if a protocol was not available) to the reported results of the study.

Data synthesis

A meta-analysis would have been considered only if we had had two or more studies that were homogeneous regarding population, interventions, comparisons and outcomes. In instances where meta-analysis would not be possible, we planned to report the results as a descriptive narrative only. For studies that were sufficiently clinically and statistically homogenous ($I^2 < 50\%$), we planned to use a random-effects model. Where possible, we would have included both relative and absolute measures of effect in the meta-analysis. We would have performed data synthesis using Review Manager 5.2 (RevMan 2011). Furthermore we intended to use GRADE-profiler software to assist in the preparation of the 'Summary of findings' tables (GRADEpro 2010).

Subgroup analysis and investigation of heterogeneity

Had sufficient data been available, we planned to perform subgroup analyses to compare outcomes for:

- shift to shift handover on nursing wards providing different levels of care, such as: regular ward-based care, high dependency care and ICU;
- interdepartmental handover: from one ward to another ward (same level of care), and between departments with different levels of care: for example from ICU to ward, from recovery to ward, from ward to ICU.

Sensitivity analysis

We planned to perform a sensitivity analysis to explore the impact of the following study characteristics: fixed-effect versus random-effects analysis; odds ratios versus risk ratios; and studies with imputed standard deviations versus without imputed standard deviations.

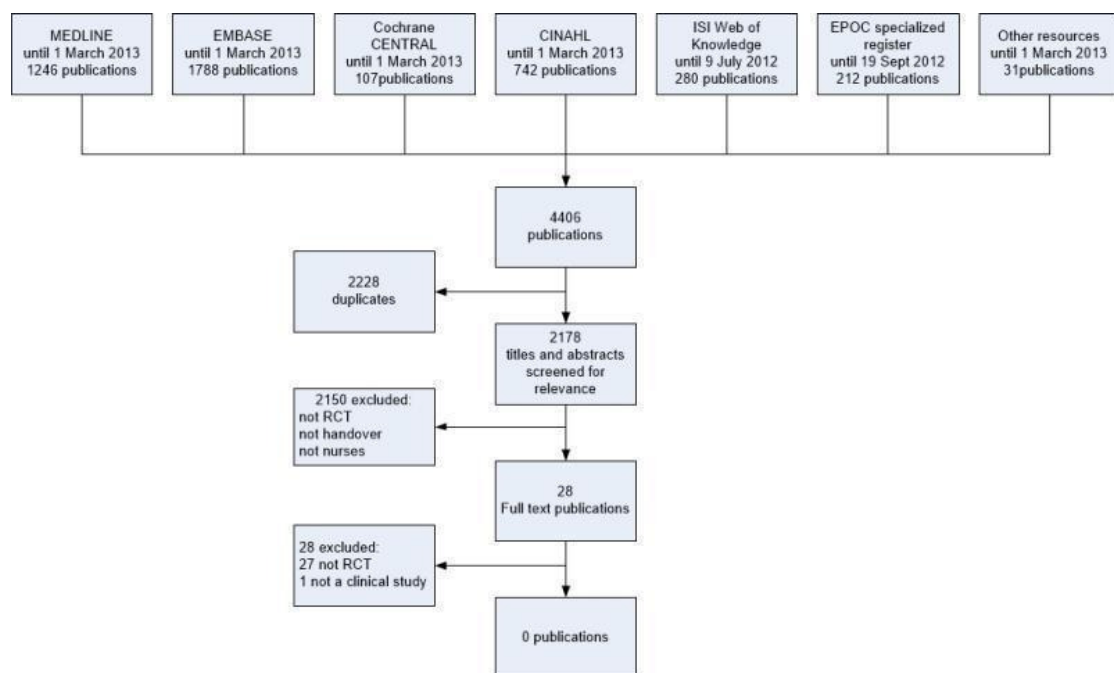
RESULTS

Description of studies

Results of the search

The search identified 2178 citations. Independent examination by the reviewers resulted in retrieval of 28 publications that were potentially eligible for inclusion in the review (Figure 1). After assessment of the full text of these studies, no study was found to meet the inclusion criteria. A description of the retrieved studies and the reasons for their exclusion are presented in the 'Characteristics of excluded studies' section.

Figure 1. Flow diagram of search



Included studies

No eligible studies were found for inclusion in this review.

Excluded studies

Main reason for exclusion was that the studies did not meet the RCT study design: 18 studies used a simple before-and-after design (Antonoff 2013; Athwal 2009; Baldwin 1994; Benestante 2008; Chung 2011; Craig 2012; Dean 2012a; Evans 2012; Hussain 2011; Joy 2011; Jukkala 2012; Radtke 2013; Raptis 2009;

Stahl 2009; Streitenberger 2011; Thomas 2012; Tucker 2009; Wentworth 2012) three studies were opinion papers (Benaglio 2006; Dean 2012b; Ten Cate 2012), two studies used a qualitative design (Adams 2012; Clair 1969), two studies were editorials (Moore 2012; Rabol 2011), one study was a simulation study (Dowding 2001), one study performed post implementation evaluation only (Alvarado 2006) and one study was a project description (Aellig 2012). In addition four of the studies were not on nursing handover (Aellig 2012; Antonoff 2013; Dean 2012a; Hussain 2011). The detailed description of retrieved studies and

reasons for their exclusion are presented in the 'Characteristics of excluded studies' section.

Risk of bias in included studies

No eligible studies were found for inclusion in this review, so we made no assessment of risk of bias.

Allocation

No eligible studies were found for inclusion in this review, so we made no assessment of selection bias.

Blinding

No eligible studies were found for inclusion in this review, so we made no assessment of performance or detection bias.

Incomplete outcome data

No eligible studies were found for inclusion in this review, so we made no assessment of attrition bias.

Selective reporting

No eligible studies were found for inclusion in this review, so we made no assessment of reporting bias.

Other potential sources of bias

No eligible studies were found for inclusion in this review, so we made no assessment of other sources of bias.

Effects of interventions

No eligible studies were found for inclusion in this review, so we cannot report any effects of interventions.

DISCUSSION

We did not find any randomised studies and could not include any studies that fulfilled our methodological criteria for this review. Therefore, we are unable to draw any conclusions about the effectiveness of different nursing handover styles for ensuring continuity of information in hospitalised patients. This is disappointing in view of the important role of the nursing handover in continuity of care and the widespread attention the topic receives in light of patient safety. Within the field of physician handover we identified three publications from two randomised studies comparing usual care to an intervention (Lee 1996; Van Eaton 2005; Van Eaton 2010), which indicates that it is possible to apply this design for

evaluation of handover styles. One study used a randomised cross-over design and the other study used randomisation of members to a team. Unfortunately one study was a small study ($n = 19$) and both studies had a short time frame (three and five months respectively). The outcomes measured were efficiency (workflow and time), continuity of care, safety (adverse events) and self-reported assessment of the new procedure.

Although no reliable evidence exists yet, there are many examples of researchers attempting to evaluate effectiveness of nursing handover styles in order to improve patient safety and quality of care (listed within the [Characteristics of excluded studies](#)). Most of these studies (18 out of 28 studies) were limited to simple before-and-after designs of local experiences with quality improvement (QI) initiatives in which the handover practice and how it was performed was described to a varying degree, making reproduction difficult. The handover practice was often evaluated at the level of self-reported satisfaction (six studies on nurse satisfaction and two on patient satisfaction) and not at the level of effectiveness.

The topic of nursing handover has received considerable attention lately, but the studies designed so far are at a high risk of bias, generate only local knowledge or have not been designed to generate effectiveness data (Glasziou 2011; MRC 2000; Ovreteit 2011; Shojania 2004; Shojania 2005). There is an urgent need for high-quality studies to provide hospital management with appropriate evidence to guide decisions about the most effective nursing handover style.

Summary of main results

No eligible studies were found for inclusion in this review.

Overall completeness and applicability of evidence

This review is complete, based on the evidence currently available.

Quality of the evidence

No randomised controlled trials were available for inclusion in this review. The majority of the excluded studies were simple before-and-after evaluations of local experiences with QI initiatives. The major drawback of this design is a high risk of bias, since there is no control available and changes over time in patient populations, or changes in practice, that are unrelated to the QI intervention may produce the desired improvements (Fan 2010).

Potential biases in the review process

The extensive search strategy was carefully designed and adapted to existing terminology by experienced clinical librarians. We searched a large number of databases and relevant websites. Two review authors independently assessed all potentially eligible titles and abstracts against the eligibility criteria to ensure that no important references were missed. Additionally we searched reference lists of systematic reviews that were identified in the search.

Agreements and disagreements with other studies or reviews

During the inclusion process for primary studies on nursing handover we also identified 27 potential systematic reviews on handover (Appendix 7), six of which could be classified as systematic reviews (Arora 2009; Calleja 2011; Foster 2012; Ong 2011; Riesenbergs 2010; Staggers 2013), according to the DARE criteria (NIHR 2013). These reviews had wider inclusion criteria than this review regarding methodology, consisting of QI studies using primarily simple before-and-after designs and a wider scope that also included physician or interdisciplinary handover. Searching the references of these reviews revealed no high quality studies we might have missed in our search. Also a recent review by Scott revealed no RCTs, interrupted time series (ITS) or controlled before-and-after studies (CBA) (Scott 2012). All the reviews also concluded that the existing literature on patient handovers does not yet support definitive research conclusions, and all addressed the need for high quality studies.

AUTHORS' CONCLUSIONS

Implications for practice

We found no eligible studies for inclusion in the review and therefore the review question remains unanswered. As a consequence, uncertainty remains about the most effective nursing handover practice and, as previously noted, one can only rely on insights obtained from systematic reviews of studies with simple before-and-after designs. Breakdowns in communication are one of the main causes of adverse events (AEs) and an accurate handover of clinical information is of great importance to continuity and safety of care. According to current knowledge, the following guiding principles can be applied when redesigning the nursing handover process: face-to-face communication, structured documentation, patient involvement and use of information technology to support the process. When designing and implementing a quality improvement (QI) initiative to improve nursing handover one should consider conducting an evaluation using a robust design, (e.g. an interrupted time series (ITS) or a controlled before-and-after (CBA) study) to strengthen the evidence about this topic.

Implications for research

At present, high quality evidence on the effectiveness nursing handover styles for ensuring continuity of information in hospitalised patients is lacking. Researchers wishing to evaluate the effectiveness of different nursing handover styles in hospitalised patients should use well designed rigorous studies. Experimental methods such as (cluster) randomised controlled trials (RCTs) are recommended because they offer protection from the effects of background variation. However their use in QI research may be beyond the capacity of many clinicians and researchers because of difficulty in blinding and concealment of allocation (Rotter 2010; Shojania 2004; Shojania 2005). Another feasible rigorous study design that can correct for the drawbacks of simple before-and-after designs is an ITS with at least three data points before and three data points after the intervention and at least two intervention sites (EPOC 2009; Grimshaw 2000; Ramsay 2003). This design conveys the extent of background variation and also indicates the extent to which any trend toward improvement may have been present prior to the intervention. When multiple time points before and after an intervention are not feasible, a reasonable alternative to a time-series analysis is a CBA study, in which the same before-and-after measurements occur in one or more hospitals that did not implement the change of interest but are otherwise comparable (EPOC 2009; Grimshaw 2000; Ramsay 2003). Within these designs interventions to improve nursing handovers, such as bedside handover or structured formats for handover can be compared against usual care (i.e. unstructured handover in the office). Also it appears that there is no one single handover format that is applicable everywhere, the context and local situation are important factors to consider when designing a handover process and structure.

Ideally, when evaluating the effectiveness of nursing handover styles objective outcome measures should be used. Nurse-sensitive indicators are being proposed as a means of measuring the impact of nursing care quality on patient outcomes. These include preventable AEs such as medication errors and patient falls, or complications such as pressure ulcers and nosocomial infections, as well as length of hospital stay and patient satisfaction (Burston 2013). Process outcomes that can be used include recall of information, compliance with the plan of care, time and interruptions. Since the incidence of AEs is not high, a sufficient number of participants (for RCT designs) or sufficient time interval (for ITS and CBA designs), or both, should be applied.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Adams 2012	Qualitative interview study with 20 nurses to develop a model structure for a standardised nursing handover. Did not meet RCT study design criteria
Aellig 2012	A quality improvement project on handover between institutions. Did not meet RCT study design criteria and in-hospital nursing handover criteria
Alvarado 2006	Development, implementation and evaluation of a combination of written and verbal nursing shift handover with a safety check at the bedside. Did not meet RCT study design criteria as performed only a post-implementation evaluation (of nurses' experiences)
Antonoff 2013	Development, implementation and evaluation of a combination of written and verbal shift handover for residents. Did not meet RCT study design criteria as only simple before-and-after comparison was performed (on satisfaction with sign-outs, perceptions of patient safety, adequacy of information provided in sign-out, and patient knowledge by on-call residents) and not on nursing handover
Athwal 2009	Development, implementation and evaluation of a combination of written and verbal nursing shift handover at the bedside. Did not meet RCT study design criteria as performed only simple before-and-after comparison (on the amount of time spent for shift report, overtime expenses related to shift report, call lights, staff satisfaction, and patient falls)
Baldwin 1994	Development, implementation and evaluation of a computer-generated written nursing shift handover. Did not meet RCT study design criteria as performed only simple before-and-after comparison (on overtime and staff satisfaction)
Benaglio 2006	Opinion paper on nursing shift handover; did not meet RCT study design criteria
Benestante 2008	Implementation and evaluation of bedside nursing shift handover. Did not meet RCT study design criteria as performed only simple before-and-after comparison (on nurses belief that bedside reporting improves patient safety)
Chung 2011	Development, implementation and evaluation of a standardised nursing shift report. Did not meet RCT study design criteria as performed only simple before-and-after comparison (on staff opinions and overtime)
Clair 1969	Qualitative study to find out what should be included in a nursing shift handover report and to determine the extent to which nurses acted upon their beliefs. Did not meet RCT study design criteria
Craig 2012	Development, implementation and evaluation of multidisciplinary structured verbal, written bedside handover from cardiac operating room to paediatric intensive care. Did not meet RCT study design criteria as performed only simple before-and-after comparison (on handover score, staff perception, duration and number of interruptions)

(Continued)

Dean 2012a	Development, implementation and evaluation of a standardised handover from ambulance to ED. Did not meet RCT study design criteria as performed only simple before-and-after comparison and did not meet in-hospital nursing handover criteria
Dean 2012b	Opinion paper on nursing handover; did not meet RCT study design criteria
Dowding 2001	Simulation of the effect that manipulating the style and content of the nurse shift handover had on an individual's ability to plan patient care, not in a clinical setting
Evans 2012	Development, implementation and evaluation of bedside nursing shift handover. Did not meet RCT study design criteria as performed only simple before-and-after comparison (on nurses' job satisfaction and time spent delivering report)
Hussain 2011	Development, implementation and evaluation of a weekend handover for residents. Did not meet RCT study design criteria as performed only simple before-and-after comparison and not on nursing handover
Joy 2011	Development, implementation and evaluation of a structured handover from cardiac operation room to ICU. Did not meet RCT study design criteria as performed only simple before-and-after comparison (on technical errors, information omissions and realised errors)
Jukkala 2012	Development, implementation and evaluation of a structured written and verbal nursing shift report in a medical ICU. Did not meet RCT study design criteria as performed only simple before-and-after comparison (on nurse's perception of handoff communication during shift report)
Moore 2012	Editorial; did not meet RCT study design criteria.
Rabol 2011	Editorial; did not meet RCT study design criteria
Radtke 2013	Development, implementation and evaluation of a bedside nursing shift report on a medical/surgical intermediate care unit. Did not meet RCT study design criteria as performed only simple before-and-after comparison (on patient satisfaction)
Raptis 2009	Comparison of a paper-based and electronic-based medical handover from day team to out-of-hours team consisting of specialist nurses, medical staff and surgical staff. Did not meet RCT study design criteria as performed only simple before-and-after comparison (on patient details and patient location, primary diagnosis and current problem, plan of action and day team details)
Stahl 2009	Prospective cohort study of trauma and surgical ICU teams (interns, residents, and fellows) to determine whether a structured checklist for ICU handovers prevents information loss. Did not meet RCT study design criteria as performed only simple before-and-after comparison (on data lost)
Streitenberger 2011	Proceedings abstract on development, implementation and evaluation of a standardised nursing shift handover in 3 paediatric ICUs. Did not meet RCT study design criteria
Ten Cate 2012	Opinion paper; did not meet RCT study design criteria

(Continued)

Thomas 2012	Development, implementation and evaluation of a standardised bedside nursing shift handover on medical surgical units. Did not meet RCT study design criteria as performed only simple before-and-after comparison (on nurse and patient satisfaction)
Tucker 2009	Development, implementation and evaluation of a bedside 'reading' nursing shift handover. Did not meet RCT study design criteria as performed only simple before-and-after comparison (the standard of record keeping)
Wentworth 2012	Development, implementation and evaluation of an electronic handover communication tool for transferring uncomplicated routine patients to and from a progressive care unit and cardiac laboratories. Did not meet RCT study design criteria as performed only simple before-and-after comparison (on implementation evaluation)

Abbreviations

ED = emergency department

ICU = intensive care unit

RCT = randomised controlled trial

DATA AND ANALYSES

This review has no analyses.

APPENDICES

Appendix 1. EPOC Specialised Register

- 1 All Non-Indexed fields {continuity of care} AND {communicat*} AND {nurse} OR
- 2 All Non-Indexed fields {handover} OR {hand* over} OR {hand* off} OR {handoff} OR
- 3 All Non-Indexed fields {bedside report*} OR {bed side report*} OR {chang* of shift} OR {changing shift*} OR {shift chang*} OR
- 4 All Non-Indexed fields {shift report*} OR {sign out} report* OR {sign out system} OR {transfer report} OR {intershift} OR {inter-shift*} OR
- 5 All Non-Indexed fields {patient*} AND {transfer*} AND {nurse} OR
- 6 All Non-Indexed fields {patient* care} AND {communicat*} OR
- 7 All Non-Indexed fields {patient* care} AND {transfer*} OR
- 8 All Non-Indexed fields {discharge planning} AND {nurse} OR
- 9 All Non-Indexed fields {patient discharg*} AND {nurse} OR
- 10 Title, primary {patient} AND {transfer} OR
- 11 All Non-Indexed fields {care transition} OR {transition of care} OR
- 12 All Non-Indexed fields {interfacility} AND {transfer} OR
- 13 All Non-Indexed fields {inter-facility} AND {transfer} OR
- 14 Keywords patient transfer* OR
- 15 All Non-Indexed fields {care transition} OR {transition*} OR {transition of care}

Appendix 2. Cochrane Central Register of Controlled Trials (CENTRAL) search strategy

- #1 (Interfacility or inter-facility or intra-hospital or intrahospital):ti,ab,kw
- #2 (interprofessional or inter-professional or interdepartment* or inter-department*):ti,ab,kw
- #3 (#1 OR #2)
- #4 (patient* near/3 transfer*)
- #5 (sign-over* or service change*):ti,ab,kw
- #6 (care near/2 transition*):ti,ab,kw
- #7 MeSH descriptor Patient Transfer, this term only
- #8 (#4 OR #5 OR #6 OR #7)
- #9 (#3 AND #8)
- #10 (#3 AND #8)
- #1 (interprofessional or inter-professional or interdepartment* or inter-department*):ti,ab,kw
- #2 (Interfacility or inter-facility or intra-hospital or intrahospital):ti,ab,kw
- #3 (#1 OR #2)
- #4 MeSH descriptor Patient Care Planning explode all trees
- #5 MeSH descriptor Patient Care Management, this term only
- #6 MeSH descriptor Patient-Centered Care, this term only
- #7 MeSH descriptor Continuity of Patient Care, this term only
- #8 MeSH descriptor Progressive Patient Care, this term only
- #9 MeSH descriptor Critical Pathways, this term only
- #10 (#4 OR #5 OR #6 OR #7 OR #8 OR #9)
- #11 (#10 AND #3)
- #1 "change-of-shift" or "bedside report*" or "bed-side report*":ti,ab,kw

#2 (transfer and report*):ti
 #3 (#1 OR #2)
 #1 "shift report*" or "sign-out report*"
 #2 "sign* out":ti,ab,kw
 #3 "hand over*" or "handing over" or handover* or handoff* or "handing off" or "hand off*" or handoff* or "handing off" or "hand off*":ti,ab,kw
 #4 (#1 OR #2 OR #3)

Appendix 3. MEDLINE search strategy

1. (hand over? or handing over or handover?):ti,ab.
2. "shift report*":ti,ab.
3. (handoff? or handing off or hand off?):ti.
4. (handoff? or handing off or hand off?):ab.
5. (shift adj3 chang*).ti,ab. and (patient? or care).ti,hw.
6. "sign-out report*":ti,ab.
7. (sign out adj2 (report* or system? or patient?)).ti,ab.
8. (sign out adj2 (report* or system?)).ti,ab.
9. (sign* out adj4 (nurse? or physician? or doctor? or resident? or patient?)).ti,ab.
10. or/1-9
11. (change-of-shift or (bedside report\$ or bed-side report\$)).ti,ab.
12. transfer report.ti. or (transfer report? adj3 (nurse? or doctor? or physician? or patient?)).ab.
13. ((intershift? or inter-shift? or shift?) adj2 report\$).ti,ab.
14. or/11-13
15. Patient transfer/
16. (patient? and (transfer? or transport*)).ti.
17. (patient? adj3 (transfer\$ or transport*)).ab.
18. ((interprofessional or inter-professional or interdepartment\$ or inter-department\$) adj2 transfer\$).ti,ab.
19. sign-over?:ti,ab.
20. service change?:ti,ab.
21. (care adj2 transition\$).ti,ab.
22. ((Interfacility or inter-facility or intra-hospital or intrahospital) adj3 transfer\$).ti,ab.
23. (patient care management/ or exp patient care planning/ or patient-centered care/ or "continuity of patient care"/ or progressive patient care/ or critical pathways/) and ((patient adj2 transfer?) or shift chang\$ or shift-to-shift).ti,ab.
24. or/15-23
25. exp Nursing/
26. exp nurses/ or nurse administrators/ or nurse anesthetists/ or nurse clinicians/ or nurse midwives/ or nurse practitioners/ or nurses, male/
27. nursing staff/ or nursing staff, hospital/
28. exp Nursing Care/
29. (patient care/ or exp critical care/ or "episode of care"/ or exp hospitalization/ or exp life support care/ or exp long-term care/ or exp night care/ or palliative care/ or perinatal care/ or exp perioperative care/ or postnatal care/ or prenatal care/ or preoperative care/ or subacute care/ or exp terminal care/) and ((nurse? or nursing).ti. or (or/25-27))
30. (nurse? or nursing).ti,ab,hw.
31. or/25-30
32. 10 and 31
33. 14 and 31
34. 24 and 31
35. intervention?.ti. or (intervention? adj6 (clinician? or collaborat\$ or community or complex or design\$ or doctor? or educational or family doctor? or family physician? or family practitioner? or financial or GP or general practice? or hospital? or impact? or improv\$ or individual?e? or individual?ing or interdisciplin\$ or multicomponent or multi-component or multidisciplin\$ or multi-disciplin\$ or multifacet\$ or multi-facet\$ or multimodal\$ or multi-modal\$ or personal?e? or personal?ing or pharmacies or pharmacist? or pharmacy

or physician? or practitioner? or prescrib\$ or prescription? or primary care or professional\$ or provider? or regulatory or regulatory or tailor\$ or target\$ or team\$ or usual care)).ab.

36. (collaborativ\$ or collaboration? or tailored or personali?ed).ti,ab.

37. (exp hospitals/ or exp Hospitalization/ or exp Patients/ or exp Nurses/ or exp Nursing/) and (study.ti. or evaluation studies as topic/)

38. demonstration project?.ti,ab.

39. (pre-post or "pre test\$" or pretest\$ or posttest\$ or "post test\$" or (pre adj5 post)).ti,ab.

40. (pre-workshop or post-workshop or (before adj3 workshop) or (after adj3 workshop)).ti,ab.

41. trial.ti. or ((study adj3 aim?) or "our study").ab.

42. (before adj10 (after or during)).ti,ab.

43. ("quasi-experiment\$" or quasiexperiment\$ or "quasi random\$" or quasirandom\$ or "quasi control\$" or quasicontrol\$ or ((quasi\$ or experimental) adj3 (method\$ or study or trial or design\$))).ti,ab,hw.

44. ("time series" adj2 interrupt\$).ti,ab,hw.

45. (time points adj3 (over or multiple or three or four or five or six or seven or eight or nine or ten or eleven or twelve or month\$ or hour? or day? or "more than")).ab.

46. pilot.ti.

47. Pilot projects/

48. (clinical trial or multicenter study).pt.

49. (multicentre or multicenter or multi-centre or multi-center).ti.

50. random\$.ti,ab. or controlled.ti.

51. (control adj3 (area or cohort? or compar? or condition or group? or intervention? or participant? or study)).ab. not (controlled clinical trial or randomized controlled trial).pt.

52. "comment on".cm. or systematic review.ti. or literature review.ti. or editorial.pt. or letter.pt. or meta-analysis.pt. or news.pt. or review.pt.

53. exp animals/ not humans.sh.

54. (or/35-51) not (or/52-53)

55. (randomized controlled trial or controlled clinical trial).pt. or randomi?ed.ab. or clinical trials as topic.sh. or randomly.ab. or trial.ti.

56. exp animals/ not humans/

57. (rat or rats or mice or mouse or horse or equine or cow or bovine or pig or porcin*).ti,hw.

58. comment on.cm. or systematic review.ti. or literature review.ti. or editorial.pt. or meta-analysis.pt. or news.pt. or review.pt.

59. 55 not (or/56-58)

60. 54 not 59

61. 32 and 60 [epoc hand-over]

62. 33 and 60 [epoc shift]

63. 34 and 60 [epoc transfer]

64. 32 and 59 [rct hand-over]

65. 33 and 59 [rct shift]

66. 34 and 59 [rct transfer]

67. (handover? or "hand over?" or hand* over?).ti,ab. and (nurse or nurses or nursing).ti,hw.

68. ((nurse or nursing or nurses) adj3 (handover? or "hand over?" or hand* over?)).ti,ab.

69. ((patient? or inpatient? or outpatient?) adj3 (handover? or "hand over?" or hand* over?)).ti,ab.

70. or/67-69 [handover-ruim]

Appendix 4. EMBASE search strategy

1. (hand over? or handing over or handover?).ti,ab.
2. "shift report".ti,ab.
3. (handoff? or handing off or hand off?).ti.
4. (handoff? or handing off or hand off?).ab.
5. (shift adj3 chang*).ti,ab. and (patient? or care).ti,hw.
6. "sign-out report".ti,ab.
7. (sign out adj2 (report* or system? or patient?)).ti,ab.
8. (sign out adj2 (report* or system?)).ti,ab.
9. (sign* out adj4 (nurse? or physician? or doctor? or resident? or patient?)).ti,ab.
10. or/1-9
11. (change-of-shift or (bedside report\$ or bed-side report\$)).ti,ab.
12. transfer report.ti. or (transfer report? adj3 (nurse? or doctor? or physician? or patient?)).ab.
13. ((intershift? or inter-shift? or shift?) adj2 report\$).ti,ab.
14. or/11-13
15. Patient transfer/
16. (patient? and (transfer? or transport*)).ti.
17. (patient? adj3 (transfer\$ or transport*)).ab.
18. ((interprofessional or inter-professional or interdepartment\$ or inter-department\$) adj2 transfer\$).ti,ab.
19. sign-over?.ti,ab.
20. service change?.ti,ab.
21. (care adj2 transition\$).ti,ab.
22. ((Interfacility or inter-facility or intra-hospital or intrahospital) adj3 transfer\$).ti,ab.
23. (patient care management/ or exp patient care planning/ or patient-centered care/ or "continuity of patient care"/ or progressive patient care/ or critical pathways/) and ((patient adj2 transfer?) or shift chang\$ or shift-to-shift).ti,ab.
24. or/15-23
25. exp Nursing/
26. exp nurses/ or nurse administrators/ or nurse anesthetists/ or nurse clinicians/ or nurse midwives/ or nurse practitioners/ or nurses, male/
27. nursing staff/ or nursing staff, hospital/
28. exp Nursing Care/
29. (patient care/ or exp critical care/ or "episode of care"/ or exp hospitalization/ or exp life support care/ or exp long-term care/ or exp night care/ or palliative care/ or perinatal care/ or exp perioperative care/ or postnatal care/ or prenatal care/ or preoperative care/ or subacute care/ or exp terminal care/) and ((nurse? or nursing).ti. or (or/25-27))
30. (nurse? or nursing).ti,ab,hw.
31. or/25-30
32. 10 and 31
33. 14 and 31
34. 24 and 31
35. intervention?.ti. or (intervention? adj6 (clinician? or collaborat\$ or community or complex or design\$ or doctor? or educational or family doctor? or family physician? or family practitioner? or financial or GP or general practice? or hospital? or impact? or improv\$ or individuali?e? or individuali?ing or interdisciplin\$ or multicomponent or multi-component or multidisciplin\$ or multi-disciplin\$ or multifacet\$ or multi-facet\$ or multimodal\$ or multi-modal\$ or personali?e? or personali?ing or pharmacies or pharmacist? or pharmacy or physician? or practitioner? or prescrib\$ or prescription? or primary care or professional\$ or provider? or regulatory or regulatory or tailor\$ or target\$ or team\$ or usual care)).ab.
36. (collaborativ\$ or collaboration? or tailored or personali?ed).ti,ab.
37. (exp hospitals/ or exp Hospitalization/ or exp Patients/ or exp Nurses/ or exp Nursing/) and (study.ti. or evaluation studies as topic/)
38. demonstration project?.ti,ab.
39. (pre-post or "pre test\$" or pretest\$ or posttest\$ or "post test\$" or (pre adj5 post)).ti,ab.
40. (pre-workshop or post-workshop or (before adj3 workshop) or (after adj3 workshop)).ti,ab.
41. trial.ti. or ((study adj3 aim?) or "our study").ab.

42. (before adj10 (after or during)).ti,ab.
43. *experimental design/ or *pilot study/ or quasi experimental study/
44. ("quasi-experiment\$" or quasiexperiment\$ or "quasi random\$" or quasirandom\$ or "quasi control\$" or quasicontrol\$ or ((quasi\$ or experimental) adj3 (method\$ or study or trial or design\$))).ti,ab.
45. ("time series" adj2 interrupt\$).ti,ab.
46. (time points adj3 (over or multiple or three or four or five or six or seven or eight or nine or ten or eleven or twelve or month\$ or hour? or day? or "more than")).ab.
47. pilot.ti.
48. (multicentre or multicenter or multi-centre or multi-center).ti.
49. random\$.ti,ab. or controlled.ti.
50. "comment on".cm. or systematic review.ti. or literature review.ti. or editorial.pt. or letter.pt. or meta-analysis.pt. or news.pt. or review.pt.
51. (animal/ or animal.hw.) not ((animal/ or animal?.kw,hw.) and (human/ or human?.hw,kw.))
52. (or/35-49) not (or/50-51)
53. randomized controlled trials/ or controlled clinical trials/ or randomi?ed.ab. or clinical trials as topic.sh. or randomly.ab. or trial.ti.
54. exp animals/ not humans/
55. (rat or rats or mice or mouse or horse or equine or cow or bovine or pig or porcine*).ti,hw.
56. (comment on or systematic review or literature review).ti. or editorial.pt. or meta-analysis/ or news.ti. or review.pt.
57. 53 not (or/54-56)
58. 52 not 57
59. 32 and 58 [epoc handover]
60. 33 and 58 [epoc shift]
61. 34 and 58 [epoc transfer]
62. 32 and 57 [rct handover]
63. 33 and 57 [rct shift]
64. 34 and 57 [rct transfer]
65. (handover? or "hand over?" or hand* over?).ti,ab. and (nurse or nurses or nursing).ti,hw.
66. ((nurse or nursing or nurses) adj3 (handover? or "hand over?" or hand* over?)).ti,ab.
67. ((patient? or inpatient? or outpatient?) adj3 (handover? or "hand over?" or hand* over?)).ti,ab.
68. or/65-67 [handover ruim]

Appendix 5. CINAHL search strategy

S84 s33 and s41 and s81
 S83 s18 and s81
 S82 s11 and s81
 S81 s66 not s77
 S80 S33 and S41 and S77
 S79 S18 and S77
 S78 S11 and S77
 S77 S71 or S72 or S73 or S74 or S75 or S76
 S76 (MM "Clinical Trials+")
 S75 TI ("control* N1 clinical" or "control* N1 group*" or "control* N1 trial*" or "control* N1 study" or "control* N1 studies" or "control* N1 design*" or "control* N1 method*") or AB ("control* N1 clinical" or "control* N1 group*" or "control* N1 trial*" or "control* N1 study" or "control* N1 studies" or "control* N1 design*" or "control* N1 method*")
 S74 TI controlled or AB controlled
 S73 TI random* or AB random*
 S72 TI ("clinical study" or "clinical studies") or AB ("clinical study" or "clinical studies")
 S71 TI ((multicent* n2 design*) or (multicent* n2 study) or (multicent* n2 studies) or (multicent* n2 trial*)) or AB ((multicent* n2 design*) or (multicent* n2 study) or (multicent* n2 studies) or (multicent* n2 trial*))
 S70 S33 and S41 and S66
 S69 S18 and S66

S68 S11 and S66

S67 (S42 or S43 or S44 or S45 or S46 or S47 or S48 or S49 or S50 or S51 or S52 or S53 or S54 or S55 or S56 or S57 or S58 or S59 or S60 or S61 or S62 or S63 or S64 or S65) and (S11 and S66)

S66 S42 or S43 or S44 or S45 or S46 or S47 or S48 or S49 or S50 or S51 or S52 or S53 or

S54 or S55 or S56 or S57 or S58 or S59 or S60 or S61 or S62 or S63 or S64 or S65

S65 TI ((time points n3 over) or (time points n3 multiple) or (time points n3 three) or (time points n3 four) or (time points n3 five) or (time points n3 six) or (time points n3 seven) or (time points n3 eight) or (time points n3 nine) or (time points n3 ten) or (time points n3 eleven) or (time points n3 twelve) or (time points n3 month*) or (time points n3 hour*) or (time points n3 day*) or (time points n3 “more than”)) or AB ((time points n3 over) or (time points n3 multiple) or (time points n3 three) or (time points n3 four) or (time points n3 five) or (time points n3 six) or (time points n3 seven) or (time points n3 eight) or (time points n3 nine) or (time points n3 ten) or (time points n3 eleven) or (time points n3 twelve) or (time points n3 month*) or (time points n3 hour*) or (time points n3 day*) or (time points n3 “more than”))

S64 TI ((control w3 area) or (control w3 cohort*) or (control w3 compar*) or (control w3 condition) or (control w3 group*) or (control w3 intervention*) or (control w3 participant*) or (control w3 study)) or AB ((control w3 area) or (control w3 cohort*) or (control w3 compar*) or (control w3 condition) or (control w3 group*) or (control w3 intervention*) or (control w3 participant*) or (control w3 study))

S63 TI (multicentre or multicenter or multi-centre or multi-center) or AB random*

S62 TI random* OR controlled

S61 TI (trial or (study n3 aim) or “our study”) or AB ((study n3 aim) or “our study”)

S60 TI (pre-workshop or preworkshop or post-workshop or postworkshop or (before n3 workshop) or (after n3 workshop)) or AB (pre-workshop or preworkshop or post-workshop or postworkshop or (before n3 workshop) or (after n3 workshop))

S59 TI (demonstration project OR demonstration projects OR preimplement* or pre-implement* or post-implement* or postimplement*) or AB (demonstration project OR demonstration projects OR preimplement* or pre-implement* or post-implement* or postimplement*)

S58 TX (intervention n6 clinician*) or (intervention n6 community) or (intervention n6 complex) or (intervention n6 design*) or (intervention n6 doctor*) or (intervention n6 educational) or (intervention n6 family doctor*) or (intervention n6 family physician*) or (intervention n6 family practitioner*) or (intervention n6 financial) or (intervention n6 GP) or (intervention n6 general practice*) Or (intervention n6 hospital*) or (intervention n6 impact*) Or (intervention n6 improv*) or (intervention n6 individualize*) Or (intervention n6 individualise*) or (intervention n6 individualizing) or (intervention n6 individualising) or (intervention n6 interdisciplin*) or (intervention n6 multicomponent) or (intervention n6 multi-component) or (intervention n6 multidisciplin*) or (intervention n6 multi-disciplin*) or (intervention n6 multifacet*) or (intervention n6 multi-facet*) or (intervention n6 multimodal*) or (intervention n6 multi-modal*) or (intervention n6 personalize*) or (intervention n6 personalise*) or (intervention n6 personalizing) or (intervention n6 personalising) or (intervention n6 pharmaci*) or (intervention n6 pharmacist*) or (intervention n6 pharmacy) or (intervention n6 physician*) or (intervention n6 practitioner*) Or (intervention n6 prescrib*) or (intervention n6 prescription*) or (intervention n6 primary care) or (intervention n6 professional*) or (intervention* n6 provider*) or (intervention* n6 regulatory) or (intervention n6 regulatory) or (intervention n6 tailor*) or (intervention n6 target*) or (intervention n6 team*) or (intervention n6 usual care)

S57 TI (collaborativ* or collaboration* or tailored or personalised or personalized) or AB (collaborativ* or collaboration* or tailored or personalised or personalized)

S56 TI pilot

S55 (MH “Pilot Studies”)

S54 AB “before-and-after”

S53 AB time series

S52 TI time series

S51 AB (before* n10 during or before n10 after) or AU (before* n10 during or before n10 after)

S50 TI ((time point*) or (period* n4 interrupted) or (period* n4 multiple) or (period* n4 time) or (period* n4 various) or (period* n4 varying) or (period* n4 week*) or (period* n4 month*) or (period* n4 year*)) or AB ((time point*) or (period* n4 interrupted) or (period* n4 multiple) or (period* n4 time) or (period* n4 various) or (period* n4 varying) or (period* n4 week*) or (period* n4 month*) or (period* n4 year*))

S49 TI ((quasi-experiment* or quasiexperiment* or quasi-random* or quasirandom* or quasi control* or quasicontrol* or quasi* W3 method* or quasi* W3 study or quasi* W3 studies or quasi* W3 trial or quasi* W3 design* or experimental W3 method* or experimental W3 study or experimental W3 studies or experimental W3 trial or experimental W3 design*)) or AB ((quasi-experiment* or quasiexperiment* or quasi-random* or quasirandom* or quasi control* or quasicontrol* or quasi* W3 method* or quasi* W3 study

or quasi* W3 studies or quasi* W3 trial or quasi* W3 design* or experimental W3 method* or experimental W3 study or experimental W3 studies or experimental W3 trial or experimental W3 design*)

S48 TI pre w7 post or AB pre w7 post

S47 MH "Multiple Time Series" or MH "Time Series"

S46 TI ((comparative N2 study) or (comparative N2 studies) or evaluation study or evaluation studies) or AB ((comparative N2 study) or (comparative N2 studies) or evaluation study or evaluation studies)

S45 MH Experimental Studies or Community Trials or Community Trials or Pretest-Posttest Design + or Quasi-Experimental Studies + Pilot Studies or Policy Studies + Multicenter Studies

S44 TI (pre-test* or pretest* or posttest* or post-test*) or AB (pre-test* or pretest* or posttest* or "post test*") OR TI (preimplement*" or pre-implement*") or AB (pre-implement*" or preimplement*")

S43 TI (intervention* or multiintervention* or multi-intervention* or postintervention* or post-intervention* or preintervention* or pre-intervention*) or AB (intervention* or multiintervention* or multi-intervention* or postintervention* or post-intervention* or preintervention* or pre-intervention*)

S42 (MH "Quasi-Experimental Studies")

S41 S34 or S35 or S36 or S37 or S38 or S39 or S40

S40 AB interprofessional or inter-professional or interdepartment* or inter-department*

S39 TI interprofessional or inter-professional or interdepartment* or inter-department*

S38 AB Interfacility or inter-facility or intra-hospital or intrahospital

S37 TI Interfacility or inter-facility or intra-hospital or intrahospital

S36 TX patient unit*

S35 (MH "Interprofessional Relations+")

S34 (MH "Transfer, Intrahospital")

S33 S19 or S20 or S21 or S22 or S23 or S24 or S25 or S26 or S27 or S32

S32 S28 and S31

S31 S29 or S30

S30 AB patient N2 transfer* or shift chang* or shift-to-shift

S29 TI patient N2 transfer* or shift chang* or shift-to-shift

S28 (MH "Patient Care Plans+") OR (MH "Patient Centered Care") OR (MH "Continuity of Patient Care+") OR (MH "Progressive Patient Care") OR (MH "Critical Path")

S27 AB care N2 transition*

S26 TI care N2 transition*

S25 AB "service change"

S24 TI "service change"

S23 AB sign over

S22 TI sign over

S21 AB patient N3 transfer* or patient N3 transport*

S20 TI patient and transfer?

S19 (MH "Discharge Planning+")

S18 S12 or S13 or S14 or S15 or S16 or S17

S17 TI intershift? N3 report* or inter-shift? N3 report* or shift* N3 report*

S16 AB intershift? N3 report* or inter-shift? N3 report* or shift* N3 report*

S15 AB transfer N3 report*

S14 TI transfer N3 report*

S13 TI change-of-shift or "bedside report*" or "bed-side report"

S12 AB change-of-shift or "bedside report*" or "bed-side report"

S11 S1 or S2 or S3 or S4 or S5 or S6 or S7 or S8 or S9 or S10

S10 AB hand over? or handing over or handover?

S9 TI hand over? or handing over or handover?

S8 AB "shift report*" or "sign-out report"

S7 AB (shift N3 chang*) and (patient? or care)

S6 AB sign out

S5 TI sign out

S4 TI (shift N3 chang*) and (patient? or care)

S3 TI “shift report*” or “sign-out report*”
 S2 AB handoff? or handing off or hand off?
 S1 TI handoff? or handing off or hand off?

Appendix 6. ISI Web of Knowledge search strategy

1 Topic=(handover*) AND Topic=(patient or patients or nurse or nurses or hospital* or healthcare or “health care”) NOT Title= (“Nursing Home*”)
 2 (TI=handover* AND (TI=patient* or TI=hospital* or TI=nurse or TI=nurses or TI=healthcare or TI=care)) NOT ti=“nursing home*”
Databases=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH Timespan=All Years Lemmatization=On
 3 ((TI=HANDOFF* OR ts=HANDOFF*) and (ti=NURSE OR TI=NURSES OR TI=HOSPITAL* OR TI=CARE OR TI=PATIENT* OR TI=INPATIENT* OR TS=NURSE OR TS=NURSES OR TS=HOSPITAL* OR TS=CARE OR TS=PATIENT* OR TS=INPATIENT)) NOT (TI=NURSING HOME* OR TS=NURSING HOME*)
Databases=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH Timespan=All Years Lemmatization=On

Appendix 7. Systematic reviews for which the authors searched the reference lists

	Authors	Title
1	Arora VM, Manjarrez E, Dressler DD, Basaviah P, Halasyamani L, Kripalani S	Hospitalist handoffs: a systematic review and task force recommendations. <i>Journal of Hospital Medicine</i> 2009;4(7):433-40
2	Benson E, Rippin-Sisler C, Jabusch K, Keast S	Improving nursing shift-to-shift report. <i>Journal of Nursing Care Quality</i> 2007;22(1):80-4
3	Calleja P, Aitken LM, Cooke ML	Information transfer for multi-trauma patients on discharge from the emergency department: mixed-method narrative review. <i>Journal of Advanced Nursing</i> 2011;67(1):4-18
4	Cohen MD, Hilligoss PB	The published literature on handoffs in hospitals: deficiencies identified in an extensive review. <i>Quality & Safety in Health Care</i> 2010;19(6):493-7
5	Collins SA, Stein DM, Vawdrey DK, Stetson PD, Bakken S	Content overlap in nurse and physician handoff artifacts and the potential role of electronic health records: a systematic review. <i>Journal of Biomedical Informatics</i> 2011;44(4):704-12
6	Foster S, Manser T	The effects of patient handoff characteristics on subsequent care: a systematic review and areas for future research. <i>Academic Medicine</i> 2012;87(8):1105-24
7	Fraser LE, O'Brien K, Tobar I, Waller DM	Patient care plans for intershift report. <i>Journal of Pediatric Nursing</i> 1991;6(5):310-6
8	Gordon M, Findley R	Educational interventions to improve handover in health care: a systematic review. <i>Medical Education</i> 2011;45(11):1081-9

(Continued)

9	Hoban V	How to ... handle a handover. <i>Nursing Times</i> 2003;99(9):54-5
10	Kalkman C	Handover in the perioperative care process. <i>Current Opinion in Anesthesiology</i> 2010;23(6):749-53
11	Manser T, Foster S	Effective handover communication: an overview of research and improvement efforts. <i>Best Practice & Research Clinical Anaesthesiology</i> 2011;25(2):181-91
12	Matic J, Davidson, PM, Salamonson Y	Review: bringing patient safety to the forefront through structured computerisation during clinical handover. <i>Journal of Clinical Nursing</i> 2011;20(1-2):184-9
13	McKenna LG.	Improving the nursing handover report. <i>Professional Nurse</i> 1997;12(9):637-9
14	Messam K, Pettifer A	Understanding best practice within nurse intershift handover: what suits palliative care? <i>International Journal of Palliative Nursing</i> 2009;15(4):190-6
15	Miller C	Ensuring continuing care: styles and efficiency of the handover process. <i>The Australian Journal of Advanced Nursing</i> 1998;16(1):23-7
16	Ong MS, Coiera E	A systematic review of failures in handoff communication during intrahospital transfers. <i>Joint Commission Journal on Quality & Patient Safety</i> 2011;37(6):274-84
17	Patterson ES, Wears, RL	Patient handoffs: standardized and reliable measurement tools remain elusive. <i>Joint Commission Journal on Quality & Patient Safety</i> 2010;36(2):52-61
18	Priest CS, Holmberg SK	A new model for the mental health nursing change of shift report. <i>Journal of Psychosocial Nursing and Mental Health Services</i> 2000;38(8):36-43
19	Raduma-Tomas MA, Flin R, Yule S, Williams D.	Doctors' handovers in hospitals: a literature review. <i>BMJ Quality & Safety</i> 2011;20(2):128-33
20	Riesenberg LA, Leitzsch J, Cunningham JM	Nursing handoffs: a systematic review of the literature: surprisingly little is known about what constitutes best practice. <i>The American Journal of Nursing</i> 2010;110(4):24-36
21	Scott P, Ross P, Prytherch D	Evidence-based inpatient handovers: a literature review and research agenda. <i>Clinical Governance: An International Journal</i> 2012;17(1):14-27

(Continued)

22	Siemsen IM, Michaelsen L, Nielsen J, Ostergaard D, Andersen HB	[Patient handover involves numerous safety risks]. [Review] [Danish]. <i>Ugeskr Laeger</i> 2011;173(20):1412-6
23	Staggers N	An integrative review of research on nursing handoffs in acute care settings... <i>Transitions: Unifying Practice, Education, and Research to Improve Health: Communicating Nursing Research</i> 2011;44:27-42
24	Strople B, Ottani P	Can technology improve intershift report? What the research reveals. <i>Journal of Professional Nursing</i> 2006;22:197-204
25	Watkins S	Introducing bedside handover reports. <i>Professional Nurse</i> 1997;12(4):270-3
26	Woodward HI, Mytton OT, Lemer C, Yardley IC, Ellis BM, Rutter PD, et al	What have we learned about interventions to reduce medical errors? <i>Annual Review of Public Health</i> 2010;31:479-97
27	Wong MC, Yee KC, Turner P	Clinical Handover Literature Review, eHealth Services Research Group, University of Tasmania, Australia, 2008

HISTORY

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Review first published: Issue 6, 2014

Date	Event	Description
7 May 2014	Amended	copy editing suggestions processed
18 July 2013	Amended	Revised search methods per template provided by EPOC TSC. Added an appendix listing the systematic reviews we scanned for related studies Adapted the paragraph implications for future research according to epicot

CONTRIBUTIONS OF AUTHORS

HV was responsible for the study conception and design. MS was responsible for the first and subsequent drafts of the review. All authors contributed to conceptualising and designing the review and provided comments on drafts of the review.

DECLARATIONS OF INTEREST

Marian Smeulders: nothing to declare

Cees Lucas: nothing to declare

Hester Vermeulen: nothing to declare

SOURCES OF SUPPORT

Internal sources

- Academic Medical Center at the University of Amsterdam, Amsterdam, Netherlands.
- Amsterdam School of Health Professions, Amsterdam, Netherlands.

External sources

- No sources of support supplied

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

The original MEDLINE search was expanded to include as many results as possible.

INDEX TERMS

Medical Subject Headings (MeSH)

*Hospitalization; *Nursing Process; *Patient Handoff

MeSH check words

Humans