CLINICAL HANDOVER AND PATIENT SAFETY

LITERATURE REVIEW REPORT

AUSTRALIAN COUNCIL FOR SAFETY AND QUALITY IN HEALTH CARE

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COUNCIL

Clinical Handover and Patient Safety

Literature Review Report

March 2005

The Australian Council for Safety and Quality in Health Care was established in January 2000 by the Australian Government Health Minister with the support of all Australian Health Ministers to lead national efforts to improve the safety and quality of health care, with a particular focus on minimising the likelihood and effects of error. The Council reports annually to Health Ministers.

This document provides a report of the Clinical Handover and Patient Safety Literature Review which was prepared by the Australian Resource Centre for Healthcare Innovations on behalf of the Council.

Copies of this document and further information on the work of the Council can be found at www.safetyandquality.org or from the Office of the Safety and Quality Council on telephone: +61 2 6289 4244 or email to: safetyandquality@health.gov.au.

Disclaimer

Acknowledgements

Foreword

The Australian Council for Safety and Quality in Health Care (the 'Council') was established in January 2000 by the Australian Government with the support of all Australian Health Ministers to provide national leadership and coordination of health care safety and quality activities with a particular focus on minimising the likelihood and effects of error and system failures.

One of the Council's priority areas is to support those working in the health industry to practice safely. Under this priority, the Council set up a high level Safe Staffing Taskforce (the Taskforce) to look at a broad range of staffing variables and how modifications or improvements will have direct positive impacts on patient safety.

A key priority identified by the Taskforce was to improve the continuity of care provided to patients by improving clinical handover.

The aim of this Literature Review was to gain a comprehensive understanding of the evidence and work to date in respect of the processes, skills, tools guidelines and models of clinical handover currently being explored, or in use, in the health industry.

The review has highlighted the importance of handover practices in clinical care and the need for support in this area. It has been a useful exercise in informing the Council who has agreed to lead national work to improve and promote effective continuity of patient care in Australia.

The Council is holding a national workshop on 19 April 2005 to draw together and consult with key stakeholders to determine a strategy to achieve national improvement in clinical communication to ensure safe continuity of patient care.

CONTENTS

1.   SUMMARY

The Australian Resource Centre for Healthcare Innovations (ARCHI) was contracted by the Australian Council for Quality and Safety in Health Care (the Council) to undertake a comprehensive review of published and unpublished literature on clinical handover and patient safety. The literature review was designed to identify:

- factors relating to clinical handover associated with patient safety;
- the effectiveness of safety cultures within non-health industries; and
- the quality of evidence and gaps in research.

For the purpose of this report, clinical handover includes communication between the change of shift, communication between care providers about patient care, handoff, records and information tools to assist in communication between care providers about patient care. Patient safety includes the variables that limit or affect preventable adverse patient outcomes and errors.

Information that transfers between practitioners about patient care is becoming recognised as an important consideration in improving patient safety, work flow and quality care [1, 2]. Ineffective handover can lead to wrong treatment [2], delays in medical diagnosis [3], life threatening adverse events [4], patient complaints [5], increased health care expenditure [6], increased hospital length of stay [6], and a range of other effects that impact on the health system [7].

A number of industries, unrelated to the health system, can provide new insights into improving handover and workers' safety. For this reason there are sections relating to non-health related industries in this report. These industry areas are most commonly mining, heavy industries and aviation. It is anticipated that the practices adopted and evaluated in non-health industries could be applied to the health sector.

This review was undertaken over a 3-month period and used published and unpublished literature that describes the handover process and the impact on safety.

Literature was drawn from the ARCHI extensive network of practitioners and researchers internationally contributing particularly to the collection of "grey literature" or unpublished material. Extensive searching was undertaken using electronic databases including websites. Details of the methodology used in the literature review including search terms, inclusion and exclusion criteria, and the process used for culling, examining and summarising the findings are provided at **Appendix 1**

A number of papers did not meet the inclusion criteria but provided helpful information about handover practices and these are described in **Appendix 2**

2. RECOMMENDATIONS

2.1 System factors

Well designed studies that provided the strongest evidence of reducing incidents was when:

- multi-professional groups of clinicians were involved in clinical decision-making during ward rounds; and
- continuity of care was provided and treatment was not prescribed by the on-call clinician but the patients' allocated care team.

The absence of systems, training and handover protocols may increase incidents and jeopardise patient safety, causing delays in care, increase in patient complaints, inappropriate treatment and may be a cause for litigation.

1. Patient safety research needs to include measures around clinical handover to assist in improving the evidence around patient safety interventions and causes of adverse events. There remains a substantial gap in policy and research around clinical handover.

2. Given there is no best practice arising from this review around clinical handover, innovations projects that develop systems and strategies are greatly needed. This review indicated that handover practices remain an issue internationally.

3. Incident reporting needs to include data on handover practices including issues of handover content and this needs to be routinely considered when examining causes of adverse events.

4. The question of what constitutes effective handover needs to be urgently answered and more research needs to be undertaken on this topic using well designed studies. The process of handover may include a combination of tools, checklists, electronic or computerised systems that avoid the use of memory and systematically and contemporaneously note focused and pertinent patient information around treatment goals.

5. The development of evidence-based guidelines for clinical handover is needed.

6. Once the components of effective handover is better understood, it needs to be disseminated in undergraduate health professional education and to practicing clinicians, and reflected in the communication systems within health care organisations.

7. Staffing levels at the time of handover can pose a problem for the security of a ward or clinical area. The structure and timing of handover needs to consider patient care needs, threats to security and the potential for patients to abscond.

2.2 Organisational cultural factors

Communication is a process of cooperation and generally has four elements: the sender, the message, the receiver and feedback [27]. Communication is influenced by personal feelings and these can be shaped by the organisational culture that a practitioner is working within. It important that the organisational context is considered when shaping handover processes.

Although the papers in this domain are limited, organisational context needs to include bullying, intimidation and aggression amongst colleagues and other staff in the workplace, aggression and harassment from patients and inefficient systems that decrease morale and willingness to engage in teamwork.

Organisations could consider the following organisational cultural aspects to improve handover:

1. The rating of effective communication skills as a priority when employing staff.

2. Formal and clearly stated communication and handover processes between health care practitioners that includes the minimum level of information required and the method of relaying this information.

3. A combination of verbal and written communication processes that enable feedback and clarification of information when describing the care and treatment provided.

4. Ensure that there is a culture that promotes opportunity for new ideas and improved ways of communicating, particularly in response to safety issues from any worker at any level within the organisation.

5. Enable specific information to be available around critical or emergency procedures if and when personnel are called in.

6. Evaluation using well designed studies to assess the effectiveness of handover in relation to organisational cultural changes.

2.3 Individual factors

The ability for staff to record accurately, communicate effectively and make clinical decisions appropriately requires organisations to:

- recruit competent practitioners;
- provide readily available advice and support in a non-judgemental environment;
- provide ongoing training and up-dates; and
- support a learning culture within the organisation.

1. Resources need to be provided to support the learning needs of the organisation, in particular staff identified as requiring knowledge and skill up-dates and training.

2. Organisations need to promote a learning environment and promote opportunity through learning from mistakes. This can be supported through the data collection of incidents and strategy building around preventable adverse events.

3. Clear protocols that address the minimum information requirements for effective handover are needed to guide practice and provide opportunity for remedial action when staff do not meet this standard.

3.   RESULTS

3.1   Overview of the findings

Two hundred and ten papers matched the search terms for health and 30 papers matched the search terms for non-health. One hundred and sixty-five websites were examined for suitable papers and 537 papers were hand searched from the collection of a previous literature review conducted by this team on Safe Staffing and Patient Safety[1].

Of the 777 papers that were examined for suitability to be included in the literature review, a total of 27 papers fulfilled the inclusion criteria. All the papers are published with 8 of the 27 papers being from non-health industries and 19 related to health care.

Three major domain areas relating to handover variables have been identified across both the health and non-health related documents[2]. These are:

- **System design factors**

  Handover that was described within the context of policies and procedures, operating systems, work systems and routines, supervision and legislation. System variables included support for information tools and systems such as computer based reports, written notes, checklists and tape-recording processes as well as a range of other methods of communication.

- **Organisational cultural factors**

  Communication between and amongst health professional groups that impacts on patient care; and, interpersonal relationships influencing communication ability and willingness to share information.

- **Individual factors**

  Individual staff variables relating to their knowledge, skills and attitudes that describe an individual's ability to perform their role and transfer appropriate information to another person. This can include the impact of fatigue, clinical decision-making and organisational skills in the process of knowledge transfer. Types of human errors that can be classified according to misperception, mistaken priorities, attention lapses, mistaken actions, or wilfulness, violations or sabotage.

Many of these handover variables were inter-related however the variable that was the primary focus of the paper was used to determine the domain area. Papers within these domains are summarised within the following sections of this report:

- system factors - Section 3.2;
- organisational cultural factors - Section 3.3; and
- individual factors and handover - Section 3.4.

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[1] Australian Resource Centre for Healthcare Innovations, Patient Safety and Staffing Factors <URL: http://www.safetyandquality.org/articles/Publications/s_staflitrev.pdf > (cited 4 June 2004) Safety and Quality Council, 2003.
[2] HSE *Human Factors in Industrial Safety*, HMSO, London, 1989.

3.1.1 Hierarchy of study designs and quality of evidence

The quality of evidence available on any aspect of clinical handover is extremely poor. The broad search strategy used in this review process was able to capture both published and unpublished literature on this topic. There were no unpublished papers that met the inclusion criteria and therefore are not included in the review.

Handover between shifts is a practice that is basic to the organisation of health workers and is an essential aspect of health care delivery. The absence of quality research on this topic clearly indicates the need for well designed studies to be undertaken. The majority of papers were description studies and had a level four evidence rating.

There is one study that examines interventions to promote collaboration between nurses and doctors, a Cochrane systematic review. It describes only two randomised trials that used structured team ward rounds and found that joint decision-making reduced the average length of hospital stay and hospital charges with no difference in mortality rate or type of care to which patients were discharged[3].

3.2 System factors

There were 17 papers that provided a description of system-related factors that influence clinical handover. Health literature in relation to system factors is summarised in Table 1 and non-health literature is summarised in table 2.

This domain contains the majority (63%) of papers of all three domains for this literature review. They describe the processes in an organisation that either help of hinder communication between shifts. There are a number of themes that are explored within these papers.

Incidents may increase in the following circumstances:

- when the patient it not treated by their allocated doctor or patient care team, but by a covering clinician [7];
- when communication is hindered between specialist services outside the hospital environment and the inpatient system [5]; and
- absconding in psychiatric hospitals is more likely to occur during handover times [8].

Improvements in patient safety in relation to clinical handover may occur when:

- training is provided or specialist roles are created to facilitate communication between clinicians [9];
- structures are in place to facilitate joint clinical decision-making such as multi-professional handover with doctors, nurses and in some cases pharmacists [6, 10, 11]; and
- there is a documented care planning process and medication management through charting and completion of records [9, 12].

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[3] Zwarenstein M, Bryant W, Interventions to promote collaboration between nurses and doctors (Cochrane Review), In: the *Cochrane Library*, Issue 2. Chichester, UK: John Wiley, 2004.

Patient involvement in the handover process is also considered in this domain and two papers examine the issues when handover is by the patient's bedside. Of interest is the work being done on patient complaints and that a substantial number of complaints are generated from poor communication between clinicians and patients [5]. Confusion and anxiety were increased when the patient did not understand the jargon used that described their condition and treatment when handover was at their bedside [13]. Confidentiality was considered to be a barrier to bedside handover and in one study there were mixed views by both nurses and patients that this type of handover improved patient participation [14].

Non-health papers provide examples of clear roles of accountability and the use of signing on and signing off, permits to work processes and the use of log books to record problems or potential problems as they occur [15, 16]. Processes in some industries are linked to occupational health and safety compliance guidelines to ensure that procedures are followed and systems are in place to facilitate a range of communication lines during a shift [17, 18].

TABLE 1 System factors – Health Literature Summary Table

Author / Year / Country	Type of document*	System variables (SV) examined and patient outcomes (PO)	Study design / Summary description	Comments / Findings
Zwarenstein et al / 2002 / Canada [6]	P, LR Level 2 COSD: 1	SV: Collaboration between doctors and nurses in sharing responsibility and facilitated by good communication. PO: Morbidity as well as a range of other measures.	A review of interventions designed to improve the nurse-doctor relationship SS: 1102 patients and 843 patients in another trial. RR: Not applicable. DS: Two randomised controlled trials.	The two studies of a total of 1945 admissions used structured team ward rounds and found that joint decision-making reduced the average length of hospital stay and hospital charges with no difference in mortality rate or type of care to which patients were discharged.
Menke / 2001 / USA [12]	P,S Level: 3-2 COSD: 5	SV: Use of a computerised clinical documentation system for nursing care. PO: timely and accurate patient notes and decreased medication errors and improved continuity of care across shifts.	A before and after intervention study that examined the impact of a computerised documentation system in a paediatric intensive care unit. SS: Not clear. RR: Not specified. DS: Audit of hand written charts and computer records; observed time spent recording on charts; and self-report by nurses about shift to shift reporting perceptions.	The paper reports that the introduction of the Clinical Documentation System (CDS) demonstrated a decrease in medication errors, improved completeness with documentation, improved timeliness of accessing medical data, limited human data entry by automatic data logging, improved compliance with standards, and no change in the time spent providing direct patient care. Limitations: The data is not clearly describing the results to support these conclusions.
Schlienger et al / 1999 / [10]	P, S Level:3-1 COSD: 4	SV: Use of a clinical pharmacist in detecting and reporting adverse drug events (ADE) in medical wards. PO: Reduction of adverse drug events .	Prospective cross-over study using a clinical pharmacist participating in daily ward rounds, solicited additional information from nurses and physicians and conducted chart reviews. SS: 1959 patients over a 24-mth period. RR: N/A DS: Patients in a 4 medical wards.	Initially there was a 10-fold increase in ADEs in the test wards. This increase was reduced to the same level when the test units were control units in the second part of the study. Overall, reporting of ADEs increased 9 times with the involvement of a clinical pharmacist in the ward rounds.
Bowers et al / 1999 / [8]	P, S Level 3-3 COSD: 7	SV: Reduced staff providing patient supervision during shift handover; security / supervision and professional patient relations influence patient	175 patients absconded 498 times from an acute psychiatric ward during the 5-month study period.	15% of absconding patients had the risk documented on their charts and were under observation; most absconds occurred in the first 3 weeks of admission; 58% of those who absconded expressed their intention to staff within the 24 hr period prior and 82% left directly from the ward; 9% of these patients never returned to the ward. Most likely time for this incident

* P = published or U = unpublished. L = literature review, S = study containing data, G = guideline or CS = case study.
Hierarchy of study design rating = Level 1 -4 (See table 7) COSD = classification of study design 1 - 8 (see table 6)
**SS = sample size; RR = response rate; DS = data source; SV= system variables; PO= patient outcomes

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		absconding. PO: Patients absconding from acute psychiatric wards.		was during the nursing shift change over periods at 1pm and 9pm.
Cahill et al / 1998 / [13]	P, S Level 4 COSD: 7	SV: Handover conducted at the patient's bedside. PO: Experience of hearing clinical information.	Qualitative study of tape-recorded interviews of patients recorded one day prior to hospital discharge using an in-depth interview technique and analysed using grounded theory. All patients had experienced handover at their bedside. SS: 10 RR: N/A DS: Tape recorded patient interviews.	Active participation in the handover was experienced only when the patient was well. Participation was dependent on how informed the patient felt about their illness, the more informed the more they were likely to participate. Confusion and anxiety was experienced when they didn't understand what was being said.
Litzinger et al / 1997 / Germany [11]	P, S Level: 4 COSD: 7	SV: Patient-oriented pharmacy on a ward. PO: Improvement in drug safety and drug awareness.	Pilot program of pharmacists involved in ward rounds, manage pharmacy stock and dispensing unit-dose systems for patients and provide an advisory service for medical officers, nurses and patients. SS: 123 patients. RR: Not stated. DS: Medical records and clinicians questions to pharmacists.	The descriptive study examines the activities of the 1-year pilot program. There were 111 questions from clinicians and events that lead to pharmacist lead interventions, a new advisory service was provided to staff and patients on drug safety, improvements were seen in the later part of the pilot phase of cooperation between pharmacists and medical officers that lead to a 17% reduction in medication costs compared to the previous year.
Peterson et al / 1994 / USA [7]	P, S Level: 3-2 COSD: 4	SV: Continuity of care. PO: Preventable adverse events.	Case control study over a 4-month period of patients who experienced an adverse event matched with two controls. SS: 3146 patients. RR: Not specified. DS: Review of patient notes in an urban teaching hospital.	124 adverse events were reported and 54 (44%) were judged as preventable. Significant factors for preventable adverse events were: cross-coverage by interns, Acute Physiology and Chronic Health Evaluation II score and history of GIT bleeding. Prevention was strongly associated with physician coverage from another team.
Bark et al / 1994 / UK [5]	P, S Level 4 COSD: 7	SV: Communication between the hospital and doctor. PO: Delayed treatment and unnecessary adverse	One case study described within a larger study that examines the outcomes of written complaints involving a critical incident across 20 hospitals in an 18-month period.	Case study: The patient learnt after discharge that their doctor was not aware of their admission to hospital and the drug given in preparation of the examination was not necessary.

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		reaction to a drug.	The case study describes a patient admitted for tests, had a pre-op drug prep with a reaction without the procedure taking place. The larger study: SS: 1007 written complaints. RR: 49% DS: Self-complete questionnaires.	Larger study: 72% complaints stemmed from a combination of clinical and communication problems; most complaints involved incidents with significant clinical consequences and distress; clinical complaints are more likely due to staff insensitivity and poor communication; information from complainants should be used for monitoring and improving standards of care.
Howell / 1994 / [14]	P, S Level: 4 COSD: 7	SV: Communication at the patient's bedside. PO: Implications on patient confidentiality.	Descriptive study that examined the impact of changing traditional hand-over at the nurses' station to the bedside. SS: 20 staff and 20 patients. RR: Not described. DS: Nurses' self report survey and 10-minute patient interviews.	Four of the 20 nurse participants thought patient confidentiality would not be a problem. Eighteen of the 20 nurses thought that patients never listened to the report. The paper concludes that most patient think that the report is full of too much jargon and do not listen, yet the main reason for nurses to conduct the report at the bedside was to encourage patient participation.
Sharke et al / 1994 / [9]	P, S Level:3-2 COSD: 5	SV: Introduction of an assessment and treatment program that included a written plan and education of patient assessors for respiratory care in an orthopaedic surgerical ward. PO: Change in patient morbidity.	Comparison between before the assessment – treatment plan was introduced with the period of the pilot phase of the intervention (6 mths vs 3 mths). SS: 948 admissions (645 vs 303). RR: N/A DS: Orthopaedic patients.	The use of patient assessors and a written treatment plan resulted in no difference in patient outcomes, length of stay and a reduction in treatment volumes that eventuated in a cost saving.
Petersen et al / 1994 / USA [7]	P, S Level: 3-3 COSD: 5	SV: Continuity of housestaff (medical officers) compared to cross-coverage of medical care (not the patient's usual patient care team). PO: Complications of medical therapy that resulted in disability or increased length of	Case-control study that used a panel of three internists to review case summaries of patient adverse events during a 4-mth period. Each patient had two matched controls (patients on either side of the patient's bed at the time of the event). SS: 3146 patients. RR: N/A DS: Self-report by an intern of an	54 patients that experienced an adverse event were reported and 108 controls were reviewed to determine if the adverse event was preventable in relation to medical care at the time of the incident. An adverse event was 3.5 times more likely to be experienced if the patient received medical care by a physician from another patient care team.

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		hospital stay.	adverse event.	

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TABLE 2 System factors – Non-Health Literature Summary Table

Author / Year / Country	Type of document*	System variables (SV) examined and safety culture (SC)	Study design / Summary description**	Comments / Findings
Energy Institute Human Factors Working Group / 2001 / UK [19]	P, G Level: 4 COSD: 7	Chemical and allied industry major hazard sites SV: Communication and risks resulting from missing or inaccurate information. SC: Prevention of disasters like the Alpha Piper.	Communications such as shift handover was identified as the eighth human factor in the top ten issues that Inspectors with the UK chemical and allied industry major hazards sites have compiled.	This document lists the top ten issues for hazards in chemical and allied industries and lists the tools and other relevant documents useful in addressing these human factors.
Hopkins / 2000 / Australia [15]	P, CS Level: 4 COSD: 7	Oil refinery SV: Communication between shift and the use of written and verbal reports. SC: Analysis of the disaster.	This case study examines the incidents that lead up to the Longford Disaster with recommendations for future practice.	This case study identifies 2 key points. Safety information is available and recorded at the bottom "on the ground level" but the second tier of information transfer to supervisors was more concerned with production than safety and they omitted detail around safety in their reports. Early warnings of safety issues were documented in an ad hoc approach and failed to be transferred up the management structure.
King et al / 1998 / [17]	P, CS Level: 4 COSD: 7	Mining and processing industries SC: Implications of handover as contributing causes of major accidents. SC: Explosions and major accidents that killed many workers and civilians and creating major environmental damage.	The document contains the findings of the inquiries into 4 major accidents in processing industries: 1) the explosion at the Shell Pernis oil refinery in Holland (1968); 2) the release of toxic chemicals into the environment from the Icmesa Chemical Company in Seveso (1976); 3) release of toxic chemicals into the environment from the Union Carbide plant (1984); and 4) the explosion of the Piper Alpha oil platform in the North Sea (1988).	Of the four accidents that occurred only one, the Piper Alpha disaster related directly to a failure of handing over critical information at the change of shift. There was also evidence of a failure to follow correct procedure, failure to provide adequate initial and continuing training for staff, and proper supervision as well as disregard for emergency procedures. The other accidents were primarily due to equipment failure and production processors.
Less / 1996 / [20]	P, CS Level: 4 COSD: 7	Off-shore oil mining SV: Inadequate feedback of information relating to safety at the change of shift. SC: Explosion of the Piper	The case study details the system and technical requirements to improve safety on off-shore oil platforms as a result of the Alpha Piper	Although the document describes in detail the lessons learnt from the disaster and the technical and system requirements to prevent a similar occurrence, it does not describe in detail the key issue of shift handovers and communication between personnel while

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TABLE 2 System factors – Non-Health Literature Summary Table

Author / Year / Country	Type of document*	System variables (SV) examined and safety culture (SC)	Study design / Summary description**	Comments / Findings
		Alpha oil rig killing and injuring many workers.	disaster.	inadequate communication between shifts was the primary cause for the disaster.
Lees / 1996 / [21]	P, CS Level: 4 COSD: 7	Off-shore oil mining, chemical refineries SV: Lack of handover systems and processes. SC: Explosion of the Piper Alpha oil rig.	This document outlines the necessary operation and safety systems needed to prevention disasters in process plants. It specifically discusses handover and permit systems recommended as a result of the Piper Alpha disaster.	There should be a formal and detailed procedure for shift handovers, including operating and maintenance personnel; a formal logbook which signed by incoming staff; sufficient time allocated for proper handover and communication through a permit-to-work system. Deficient systems include no written procedures for handover, no specification of the information to be communicated during handover and erratic completion of the operator's logbook. It is recommended that there needs to be a formal procedure for handover and a signed and completed logbook. A permit-to-work system that defines the status of maintenance work is critical for the maintenance and operations of the plant.
Centre for Chemical Process Safety / 1994 / [16]	P, CS Level 4 COSD: 7	Mining offshore SV: Lack of systems to check safety critical tasks completed between shifts. SC: Prevention of explosions and provision of safety procedures.	Piper Alpha disaster is investigated using a process known as STEP (sequentially timed event plotting) to investigate the initial gas leak. This is one of four case studies examined in the report.	Using this process the breakdown in communication between shifts can be diagrammatically described illustrating errors with two groups of workers that didn't communicate with each other on the same shift and one supervisor signs off inappropriately on the completion of the work. Thee was an initial failure to complete a task properly, together with a lack of communication between one team and the supervisor. This was compounded by an incorrect assumption by the supervisor. This led to incomplete communication between supervisors at shift handover and subsequent inappropriate actions that caused the explosion.

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3.3 Organisational cultural factors

There were 6 papers that provided a description of organisational cultural factors that influence clinical handover.

This domain contains relatively few papers. The papers that are in the following tables describe the factors in an organisation where communication between and amongst health professional groups impact on patient care and where interpersonal relationships influence communication ability and willingness to share information. The common theme in these papers is the impact of poor communication on the provision of health services. Poor communication includes missing detail critical in the communication process [3, 22, 23]. The need for feedback even when there is a written care plan [23, 24] is also described.

The non-health literature has two important papers that have implications in the health industry. Firstly, open lines of communication to middle and senior management regardless of status or position needs to be encouraged if a worker is concerned about a safety risk. This is particularly important for the staff member to able to relay this information outside the usual channels of communication [25]. Secondly, the on-call practitioner needs additional information quickly in times of increased work demands and sometimes stressful and pressured situations. The use of logbooks, documentation and checklists can assist the practitioner to understand the situation quickly, accurately and immediately [26].

TABLE 3 Organisational cultural factors – Health Literature Summary Table

Author / Year / Country	Type of document*	Staffing variables (SV) examined and patient outcomes (PO)	Study design / Summary description**	Comments / Findings
Pronovost et al / 2002 / USA [3]	P, CS Level: 4 COSD: 7	SV: Information exchange prior to drug administration to a patient. PO: Cardiac arrest of a patient due to the incorrect administration of a drug injected in a non-diluted form.	This paper describes an incident where a nurse handed a resident medical officer an injection ready for administration. The drug previously was provided in a diluted form from pharmacy but the supply had changed and now required the staff to dilute the dose on the ward.	The nurse failed to notice the sticker on the syringe stating that the drug needed to be diluted. Neither the doctor nor the nurse communicated confirming the drug name and dose.
McKnight et al/ 2001 / USA [23]	P, S Level: 4 COSD: 7	SV: Perceptions of information needs and communication difficulties amongst inpatient physicians and nurses. PO: Information needs and communication difficulties to assist with patient care.	This paper describes the results of a survey and the subsequent focus group used to discuss the survey findings with nurses and physicians. SS: 26 physicians and 17 nurses (survey); Focus group size is not described. RR: 21% physicians and 24% nurses. DS: Self-report survey using web-based survey for physicians and pen and paper forms for nurses.	Physicians generally believed that sources of clinical information should be on-line or on a hand-held device and nurses were concerned about web-based materials. Physician and nurses commonly reported difficulties in identifying and contacting other health care providers. Causes included an inefficient paging system, inconsistent communication at transfer of patient care, need for feedback on patient status, need for face to face discussion where mistrust or disagreement in care plans existed.
Patterson et al / 1995 / USA [22]	P, S Level:4 COSD: 7	SV: Perceptions of important information needed in nursing handovers. PO: Patient safety information as a component of handover content.	Survey contained 59 items. SS: 197 registered nurses in a variety of acute and non-acute clinical settings. RR: 45% DS: Self-report survey of registered nurses.	68% rated the information from the sending nurse as satisfactory. 56% believed that a computer based information system would assist in providing continuity of care information. Areas where there was high agreement about critically important patient information were: history of current illness and procedures; level of consciousness; medical diagnosis and problems on sending units; mental comprehension and short-term memory; physicians' orders; reason for transfer; safety considerations; and, vital sign problems.
Cantatsey et al/ 1994 / USA [24]	P, SC Level 4 COSD: 7	SV: Coordination of multidisciplinary care through a written care plan. PO: Suicidal progressed to homicidal patient.	This case study describes an approach of case conferencing that resulted in a written care plan of 24 hour nursing surveillance, periodic use of restraints and seclusion combined with drug therapy.	This care was challenging to the staff particularly as the patient became violent but ended with a managed and coordinated approach. The patient left hospital after 13 days in the open ward without formal discharge process. This case highlighted the difficulties faced between staff in adhering to the

* P = published or U = unpublished. L = literature review, S = study containing data, G = guideline or CS = case study.
 Hierarchy of study design rating = Level 1 -4 (See table 7) COSD = classification of study design 1 - 8 (see table 6)
**SS = sample size; RR = response rate; DS = data source; SV= system variables; PO= patient outcomes

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TABLE 3 Organisational cultural factors – Health Literature Summary Tables

Author / Year / Country	Type of document*	Staffing variables (SV) examined and patient outcomes (PO)	Study design / Summary description**	Comments / Findings
				written plan under stressful patient care conditions.

* P = published or U = unpublished. L = literature review, S = study containing data, G = guideline or CS = case study.
 Hierarchy of study design rating = Level 1 -4 (See table 7) COSD = classification of study design 1 - 8 (see table 6)
**SS = sample size; RR = response rate; DS = data source; SV= system variables; PO= patient outcomes

TABLE 4 Organisational cultural factors – Non-Health Literature Summary Table

Author / Year / Country	Type of document*	Staffing variables (SV) examined and safety culture (SC)	Study design / Summary description**	Comments / Findings
Patterson et al / 2001 / USA [26]	P, S Level: 3-3 Level: 7	Space aviation SV: Missing information from the preceding shift. SC: Prevention of incidents during flight operations.	Observational study that examined 16 shift handover practices at the NASA Johnson Space Centre during the 1996 10-day Space Shuttle mission. SS: 16 shifts. RR: N/A DS: Tape-recorded handover reports.	Missing information from the preceding shift can leave flight controller vulnerable to being unprepared when called during critical times of additional workload. The handover practices required incoming controllers to ask questions, review logs from the previous several shifts since last at work, be given an up-date both formal and recorded and informal highlighting certain key aspects to the work that requires attention.
Cox et al / 1998 / ? [25]	P, CS Level 4 COSD: 7	Aviation; Mining; Space aviation; Minerals processing SV: Authority impeding communication exchange (Challenger). Lack of systems to check safety critical tasks completed between shifts (Alpha Piper, Boeing). SC: Prevention of foreseeable significant disasters.	Seven cases studies that examine factors that led to disasters that killed many people, Challenger space craft, Chernobyl RBMK reactor, Flixborough, Mexico City, Bhopal, Piper Alpha and the emergency landing of Boeing 737. Inadequate handover at either between professional group (Challenger) or between shifts (Alpha Piper and Boeing) can be identified. Challenger knew the O-ring was a risk but due to pressures of time, competition for air space and community expectation senior managers kept to schedule, a decision that killed the crew. Piper Alpha was caused by a pressure safety valve being removed on the previous shift killing 167 people. Successful landing of the Boeing 737 after a deficient engine check failed to pick up major problems.	Challenger disaster lead NASA to have senior manager raise verbal rather than only written concerns, and anyone in the NASA system should be able to express any safety concern at any level. Alpha Piper demonstrates a system failure between 'permit to work' protocol and lack of information at the change of shift. Boeing 737 case study described that the engineer's handover during the shift did not include a written report, proforma, or descriptive task cards and errors occurred jeopardising the safety of the passengers and crew.

* P = published or U = unpublished. L = literature review, S = study containing data, G = guideline or CS = case study.
Hierarchy of study design rating = Level 1 -4 (See table 7) COSD = classification of study design 1 - 8 (see table 6)
**SS = sample size; RR = response rate; DS = data source; SV= system variables; SC= safety culture

3.4   Individual factors

There were four papers that provided a description of individual factors that influence clinical handover. This domain contains the least number of papers that fit the inclusion criteria for this review. It does not contain any papers from the non-health industry. Health literature in relation to individual factors is summarised in Table 5.

The central theme arising from these papers is clearly the absence or omission of essential information that impacts on the care of the patient. The initial assessment of a patient is critical to the appropriate treatment and ongoing management of the patients' care [1]. The careful recording of important health information helps to prevent adverse events [2], and a knowledge deficit by a clinician greatly impacts on their decision-making ability and is likely to increase the risk of adverse events around medication management [28].

TABLE 5 Individual factors – Health Literature Summary Table

Author / Year / Country	Type of document	Staffing variables (SV) examined and patient outcomes (PO)	Study design / Summary description**	Comments / Findings
Beach et al / 2003 / [1]	P,CS Level 4 COSD: 8	SV: Poor documentation, communication and reassessment of patient; poor transfer of information and transfer of poor information. Inappropriate initial assessment identifying a knowledge deficit. PO: Inappropriate and delayed treatment.	Case study of a 59-year-old male presented to ED with "panic attacks" had 32 medical officers assess him. In a 20 hour period there were 8 nurses who provided care. A vague and inappropriate initial diagnosis "anxiety and hyperventilation" and repeated failure to reassess the diagnosis was considered to be the primary cause of multiple inappropriate treatments and delays.	This case describes the inaccurate assessment of a patient. Lack of discussion between the care providers, poor documentation and repeated failures to re-assess his diagnosis and care plan are contributing factors to his poor care.
Anwari / 2002 / [29]	P, S Level: 4 COSD: 7	SV: Assessment of the quality of verbal handover. PO: Verbal information on patients' condition and content of handover.	Survey on the quality of handover from an anaesthetist to nurse in the Post-anaesthesia Care Unit. SS: 276 surveys of patient handover from a variety of nurses. RR: Not stated. DS: Nurses self-report.	67% of anaesthetists did not provide the required 5 points about the patient's condition at the time of handover, 15% gave information about course of surgery and status of any complications.
Dean et al / 2002 / UK [28]	P, S Level: 4 COSD: 7	SV: Factors surrounding prescribing errors of doctors in hospital settings. PO: Medication errors.	The qualitative study that examined the factors around a medication error. Prescribers of medication errors were contacted within 96hrs of the incident and interviewed. SS: 41 doctors and 44 interviews (some doctors repeated errors), 50% of the total errors (88 incidents). RR: Not stated. DS: Doctors' interviews.	Interviews were classified into several themes: active failures, errors such as slips, lapses, mistakes and violations. Error-producing conditions were identified as the physical environment (no desk), workload, dealing with another doctor's patients, written communication (messy charts), verbal communication (having no-one to ask for advice). Individual factors identified in the interviews were hunger, tiredness and knowledge.
Priest et al / 2000 / USA [2]	P, CS Level:4 COSD: 7	SV: Inappropriate assessment – knowledge deficit and missing information to subsequent shifts. PO: Inappropriate treatment and failure to identify adverse drug reaction.	This case study is used to support the principles of "Gordon's 11 functional health patterns" to guide a handover process. The case describes a patient admitted to a psychiatric unit after being picked up by police because he was "behaving oddly".	On admission the patient was given a drug to which he had a major reaction and was wrongly thought to be in a worsening state of mental illness. The incorrect assessment on admission delayed treatment and correction of the adverse drug event. Further, the patient was not known to the unit and therefore did not have records about his sensitivity to the drug.

[*] **P = published or U = unpublished. L = literature review, S = study containing data, G = guideline or CS = case study.**
Hierarchy of study design rating = Level 1 -4 (See table 7) COSD = classification of study design 1 - 8 (see table 6)
****SS = sample size; RR = response rate; DS = data source; SV= system variables; PO= patient outcomes**

5.   APPENDICES

5.1   Method

Search term used for the health industry literature

The search terms for health related literature were based on the standard medical subject headings (MeSH) and include any or all of the following terms:

- Continuity of patient care
- Communication
- Patient centered care
- Patient care planning
- Patient care team
- Quality of health care
- Interprofessional relations
- Hospitalization
- Treatment outcome
- Accident prevention
- Safety
- Handover
- Shift report
- Patient discharge/ or transfer, discharge
- Multidisciplinary team

Search terms used for non-health industries

Search terms for other literature not related to the health industry included any or all of these terms:

- Handover (search included handover and hand over at each reference below)
- Handover practice
- Shift handover
- Shift change
- Safety and the above headings
- Communication
- Communication and handover
- Communication and shift change
- Human factors
- Tools and Handover
- Cullen Report
- Lardner, Ronald
- Piper Alpha

Search terms used for web searches for health and non-health industries

Search terms for literature found on websites for health and non-health relating to handover and safety included any or all of these terms:
- Clinical handover

- Shift handover
- End of shift reports / safety
- Shift change reports / safety
- Handover practices / safety
- Patient handover
- Ward rounds / reports / safety
- Bedside handover / safety
- Reporting practices / safety / shift work
- Shift work / reports / safety
- Shift work / communication / safety
- Shift work / procedures or practices / safety (responsibility)
- Shift work / guidelines / safety
- Shift work / change over / safety
- Clinical information transfer
- Roster changeover
- Virtual team / shift reporting practices
- Team handoffs
- Shift briefings

Inclusion criteria

All literature included in the review had the following characteristics. The paper was:

- Published not earlier than 1994
- Written in English
- Related to the search terms
- Based on either qualitative or quantitative data
- A review, research paper or report, guideline, or case study that describes the relationship between handover or communication between shift variables and patient or customer outcomes

Exclusion criteria

Papers are not included if they do not provide data that links at least one handover variable* with at least one aspect of patient care outcomes or as in the case of non-health industry, at least one aspect of industry safety.

Literature that relates to occupational health and safety of staff working in the health industry is not included unless it contains data on adverse patient events. For example, violence directed at staff from patients is not included. However, papers describing violence from staff towards patients is included because the adverse event was focused on the patient.

*A handover variable includes any description where information is transferred between staff or workers and can include written, verbal, or any other technological form or tool of communication about the patient or patient care or, for non health literature, the workplace.

Process for culling the literature

The following questions were asked for each citation (where there was insufficient information in the citation, the paper was located):

> Is the paper related to health or another industry other than health?
>
> For health related papers:
>
> 1. Does the paper explore handover factors (such as communication between staff/ health professionals that can include computer reports, written, verbal or other forms of communication about patient care) and this association with patient safety (such as patient injury, harm, outcome, preventable adverse events)?
>
> 2. Is the paper a review containing data, a case study, a research study or guideline document with supporting data?
>
> For non-health related papers:
>
> 1. Does the paper examine the relationship between communication amongst worker and work performance that can impact on safety?
> 2. Is the paper a review containing data, a case study, research study or guideline document with supporting data?
>
> Paper was included when the answer was "yes" for each point.

Search strategy

Health related literature

Database electronic searching was conducted using the following between the years 1993 until March 2004:

- EMBASE
- MEDLINE
- PSYCINFO
- CINAHL

Non-health related literature

A search of electronic databases included the following:

- Australian OHS Database
- Proquest Science Journals
- Knovel
- Compendex
- Scirus

An Internet search via Google using the same search terms was also undertaken.

Web-based literature

Searches for literature on website were undertaken using Google and Alta Vista.

Unpublished health literature

The following strategies were used to access unpublished health literature:

- Posting a request on several pages of the ARCHI website
- Posting on the list server of the National Patient Safety Foundation
- Discussion with the National Patient Safety Foundation from the USA
- ARCHI acute care for the ageing e-mail discussion group (137 members)
- ARCHI change management e-mail discussion group (99 members)
- ARCHI elective surgery e-mail discussion group (35 members)
- ARCHI emergency department e-mail discussion group (140 members)
- ARCHI GP liaison e-mail discussion group (137 members)
- ARCHI health information technology e-mail discussion group (127 members)
- ARCHI clinical benchmarking e-mail discussion group (49 members)
- ARCHI health workforce management e-mail discussion group (108 members)
- ARCHI improving patient safety e-mail discussion group (192 members)
- ARCHI maternity services e-mail discussion group (46 members)
- Postings on ARCHI Net News (approximately 41,000 subscribers)
- One hundred and thirty-five letters were sent to a range of commercial industries such as weather monitoring services, aviation services, mining and transport industries.

Process for examining and summarising the findings

Endnote libraries and databases were established for tracking the searches and cataloguing the "grey literature".

The papers in the review were classified using the hierarchy of study designs listed in table 6. This classification is helpful in summarising the study design in relation to quality of evidence and was used only for research papers. A rating of the evidence was made based on the quality of evidence rating seen in table 7 and applied to each paper. This rating is useful in determining the strength of evidence and was applied to all of the types of papers used in the review including case studies.

The literature is categorised into summary tables and is divided into two main groups, health related literature and the non-health related literature. The documents are reported using the following headings:

- Author, year, country
- Type of document (published or unpublished, study, guideline or case study)
- Rating using a level of 1 - 8 using the hierarchy of study design
    This was applied to research papers only and categorises the study
    design by ranking the design. Studies that minimise bias such as
    randomised controlled trials are ranked more highly than designs that are
    subject to bias and few controls such as descriptive studies and expert opinion
- Rating the level of evidence 1 - 4

- Industry type (for non-health related literature)
- System variables examined and related patient outcomes (staffing variables examined and factors contributing to a safety culture are used for the non-health related literature)
- Study design and summary description
- Findings and comments.

Papers or case studies contained in papers were not included when:

- The communication between workers was only described around decision making and did not involve the passing on of information to another accepting the primary responsibility for carrying out tasks or treatments
- The paper described communication processes without including information on the impact of care or workers' safety (non-health)
- They examined staff perceptions and preferences with different forms of handover.

Two reviewers checked the papers that were excluded and included in the review to ensure that adequate judgment was applied to the review process.

The review process was as follows:

- A random selection of 20%, (10% to each reviewer) of the papers excluded from the review were given to the reviewers to ensure agreement around the criteria. The selection was a systematic random sample of papers listed by first author in alphabetical order.
- The papers included in the review were divided 50% to each reviewer who reviewed the paper based on the criteria established in the report. The reviewer checked their findings against the table where it is cited and determined their level of agreement.
- Where there were discrepancies then the paper was to be forwarded to the other reviewer for assessment and then determination about it's inclusion, summary and description.

TABLE 6   Hierarchy of research designs in decreasing level of importance[4]

Classification of the study design	Type of research design
1	Randomised controlled trials
2	Non-randomised controlled trials
3	Cohort studies
4	Case-control studies
5	Comparisons between time and place
6	Uncontrolled experiments
7	Descriptive studies
8	Expert opinions

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[4] Report of the US Preventive Services Task Force. *Guide to clinical preventive services*. Baltimore, USA, Williams and Wilkins, 1996.

TABLE 7   Quality of evidence ratings[5]

Levels	Controlled trials	Prevalence, risk factors and sensitivity studies
I	Evidence obtained from a systematic review of all randomised controlled trials	Evidence from a systematic review of all available population-based studies
2	Evidence obtained from at least one properly-designed randomised controlled trial	Evidence obtained from a well-designed population-based study representative cohort study
3 – 1	Evidence obtained from well-designed controlled trials without randomisation	Evidence obtained from a well-designed case control study, cohort study or less well-designed population-based study
3 – 2	Evidence obtained from well-designed cohort or analytic studies, preferably from more than one centre or research group	
3 – 3	Evidence obtained from multiple time series with or without the intervention	
4	Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees	Evidence obtained from a descriptive case series, clinical experiences, respected authorities, or reports of expert committees

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[5] Quality of Care and Health Outcomes Committee, National Health and Medical Research Council. *Guidelines for the development and implementation of clinical practice guidelines. Canberra*. AGPS, 1995.

5.2   List of useful handover practices that did not meet the inclusion criteria

Reference / Aspect of handover	Description of the tool / system	Objective	Evaluated / comments
Health			
Bernick et al / 1994 / USA [30] Written documented handover.	Standardised flow sheet, focus charting and charting by exception (problem, intervention and evaluation – PIE).	Chart patient's care meaningfully and appropriately in accordance with policies and procedures.	Yes. Increased teamwork in nursing, compliance with documenting resulted from the education process. Education sessions and a self-directed learning package on appropriate documentation combined with a chart audit to change practice with documentation was pilot tested on 12 registered nurses and 19 registered nursing assistants over a 4-month period.
Buchanan et al / 1996 / Hong Kong [31] Written documentation and communication.	GP referral forms. Patient letters and instructions. Validation of waiting lists by consultants.	Improve the use of operating theatres and patient flow.	No. The processes have not been evaluated but were derived from a patient mapping process to examine the barriers to efficient patient flow.
Kramer et al / 2004 / USA [32] Written documentation	Web-based discharge navigator to improve transfer of clinical information from hospital to out-patient clinicians.	Improve continuity and quality care through the coordination of patients as in-patients and out-patients.	Yes. Trialed on 528 discharge summaries and 564 inpatient encounters.
Kim et al / 2003 / USA [33] Written documentation	Web-based signout – generation tool that interfaces with the electronic medical record as a handover process between members of the in-patient team .	Improve communication and the risk of adverse events between patient care teams when transferring patients.	No. The tool is not evaluated but an analysis of information needs has been undertaken where house officers generally required improved content, format and a handover process for the sign out information.
Prouse / 1995 / UK [34] Tape-recording of handovers between nursing shifts	Individual tapes were kept with the patient charts at the bedside and nurses would record their handover prior to the on-coming shift.	Reduce handover time, improve content of handover and flexibility with the timing of handover.	Yes. The tape-recording was a pilot study where the method and results are not well described.
Field et al / 2002 / UK [35] An analysis of an audit tool of ward-based practice	Focused questions as an audit tool for assess handover MARP (multi-angle review of practice).	To review the key influences on patient care such as communication, resources etc.	No. The introduction of MARP provided insight into changes needed to improve patient care including the way in which handover was conducted.

Reference / Aspect of handover	Description of the tool / system	Objective	Evaluated / comments
Health			
Royal children's Hospital / 2003 / Australia [36] Protocol for the nursing shift handover of patient care	The protocol describes the handover process as being a succinct verbal report, review of documentation, review of care plan and the Patient Nurse Dependency System, as well as a visual clinical assessment of the patient.	To standardise the handover process.	No.
Currie / 2002 / UK [37] Improving the efficiency of patient handover	Focused handover following the CUBAN method: Confidential, Uninterrupted, Brief, Accurate, Named nurse.	To ensure that nurses use a standard approach to verbal handover.	No.
Footitt / 1997 / USA [38] Improving the efficiency of verbal handover	Recording of patient information in a telephone system, the Nurse Communicator.	Reduce the time taken to provide patient information on a need to know basis.	Yes. The system saved staff time, the cost for the system was recouped in hours of staff time saved, and provided the nurse with a focused report.
Greaves / 1999 / UK [39] Evaluation of the verbal handover at the patient's bedside	A series of questions were asked of patients about their experience of the bedside handover.	Increase the nurse's understanding of the patient's experience.	This was a qualitative study using an interview tool not validated. The themes of involvement, access to information, continuity, embarrassment, overhearing, confidentiality, discussion, education, self-knowledge and neglect arose from the interviews.
Hansten / 2003 / USA [40] Stream-lining the change of shift report	The "four p's", purpose, picture, plan and part is suggested as a way of focusing the verbal handover.	To improve the efficiency of verbal handover.	No. The "four p's" was derived from 'experts' working the in the field. There is little explanation about the usefulness of the tool.
Payne et al / 2001 / USA [41] Computerised practitioner order entry system	Computerised practitioner order entry.	Reduce errors and improve quality of care. It is used for a range of treatments including prescribing medications.	Yes. Anecdotal comments about the usefulness of the system by medical officers.
Prince Alfred Hospital / 2003 / Australia [42] Handover procedures in the emergency department for medical officers	This policy outlines the times that medical registrars on duty need to attend handover. It also describes when the registrar can leave their shift based on the number of patients waiting in the ED.	This is the policy outlined in the medical registrars' orientation manual.	No.

Reference / Aspect of handover	Description of the tool / system	Objective	Evaluated / comments
Health			
Moen et al / 1998 / Norway [43] Handover procedure in the ED using an electronic health care record system	This computerised medical record system enables the nurse to collect information prior to the change of shift and provide a one page summary for the shift change over.	Not stated.	Yes. The nurses found the system to be able to save time and improved the quality of their handover.
Musfeldt at al / 1993 / USA [44] Physician-directed therapeutic plans	Physicians develop critical pathways that define the care the patient is to receive. It defines the processes, time-lines, and responsibilities associated with the patient's clinical needs from pre-admission to discharge.	Improve intra and interdisciplinary communication and increase efficiency in treatment.	Not clear if evaluated. The paper describes a cost saving with the introduction of the care plans.
Bunston at al / 1993 / Canada [45] Use of a psychosocial summary flow sheet to facilitate the coordination of care.	The psychosocial flow chart is similar to a nursing care plan but documents the service name required, the date, the intervention and course of action. These related to psychosocial needs such as chaplaincy, pain consultants, and psychiatry.	Facilitate coordination of care and increase the quality of care based on the patient's psychosocial needs.	Yes. Evaluation showed that the up-take of the chart by staff was poor. Those who used it and completed the survey stated that the instructions were easily understood.
Royal College of Physicians / 2000 / Australia [46] General professional training, guidelines on effective handover for physicians.	The guidelines outline the time, place and content of the handover. It describes this in relation to cross cover, admission ward, and phone handover.	To clarify best practice for physicians working partial and full shifts in addition to on-call rotas.	No evaluation or evidence supporting best practice is described.
Shrake et al / 1994 / USA [47] Respiratory care assessment, a treatment program that uses patient evaluators and a respiratory care plan	Specific roles for assessing the respiratory care needs of patients were developed who then implemented a written plan using an appropriate care protocol for the care of respiratory patients in the hospital setting.	Decrease length of stay and improve early responses to respiratory complications in hospitalised patients on an orthopaedic ward.	Yes. The use of the evaluators and plans was evaluated during a pilot project. The evaluation method involved a review of changes before and after the introduction of the scheme. Operating cost of the hospital were reduced, improved communication between physicians and nurses were highlighted.

Reference / Aspect of handover	Description of the tool / system	Objective	Evaluated / comments
Non – Health			
BHP Billiton / 2003 / Australia [48] Shift handover forms that describe the status of each piece of equipment at shift change	A form that outlines the status of every piece of equipment in at a mining site is completed prior to and in preparation of the change of shift. It is used as a checklist.	Designed to improve safety and efficiency.	No evaluation described.
Civil ATS / 2003 / Australia [49] Hand-over / Take-over Standards for Air Traffic Controllers using principles of due diligence and checklists as tools for communication	This is a protocol used by air traffic controllers for the handover / takeover process. It outlines the procedures, the check-list items, the log requirements, fitness for duty, the concentrating and de-concentrating of work-stations.	Designed to ensure safety and the smooth flow of information.	No evaluation described.
Lardner / 1996 / UK [50] Helpful hints on handover	A review of 5 case studies with 14 suggestions about how to conduct handover is described. These include: training in communication skills with staff, the need to have a greater reliance on written communication, and design information exchange on the needs of the operator.	Prevention of disasters.	Not evaluated but based on the lessons learned from industry disasters.

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