

REVIEW PAPER

Information transfer for multi-trauma patients on discharge from the emergency department: mixed-method narrative review

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Abstract

Aim. This paper is a report of a review conducted to identify (a) best practice in information transfer from the emergency department for multi-trauma patients; (b) conduits and barriers to information transfer in trauma care and related settings; and (c) interventions that have an impact on information communication at handover and beyond.

Background. Information transfer is integral to effective trauma care, and communication breakdown results in important challenges to this. However, evidence of adequacy of structures and processes to ensure transfer of patient information through the acute phase of trauma care is limited.

Data sources. Papers were sourced from a search of 12 online databases and scanning references from relevant papers for 1990–2009.

Review methods. The review was conducted according to the University of York's Centre for Reviews and Dissemination guidelines. Studies were included if they concerned issues that influenced information transfer for patients in healthcare settings.

Results. Forty-five research papers, four literature reviews and one policy statement were found to be relevant to parts of the topic, but not all of it. The main issues emerging concerned the impact of communication breakdown in some form, and included communication issues within trauma team processes, lack of structure and clarity during handovers including missing, irrelevant and inaccurate information, distractions and poorly documented care.

Conclusion. Many factors influence information transfer but are poorly identified in relation to trauma care. The measurement of information transfer, which is integral to patient handover, has not been the focus of research to date. Nonetheless, documented patient information is considered evidence of care and a resource that affects continuing care.

Keywords: discharge, emergency department, information transfer, mixed-method narrative review, multi-trauma patients, nursing

Introduction

Information processes are important for communicating all patient care. For multi-trauma patients (who have injuries to more than one area of the body), communication issues may be further intensified by care context, time, patient acuity, patient complexity and number of people involved in their care.

Information transfer is the process surrounding the transition of patients between departments/wards. This is a larger process than handover, which is often referred to as a discrete point in patient transition. Information transfer includes the lead up to handover and the remaining information accessible after the handover is complete. For multi-trauma patients, this includes trauma team communication, handover and the documentation process. Information transfer for trauma patients is especially crucial, as trauma care is usually given by many inter-disciplinary teams that provide acute and ongoing care, often at the same time. Effective information transfer enables quality patient care and is a vital aspect of patient transition and handover in all care contexts.

Internationally, strategy development for prevention and management of trauma is a high priority (Peden *et al.* 2002). Unintentional injuries were the sixth highest cause of death for males and females combined, worldwide, in 2004 (World Health Organisation 2008). In Australia, in 2004–05, the principal diagnosis of ‘Injury, poisoning and certain other consequences of external causes’ was the second highest reason for public hospital discharges (AIHW 2006). Once trauma occurs, a number of factors are believed to influence patient outcomes, but are not yet completely understood (Richmond *et al.* 2003).

Communication is the cornerstone of teamwork (McFetridge *et al.* 2007, Miller *et al.* 2009), especially for teams that provide care for multi-trauma patients (Bergs *et al.* 2005). Poor communication can cause serious breakdowns in continuity of care and inappropriate treatment, which may be harmful to the patient (World Health Organization – Collaborating Centre for Patient Safety Solutions 2007; Wong *et al.* 2008). While a trauma team may manage a patient with a single severe trauma very well, often more people are required to care for a patient with multiple severe injuries. As a result, communication of patient information may not be optimal because care and team dynamics become more complex, increasing the opportunity for error and reducing the quality of ongoing care.

Communication of patient information is such a vital issue in many countries that international collaboration is occurring on a number of projects. One such joint project is ‘Priority

Program 5 – National Clinical Handover Initiative’, administered by the World Health Organization (WHO) Patient Safety Alliance and the Australian Commission for Safety and Quality in Health Care (Australian Commission for Safety and Quality in Health Care 2007). This project includes a number of different initiatives using different methods, which were piloted across Australian healthcare settings to improve clinical handover. The outcomes of these are to be adapted for healthcare settings in developing countries.

The inherent risks of communication breakdown for any patient transition are worrying, but may be magnified when considering the increased patient acuity and time pressures present in trauma care.

The review

Aims

This literature review was the first phase in a multi-phase intervention study designed to improve information transfer for multi-trauma patients. The aims of the literature review were to identify

- best practice in information transfer from the ED for multi-trauma patients.
- conduits and barriers to information transfer in trauma care and related settings.
- interventions that have an impact on information communication at handover and beyond and their effect.

Design

This narrative review followed the principles described in the University of York’s Centre for Reviews and Dissemination guidelines for undertaking reviews in health care (Centre for Reviews and Dissemination 2009). An initial search identified gaps in the literature describing and/or testing transfer of multi-trauma patients, and indicated the need for a narrative review.

A conceptual framework of the mechanics of patient transition points from trauma occurrence to discharge from acute care was initially mapped. With input from clinical experts (trauma service, trauma team, intensive care and emergency clinicians) and our clinical experience, the issue of what constitutes difficulties in patient transition at these points was identified. Although the research study for which this review was conducted concerns multi-trauma patients only (due to scope of the study, time and resource constraints), studies on other acute care transition points (for information transfer and surrounding issues such as trauma

team performance, clinical handover and communication during the acute phase of trauma resuscitation) were also included in the review.

Search methods

The search was limited to papers published between 1990 and 2009, as 1990 was the earliest date when trauma systems and trauma teams (TTs) were studied and reported. A systematic search of general to specific terms limited to English in relation to trauma and communication was conducted via the databases of Medline, OVID, CINAHL, Proquest, Blackwell Synergy, Google Scholar, Ingenta, PubMed, Science direct, EBSCO, Informit and Cochrane Database. The reference lists from retrieved papers were also checked for other relevant studies.

Search terms were cross-referenced with each other (e.g. Trauma AND documentation). Terms included trauma (care, injury, nursing, teams, communication, documentation, chart), emergency (department, care, documentation), information (continuity, transfer, patient, transmission), handover (patient, handoff, nursing, clinical), documentation (clinical, nursing), transfer (inter-hospital, patient, intra-hospital), transition points, continuity of care, transition care and patient outcomes.

Inclusion of studies in the review was based on issues identified in the literature and by us and the expert clinicians we consulted. Studies were included if they addressed one or more aims of the review. There have been numerous published studies in some topic areas, for example, clinical handover has many studies (Wong *et al.* 2008), but not all were included in this review. Studies were excluded if the issues or interventions were not related to trauma care and issues of information transfer at inter-department transition points.

Titles and abstracts were scanned for possible relevance to the review aims. The process of selection continued with data extraction. As the studies were read through and a data extract sheet was completed, if the content was not relevant, the paper was excluded.

Search outcomes

In the absence of specific studies related to trauma-specific information transfer, any studies including surrounding issues of patient, team and process factors affecting communication of patient care were assessed for inclusion in the review. Initial searches after scanning titles identified 316 possible papers to be included. Data extraction sheets were then completed for all papers, and further inclusion and exclusion

decisions were made. In total, 50 papers were included in the review.

Quality appraisal

Included papers were those published in peer-reviewed journals or from government websites. As there were no papers that addressed this topic in its entirety, any study report that could be reasonably linked to the inclusion criteria was included. No formal appraisal of study quality was undertaken.

Data extraction

For each paper, a cover sheet was completed summarizing date, author, paper title, problem definition/objective, background, methodology, ethical issues, sample, sample size, data collection strategies, results/findings/conclusions, strengths, limitations, and relevance or link to study topic.

Data synthesis

The conceptual framework for this mixed-method narrative review was initially developed based on discussions with clinicians in the field of trauma care. This was to guide the analysis of the current body of knowledge in the area of information transfer for multi-trauma patients. Analysis of the identified literature then involved a narrative synthesis aimed at analysing relationships within and between studies, especially as the studies were too diverse to combine in a meta-analysis (Centre for Reviews and Dissemination 2009). This involved critical analysis of the content from studies that were considered relevant to the topic. The papers analysed were limited to research papers, literature reviews and government reports. After reading articles in detail, the aims and outcomes of the papers were compared to identify similarities. Tables of information from the studies were developed to aid synthesis by enabling the content details to be tabulated into issues identified in each paper (Green *et al.* 2001), for example, the effect of interruptions on nursing documentation, the use of a whiteboard as a strategy to improve communication (see supporting information Tables S1–S4 in the online version of the article in Wiley Online Library). These issues were then condensed into overarching themes and specific factors that affect information transfer for patients with multi-trauma and the conceptual framework was modified based on the issues and themes identified. Individual studies were reported on and their importance for the topic discussed. Table 1 summarizes the papers included in this review.

Table 1 Summary of papers included in review

Reference	Aim	Participants	Method
Impact of Trauma Teams			
Wong and Petchell (2003) Australia	Estimate use of trauma teams in Australian hospitals, composition, leadership and activation criteria	Trauma Teams (TTs) in Australia	Questionnaires with telephone follow up
Lavoie <i>et al.</i> (2003) Canada	Identify current distribution of Trauma Team Leader (TTL) role in Canada	Trauma centres in Canada	Descriptive survey
Xiao and Moss (2001) USA	Identify practices to ensure reliability in teams with high failure risk	Trauma Teams	Observation, semi-structured interviews
Sugrue <i>et al.</i> (1995) Australia	Measure overall performance of TTL role in Liverpool Hospital	TTLs in Liverpool Hospital	Observation
Cole and Crichton (2006) UK	Explore culture of TT – about impact of human factors performance	Trauma Teams	Observation, semi-structured interviews
MacKenzie <i>et al.</i> (2004) USA	Video task analysis methodology for research data, and analysis	TT Anaesthesia care providers	Retrospective Video analysis during tape review, semi-structured interviews, Questionnaires
Bergs <i>et al.</i> (2005) Netherlands	Describe and evaluate communication during multidisciplinary trauma resuscitation	Trauma resuscitation teams (Multidisciplinary)	Observation over 4 months, prospectively and consecutively evaluated with criteria
Howard <i>et al.</i> (2006) USA	Assess statistical significance of missed injuries using tertiary exam at level II trauma centre	Trauma patients	Observational prospective study-implementation of trauma tertiary exam form and missing injuries tabulated
Curtis (2001), Australia	Identify issues relating to nursing care of trauma patients	Nurses providing trauma care	Focus groups with consistent moderator
Xiao <i>et al.</i> (2007), USA	How a traditional whiteboard in operating theatre (OT) can support communication in dynamic and collaborative workplace	Whiteboard communication in an OT	Observation by 10 people over 5 years using the Distributed Cognition Model
Issues of Communication			
Miller <i>et al.</i> (2009) USA	Measure markers of key nursing behaviours in interdisciplinary teams during critical events to assess the extent of high reliability	Health care team members in labour rooms in 3 hospitals	In-situ simulation based on actual event with inbuilt prompts to display specific skills
Al-Naami <i>et al.</i> (2003) Saudi Arabia	Evaluate Quality Improvement (QI) data following a mass casualty event and its impact on trauma care process and outcomes	All involved in a single motor vehicle crash	Pilot study, Pre-designed QI forms used to collect data- from admission - 8 weeks post trauma
Laxmisan <i>et al.</i> (2007) USA	Identify factors that constrain safe decision making in patient care in the ED. Focussed on interruptions, multitasking and shift change	Physicians in EDs in decision making capacities	Non-participant observation, semi-structured interviews. Ethnography for method, grounded theory for data analysis
Snow <i>et al.</i> (2009) USA	Policy statement for transitions of care. Presented at “Transitions of Care Consensus Conference” in 2007	N/A	Executive committees agreed to jointly develop a policy statement of transitions of care

Table 1 (Continued)

Reference	Aim	Participants	Method
Issues of Documentation			
Pape <i>et al.</i> (2000) Germany	Identify modes and options for European trauma care documentation standardisation	Trauma documentation systems in 3 European countries	Comparative review of documentation system
Probst <i>et al.</i> (2006) Germany	Demonstrate lessons learnt and identify possible changes due to changes in communication and medical and economic requirements	Literature on trauma registry and documentation from 7 countries	Database and literature search, comparative review using specified success parameters
Cheevakasemsook <i>et al.</i> (2006) Thailand	Explore complexities in nursing documentation and related factors	Chairman and nursing committee, documentation in patient charts	Interview, participant observation, time and motion study of nursing activities, chart audit
Bjorvell <i>et al.</i> (2002) Sweden	Evaluate long-term effects of intervention on nursing documentation	RNs documentation in 1 Hospital	Quasi-experimental longitudinal design
Bjorvell <i>et al.</i> (2003) Sweden	Find factors that acute care RNs perceived as important to document	RNs in Sweden	Comparative descriptive design using questionnaire
Darmer <i>et al.</i> (2004) Denmark	Explore nurses knowledge and attitudes of documentation	Nurses who document	Prospective, comparative, and quasi-experimental
Griffiths and Hutchings (1999) UK	Determine adequacy of documentation in nursing care plans by district nurses	Nursing care plans	Retrospective criteria based audit of patient notes. Piloted data collection tool
Saranto and Kinnunen (2009) Finland	Assess the research methods applied in the evaluation of nursing documentation	CINAHL, Pub Med and Cochrane database	Literature review of terms related to nursing documentation, care plans, record systems, assessment and evaluation
Considine <i>et al.</i> (2006) Australia	Examine the effect of nursing practice standards with in-service education on documentation of the initial nursing assessment	ED RNs initial documentation on patients with chest pain	Pre-test/post-test design
Issues of Clinical Handover			
ACSQHC (2005) Australia	Conduct a literature review on clinical handover and patient safety	English publications since 1994 in multiple databases	Literature review. Search terms: handover, communication between shift variables, and patient or customer outcomes.
Wong <i>et al.</i> (2008) Australia	Conduct a comprehensive review of the literature on behalf of The Australian Commission for Safety and Quality in Health Care	Multiple Databases	Evidence based review guided by five questions.
Messam and Pettifer (2009) UK	Identify and appraise what is known about best practice within nurse inter-shift handover and evaluate implications for practice	English publications since 1997 in Medline, CINAHL and BNI	Literature review of terms related to reporting and handover between both nurses and inter-disciplinary team members
Catchpole <i>et al.</i> (2007) UK	Improve handover quality and safety for patients from OT to ICU using analogy of Formula 1 pit stop and aviation expertise	Ferrari racing team, health teams in OT and ICU	Prospective intervention with direct observation of handover
Patterson <i>et al.</i> (2004) USA and Canada	Describe strategies employed during handoffs in four settings with high consequences for failure	Handoff - NASA, nuclear power plant, railroad and ambulance dispatch	Observation with thematic analysis
McFetridge <i>et al.</i> (2007) UK	Explore patient handover and communication between ED and ICU nurses on patient transfer from ED to ICU	RNs from ED and ICU	Qualitative documentation review analysis, semi-structured interviews, focus groups

Table 1 (Continued)

Reference	Aim	Participants	Method
Currie (2002) UK	Identify content requirements of handover in the ED	ED nurses	Questionnaire
Manias and Street (2000) Australia	Examine communication practices used among nurses during handover	Nurses in multiple contexts	Participant observation, professional journaling and focus group interviews
O'Connell and Penney (2001) Australia	Discuss strengths and limitations of three handover methods (verbal in the office, tape-recorded, and bedside handovers)	Nurses, patients and relatives	Interviews and observation
O'Connell <i>et al.</i> (2008) Australia	Examine nurses' perceptions of handover and determine strengths and limitations of the handover process	Nurses involved in handover, multiple contexts	Survey –quantitative and qualitative data collected and analysed
Kerr (2002) UK	Understand handover practices and functions and their implications for effectiveness	Nursing staff in shift handover on 2 paediatric wards	Cross-sectional, comparative, case study design. Observation, semi-structured individual interviews, group interviews
Sexton <i>et al.</i> (2004) Australia	Compare content of nursing handover to formal documentation sources	Nursing handovers in one general medical ward	Observation and audio taping
Lally (1998) UK	Investigate functions of nurses' communication during shift-to-shift handover	Handover between nurses at shift change at 1 ward in general hospital	Unstructured observation, audio tape recordings. Data matched with field notes of non verbal communication
Philpin (2006) UK	Part of a larger study- explore and interpret elements of ritual and symbolism in verbal bedside handovers and written accounts.	Nurses in an Intensive Therapy Unit	Interviews and examination of documented care
Pothier <i>et al.</i> (2005) UK	Assess differences in information retention for various handover styles	Nurses performing handover	Observation, descriptive analysis
Horwitz <i>et al.</i> (2009) USA	Identify, describe and categorise vulnerabilities ED to Internal Medicine (IM) patient transfers	Medical officers and physician assistants from ED and IM	Cross-sectional survey study (pilot tested)
Bruce and Suserud (2005) Sweden	Explore nurses' experiences receiving emergency patients from ambulance crews- analysing handover and triage process	Emergency nurses	Qualitative descriptive interview study
Strange (1996) UK	Discover the features and functions of everyday nursing handover	Nurses handing over in one ward	Participant observation where researcher worked intermittently for 11 years, during working hours, no notes
Fenton (2006) UK	Identify if the development of a guide for improving structure of handover was effective	Nursing staff who handover	Pre-post implementation, audit pro forma
Jenkin <i>et al.</i> (2007) UK	Identify the current process of information transfer between ambulance staff and ED staff during patient handover	Ambulance staff and ED health professionals	Quantitative survey, using a descriptive non-experimental cross-sectional survey
Yong <i>et al.</i> (2008) Australia	Evaluate emergency clinician attitudes to handover from pre-hospital paramedics and determine content and methods of handover	Emergency clinicians who receive paramedic handovers	Exploratory study, Questionnaire to emergency clinicians and observation of handovers

Table 1 (Continued)

Reference	Aim	Participants	Method
Owen <i>et al.</i> (2009) Australia	Investigate perceptions by paramedics and hospital receiving staff about what enables and constrains handover in the ED	Paramedics, nurses and doctors in 2 states	Semi structured interviews, taped and transcribed, grounded theory analysis
Alem <i>et al.</i> (2008) Australia	Examine the information environment and use of tools to support medical handovers over weekends	Medical handovers over weekends in a metropolitan hospital	Observation and note taking, tools collection and equipment survey to inform intervention and post intervention observation
Ye <i>et al.</i> (2007) Australia	Determine problems arising from ED handover, deficits in procedures and if patient care or ED processes are adversely affected	Multi-site study in 3 hospitals. Patient handovers by medical staff in the ED	Handover observation using checklist. Survey of receiving doctors at 2 hours after handover. General survey of all doctors
Borowitz <i>et al.</i> (2008) USA	Characterise the effectiveness of the sign-out process between resident physicians	Resident physicians in acute paediatric ward at night shift sign out	Prospective study, survey
Yee <i>et al.</i> (2009) Australia	Develop a standardised operating protocol and minimum dataset to improve shift-to-shift handover by medical and nursing staff.	Nursing and medical handovers in one hospital in 6 clinical areas	Pilot study using socio-technical approach, observation, interviews, focus groups
Quin <i>et al.</i> (2009) Australia	Evaluate the appropriateness and acceptability of 5 standardised tools for shift-to-shift handover	Medical staff undertaking handover to night colleagues in 4 hospitals	Pilot project, stakeholder input to develop Key Performance Indicators and 5 tools
Bomba and Prakash (2005) Australia	Analyse communication process during handover and identify common problems	Medical personnel who handover	Mixed method design survey, observation and semi-structured interviews

KEY: ED = Emergency Department, TT = Trauma Team, TTL = Trauma Team Leader, QI = Quality Improvement, RNs = Registered Nurses, OT = Operating Theatre, RNs = Registered Nurses, ICU = Intensive Care Unit, IM = Internal Medicine, ACSQHC- Australian Council for Safety and Quality in Health Care, BNI- British Nursing Index

Results

The four overarching themes having an impact on information transfer for multi-trauma patients were impact of TTs, communication, documentation and clinical handover. Within these themes, a number of factors emerged: patient factors, team factors, process factors, ethics, resources, organizational factors, legal elements, environmental factors and individual (healthcare professional) performance factors.

The results are discussed below under these headings and the applicable factors are listed at the end of each section. Further details of the individual studies, tabulated under the overarching theme, can be seen in Tables S1–S4 (see supporting information in the online version of the article in Wiley Online Library), while the relationship of factors to overarching themes can be seen in Table 2.

Trauma teams

Trauma teams are usually multidisciplinary teams specifically formed for immediate, expert assessment and treatment of a

trauma patient (Wong & Petchell 2003). Despite the belief of many clinicians that TTs improve care outcomes, many countries have a varied uptake of the use of TTs, usually due to organizational culture and resources (Wong & Petchell 2003).

Trauma teams remain a current focus of many studies and discussions in the literature (see supporting information Table S1 in the online version of the article in Wiley Online Library), with major issues centring on team composition (Wong & Petchell 2003, Cummings & Mayes 2007, Patient 2007), from which specialty the team leader should come (Lavoie *et al.* 2003, Wong & Petchell 2003), how effectively team members work together or perform their roles (Sugrue *et al.* 1995, Xiao & Moss 2001, Cole & Crichton 2006), and team formulation and activation (Wong & Petchell 2003).

For teams to work effectively, there must be clear roles and relationships and trust that all are able to fulfil their roles (Xiao & Moss 2001). Teams termed ‘resistant to failure’ (Xiao & Moss 2001) were those whose work and environments increased the risk of major errors and poor outcomes, but which usually avoided adverse outcomes. Trauma

Table 2 Relationship of factors affecting information transfer for multi-trauma patients to themes

Factors	Themes			
	Trauma teams	Communication	Documentation	Handover
Ethical elements				X
Legal elements			X	
Team factors	X	X		
Patient factors	X	X		X
Environment factors	X	X		X
Process factors		X	X	X
Individual performance elements	X	X	X	X
Resource factors	X	X	X	X
Organizational factors	X	X	X	X

healthcare teams were compared with these. In the trauma care setting, factors likely to increase the risk of error (e.g. missed injuries) can be either environmental/resource-specific, patient-oriented or clinician-based (Howard *et al.* 2006). Practices and behaviours that reduced this level of risk included the ability of team members to work effectively in their team roles using structured audible communication (Xiao & Moss 2001).

Trauma team culture was found to have an impact on team performance (Cole & Crichton 2006), with communication skills considered fundamental to successful performance. Communication was affected by patient acuity and stability, and became more complex with higher risks for error as patient acuity increased (Cole & Crichton 2006). Failure to communicate was a common error in TT practice (Mackenzie *et al.* 2004), and had an impact on missing or fragmented patient care information (Howard *et al.* 2006). Trauma team functioning was also affected by the noisy, busy environments inherent in trauma care (Cole & Crichton 2006).

Factors related to the Trauma Team theme included individual performance of team members (knowledge, skills and attitudes), patient complexity, acuity and neurological status, and access to enough additional information (history, co-morbidities usually from family/ambulance staff). Overall, team issues and performance, legal issues, resources and environment were also identified as relevant.

Communication

Transition points for patients are high-risk areas for patient safety (Wong *et al.* 2008). As a result, discussions on best practice at transition points of care are becoming more prevalent (World Health Organization – Collaborating Centre for Patient Safety Solutions 2007). Patient transition linked to safety has become an international priority. Until very recently, this issue has only attracted small amounts of

research and local policy-making (or none at all) to inform patient care, but is fast being developed at national and international levels. Some examples of this include WHO initiatives (World Health Organization – Collaborating Centre for Patient Safety Solutions 2007), the WHO-commissioned Australian project called National Clinical Handover Initiative (Australian Commission for Safety and Quality in Health Care 2007) and a United States of America-based policy statement for transition of care (Snow *et al.* 2009).

Interest in how healthcare teams work towards facilitating survival and improving patient outcomes has led to a number of research-based reports of communication breakdown as a common issue (Xiao & Moss 2001, Mackenzie *et al.* 2004, Bergs *et al.* 2005, Cole & Crichton 2006). Overall communication in TTs is very complex, becomes more problematic with pressures of multiple injuries and multiple care providers involved (Al-Naami *et al.* 2003, Bergs *et al.* 2005), and is largely unstructured during inter-department handover (McFetridge *et al.* 2007, Horwitz *et al.* 2009).

Healthcare professionals believe that quality handover of emergency patients is vital to the quality of continuing care, but a number of barriers have been shown to be present in most contexts (Curtis 2001, McFetridge *et al.* 2007). Barriers to communication between medical officers and nurses were (i) the perceived level of nurse competence by the medical officer, (ii) that medical officers would be unpleasant and not value nurses' opinions (Curtis 2001) and (iii) the environment of emergency care includes multi-tasking with consistent interruptions, which is cognitively taxing for professionals and leaves room for errors affecting patient safety (Laxmisan *et al.* 2007). Nurses have indicated that episode of care coordination is often poorly managed, and that during complex or critical interactions, errors or poor care frequently occur (Curtis 2001, Miller *et al.* 2009). Effective communication strategies include an appropriate knowledge base, range of behavioural skills, positive attitude towards

communication and the availability of opportunities to communicate (Curtis 2001). Reports of support tools for communication indicate that a whiteboard in a trauma operating theatre was effective and may be transferrable to other trauma care environments (Xiao *et al.* 2007).

Factors identified in this theme were patient factors, especially patient acuity and multi-trauma due to multiple healthcare team members involved (team factors), organizational issues, team culture, individual performance of the healthcare professional, the environment where clinicians are required to multi-task, process factors, and available resources. Reports that mentioned communication errors, but were better placed under other themes (e.g. documentation), are not tabulated in Table S2 (see supporting information in the online version of the article in Wiley Online Library), but are discussed under the appropriate theme.

Documentation

Investigating documentation is one way of identifying issues in information transfer, which last beyond the oral handover. One review investigated how nursing documentation was evaluated and researched, finding little collaboration and agreement on auditing tools, and that most tools were not tested; this therefore prompted questions about the validity of the study results (Saranto & Kinnunen 2009).

Documentation issues directly related to trauma care were confined to trauma registry studies, being unable to find required data, and data being fragmented and incomplete (Pape *et al.* 2000, Probst *et al.* 2006) (see supporting information Table S3 in the online version of the article in Wiley Online Library). All the studied registries revealed poor documentation of treatment, thus having an impact on the ability to collect data (Pape *et al.* 2000).

Other related documentation issues came from the wider healthcare field and included poor quality, fragmented information and complex barriers to documentation improvement. Staff reported that they felt unsupported to manage appropriate documentation in their care contexts (Cheevakasemsook *et al.* 2006). Where documentation was measured, standardized documentation studies showed more positive than negative outcomes (Saranto & Kinnunen 2009), but that poor documentation also had legal and quality care impacts (Saranto & Kinnunen 2009).

Long-term improvement in nursing documentation is possible with a standardized documentation implementation tool, and also requires change in the organizational culture to be successful (Bjorvell *et al.* 2002). Added to this providing standards and guides as resources to support education about documentation is important (Considine

et al. 2006). Nurses have positive attitudes towards documentation but, while they demonstrate good knowledge of the documentation system, they lack analytical skills about documented content (Darmer *et al.* 2004). This suggests that a high degree of management support is required for nursing documentation to be improved and maintained (Darmer *et al.* 2004).

Another study showed that initial assessment and evaluation of care were inadequately recorded, but then the researchers successfully used chart audit as a framework for practice development and performance improvement (Griffiths & Hutchings 1999). Documentation investigation can be problematic if audit tools do not actually measure what they are intended to, and yet audit tools are a common method in documentation research. Common factors related to documentation include legal elements, process factors, individual performance, and resource and organization factors.

Clinical handover

Handover is part of the process of patient transition from one care provider to another, and from one care area to another (Australian Council for Safety and Quality in Health Care 2005). However, handovers may not give all information that is essential for safe care (see supporting information Table S4 in the online version of the article in Wiley Online Library). This can interrupt continuity of care, lead to inappropriate treatment and potentially cause harm (World Health Organization – Collaborating Centre for Patient Safety Solutions 2007). A report on clinical handover and patient safety identified three main factors that had an impact upon patient safety, namely organizational, cultural factors and individual factors (Australian Council for Safety and Quality in Health Care 2005).

Primarily, handover is seen by healthcare professionals as a basis for care continuity (Manias & Street 2000, Currie 2002, McFetridge *et al.* 2007). Only two studies examined inter-departmental handover involving the ED (McFetridge *et al.* 2007, Horwitz *et al.* 2009). One of these focused on nurses' handover and communication from ED to ICU (McFetridge *et al.* 2007), and found similar issues to a study of physician experiences of handover from ED to an internal medicine unit (Horwitz *et al.* 2009). Specifically, errors were likely when communication and interpersonal failures occurred. These were related to the need for a discrete time and place for handover without distractions, difficulties in communication, absence of a structured or consistent approach, differences in expectations, and the quality of the handover relied on good information resources and interactive communication.

Problems in handover processes in most disciplines and contexts included lack of structure (Bomba & Prakash 2005, McFetridge *et al.* 2007, Borowitz *et al.* 2008, Horwitz *et al.* 2009), not understanding each other's roles and expectations about handover (Australian Council for Safety and Quality in Health Care 2005, McFetridge *et al.* 2007, Horwitz *et al.* 2009), a marked variation in content and approaches for handover (O'Connell & Penney 2001, Gillespie *et al.* 2007, Borowitz *et al.* 2008, Horwitz *et al.* 2009). Many of these issues were especially evident in the emergency context (Manias & Street 2000, Horwitz *et al.* 2009, Owen *et al.* 2009). Five researchers recommended the development of a guide for processes and structure for handover (Currie 2002, McFetridge *et al.* 2007, Ye *et al.* 2007, O'Connell *et al.* 2008, Horwitz *et al.* 2009). The culture of handover between nurses has often been described negatively by nurses. Despite this, the processes were indoctrinated during practice and perpetuated by staff (Manias & Street 2000).

Fragmented communication between staff disciplines can exacerbate the problems identified (Jenkin *et al.* 2007, Yong *et al.* 2008). The oral culture in handover can mean that information is likely to be lost (Pothier *et al.* 2005) and, regardless of the model of nursing handover, there can be information gaps, mostly due to uncertainty about a patient (O'Connell & Penney 2001). Inadequate handovers can result in large amounts of time spent by nurses on the oncoming shift having to search for the required information (O'Connell & Penney 2001).

Inadequate handovers also include information missing, incorrect or irrelevant. Missing information or incorrect information handed over in one study of medical staff handing over to each other in the ED was linked by participants to adverse patient events (Ye *et al.* 2007). Most study participants have found handover to be 'good', but this perception can change radically when they experience a handover that is inadequate and or an adverse patient event or near miss (Ye *et al.* 2007).

In the emergency context, a number of researchers have investigated handover from prehospital paramedics to ED staff. These studies have identified tensions about the transfer of information and the physical transfer of patients. This has been discussed as a tension between 'doing and listening' (Owen *et al.* 2009), and that when it was perceived that the 'doing' was taking priority over the 'listening', this caused frustration and concern for the transfer of information (Jenkin *et al.* 2007, Yong *et al.* 2008, Owen *et al.* 2009).

When comparing strategies employed during handoffs (similar to handover in health settings) in four settings in North America (USA and Canada) with major consequences for failure (NASA space centre, a nuclear power centre, a rail

road dispatch centre and an ambulance dispatch centre), similar characteristics were identified between the agencies studied and healthcare settings (Patterson *et al.* 2004). However, the difference for patient handover was that healthcare personnel lacked knowledge of the overview status of patients and historical information displays, meaning that more information must be covered in a healthcare handover (Patterson *et al.* 2004). A simple trainable protocol at patient transition between wards made a positive difference for handover, resulting in a reduction in errors and missed information during handover (Catchpole *et al.* 2007).

A simulated experiment to assess the differences in information retention for three handover styles over a cycle of nursing handovers showed major issues with incorrect and missing data, which were attributed to the handover style used (Pothier *et al.* 2005). These styles were oral only, oral with note-taking, and typed information sheet with oral handover. Degradation of data was found in all styles in the study, but oral-only handover showed the most data loss until after the fifth cycle, and no original or correct data were handed over for any of the simulated patients. This data substitution was not present in the other handover styles. The note-taking group had a steady data loss, but not as much as the oral group had. With the note-taking group, only 31% of data were accurate on simulation completion. The group with typed information accompanying oral handover had very little data loss over the simulation, and retained the most accurate information (Pothier *et al.* 2005).

The main issues with handover were little structure and poor clarity in oral handovers where patients changed departments/wards or caregivers. Topics or issues handed over were inconsistent and the content of handovers changed with different staff. A frequent recommendation was the need for a structured guide for handover of patient information. Other problems identified included missing information (particularly in documented information), distractions, lack of confidentiality and irrelevant and inaccurate information given. Interventions that were implemented showed positive outcomes when focused on improving the structure of handover. Factors identified as specific issues for clinical handover included process factors, patient factors, resources, individual factors, environment and ethical elements.

Discussion

Review limitations

Due to the limited number of papers directly applicable to this topic, similar issues in other care contexts were reviewed and links to the trauma care context presented. There was no

What is already known about this topic

- Communication issues are identified as having an impact on patient care in most areas of health care.
- Patient care transition points use handovers to pass information on about patient care, and deficits in the quality, amount and appropriate content have often been identified as a major issue with clinical handovers.
- Multi-trauma patients have multiple transition points and care providers, and this makes the potential for communication deficits important.

What this paper adds

- Communication issues in the care of the multi-trauma patient exist and relate to trauma team processes, and lack of structure and clarity during handovers, including missing information, fragmented, irrelevant and inaccurate information, and poorly documented care.
- Despite communication being regularly identified as needing improvement in health care, very little is reported about efforts to improve communication, particularly at transition points of care and about documented information.
- Gaps in knowledge exist about information transfer for trauma patients, and a model of factors that have an impact upon this issue is proposed.

Implications for practice and/or policy

- Specific handover measures in use may not take into account the need for coherent, locatable documentation that is available about patient care after the handover phase is complete.
- Research is needed to test interventions to improve information transfer in the multi-trauma care context.
- Principles of patient safety and risk management should inform processes for trauma care, including handover and documentation, with the aim of facilitating effective information transfer for multi-trauma patients during inter-department transition.

consistency in the research designs used for the studies reported, and therefore this review is a critical analysis of the content only. There was no quality appraisal of individual studies. All evidence was included irrespective of study quality, and this is a weakness when interpreting findings and may reduce the ability for them to be generalized. The review was limited to papers in English, and no studies

investigating the effectiveness of communication strategies in trauma-specific handovers were found.

Communication issues

Communication quality is constantly identified as an important issue in health care, both nationally and internationally (World Health Organization – Collaborating Centre for Patient Safety Solutions 2007), and especially in trauma care (Sugrue *et al.* 1995). A gap exists in the literature about the effects on patient care of missing, fragmented, unclear and inconsistent information. Opinions of missing information having an impact on adverse events have started to emerge from studies conducted about medical handover (Ye *et al.* 2007, Borowitz *et al.* 2008, Horwitz *et al.* 2009). The influencing factors have not been measured for trauma patients and they are not reported to be the focus of further study. Anecdotal evidence suggests that information transfer and consistency of information handed over are particular issues of concern, and missing or fragmented information appears to be a continuing challenge in providing care.

Gaps in communication transfer can be the cause of serious breakdowns in continuity of care and inappropriate treatment, and these may be potentially harmful to patients (Ye *et al.* 2007, Borowitz *et al.* 2008, Wong *et al.* 2008, Horwitz *et al.* 2009). Patient safety and continuity of care when treated by multiple teams rely on good communication. When this fails, safety risks can occur. For multi-trauma patients, this can be further affected by the requirement to deliver definitive care in appropriate timeframes and the clinical context of the emergency setting, adding complexity to an already acute situation with multiple team players involved in care provision (Bergs *et al.* 2005, McFetridge *et al.* 2007, Miller *et al.* 2009).

The implications of communication breakdown or poor communication are so important that new roles have appeared to support information transfer to ensure continuity of care. In trauma care, an example is the Trauma Case Manager role, usually undertaken by an experienced trauma nurse to coordinate, track, communicate and organize postresuscitation care (Curtis *et al.* 2006). Information transfer for multi-trauma patients can be influenced considerably by time pressure factors, the complexity of injuries and information discontinuity that results from the communication processes used and the number of transition points and care providers [for example: primary retrieval of the patient by ambulance and subsequent treatment in the emergency department, operating theatre, and high dependency or intensive care unit (ICU)] (Curtis 2001).

To provide care successfully to multi-trauma patients, TTs use specific strategies, knowledge and skills to facilitate survival and reduce possible disabilities (Xiao & Moss 2001). Research has focused on how teams work towards this goal, with communication having a major impact on outcomes (Xiao & Moss 2001, Mackenzie *et al.* 2004, Bergs *et al.* 2005, Cole & Crichton 2006). Despite its regular identification, the need for communication improvement (including aspects of both quality and quantity) has not usually been the focal point of these studies. Instead, issues or errors brought about by poor communication have been the focus, with the need for communication improvement a recurring recommendation.

Communication amongst healthcare teams was found to be affected by multiple factors related to timely treatment. In a study (Bergs *et al.* 2005), team communication was found to be complex due to multiple factors specific to trauma patients. Another study of handover practices for patients transferred from ED (not trauma specific patients) to the ICU showed communication to be unstructured, even though healthcare professionals thought that quality handover of emergency patients was vital to the quality of continuing care (McFetridge *et al.* 2007). Several improvements for communication were suggested; however, the scope of this study did not include an improvement intervention. Strategies and tools that have been tested in other care areas could be adapted to benefit trauma patients and staff.

Patient handover is a topical issue, with many resources now being allocated to improve it (for example, WHO and Australian Commission for Safety and Quality in Health Care project's National Handover Initiative). One aspect is documented information, which does not seem to be being studied as a specific factor for patient transitions. The patient record can be accessed by every healthcare provider caring for a patient, and is the definitive and unchanging repository for information about previous care. Oral handover, however, only survives for those who receive it. After handover, unless tape-recorded and kept with the medical record (not a current practice), oral information cannot be retrieved and can be affected by memory and perception of communication. Furthermore, when documentation is studied, there is little congruence between auditing tools used and, in many cases, no reporting of or pilot-testing of these tools. This leads to questioning the validity of the results, and particularly the transferability of such audit tools.

Handover as a process also relates to who has responsibility for the patient, and the strategies and structures studied in the literature were aimed at improving this process of communication during the handover as a whole. There seems to be a gap, however, in linking the documentation to

support effective clinical handover. The written patient record survives far into the future and should serve to give a clinical picture of the patient that is accurate, legible, clear and precise. Continuity of care and avoidance of errors depend on this.

Conclusion

This review has raised a number of issues and indicated some suggestions for future research and practice. Further research should be undertaken to develop and test strategies to improve information transfer for multi-trauma patients. The perceived relationship between how documented patient information supports or informs continuing care before, after and during patient handover should be investigated. Communication strategies and tools used in other healthcare areas should be considered for how they may be transferred and adapted to trauma patient care. If strategies can be developed to help reduce barriers and prevent communication breakdown, there is great potential to improve patient care.

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Conflict of interest

No conflict of interest has been declared by the authors.

Author contributions

PC, LA and MC were responsible for the study conception and design. PC, LA and MC performed the data collection. PC, LA and MC performed the data analysis. PC, LA and MC were responsible for the drafting of the manuscript. PC, LA and MC made critical revisions to the paper for important intellectual content. PC, LA and MC provided statistical expertise. PC, LA and MC obtained funding. PC, LA and MC provided administrative, technical or material support. LA and MC supervised the study.

Supporting Information

Additional Supporting Information may be found in the online version of this article:

Table S1. Impact of Trauma Teams.

Table S2. Issues of Communication.

Table S3. Issues of Documentation.

Table S4. Issues in Clinical Handover.

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