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STRATEGIES TO IMPROVE INFORMATION TRANSFER FOR MULTI-TRAUMA PATIENTS

Authors:

Dr Pauline Calleja, p.calleja@griffith.edu.au, Telephone +61 7 3735 7389, Fax: 37355431

Director of Post Graduate Nursing Programs, School of Nursing & Midwifery, and Menzies Health Institute Queensland, Griffith University, 170 Kessels Road, Nathan, QLD 4111.

Professor Leanne M Aitken, leanne.aitken.1@city.ac.uk, Telephone +44 (0)20 70405968

Professor of Critical Care, School of Health Sciences, City, University of London, Northampton Square, London EC1V 0HB, United Kingdom.

Affiliations:

School of Nursing & Midwifery, and Menzies Health Institute Queensland, Griffith University, 170 Kessels Road, Nathan, QLD 4111.

Intensive Care Unit, Princess Alexandra Hospital, 199 Ipswich Road, Woolloongabba, QLD 4102.

Professor Marie Cooke, m.cooke@griffith.edu.au, Telephone +61 7 3735 5253, Fax: 37354712

Deputy Head of School (Research), School of Nursing & Midwifery, and Menzies Health Institute Queensland, Griffith University, 170 Kessels Road, Nathan, QLD 4111.

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Biographies:

Dr Pauline Calleja is a Senior Lecturer and Director of Postgraduate Nursing Programs at the School of Nursing and Midwifery, and a member of the Menzies Health Institute Queensland, Griffith University.

Professor Leanne Aitken is a Professor of Critical Care at the School of Health Sciences, City, University of London, and is an academic title holder as Professor of Nursing at the School of Nursing and Midwifery, Griffith University, a visiting scholar at Princess Alexandria Hospital, an Honorary Professor, School of Nursing and Midwifery, University of Dundee.

Professor Marie Cooke is a Professor of Nursing at the School of Nursing and Midwifery, and a member of the Menzies Health Institute Queensland, Griffith University.

Abstract

The aim of this multi-phase mixed-method study was to improve access, flow and consistency of information transfer for multi-trauma patients leaving the Emergency Department. Methods included literature review, focus group interviews, chart audits, staff surveys and a review of international trauma forms to inform an intervention developed with a researcher-led, clinician stakeholder group. Analysis included descriptive and inferential statistics. Baseline data revealed variability existed in patient care documentation, showing little standardisation. Improvement strategies implemented included a gold standard for information embedded in handover tools, raising staff awareness of complexities for information transfer. Improvement was seen in communication between wards coordinating transfer; improved documentation; decreased information duplication; improved legibility, and increased ease and efficiency in navigating to key information. Improvement in communication at patient transition is essential to continuity of safe effective care, and is impacted by complex interactions between multiple factors. Difficulty increases for patients with high acuity.

INTRODUCTION

Traumatic injury can be caused by contact with blunt or penetrating external force or energy to the body (Bergeron et al., 2007). Trauma and the effect it has on the patient and health care system continues to be a priority both nationally and internationally and as such trauma care has become a speciality within health care. This paper reports on a study designed to identify and test interventions to improve information transfer for multi-trauma patients when discharged from the Emergency Department (ED).

BACKGROUND

Excellent communication is the cornerstone to reliable, efficient collaboration in health care delivery (Patterson, Roth, Woods, Chow, & Gomes, 2004). For effective provision of care that promotes recovery and reduces disability, communication within the trauma team and with ongoing care providers must be thorough, accurate, complete, timely and easy to access (Calleja, Aitken, & Cooke, 2011). There is little in the literature in regard to the most appropriate strategies to achieve documentation and communication during and after trauma care.

Documentation in particular is a concern in trauma care (Pape et al., 2000). Data completeness is significant to health professionals who must rely on documentation completeness to influence patient care decisions. Aside from the verbal handover of patient care, written sources are often the only point of reference for subsequent care provision. Without communication processes that support and encourage continuity of information, patient care and recovery can be sub-optimal (Australian Council for Safety and Quality in Health Care, 2005). If strategies could be developed to help improve information transfer and communication between healthcare professionals, the potential to improve resulting patient outcomes could be significant. Multi-trauma patient discharge from the ED is considered a transition point for information transfer and is one of many in a patient's journey from pre-hospital care to discharge home and community follow-up. Transition out of the ED is considered particularly complex, especially when patients leave the ED for other high acuity areas (e.g. ICU) (Catchpole et al., 2013). Trauma patients are often the sickest patients and need to be transferred rapidly which makes them at higher risk for errors/omissions at transition (Catchpole et al., 2013) due to the rapid and complex nature of multidisciplinary trauma team communications (Jacobsson, Hargestam, Hultin, & Brulin, 2012). Therefore a particular goal for effective information transfer is to support seamless transition points to enable interdependent clinicians and technologies to perform as one (Jacobsson et al., 2012).

CURRENT CONTEXT

The research site was a major metropolitan ED with a trauma service. The context of the hospital was a tertiary referral centre undergoing reassessment for magnet credentialing. As demonstrated in the background, transfer of information to support continuity of care for trauma patients is noted to be of concern in the international literature and, through local consultations and ad hoc feedback from staff conducting and receiving transferred patients, was identified as an area requiring improvement at the research site.

METHODS

This study was a four-phase, descriptive mixed method study using a prospective cohort in one major metropolitan ED with a trauma service in Brisbane, Australia. Ethical approval was granted by both the hospital and university. Phases One and Two were designed to assess current practice and determine staff views on handover, Phase Three included development and implementation of the intervention and Phase Four was assessment after the intervention.

Study Aim

The aim of the study was to develop and implement an intervention to improve information transfer for multi-trauma patients on discharge from the emergency department. Research Questions were:

1. What information should be conveyed at patient transition points?
2. What are the strengths and deficits in communication of trauma care on discharge from the ED?
3. Which factors (people, resources and environmental) can improve communication?
4. Did the developed strategies improve patient care information recording, information flow and transfer?

Phase One

As a baseline measure of what was known about this topic a literature review was undertaken and has been published (Calleja et al., 2011). Following this, an evaluation of the current context of the work environment was undertaken to identify what information was needed for handover at transition. This was undertaken in two parts. First, focus groups were used to identify what was perceived as best practice for handover (as reported in Calleja, Aitken, & Cooke, 2016). Participants in focus groups were staff working in roles where patient information was communicated at transition points for multi-trauma patients leaving the ED such as doctors and nurses from ED, Perioperative services (PERIOP), Intensive Care Unit (ICU), Trauma Service Unit (TSU) and High Dependency Unit (HDU).

Concurrently, trauma forms from international trauma centres were reviewed to identify commonalities in documentation for trauma patients. Results of the literature review, focus groups and the national and international forms review were used to formulate a pre-intervention staff survey (undertaken in Phase Two) which aimed to validate and identify any new aspects that were required to be added to the comprehensive list of information needed at patient transition.

Phase Two

Staff survey

The staff survey was distributed in hard copy to five specialty areas (ED, PERIOP, ICU, HDU, TSU) and a follow-up email sent to potential participants. The target population included all nursing and medical staff that provided trauma care for patients in the areas of ED, and nursing staff in PERIOP, HDU, TSU and ICU at the time of data collection. Surveys were anonymous and contained multiple choice, fixed response (Likert Scale) questions and areas for comments and short answer questions (Powers & Knapp, 2010) . Consent was implied with

return of the survey. The fixed response questions used a four-point scale that forced a positive or negative response and were piloted and refined by the researchers and with two clinicians. The staff survey was undertaken to triangulate the data and ensure that the themes identified in the focus groups were valid for a wider audience and identified trends in opinion.

Data collated from the survey were analysed according to a number of methods. IBM SPSS Statistics for Windows, Version 21.0, Armonk New York (IBM Corporation, 2012) was used in the data analysis of the staff surveys. Likert Scale questions were measured using ordinal measurement (1 = strongly agree, 4 = strongly disagree) to show the relative ranking of the staff agreement (Willits, Theodori, & Luloff, 2016). Unanswered statements were treated as missing data. Content analysis was used to make sense of and collate the data gathered in the open-ended questions.

Patient chart audit

As a third form of validation a pre-intervention patient chart audit was also conducted. Patient charts were audited first as a baseline to discover information that was present and/or missing in documentation. Preliminary results informed the development of an intervention designed to improve completeness of documented information. The chart audit tool was developed based on the results of Phase one's focus groups and Phase two's staff survey. Charts audited were identified using the following patient characteristics:

a) Trauma to multiple body regions where 1 of the body regions had an AIS ≥3 and a second body region had an AIS ≥ 2 (regardless of body region)

b) Age ≥ 18yrs

c) Any injury type

d) Those who were discharged from the ED to any of the following ward areas-PERIOP, ICU, HDU

Patients were identified via a report from the Queensland Trauma Registry. A convenience sample consisted of all charts from eligible patients who presented at the hospital site over a six-month period (July-December 2009). Access to charts were managed by the hospital data custodian with approval via the Public Health Act to gain access without individual patient consent. All identified charts were targeted for auditing.

Descriptive statistical analysis was undertaken using nominal (yes/no answers within the tool) measurement (Willits et al., 2016). Data were analysed using the Chi square test, Fisher's exact test (where cell counts were 0 or where more than 20% of cells had a count <5) and the Mann-Whitney U test where distributions were not normal. Both the staff survey and chart audit were used as a baseline measure for comparison with Phase four results in this study.

Phase Three

A strategy development working group consisting of key stakeholders used the results of phases one and two to develop an intervention (made up of a range of strategies as outlined in Table 1) aimed to improve information transfer for multi-trauma patients on discharge from the ED. Participants provided fully informed consent in writing. The main focus of the strategy was to implement standardisation of a minimum data set through the use of an adapted SBAR handover (Table 1). Table 1 outlines more detail of the other strategies used including; education and awareness raising about the gold standard of information required, sequencing of tasks, continuity in care provider being the one to transfer the patient, local change agents in each area, experienced staff be the documenters in the trauma resuscitation, acknowledging aspects of current good practice and interdisciplinary staff handover before the resuscitation team disbanded.

Phase Four

After implementing the intervention in Phase three, the patient chart audit was repeated to identify any significant changes and evaluate the effectiveness of the intervention, and the staff survey was repeated to consider trending data, but was not tested for significance since results could not be paired. A convenience sample consisted of all charts from eligible patients who presented at the hospital site over a six-month period after Phase three (August 2011-January 2012). Access to charts were managed by the hospital data custodian with approval via the Public Health Act to gain access without individual patient consent. All identified charts were targeted for auditing.

RESULTS

Focus groups

The results of the focus groups have previously been reported (see citation to be inserted after review) as specific research questions drove this aspect of the research. Focus groups were conducted across five clinical areas. Group membership included the ED (nine Registered Nurses [RN), one Medical Officer [MO]), the HDU (three RNs), the TSU (three RNs, one MO), PEROP (five RNs) and the ICU (six RNs). Participants provided fully informed consent in writing.

In summary four themes emerged from the focus groups. Variability that related to staff skills, knowledge and how they handed over and documented information; Continuity, that incorporated people, resource and information inconstancies; Putting the pieces together, that incorporated issues of putting together a picture of the patient, planning safe care, and missing pieces . Values/Context was the final overarching theme that influenced all themes and related to what values and biases were held by staff and how their context (specialty area) shaped these values or influenced them in some way . Another outcome of the focus groups

was the development of a draft minimum data set for information that should be handed over and documented at transition out of the ED (Figure 1).

National and international forms data

Trauma forms from six hospitals were received and reviewed. This included forms from Scotland, New Zealand, Germany, South Africa and Australia. Examination of the trauma forms revealed that there was widespread variability in the depth of documentation. The review revealed common elements in the medical documentation templates, with all of the templates covering primary and secondary survey (thus reflecting current accepted practice). Differences related to how in-depth and comprehensive the templates were. The more in-depth templates linked the documentation to embedded resources (e.g. Ottowa ankle scale rules were embedded into limb assessment). While some forms integrated nursing and medical notes, most did not and some hospitals did not use a specialised trauma documentation template for nursing documentation.

Survey of staff that provide trauma care

Response rates to the survey varied considerably between clinical areas. HDU staff returned the most surveys overall (73% returned Phase two, 40% returned Phase four), while ED had a rise in response rate post-intervention (57% Phase two, 63% Phase four). ICU achieved a consistent 18% response rate across both surveys. The PERIOP area targeted specific staff who worked in the emergency theatre and even though both phases achieved a 20% response rate, staff feedback was that they did not really believe the issues identified related to them as they did not see themselves as a care area like the other wards. This was a clear idea identified also in the focus groups that PERIOP staff's focus was on immediate needs of the patient (like the ED staff) which was different to the other ward areas who expressed a longer-term view of their care focus for patients. TSU did not respond to the surveys, possibly due to all of their

staff being present in the focus groups and therefore feeling they had already contributed their opinion regarding these issues.

There were few trending differences between the groups. Staff surveys validated the major themes identified in the focus groups with no new information identified. The difference in groups (ED vs ICU) continued to show variation in opinion and expectations among clinical areas. For example, as was found in the focus groups, differences of expectations occurred in relation to documentation. While documentation was espoused to be important in all places, staff from PERIOP, ED, and TSU accepted that sometimes documentation would be less comprehensive in times where life or limb of the patient was under threat, whereas staff from ICU and HDU did not accept this situation as reasonable.

Patient chart audit

In Phase two, 103 multi-trauma patients were identified as being admitted to the ED. One chart was excluded as the patient did not receive care in the ED, but was admitted directly to the HDU. Of the remaining 102 charts, 92 (90%) were able to be obtained and audited. In Phase four, 134 multi-trauma patients were identified as admitted to the ED and included in the study. Seventeen of these were excluded as the patients did not meet one or more of the inclusion criteria. Of the remaining 117 charts, 106 (90%) charts were able to be obtained and audited.

Patient cohort descriptions

Patients in both audit periods had similar admission and discharge times for the two groups and were discharged from the ED on similar days of the week. In Phase two, 10.9% of discharge dates were unable to be determined from the documentation due to missing information. In Phase four, this was reduced to 0.9%. While this difference was not statistically significant, it does represent a valuable clinical improvement. Overall, patients were most

often discharged from the ED to the HDU. In Phase two the next highest discharge destination was to the ICU, then PERIOP, with a further 3% of discharge destinations unable to be determined solely from the patient chart. This was different in Phase four with the second highest discharge destination being PERIOP and then ICU. All patient discharge destinations were able to be accounted for in Phase four. Results also showed a significant improvement between Phase two and Phase four groups in being able to determine admission time to the ED.

Discipline specific progress notes

Discipline specific progress notes were used to report paramedic, medical and nursing specific activities. Points of interest in relation to each of these notes include:

- paramedic notes were printed directly from a template,
- nursing notes were in the form of a template,
- medical notes had recently undergone a transformation from free-form notes to a template (Trauma Assessment Form [TAF]), implemented approximately four weeks prior to the commencement of data collection in Phase two.

In Phase two the TAF had been used for approximately half of the patients, with significantly more usage in the post-intervention phase. Of interest was that more paramedic notes were missing from the patient chart in Phase four. In Phase two paramedic notes were unable to be located in 2% of charts, in Phase four this grew to 9% (p 0.038).

Documented patient and staff identifying information

The content of progress notes was considered from the perspective of legal and institutional requirements (e.g. date, time, staff name etc.). Patient and staff identifying information was assessed as present, yes/no. A significant improvement was found in the

nursing documentation for recording times (p 0.001) and clinicians' names (p <0.001) in Phase four. Other elements crucial to documentation included those that decreased the chance of error in information recorded about specific patients such as patient name, date of birth, sex, address etc. This information did not significantly change between the groups, except for a significant improvement in the recording of the disposal of patient's property. A reduction was found in addresses being recorded in ED notes in Phase four.

Content of progress notes

There were no significant differences in documentation about injuries, diagnoses and information about socioeconomic, emotional and family issues. Significant improvements existed in being able to identify management plans for patient care after transfer from the ED. In particular legibility and completeness of pain management plans, diet plans and surgery plans were improved (Table 2). The frequency of documentation of standard observations did not change significantly between groups, except for improvements in temperature being recorded and patient level of consciousness recorded on leaving the ED (Table 2).

Factors affecting flow of information

Three factors identified during the focus group interviews as potentially affecting information flow were (i) if a trauma call was activated, (ii) whether the operating theatre staff were updated on the progress of the trauma call once they had been placed on alert, and (iii) if the patient's physical injuries would impact on physical transfer at handover. Documentation of activation of a trauma call did not significantly improve from between groups, however the process of updating operating theatre staff on the progress of the trauma call did (Table 3). This was judged based on the presence in the patient care notes of evidence of activation of trauma call or notification to the operating theatre staff.

Ease and efficiency of accessing information

A number of measures were used to establish difficulty in accessing information in the patient's health record (Table 3). Navigating to key data in the patient health record was a proxy measure of how easy or difficult it would be for clinicians to access information and was also based on how long it took to conduct the audit (recorded in minutes), as a judgement made by the researcher during data collection. Difficulty in finding information also improved in Phase four.

Improvements were seen in documented evidence of updates given to operating theatre staff on the progress of the patient; less duplication in presented information; improved legibility; and detail about investigations. One significant result that was more difficult to quantify, was whether injuries were likely to affect physical transfer at handover. While the change was significant, it is difficult to identify whether this was a positive change or related to better documentation.

Strategy development

The strategy development group included seven clinicians from the five clinical areas and the researcher. Group membership included two RNs and one MO from emergency, and one RN representative from each of the other areas (HDU, ICU, PERIOP and TSU). The strategy development group felt variability in practice could be attributed to individual staff knowledge and skills, team communication processes, the expectations of team members and the patient's acuity and their presenting situation. These factors along with ward culture and climate were important to plan for when attempting to improve outcomes that are focussed on patient safety (Botti et al., 2009). The group considered a multifaceted approach (see Table 1 for intervention strategies details), as previous attempts to improve clinical handover had failed due to only focusing on one factor or because tools used to improve practice were not

customised to the setting and context. This was a particular focus in the documentation of patient care, as staff felt that their current nursing template was too difficult to use did not support an adequate handover structure.

Change agents were used to implement the standardised approach for information transfer as changing processes was difficult for some staff to accept. Using people in roles that have inbuilt focuses for knowledge sharing and practice change as change agents are linked to increased cooperation (de Vries, van den Hooff, & de Ridder, 2006), therefore local change agents in education and leadership roles were selected for this study.

Standardisation

Along with agreed processes, participants also discussed the need for advanced communication skills and knowledge, and that an agreed minimum data set was required to ensure all of the information needed to safely transition the patient was documented and handed over. An outcome of this study was the development and trial of a minimum data set for multi-trauma patients as one element of best practice for communication in this context – a gold standard of practice (as represented in Figure 1).

The belief that well-constructed, standardised templates can improve the documentation of trauma care was supported by the improvement in the quality of medical documentation in the ED. Highlighting specific issues in documentation without changing documentation forms and templates can still improve quality. One manager commented during the strategy development phase that shining a light on particular issues gave staff something to aim for instead of a broad explanation of issues. This seems to have particularly been the case in this ED environment. Following the initial staff resistance to gaps identified in the documentation of care, the strategy development group and change agents prioritised the gaps in documentation, and specifically highlighted the issues seen as the most important to improve.

In Phase four these areas (fluid balance, level of consciousness on leaving the ED, the temperature of the patient, identifying staff who were involved in the care, when care was given and being able to build a picture of the patient in how they responded to interventions) all significantly improved.

DISCUSSION

The aim of effective information transfer is to support the patient's transition from one care point to another. The results in this study echo the issues found in the literature, specifically that the quality of a patient's transition, either between care givers or between departments, is reliant on a number of variables and all of these variables influence the quality of information transfer at the patient's transition (Calleja et al., 2011). The variables found to influence patient transition according to clinicians in this study also align with those reported in the literature (Calleja et al., 2011) such as; patient acuity and stability, trauma team factors, level of experience of clinicians, context of where the transition is taking place, time pressures, organisational requirements and norms, handover practices and the number of people involved in the patient's care.

In the tools used to document trauma care, variability existed internationally; however, what was consistent was the use of triggers to prompt the clinician to document (or enact) specific aspects of assessment to meet a minimum standard of care. Some forms contained explicit instructions and triggers for clinicians to follow, but were difficult to work through due to the amount of detail. Other forms had few triggers and little structure and therefore may be too open to interpretation to be useful in standardising care, especially in teams with varying experience, knowledge or skills.

Nursing staff in this study believed that there were issues with documentation, but that their own documentation was as good as the current template and situation allowed. Very few

ED nurses were in a position to look at their own documentation as patients were often transferred quickly to another clinical area and few ED nurses referred to documentation during handover. This created an inconsistency between staff beliefs about documented information and the reality of documentation as examined in the patient chart audit results. This is likely why many ED nurses felt unable to accept the results of the chart audit as it contrasted with their personal beliefs. The dichotomy between what clinicians perceived they did and what they actually did was also noted in another study on improving nursing documentation using a standardised process (Bjorvell, Wredling, & Thorell-Ekstrand, 2003).

One measure of improvement was how easy it was to navigate to key data, and how much time it took to traverse the patient notes. There was a statistically significant improvement (Table 3) in Phase four, which may be attributed to a number of factors. First, writing was more legible (Table 3), second, documentation was more complete, and third, a standardised form was implemented and significantly improved documentation in Phase four (Table 3). While these would seem to be the most important reasons for why improvement was noted, the researcher's familiarity with finding information was also a possible factor. However, when reviewing the field notes made towards the end of Phase two, large amounts of time was spent looking for information because there was no set place for it, therefore every piece of information needed to be read. This was frustrating as the writing was often illegible, however with the advent of electronic medical records in emergency settings this issue may disappear. Having more complete data and a standardised form well adhered to by clinicians significantly saved time and improved navigation of information (Table 3: Total time spent on audit).

Ease of use of forms and templates was a major concern of participants in this study. A previous study (Benham-Hutchins & Effken, 2010) sought to identify how clinicians exchanged patient information in acute settings to find how health information technology could support communication. They found that communication structures were closely linked to context and

how staff transferred information was an essential consideration to develop forms and technology to support communication. Staff felt that the ease of use of forms affected how nurses communicated or used formats for communication (e.g. SBAR), and this could be a factor in favour of developing a user-designed form (Gurses, Xiao, & Hu, 2009).

Working party participants agreed about which core elements should be included in the forms or templates, with some discussion about the detail. This is consistent with what was found in the international forms, where the core information of primary and secondary surveys was contained in all of them and variability existed in the details. This is also consistent with debates regarding standardisation. Apart from one study (Benham-Hutchins & Effken, 2010) most report that standardising communication processes improved outcomes (Braun, 2012; Ferran, Metcalfe, & O'Doherty, 2008). Detractors from the standardisation approach outlined concerns about standardised processes interrupting rather than assisting information gathering processes. One study considered the effect of a standardised trauma form on medical documentation of trauma care (Hamill, Paice, & Civil, 2000) and found a positive effect on the amount of care documented. They also noted that some level of duplication in documentation was acceptable and even best practice, and mainly included vital sign documentation as a signpost for underpinning clinical decision making. Interestingly, most studies considered in the literature only dealt with either nursing or medical documentation, investigating and reporting on one discipline's performance and responsibility. There was a lack of research that considered the whole team approach to trauma care, which is problematic as the patient experiences all disciplines in their care experience simultaneously.

Patient records may also indicate the acuity of a patient's needs. Patient acuity may also be considered by their injury type, interventions needed and if interventions were not at hand. However, documentation for very unwell patients was often not as comprehensive compared to other patients. In this study, when a patient was in a situation that was considered life or

limb threatening, documentation was sparse as staff focused efforts on interventions, and these patients were usually in the ED for a very short time. Interestingly, this was seen as acceptable by most staff receiving these patients. Often these patients spent very little time in the ED and were quickly transferred through to the operating theatre to receive definitive care. Regardless of acuity, some aspects of documentation improved significantly in Phase four (e.g. statistically significant improvement in pain management, fluid balance and medications given, see Table 3 for more details). This included being able to determine which staff were involved in the care (Table 3), when care was given (Table 3), where patient property was (Table 3) and if police were involved (Table 3). Other aspects of documentation that improved included the content and detail of the patient progress notes (see Table 3 for specific details). ED staff anecdotally discussed being more aware of where gaps in documentation had been identified and changed their practice of having the least experienced nurse document information and nominated an experienced nurse or team leader to document trauma cases. This resulted in significant improvements in being able to identify the patient's level of consciousness upon leaving the ED (Table 2), recording the temperature of the patient (Table 2) and fluid balance information (Table 2). Medical staff documenting were able to improve on spinal clearance status (Table 2), being able to identify a clear plan of care (see Table 2 for all aspects), which specialty consultations were requested, and if and when the patient would have surgery. In highlighting the lack of clarity regarding diet, pain management, and ordering of medications and fluids, medical staff were also able to improve on documenting these aspects of vital care. These improvements assisted with navigation to key information needed to deliver care and reduce information gaps in Phase four.

In this study, staff believed patient outcomes, could be affected by the quality, organisation and acceptance/delivery of information at handover. This was supported in another study where staff believed that lost information would contribute to worse patient outcomes

(Zakrison et al., 2016). Therefore, the strategy development group wanted to develop better processes around manipulating the quality, organisation and process of the handover itself. This was an underpinning reason for a standardised approach to handover. Standardised approaches to communication have been studied and varied outcomes identified (Saranto & Kinnunen, 2009). Trends identified in this study indicated little change in staff perception of agreed expectations of information documented or handed over; however, chart audit results showed significant improvement in many aspects of documented information.

Participants felt that if a minimum data set could be developed, then some of the uncertainty involved in handing over to staff in other clinical areas where expectations were unknown would be alleviated. This has specifically been identified in another study about lost information for trauma patients transitioning from the ED to the ICU (Zakrison et al., 2016). Indeed, in the literature, standardisation of information received a common goal to enable the achievement of optimal communication and safe care (Braun, 2012; Klee, Latta, Davis-Kirsch, & Pecchia, 2012). Another study showed a positive impact of standardisation when clinicians followed a standardised trauma care pathway, which improved continuity of care and reduced treatment variations (Bernhard et al., 2007). However, not all literature endorses standardisation processes, some question the value of standardisation and the impact that context has on improving handover communications due to issues around fully understanding the nature of handover communication in various contexts (Abraham, Kannampallil, & Patel, 2012; Benham-Hutchins & Effken, 2010).

Strengths and limitations

The strengths of this study relate to the work and intervention being undertaken in context of the clinical area. The development of both the chart audit tool and staff survey tool ensured relevance as it evolved from the literature and focus group findings. The strategies

implemented were also driven by key stakeholders and their development was inclusive, negotiated, collaborative and consultative. The intervention was multi-faceted and relied on change agents to embed them into the clinical environment. This meant the change message was being delivered in a less threatening way then by an external entity and was credible and acceptable to staff.

Limitations are related to the study and the intervention only being conducted in one hospital site and in relation to some of the methods used. In using chart audits to collect information, a number of limitations may be considered. Patient information must be documented to extract it. Further limitations in using chart audits existed around judging content out of context. Patient progress notes are only valuable if they also comply with rules of relevance, legibility, completeness and objectivity. Not all of these conditions could be judged by the researcher. Issues such as relevance, completeness (except where specific rules apply such as drug orders) and objectivity are difficult to judge without the researcher comparing the written notes to the patient condition as it was evolving, which was not in the scope of this study. While staff perception of expectations was measured, in-depth views of staff expectations were not able to be explored in Phase four as was done in Phase two due to constraints in time and resources. For the same reason clinical handovers were unable to be observed for adherence to the minimum data set identified. The design of this study did not test for uptake of the intervention and focussed only on measuring projected outcomes. Changes in documentation were measured over a six-month period; therefore, the sustainability of improvements beyond that time is not known.

CONCLUSION

Information transfer for multi-trauma patients on discharge from the ED is a complex topic. In this study designed to improve information transfer, a minimum data set was developed

and underpinned the intervention in this study, which could be transferrable to many trauma settings. Interventions to overcome barriers for complex issues such as that of multi-disciplinary communication need to be considered in context. Contextual factors such as staff skills, culture in the organisation, processes in place and other overarching aspects of what is happening at an organisational level, all impact significantly on how changes can be planned for and implemented. For this type of change to have a chance of success, engagement by the staff who the change is affecting is crucial. Communication is embedded into each person's personal and professional traits and therefore changes to how people enact this will always need to be contextually and individually relevant. In considering documentation for the multi-trauma patient, the nursing and medical templates used in the environment actually upheld the gold standard of information details; however, due to parts of the nursing form no longer being relevant, there tended to be poorer overall adherence to completing the form. The gold standard for information previously reported in the literature (ref to be added after review) included; patient details, vital signs, referrals or consultations, primary patient complaint, injuries and related restrictions, treatment plan, ventilation requirements and airway status, procedures required, intravenous or arterial access, blood products given/ordered, fluid balance, consent form, relatives and information given to them, involvement with police, or allied health, and any pertinent psychosocial aspects. Documentation degradation could be seen where staff did not fully engage in using the obsolete areas of the form due to lack of relevance to current practice. Significant improvement was seen in documented information for areas that were highlighted as needing improvement, but not in most areas affecting patient flow. Adoption of a communication protocol is essential for providing safe patient care and improving outcomes.

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Table 1 **Intervention strategies**

- **Modified SBAR handover structure**. Disseminated as an intervention flyer, posters, handover sheet/template, computer screen savers and a laminated prompt resource to fit onto staff identification badge holder.
- **Education and awareness-raising for documentation.** Aimed to encourage staff engagement to achieve minimum levels of information recorded and handed over with both ED and receiving staff. Areas highlighted as needing improvement included: Regular recording of temperature and GCS, fluid balance details, police involvement, patient trends and response to interventions, and specifying the trauma team staff, c-spine clearance status, pain management plans, updating PERIOP area of status of patient, fluid and medication orders. Education sessions were both formal and informal and included opportunistic education at orientation.
- **Trial change of sequence for patient handover**. Where possible staff were encouraged (due to patient condition at the time) to handover before physically moving the patient off the ED bed onto the receiving ward bed.
- **Where possible, the same RN caring for the patient in ED provided the ward handover.** Where this was not possible the RN was to handover to the ward via telephone before the patient left the ED.
- **Use of change agents within each ward area.** To promote and support implementation of these interventions, change agents provided education, facilitated conversations about issues identified, and championed changes at the bedside and when supporting new or junior staff.
- **More experienced/senior staff to undertake documentation of the resuscitation where possible.**
- **Identify and communicate gold standard minimum data set.** Advertised to staff that the current nursing Resuscitation Form paired with the medical Trauma Assessment Form actually gave the gold standard of information needed to provide safe trauma patient care.
- **Identify current aspects of documentation and practice that were positive and necessary to continue.**
- **Implement an interdisciplinary handover for staff involved in the resuscitation before leaving.** Medical officers and nursing staff who left the resuscitation room were to handover to the nurse left caring for the patient once resuscitation efforts in the ED setting were completed. This was to ensure care plans were clear, orders were present and patient history was clear to facilitate better transition handover when the patient left the ED.

Table 2. Details of interventions and procedures recorded

Was documentation of interventions/ procedures present and complete?		Phase two n=92, n (%)	Phase four n= 106, n (%)	Test	p-value
Size & placement of tubes/ drains used	Complete and legible	72 (78)	84 (79)	x^2 4.587	0.101
	Present but incomplete/ illegible	17 (18)	12 (11)		
	Not present	3 (3)	10 (9)		
Fluid orders	Complete and legible	60 (65)	83 (78)	x^2 8.207	**0.017**
	Present but incomplete/illegible	25 (27)	12 (11.3)		
	Not present	7 (7)	11 (10)		
Fluid balance	Complete and legible	3 (3)	43 (40)	x^2 42.242	**<0.001**
	Present but incomplete/illegible	27 (29)	29 (27)		
	Not present	62 (67)	34 (32)		
Medications ordered	Complete and legible	36 (39)	111 (56)	x^2 23.347	**<0.001**
	Present but incomplete/illegible	49 (53)	71 (35)		
	Not present	7 (7)	9 (8)		
Medications given	Complete and legible	57 (62)	79 (74)	x^2 3.980	0.137
	Present but incomplete/illegible	27 (29)	19 (17)		
	Not present	8 (8)	8 (7)		
Pain management (general)	Complete and legible	63 (68)	98 (92)	x^2 20.194	**<0.001**
	Present but incomplete/illegible	12 (13)	1 (1)		
	Not present	17 (18)	7 (6)		
Spinal Clearance	Complete and legible	50 (54)	91 (85)	x^2 24.058	**<0.001**
	Present but incomplete/illegible	11 (12)	5 (4)		
	Not present	31 (33)	10 (9)		
Details of management plans documented for care after transfer					
Pain	Complete and legible	67 (72)	91 (85)	Fisher's exact	**0.032**
	Not present or incomplete/ illegible	25 (27)	15 (14)		
Diet	Complete and legible	49 (53)	86 (81)	Fisher's exact	**<0.001**
	Not present or incomplete/ illegible	43 (46)	20 (18)		
If requiring surgery & when	Complete and legible	34 (37)	55 (51)	Fisher's exact	**0.045**
	Not present or incomplete/ illegible	58 (63)	51 (48)		
Is patient conscious on leaving the ED	Yes	23 (25)	39 (36)	x^2 8.176	**0.017**
	Unknown/unable to determine	46 (50)	32 (30)		
	No	23 (25)	35 (33)		
Temperature	Regularly recorded/ able to trend	57 (62)	80 (75)	x^2 4.220	**0.040**
	Not recorded at all or enough to trend	35 (38)	26 (24)		

Table 3 Factors affecting flow, ease and efficiency of accessing information in the patient health record

		Phase two n=92, n (%)	Phase four n= 106, n (%)	Test	p-value
Trauma Call activated	Yes	43 (46)	58 (54)	x^2 4.945	0.084
	Unable to identify	44 (47)	36 (34)		
	No	5 (5)	12 (11)		
Operating theatre updated	Yes	13 (14)	35 (33)	x^2 10.833	**0.004**
	Unable to identify	1 (1)	3 (2)		
	No	78 (84)	68 (64)		
Were injuries likely to affect physical transfer at handover?	Yes	75 (81)	70 (66)	x^2 25.139	**0.001**
	Unable to identify	11 (12)	2 (1)		
	No	6 (6)	34 (32)		
Duplication of information present	Yes	17 (18)	5 (4)	x^2 9.444	**0.002**
	No	75 (81)	101 (95)		
Total time spent on audit in mins	Median	17.5	13	**Mann-Whitney U** 2614.500	**<0.001**
	IQR	13-22	11-15.25		
Difficulty in navigating to key data	Median	6	3	**Mann-Whitney U** 2008.500	**<0.001**
	IQR	4-8	2-4		
			Difficulty scale - 1 = easy and 10 = very difficult		
Ease of finding investigations in notes	Easy to find-complete	23 (25)	48 (45)	x^2 13.273	**0.001**
	Some difficulty in finding/part recorded	52 (56)	51 (48)		
	Very difficult to find, confusing	17 (18)	6 (5)		
Ease of finding diagnoses	Easy to find-complete	65 (42)	87 (82)	x^2 4.215	0.122
	Some difficulty in finding/part recorded	20 (21)	12 (11)		
	Very difficult to find, confusing	7 (7)	7 (6)		
Were written notes legible	Overall Yes	80 (87)	106 (100)	Fisher's exact	**<0.001**
	Many areas illegible	12 (13)	0 (0)		
	Many areas illegible	12 (13)	0 (0)		

Table 3 continued

Were progress notes present?			Pre-intervention n=92, n (%)	Post-intervention n= 106, n (%)	Test	*p*
Trauma assessment form	Medical	Yes	90 (97.8)	104 (98.1)	Fisher's exact	1.000
		No	2 (2.2)	2 (1.9)		
	Nursing	Yes	48 (52.2)	98 (92.5)	x^2 41.263	**< 0.001**
		No	44 (47.8)	8 (7.5)		
	Ambulance	Yes	91 (98.9)	105 (99.1)	Fisher's exact	1.000
		No	1 (1.1)	1 (0.9)		
		Yes	90 (97.8)	96 (90.6)	Fisher's exact	**0.038**
		No	2 (2.2)	10 (9.4)		
Legal requirements present in documentation						
Date	Medical	Yes	79 (85.9)	86 (81.1)	x^2 0.796	0.372
		No	13 (14.1)	20 (18.9)		
	Nursing	Yes	90 (97.8)	102 (97.1)	Fisher's exact	1.000
		No	2 (2.2)	3 (2.9)		
Time	Medical	Yes	33 (35.9)	45 (42.5)	x^2 0.894	0.344
		No	59 (64.1)	61 (57.5)		
	Nursing	Yes	75 (81.5)	102 (96.2)	Fisher's exact	**0.001**
		No	17 (18.5)	4 (3.8)		
Staff Name	Medical	Yes	83 (90.2)	96 (90.6)	x^2 0.007	0.934
		No	9 (9.8)	10 (9.4)		
	Nursing	Yes	63 (68.5)	93 (87.7)	x^2 10.929	**<0.001**
		No	29 (31.5)	13 (12.3)		
Staff Designation	Medical	Yes	81 (88)	94 (88.7)	x^2 0.019	0.889
		No	11 (12)	12 (11.3)		
	Nursing	Yes	72 (78.3)	87 (82.1)	x^2 0.453	0.501
		No	20 (21.7)	19 (17.9)		
Patient Identifiers	Medical	Yes	91 (98.9)	105 (99.1)	Fisher's exact	1.000
		No	1 (1.1)	1 (0.9)		
	Nursing	Yes	90 (97.8)	104 (99)	Fisher's exact	0.600
		No	2 (2.2)	1 (1)		
Written in indelible ink	Medical	Yes	92 (100)	105 (99.1)	Fisher's exact	1.000
		No	0 (0)	1 (0.9)		
	Nursing	Yes	91 (98.9)	105 (99.1)		1.000

	No	1 (1.1)	1 (0.9)	Fisher's	
Patient name	Not present OR incomplete/illegible	4 (4.3)	5 (4.7)	Fisher's exact	1.000
	Complete and legible	88 (95.7)	101 (95.3)		
Date of Birth	Not present OR incomplete/illegible	2 (2.2)	5 (4.7)	Fisher's exact	0.453
	Complete and legible	90 (97.8)	101 (95.3)		
Age	Not present OR incomplete/illegible	3 (3.3)	5 (4.7)	Fisher's exact	0.727
	Complete and legible	89 (96.7)	101 (95.3)		
Sex	Not present OR incomplete/illegible	1 (1.1)	5 (4.7)	Fisher's exact	0.219
	Complete and legible	91 (98.9)	101 (95.3)		
Address	Not present OR incomplete/illegible	15 (16.3)	24 (22.6)	x^2 1.251	0.263
	Complete and legible	77 (83.7)	82 (77.4)		
Next of Kin details	Not present OR incomplete/illegible	38 (41.3)	46 (43.4)	x^2 0.088	0.766
	Complete and legible	54 (58.7)	60 (56.6)		
Medical History	Not present OR incomplete/illegible	22 (23.9)	18 (17)	x^2 1.468	0.226
	Complete and legible	70 (76.1)	88 (83)		
Allergies	Not present OR incomplete/illegible	12 (13)	15 (14.2)	x^2 0.051	0.821
	Complete and legible	80 (87)	91 (85.8)		
Property disposition	Not present OR incomplete/illegible	62 (67.4)	16 (15.1)	x^2 56.420	**<0.001**
	Complete and legible	30 (32.6)	90 (84.9)		
Police involvement	Not present OR incomplete/illegible	85 (92.4)	86 (81.1)	x^2 5.302	**0.021**
	Complete and legible	7 (7.6)	20 (18.9)		
Health insurance	Not present OR incomplete/illegible	34 (37)	32 (30.2)	x^2 1.015	0.314
	Complete and legible	58 (63)	74 (69.8)		

Figure 1: Gold standard and minimum data set required for multi-trauma patients at transition

Patient focused	Care in the ED	Future care
✓ mechanism of injury ✓ past history ✓ clinical stability ✓ any advance directives ✓ vital signs ✓ pre-hospital care given ✓ relevant family and social information ✓ property disposition ✓ police involvement	✓ what interventions were conducted ✓ how the patient responded to interventions ✓ who were the treating teams involved	✓ future care plans ✓ tasks still left to complete or investigations still pending ✓ upcoming risks ✓ relevant orders for care

Notes

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LIST OF ABBREVIATIONS

ED Emergency Department

HDU High Dependency Unit

ICU Intensive Care unit

PERIOP Perioperative services

TAF Trauma Assessment Form

TSU Trauma Service Unit

SBAR Situation Background Assessment/Action Recommendations - SBAR communication tool