Comparing Care Transition Outcomes in Pediatric and Adult Trauma Patients

RuthAnn Haefli, Dr. Abigail Wooldridge

Introduction

Care transitions (also referred to as handoffs or handovers) are the transfer of patient responsibility and information from one health care team to another [1]. These transitions are critical to patient safety. Intensive care units (ICUs) can be particularly prone to medical hazards and errors due to the volume and vulnerability of patients [2].

Multiple studies have defined critical care transition outcomes that affect the quality of patient care [3]. These outcomes include communication [1,2,3,4], situation awareness [1,2,3,5], interruptions/distractions [1,3] and formal acceptance of responsibility [3]. Due to the multiple inputs related to the success of transitions, it is necessary to analyze the surrounding organizational factors as well as the personnel and events directly involved in the transition [1]. Handoff standardization tools such as checklists and electronic documentation tools have been implemented to improve outcomes with mixed results [3,5]. Further, these studies investigated different outcomes of varying specificity, validity and importance to handoff participants, thus demonstrating lack of consensus in what outcomes are important to study.

The objective of this study is to compare care transition outcomes in two different sociotechnical contexts: the transition of pediatric trauma patients from the operating room (OR) to the pediatric intensive care unit (PICU) versus the transition of adult trauma patients form OR to ICU.

Methods

This project is a secondary analysis of interviews with staff working in the OR, PICU, and ICU. The original study was approved by the University of Wisconsin-Madison IRB, and the secondary data analysis was approved by the IRB at the University of Illinois at Urbana-Champaign.

Setting and Sample

The interviews were conducted at an academic teaching hospital in a Midwestern city. Interview data was collected over a two-year period from multiple health care professionals including nurses, intensivists, anesthesiologists and surgeons, including attending, fellow and resident physicians.

Data Collection

Semi-structured interviews were used to collect the original dataset. Interview questions focused on the describing the care transition process, good and poor care transition experiences, and opportunities for improvement.

Qualitative Data Analysis

In the previous analysis of this data set, participants mentioned nine outcome categories during the interviews, including: (a) communication being sufficient, complete and accurate, (b) handoff timing, (c) patient outcomes, (d) change in workload, (e) individual situation awareness, (f) team situation awareness, (g) organization awareness, (h) team experience and (i) delayed feedback. Please see Table A1 in the appendix for the full definition of each category.

A total of 147 interview segments were coded with these outcome categories. In this analysis, we reviewed each segment to determine the direction of the outcome category. If the direction was positive (i.e., communication was sufficient, there were no delays, workload was reduced or not impacted, etc.) or

negative (i.e., communication was not sufficient, there were delays, workload was increased). Each interview segment was coded for a positive (j) or negative (k) direction.

Inter-Rater Reliability

To enhance the rigor of the qualitative data analysis, we employed triangulation of analysts [6]. An interrater reliability assessment was conducted to validate the coding of the outcome directions. A second researcher coded two full interviews, and a Cohen's kappa value of 0.82 was calculated for positive and negative directions. This Cohen's kappa value is above the acceptable value of 0.8 and indicates that the interpretation and coding of interview data are reliable.

Statistical Analysis

Following the qualitative data analysis, we counted the frequency of each code application for both pediatric and adult care transitions. Chi-Squared tests were conducted using Microsoft Excel© to determine the following:

1. For pediatric patients, are the outcome direction (j and k) and outcome category (a-i) independent?

2. For adult patients, are the outcome direction (j and k) and outcome category (a-i) independent?

3. For positive directions, are the patient type (pediatric vs adult) and outcome category (a-i) independent?

4. For negative directions, are the patient type (pediatric vs adult) and outcome category (a-i) independent?

Results

Outcome Direction vs Category

Tables 1 and 2 show the frequency of coded interview excerpts in each of the nine outcome categories for adult and pediatric handoffs respectively. Chi-squared tests of independence were calculated comparing the frequency of outcome categories for positive (3j) and negative (3k). Insignificant interactions were found ($\chi^2(9) = 12.2$, $p>0.05$ for adult transitions; $\chi^2(9) = 6.56$, $p>0.05$ for pediatric transitions) indicating there was not a significant relationship between outcome category and the overall positive/negative outcome for either adult or pediatric handoffs.

Table 1. Frequency of Outcome Category for Adult Transitions.

Adult Transitions		
Code	***Positive Direction***	***Negative Direction***
Communication sufficient, complete and accurate	50	20

Table 2. Frequency of Outcome Category for Pediatric Transitions.

Pediatric Transitions		
Code	***Positive Direction***	***Negative Direction***
Communication sufficient, complete and accurate	24	10

Handoff timing	16	3
Patient outcomes	13	8
Change in workload	7	5
Individual situation awareness	13	4
Team situation awareness	18	4
Organization awareness	3	2
Team experience	2	1
Delayed feedback	1	1

Handoff timing	7	11
Patient outcomes	5	4
Change in workload	2	1
Individual situation awareness	5	1
Team situation awareness	12	5
Organization awareness	2	1
Team experience	1	0
Delayed feedback	0	2

Patient Type vs Outcome

Tables 3 and 4 show the frequencies of coded interview excerpts of adult and pediatric handoffs in each of the nine outcome categories for positive and negative directions respectively. Chi-squared tests of independence were performed to compare the frequency of outcome categories for adult handoffs and pediatric handoffs. Insignificant interactions were found ($\chi^2(9) = 2.75$, $p>0.05$) for positive directions. This indicates that, of positive outcomes, there was not a significant relationship between outcome category and the patient type. Significant interactions ($\chi^2(9) = 20.9$, $p<0.05$) were found for negative directions. This indicates that, for negative outcomes, there was a significant relationship between outcome category and the patient type. When speaking about negative directions, the category of outcome (a-i) that staff address is related to the type of patient handoff (adult vs pediatric).

Table 3. Frequency of Outcome Category for Positive Directions.

Positive Directions		
Code	***Adult***	***Pediatric***
Communication sufficient, complete and accurate	50	24
Handoff timing	16	7
Patient outcomes	13	5
Change in workload	7	2
Individual situation awareness	13	5
Team situation awareness	18	12
Organization awareness	3	2
Team experience	2	1
Delayed feedback	1	0

Table 4. Frequency of Outcome Category for Negative Directions.

Negative Directions		
Code	***Adult***	***Pediatric***
Communication sufficient, complete and accurate	20	10
Handoff timing	3	11
Patient outcomes	8	4
Change in workload	5	1
Individual situation awareness	4	1
Team situation awareness	4	5
Organization awareness	2	1
Team experience	1	0
Delayed feedback	1	2

When asked about adult handoffs with negative directions, interviewees spoke most about communication (3a), patient outcomes (3b), and change in workload (3f). However, when asked about pediatric handoffs with negative directions, interviewees spoke most about handoff timing (3b), communication (3a), and team situational awareness (3f).

Communication seemed to be the most critical outcome.

> "*[Loss of information is] ...kind of like the worst event. … [Y]ou can see how that might lead to a bad outcome, because … if we aren't made aware [of a]… unique circumstance that's out of the realm of normal for that case…[then]... we don't know to look for it."* (Pediatric Fellow)

This is in line with the goal of transitions: the transfer of information, authority and responsibility for a patient. Without communication, that goal cannot be achieved.

However, pediatric handoffs may be more sensitive to timing and the team situational awareness. Good communication ties into handoff timing because "*... [when there is a lack of communication] then there's*

a lot of phone tag that happens...." (Pediatric Fellow). Calling ahead of time allows the receiving staff to prepare and review necessary information. This preparation allows them to better receive new information during the handoff. *"[When handoffs are performed] over the phone,… [one person is] supposed … to ask questions for everybody. But it's hard for [one member] to think of all those questions, because [they are] not in that role..."* (Pediatric Fellow). When staff are able to relay information that pertains to the receiving team the transition is improved. It was often relayed smoother transitions were performed face-to-face at the bedside. *"[H]av[ing] everyone together is the only way to not have that verbal lack of communication."* (Health care staff)

On the other hand, adult handoffs may be more sensitive to the workload of the staff. *"…[S]urgeons… [are] oftentimes tied up with other things and aren't necessarily there for a bedside hand-off."* (Adult Attending). However, "*[Handoffs are easier] the more people that are there… [because there are] less …steps in communication to go through…"* (Adult Resident). This makes sense given that the adult transitions include separate handoffs form nurses to nurses and physician to physician. More work would have to be done to transfer the same information to all teams and keep similar levels of team awareness.

Discussion & Conclusion

Though most results of the statistical tests were insignificant, this indicates that the outcomes are universal across the OR to ICU care transition of two types of patients. Further, the emphasis on the importance of good communication (3a), handoff timing (3b), and team situational awareness (3f) suggests that these elements play a strong role in the success of care transitions. The complexity of care transitions and variations in hospital processes make it difficult to find a definite solution to improve care transitions. This study aimed to analyze the relationship between the categories of transition outcomes (a-i), the overall transition outcome (j and k) and the type of patient handoff (adult vs pediatric) in transitions from the OR to the ICU/PICU. The Chi-Squared tests for independence showed that, for negative outcomes, there was a significant dependence between the type of patient handoff and the outcome categories addressed by the interviewee. This indicates that staff speak about adult and pediatric handoffs differently. Adult handoffs are likely to have more trouble with workload while pediatric handoffs are likely to have more trouble with handoff timing and team situational awareness. This study is limited in that is sample is from one participating site and does not include patient and family perspectives.

References

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Appendix

Table A1. Category Definitions.

#	Code Name	Definition
3a	Communication sufficient, complete and accurate	Whether or not sufficient, and accurate information was communicated (Lingard et al., 2004) to healthcare professionals involved in the handoff, i.e., the communication and information flow was effective, information was firsthand (from person who cared for patient in OR), errors in others' reports were corrected, the receiver was able to care for the patient with information provided.
3b	Handoff timing	Whether or not there was a delay in starting the handoff, the handoff was appropriate in length (duration) with/without repeating information and/or distractions or interruptions (Starmer et al., 2017).
3c	Patient outcomes	Whether or not the handoff impacts patient safety and quality of care, e.g., harmed with lost/inaccurate information potentially causing patient safety issues, and/or medical errors or outcome improved with errors caught, decisions revisited, etc. (Carayon et al., 2013).
3d	Change in workload	Whether or not the handoff impacts the workload of the healthcare professionals, for example causing an increase in the need to seek additional information via phone calls, chart review, etc.; high workload can negatively impact patient safety (Carayon, Alvarado & Hundt, 2003).
3e	Individual situation awareness	Whether or not each healthcare professionals in the handoff perceives information elements in the handoff, comprehends the meaning of these elements and projects the status of these elements in the near future (Endsley, 1988, 1995); in other words, whether or not the professional can contextualize the patient and the information received. Wickens (2000) calls for awareness of the external environment, systems and task (including the coordinated activities others are doing). This is beyond information transfer (3a), and includes individuals perceiving, comprehending and projecting the information transferred in the handoff.
3f	Team situation awareness (SA)	Whether or not each healthcare professional on the team has their own SA and also is aware of the processes of other team members (Endsley & Jones, 1997; Prince & Salas, 2000); at the team level, this is the aggregate of unique and shared SA). Cooke et al. (Cooke, Gorman & Rowe, 2004) and Gorman et al. (Gorman, Cooke & Winner, 2006) emphasize that this does not mean all team members have exactly the same SA, rather that there is some minimum overlap. In other words, whether or not the team members have the same understanding about the patient after the handoff.

3g	Organization awareness	Whether or not each healthcare professional is aware of how their role/job fits in the organization and their relationship to others; in other words, whether or not they are aware of the impact of their actions the upstream and downstream (Schultz et al., 2007).
3h	Team experience	Whether or not the handoff impacts the experience of the team in terms of familiarity, length of time working together and how frequently they work together. Each handoff interaction could be an instance of that team working together, which would positively impact team performance and communication (Cooke et al., 2007). Each handoff can increase team experience and thus can impact team performance and communication.
3i	Delayed feedback	Whether or not clinicians sending the patients immediately know if handoffs were successful, . Because they may not perceive a problem with information flow, negative patient outcomes may occur much later or may be avoided, etc This impacts the feedback loop in the SEIPS model.
3j	Positive outcome	The interviewee describes a positive impact on one of the other handoff outcome codes (3a-3i). For example, communication was sufficient, complete and accurate; handoff timing was good (no delay, appropriate length); patient outcomes were improved (or at least not harmed); workload was decreased; individual SA was improved; team SA was improved; organization awareness was improved; team experience was improved; feedback was not delayed. This should only be applied in conjunction with at least one of 3a-3i.
3k	Negative outcome	The interviewee describes a negative impact on one of the other handoff outcome codes (3a-3i). For example, communication was not sufficient, complete and accurate; handoff timing was not good (delayed, inappropriate length); patient outcomes were not improved (or were harmed); workload was increased; individual SA was not improved; team SA was not improved; organization awareness was not improved; team experience was not improved; feedback was delayed. This should only be applied in conjunction with at least one of 3a-3i.