

Contextual factors influencing barriers and facilitators in paediatric trauma care transitions

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ABSTRACT

Care transitions, important for patient safety and quality of care, are common during inpatient care of paediatric trauma patients. Previous research has described the sociotechnical systems involved in care transitions from the emergency department to operating room, emergency department to paediatric intensive care unit and from operating room to paediatric intensive care unit, identifying work system barriers and facilitators that hinder or support work in those transition processes. However, that work did not explore how contextual factors, which vary across the transitions, influenced those barriers and facilitators. In this secondary analysis of interviews with 18 physicians, advanced practice providers, nurses and support staff, we investigated contextual factors that impact work system barriers and facilitators. We identified eight contextual factors that influenced barriers and facilitators in the three care transitions: time pressure, documentation practices, patient acuity, unknown or uncertain information, on-call staff, relationship between units, handoff organisation and organisational resources. Identifying contextual factors influencing barriers and facilitators to work could be an additional way to consider how interactions between system elements impact work. Future work should develop additional methods to explore and quantify work system interactions, as well as use the identified contextual factors to inform improvement efforts to redesign care transitions.

KEYWORDS

Care transitions, paediatric trauma, contextual factors

Introduction

It is well accepted that care transitions – transfers in responsibility, authority and information about patient care from one clinician or group of clinicians to another (Abraham et al., 2014) – are important for patient safety and quality of care, with opportunity for resilience as well as error or information loss (Arora et al., 2009; Perry, 2004). As part of a larger, ongoing study, we have previously applied ergonomics/human factors (referred to here as human factors) methods to study and analyse care transitions of paediatric trauma patients. Trauma is the leading cause of death in children and young adults in the United States (Centers for Disease Control and Prevention, 2015). We used the Systems Engineering Initiative for Patient Safety (SEIPS)-based process modelling method (Wooldridge et al., 2017) to analyse the work involved in three transitions early in the care of patients at the hospital: from emergency room (emergency department, ED) to operating room (OR), from ED to paediatric intensive care unit (PICU), and from OR to PICU (Wooldridge et al., Submitted). The three care transitions involved some similar work: communication and coordination in preparation for patient movement, the actual physical movement and a handoff

between clinicians in the transition, and follow up work continuing patient care and completing documentation. There were also differences: the OR to PICU handoff was done in a group, with physicians and nurses from anaesthesia, surgery and PICU together, while the others were separated by professionals (Wooldridge et al., Submitted).

In that analysis, we also identified nine dimensions of work system barriers and facilitators (Carayon et al., 2005) that hinder or expedite the care transition work, respectively: anticipation, ED decision making, interacting with family, physical environment, role ambiguity, staffing or resources, team cognition, technology, and characteristics of trauma care (Wooldridge et al., Submitted). However, beyond reporting significant variation in frequency of each dimension across the three care transitions, we did not explore the reasons for this variation. Each of the three care transitions represents three different contexts, or sociotechnical systems (Moray, 1994; Wilson, 2014). Human factors provides useful models to consider context; such as Moray's (1994) model that included the influence of societal and cultural factors, legal and regulatory considerations and organisational behaviour to a description of a work environment. A few years prior, the work system model – the foundation of the SEIPS model – had done the same, although depicted differently in graphic form (Carayon, 2009; Carayon et al., 2006; Smith and Carayon-Sainfort, 1989). However, in our prior analysis of work system barriers and facilitators, we did not explore the impact of context on the dimensions of barriers and facilitators. Therefore, the goal of this paper is to identify contextual factors that influence work system barriers and facilitators in paediatric trauma care transitions.

Methods

This secondary data analysis is part of a larger study focused on designing health information technology to support teams caring for paediatric trauma patients. Initial approval for this study was obtained from the IRB at the University of Wisconsin-Madison, while approval for secondary analysis of the data was obtained from the IRB at the University of Illinois at Urbana-Champaign.

Setting and sample

The participating hospital is an academic, level 1 paediatric trauma centre with 111 beds, eight operating room suites and 21 PICU rooms. We used purposeful sampling to recruit 18 healthcare professionals who are experts in the paediatric trauma care process: seven physicians (residents, fellows and attendings; one emergency medicine, two anaesthesiologists, two surgeons, two paediatric intensivists), one advanced practice provider (anaesthesia), eight nurses (two ED, four OR, two PICU) and two support staff from the ED. Two OR nurses participated in one interview together, for a total of 17 interviews.

Data collection

Each semi-structured interview was conducted in person by two human factors researchers to obtain a detailed understanding about the care transition process, what makes care transitions go well or poorly and why. The interview guide is available at: <http://cqpi.wisc.edu/teamwork-and-care-transitions-in-pediatric-trauma/>. The average interview duration was 52 minutes. We iterated between data collection and analysis, monitoring for saturation as previously described (Wooldridge et al., Submitted).

Data analysis

We previously reported the SEIPS-based process analysis and the identification of the work system barrier and facilitator dimensions (Wooldridge et al., Submitted). These analyses included discussions between human factors researchers, the clinician research team and interviewees to enhance rigour.

The processes analysis gave us a deep understanding of how the care transitions were similar and different. The human factors research team and the clinician collaborators thoroughly reviewed the work system barriers and facilitators in each care transition. Then, in a consensus-based process, we identified contextual factors that influence variation in the dimensions of barriers and facilitators in each care transition process.

Results

The three different contexts included in this study are the ED to OR, ED to PICU and OR to PICU care transitions. We identified eight contextual factors that influenced barriers and facilitators in the three care transitions: time pressure, documentation practices, patient acuity, unknown or uncertain information, on-call staff, relationship between units, handoff organisation and organisational resources. Table 1 summarises the different ways these contextual factors influence the three care transitions.

Table 1: Contextual Factors that Influence Barriers and Facilitators in Care Transitions

Contextual factors	Impact in ED to OR transition	Impact in OR to PICU transition	Impact in ED to PICU transition
Time pressure	<ul style="list-style-type: none"> High time pressure and rushed, with an unstable patient who requires lifesaving surgical intervention immediately 	<ul style="list-style-type: none"> Less time pressure, as surgical intervention should have stabilised patient 	<ul style="list-style-type: none"> Varying time pressure, as patient may urgently need ICU-level resources for stabilisation prior to surgery or may be more stable and admitted for observation
Documentation practices	<ul style="list-style-type: none"> ED team may not complete documentation before patient has departed from ED, in part due to resources, patient needs or time pressure 	<ul style="list-style-type: none"> Surgical team documents during surgery routinely, so more information is available in electronic medical record during and immediately after case 	<ul style="list-style-type: none"> ED team may not complete documentation before patient has departed from ED
Patient acuity	<ul style="list-style-type: none"> Patient acuity impacts the care transition: there is more information to share and higher time pressure with “sicker” patients (those who have more complex and/or serious injuries) 		
Unknown or uncertain information	<ul style="list-style-type: none"> Much information may be unknown about the patient and/or traumatic event 	<ul style="list-style-type: none"> More information is often known about the patient, as information is gathered during surgery 	<ul style="list-style-type: none"> Much information may be unknown about the patient and/or traumatic event
On-call staff	<ul style="list-style-type: none"> May depend on arrival of on-call surgical team if traumatic event occurs overnight 	<ul style="list-style-type: none"> None described, all involved staff at hospital 	<ul style="list-style-type: none"> None described, all involved staff at hospital

Contextual factors	Impact in ED to OR transition	Impact in OR to PICU transition	Impact in ED to PICU transition
Relationship between units	<ul style="list-style-type: none"> • ED and OR teams interact less frequently outside of trauma cases, so limited rapport and relationships 	<ul style="list-style-type: none"> • Frequent interaction between OR and PICU teams (from regularly scheduled surgeries) creates stronger rapport 	<ul style="list-style-type: none"> • Sometimes strained relationship between ED and PICU teams due to different professional cultures
Handoff organisation	<ul style="list-style-type: none"> • Handoffs may be over the phone and/or in person, usually separated by professions; limited OR staff in ED trauma bay 	<ul style="list-style-type: none"> • Formalised handoff procedure resulting from a dedicated improvement effort • Team handoff includes physicians and nurses from surgery, anaesthesia and PICU 	<ul style="list-style-type: none"> • Handoffs may be over the phone and/or in person, usually separated by professions • PICU team often involved in care in ED, so transition can be less abrupt
Organisational resources	<ul style="list-style-type: none"> • Short ED stay is a priority for the hospital to ensure room availability for next patient, so sometimes patients are moved quickly • Staff are readily available at beginning of trauma, but return to usual duties sometimes before patient transitions, making transport a challenge 	<ul style="list-style-type: none"> • During regular operating hours, often pressure for surgical team to return to OR quickly to begin next case, sometimes shortening handoff 	<ul style="list-style-type: none"> • Short ED stay is a priority for the hospital to ensure room availability for next patient, so sometimes patients are moved quickly • PICU physicians may be asked to assume care in ED (depending on available ED staff and specific patient); they may be able to share less information with staff in PICU, but transition is “smaller”

The ED to OR care transition was characterised by high time pressure and could be rushed and chaotic when the patient is unstable and requires immediate, lifesaving surgical intervention. The ED to PICU transition could also be rushed and chaotic if the patient is unstable. The OR to PICU care transition usually occurred under less time pressure, as the surgery should have stabilised the patient and there was likely more time to plan for the transition.

The ED and OR have two different documentation practices, which influenced the receiving units’ ability to access information. A nurse in the trauma bay was typically dedicated to documentation, so that information is entered real time. However, this nurse could be pulled into patient care due to inadequate staffing resources or extensive and urgent patient care needs, which meant that their documentation may not be completed until later. Further, physicians in the ED may also not complete their notes until later – “[they] don’t have to write their notes until like 48 hours after the patient gets there...it’s kind of stupid sometimes that they even bother writing a note two days later because the patient has either already died or [had surgery]” (anaesthesia resident).

Patient acuity was one contextual factor that had similar impact on all three transitions. More complex, sicker or higher acuity patients increased difficulty in reaching decisions about care,

information to share and challenges in transport as well as decreased time available to prepare for transitions. Lower acuity patients reduced those challenges.

Transitions from the ED (both to the OR and the PICU) often occurred under uncertainty, as information may be unknown about the patient and/or traumatic event as the parents, family or caregiver(s) may not have arrived from the scene before the transition. Conversely, other hospital staff continued to gather information during the surgery, so more information was usually known when the OR to PICU care transition occurred, which meant that the OR to PICU transition *“is actually probably easier, because you've had the whole case to plan...you usually know ahead of time,”* (surgery resident).

The ED to OR care transition was subject to one factor that the other two care transitions were not – availability of call staff. Some traumas occur during off hours, so the surgery team would likely not be present in the hospital. Without a surgical team, the patient may not be transitioned to the OR for surgery, depending on severity and availability of trauma staff. The anaesthetist summarised some of the challenges being called in for a trauma surgery, from their perspective: *“[Y]ou have no idea what to expect. You still have to change into your scrubs...[you have] a half an hour to get there...so [you] run in...you often don't know what OR you're even going to”* (anaesthetist).

The ED team could be physically isolated from the OR and PICU teams, who routinely interacted due to scheduled procedures – these interactions (or lack thereof) may impact the rapport and communication between teams. Further, PICU and ED clinicians have different priorities and time horizons they consider – this can increase tension between those units. One PICU nurse described how understanding the ED nurses' perspectives helped her feel less irritation about those differences: *“it's conversations with them that has made me less cynical and more respectful...their job isn't to change the sheets. Their job is to get them where they need to be safest. And because of resources, that's the PICU,”* (PICU nurse).

The OR to PICU care transition had a formalised procedure, developed in response to an adverse event at the facility, including a handoff attended by the entire surgical and PICU team (surgery, anaesthesia, PICU physicians and nurses). The physicians involved in the handoff reported that nurses were an important part of the transition, in particular that they asked very practical questions important to immediate patient care that physicians sometimes would not: *“they ask a lot of like more manual-type questions, if you will. Whereas the doctors are more asking like kind of global questions,”* (anaesthesia attending). The other two transitions were less formalised and communication often occurred in professional silos.

The resources allocated by the organisation also influenced transitions differently. Shift changes sometimes created challenges getting information to the PICU if the patient had surgery before going to the PICU (for example, transitioned from ED to OR and then OR to PICU) – the clinician in the ED may have left before the PICU tried to call them for additional information. Transitions from the ED used a general elevator, which could be challenging if there were many visitors trying to use that elevator. Decisions about staffing, for example the number of nurses, also influenced who could participate in handoffs. One of the residents, when talking about their experience on the trauma team during ED to OR care transitions described other demands on their time that might prevent them from participating in a face-to-face handoff: *“[I]f I have to go put a chest tube in another kid real emergently, I'm not going to be there for that [handoff]. So I have to be able to call and do something.”* (surgery resident). The surgery clinicians experienced pressure to return to the OR quickly, since one whole surgery team in the PICU could delay the start of the next surgery in that room.

Discussion

In this study of three different care transition contexts, we identified eight contextual factors that influenced variation in work system barriers and facilitators: time pressure, documentation practices, patient acuity, unknown or uncertain information, on-call staff, relationship between units, handoff organisation and organisational resources.

One could argue that contextual factors are indicative of how interactions between work system elements create work system barriers or facilitators. Many have called to develop methods to better conceptualise, measure and describe these system interactions and this study represents an important first step in that direction. However that call unfortunately remains unanswered, but nonetheless important, at this time (Waterson, 2009; Wooldridge et al., 2017). Interactions between system elements contribute to system complexity (Flach, 2012), and – unsurprisingly – are complicated to analyse. One starting point may be to explore how barriers and facilitators shape system performance over time, for example, how proximal work system barriers or facilitators are created by misfits between system elements that are distal, or up the causal chain (Holden et al., 2013). Another opportunity may be to use quantitative analytical techniques, such as network analysis, to represent and explore relationships between work system elements involved in work system barriers and facilitators.

This study of course does have limitations. While we do consider three unique contexts, we still only included one participating site so findings may not generalise beyond that site. Additionally, although we did include many healthcare professions in our study, we were unable to include the perspective of patients or their family or caregivers due the traumatic nature of the hospitalisation. Future work should incorporate their perspectives.

Conclusion

Here we consider three different contexts represented by the sociotechnical systems of three different care transitions. We identified eight contextual factors that influenced work system barriers and facilitators in the care transition process: time pressure, documentation practices, patient acuity, unknown or uncertain information, on-call staff, relationship between units, handoff organisation and organisational resources. These factors could inform future redesign efforts to improve care transitions. Further, they likely represent interactions between work system elements. These interactions are acknowledged as an important area of research, but methods to study and quantify these interactions are currently lacking. Future work should build on efforts to describe how contextual factors influence work system barriers and facilitators to better conceptualise and measure interactions between work system elements.

Impact

To better understand the work system barriers and facilitators in care transitions, it is important to understand the context in which they occur. In this study, we include three different contexts: the ED to OR, OR to PICU and ED to PICU care transitions. Through group discussion, including with our clinical collaborators, we identified eight contextual factors that influenced barriers and facilitators in the three care transitions: time pressure, documentation practices, patient acuity, unknown or uncertain information, on-call staff, relationship between units, handoff organisation and organisational resources. These contextual factors may be helpful in considering how various work system designs create barriers and facilitators to the completion of work, and could inform system redesigns to support improvement.

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