Decreasing Handoff-Related Care Failures in Children's Hospitals

abstract

BACKGROUND AND OBJECTIVE: Patient handoffs in health care require transfer of information, responsibility, and authority between providers. Suboptimal patient handoffs pose a serious safety risk. Studies demonstrating the impact of improved patient handoffs on care failures are lacking. The primary objective of this study was to evaluate the effect of a multihospital collaborative designed to decrease handoff-related care failures.

METHODS: Twenty-three children's hospitals participated in a quality improvement collaborative aimed at reducing handoff-related care failures. The improvement was guided by evidence-based recommendations regarding handoff intent and content, standardized handoff tools/methods, and clear transition of responsibility. Hospitals tailored handoff elements to locally important handoff types. Handoff-related care failures were compared between baseline and 3 intervention periods. Secondary outcomes measured compliance to specific change package elements and balancing measure of staff satisfaction.

RESULTS: Twenty-three children's hospitals evaluated 7864 handoffs over the 12-month study period. Handoff-related care failures decreased from baseline (25.8%) to the final intervention period (7.9%) ($P < .05$). Significant improvement was observed in every handoff type studied. Compliance to change package elements improved (achieving a common understanding about the patient from 86% to 96% [$P < .05$]; clear transition of responsibility from 92% to 96% [$P < .05$]; and minimized interruptions and distractions from 84% to 90% [$P < .05$]) as did overall satisfaction with the handoff (from 55% to 70% [$P < .05$]).

CONCLUSIONS: Implementation of a standardized evidence-based handoff process across 23 children's hospitals resulted in a significant decrease in handoff-related care failures, observed over all handoff types. Compliance to critical components of the handoff process improved, as did provider satisfaction. *Pediatrics* 2014;134: e572–e579

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Patient handoffs are defined as the transfer of information, responsibility, and authority from one health care provider to another.[1] Accurate and efficient handoffs following a standardized format are critical to ensure safe and reliable transitions in health care.[2] An increased focus on effective handoffs occurred in 2003 when the Accreditation Council for Graduate Medical Education restricted resident work hours, resulting in more physician-to-physician handoffs and thus increased handoff-related risk in academic medical centers.[3–5] Additional focus occurred in 2006, when The Joint Commission required accredited institutions to implement a standardized handoff approach emphasizing reciprocal communication.[6] In 2007, the World Health Organization and The Joint Commission highlighted the role of standardized processes to reduce handoff-related errors.[2] Finally, in 2008, the Institute of Medicine recommended focusing on handoff processes to improve patient safety.[7] Patient handoffs have been consistently identified as safety risks by the world's most influential health care organizations.

Multiple efforts to improve the safety and efficiency of handoffs have been attempted. For example, Maxson et al[8] implemented a bedside nursing handoff with improvement in nursing intravenous medication reconciliation along with staff and patient satisfaction. In addition, Agarwal et al[9] demonstrated reduction in postoperative complications and improvement in 24-hour patient outcomes after implementing a standard handoff process between the operating rooms and the cardiovascular ICU at an academic children's hospital. Other single-site studies have shown standardized physician handoffs decrease "per-patient" handoff time, decrease handoff-related missed/inaccurate information, and

improve communication.[10,11] With these few exceptions, however, studies linking standardized handoff processes to decreased patient harm are rare, and limited multicenter and pediatric research has been performed.

The goal of the 23-site children's hospital "Improving Patient Handoffs" quality improvement collaborative was to enhance the safety of hospitalized children's handoffs by implementing a bundle of evidence-based practices. The primary objective of the present study was to evaluate the effect of the collaborative on handoff-related care failures over the course of the 12-month initiative. Our hypothesis was that the collaborative project would result in a decrease in handoff-related care failures at participating sites from baseline to intervention periods.

METHODS

The Collaborative

Twenty-three children's hospitals (see Acknowledgments) participated in a 12-month Improving Patient Handoffs quality improvement collaborative. This project was coordinated by the Child Health Corporation of America (CHCA, Shawnee Mission, KS), a business alliance of 43 children's hospitals with extensive experience in overseeing collaborative quality improvement.[12–14] CHCA subsequently merged with the National Association of Children's Hospitals and Related Institutions to form the Children's Hospital Association. The project was open to all CHCA-affiliated hospitals as of May 1, 2010. Participating hospitals obtained local institutional review board approval or a waiver of institutional review board oversight.

The Intervention

A multidisciplinary advisory panel (see Acknowledgments) consisting of content experts in patient handoffs was

convened by CHCA, and they developed a comprehensive, pediatric-specific change package of evidence-based practices used to guide sites in improving handoffs (Supplemental Appendix 1). Each institution was encouraged to adapt relevant practices based on handoff type targeted locally. The 4 elements identified in the change package as required for implementation across participating sites regardless of handoff types were:

1. Defined handoff intent: Ensure a common understanding (shared mental model) of the patient is achieved, confirmed by receiver.

2. Defined handoff content: Establish core and unique elements of a given handoff type.

3. Defined handoff process:

   A. Use standardized tools and methods, including minimized interruptions and distractions, and commit to a standard structure (eg, situation, background, assessment, recommendation,[15] I-PASS[16]) for verbal communication;

   B. Use standardized handoff format (encourage receiver to ask questions, use of electronic medical record information to supplement verbal handoff wherever possible);

   C. Ensure a clear and timely transition of responsibility (defining when responsibility is passed from 1 person or team to another).

4. Maximized team effectiveness: Establish leadership and use team-building tools to develop a culture of safe handoffs.

The Institute for Healthcare Improvement's Collaborative Model for Achieving Breakthrough Improvement was used to facilitate improvement.[17,18] Each site assembled a multidisciplinary oversight team including a project

leader and a senior leader, along with front-line leaders and staff from the handoff areas being targeted. An introductory virtual learning session (webinar) provided patient handoff education and an introduction to the change package and measurement grid. Hospitals learned improvement strategies that emphasized both small tests of change (Plan-Do-Study-Act) and specific sustain/spread strategies.[17] Hospitals were also free to apply other improvement methods (eg, Lean Six Sigma).[19,20] During the collaborative, sites made numerous process improvements and reported key outcome and process measures on a Web-based data repository.[21] Transparency through unblinded data reporting and sharing of successes/barriers was a critical requirement for participation. All site members had access to a project-specific Web site and a listserv coordinated by CHCA.[22] CHCA staff provided monthly feedback to site-specified senior leaders, coordinated learning sessions, provided content oversight and process management, and disseminated the project results.

The study period spanned 1 year (October 2010–September 2011). Each site chose to target ≥1 handoff type, in or between ≥1 unit within their hospital. To assess the handoff, data were collected for this specific patient handoff within 4 to 8 hours of the handoff completion by using a face-to-face structured interview of the caregiver directly involved in the posthandoff care. Each improvement team used their own notification strategy to ensure interviews at 4 to 8 hours' posthandoff, although exceptions were made in which the "observation period" was shortened to capture data immediately before shift change. The interviewer was an independent observer not involved in the handoff process, and the interviewee was the receiving clinician(s) of the specific

patient. The interviewers varied within and between hospitals but were primarily quality and safety representatives or clinical staff not involved in the handoff process. The 4- to 8-hour posthandoff observation period before the structured interview allowed receiving clinicians adequate time to "uncover" handoff-related care failures that might not be apparent immediately after the handoff (ie, missed medications, delay in subspecialist notification). The receiving clinician (interviewee) was the primary caregiver and the recipient relevant to the specific handoff (eg, ICU attending physician when the handoff was between the operating room and the ICU, nurse when the handoff was between shifts). The receiving clinician (interviewee) answered simple questions from a standard interview tool with "yes" or "no," itemizing specific care failures and giving the opportunity to identify additional care failures. The interviewee then specified ("yes" or "no") if that care failure was a result of the handoff or lack of handoff, which ultimately determined if a care failure had occurred. The required standard interview tool was created to ascertain frequency of handoff-related care failures, frequency of interruptions/distractions, appropriateness of transition from the sending team to the receiving team, and clinical understanding of the patient's condition. Baseline and follow-up interviews were conducted by using the same locally modified interview tool and interviewing caregivers from the same discipline. Hospitals were instructed to evaluate a minimum of 20 handoffs each month by using a convenience sampling approach.

Outcome Measures and Data Reporting

The primary outcome measure was handoff-related care failures, defined in a standard fashion across the collab-

orative as failures in information transfer that directly affected the patient or delayed/complicated patient care. Examples of handoff-related care failures include the reporting of incorrect or inaccurate diagnostic testing information or the failure to communicate information related to medication administration, resulting in duplicated medications (Supplement Appendix 2). All participant sites were provided with a template interview tool itemizing a core set of handoff-related care failures; that tool was specifically customized at the hospital level to meet the needs of the local handoff type and handoff environment. This paradigm provided a preintervention and postintervention level of standardization within a single hospital but intentionally permitted integration of local hospital care failures in each hospital's local interview tool. Handoff-related care failures were recorded, although they were not qualified according to severity or direct patient harm. Process measures reflected compliance to core components of the change package and included percentage of handoffs with minimal interruptions and distractions that resulted in a common understanding about the patient and demonstrated a clear transition of patient care responsibility. Questions related to interruptions and clear transitions were simple yes/no interview questions. Establishing a common understanding required the following 4 explicit components: I know my patient's issues and clinical condition, I know what my patient requires, I know when to be concerned about my patient, and I know when and how to escalate my concerns. The balancing measure of staff satisfaction was assessed to monitor the possible unintended consequence of staff dissatisfaction with standardized handoffs. Interviewees were asked to respond to the question "How satisfied were you

with this handoff?" and were given a 5-option Likert-like scale with options of very satisfied, somewhat satisfied, neutral, somewhat unsatisfied, and very unsatisfied. Only responses of very satisfied were included in the staff satisfaction reporting.

Data and Statistical Analyses

The baseline period occurred between October 1, 2010, and December 31, 2010, and the 3 intervention quarters spanned 9 months from January 1, 2011, to September 30, 2011. The baseline study period began after the first collaborative learning session. During the baseline period, each site identified target handoff types and relevant specific handoff-related care failures, which then guided the targets for baseline data collection. Baseline data collected predated implementation of the local intervention. All data were submitted by each hospital on a monthly basis during all phases of the collaborative through a secure online repository.[21] Data were aggregated to the quarterly level both to align with rapid improvement cycle durations and to maximize statistical power.

The primary outcome of percentage of handoffs with at least 1 handoff-related care failure was derived from the total number of handoff interviews identifying at least 1 handoff-related care failure (numerator) divided by the total number of handoff interviews (denominator). Percentages of handoffs with interruptions/distractions, achievement of common understanding about the patient, and a clear transition of patient care responsibility were similarly derived by using the total number of handoff interviews in which each component was met (numerator) among all handoff interviews (denominator). All measures were tracked according to hospital and handoff type. Collaborative-wide data were aggregated to the quarterly level by using raw data to

derive collaborative results. Comparisons between baseline and intervention periods for individual hospitals were made by using Fisher's exact tests. Comparisons between baseline and intervention periods for the aggregated hospital data were made by using χ^2 tests with SAS version 9.3 (SAS Institute, Inc, Cary, NC). Data are expressed as means with 95% confidence intervals (CIs). Results were considered significant for $P < .05$.

RESULTS

Twenty-three hospitals enrolled, met eligibility criteria, and were included in the final analysis. The types of handoffs targeted are shown in Fig 1, and sample applications of the change package across common handoff types are displayed in Table 1.

Hospitals reported data for 7864 handoffs with a median (range) of 681 (481–713) handoffs per month. During the baseline period, 25.8% of handoffs were linked to a handoff-related care

failure (95% CI: 23.9–27.8). Handoff-related care failures decreased each quarter (Fig 2), ultimately resulting in a 69% reduction in handoff-related care failures in the final quarter of the initiative (7.9% [95% CI: 6.8–9.2]; $P < .05$). Eighteen of the 22 hospitals that submitted baseline data showed significant decreases in handoff-related care failures, with the other 4 showing nonsignificant declines. Across the collaborative, baseline percentages of handoff-related care failures varied according to handoff type; however, significant reductions were achieved across all handoff types (Fig 3).

Percentages for the handoff process measures improved significantly from baseline to final intervention quarter as follows: achieving a common understanding about the patient, from 86% to 96% ($P < .05$); achieving a clear transition of responsibility, from 92% to 96% ($P < .05$); and operating with minimal interruptions and distractions, from 84% to 90% ($P < .05$). The overall process effectiveness (a composite
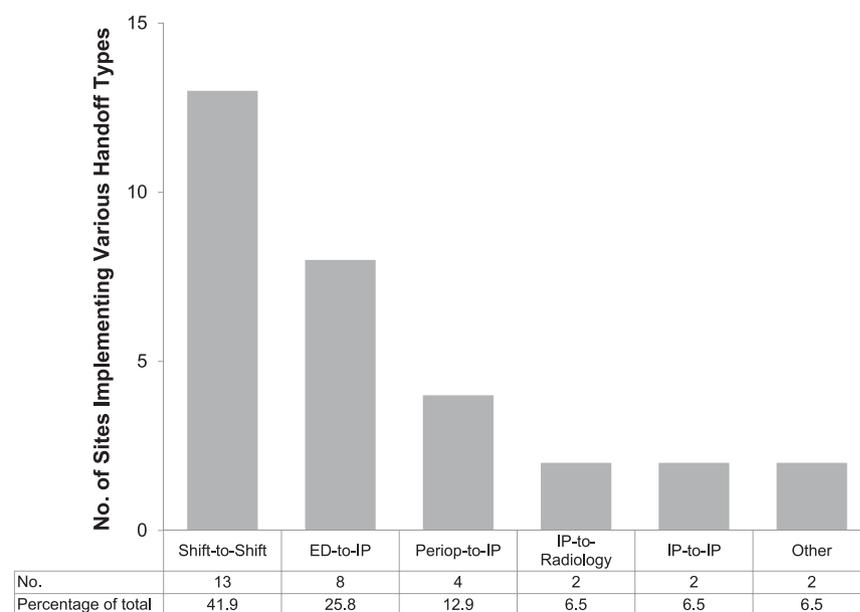
	Shift-to-Shift	ED-to-IP	Periop-to-IP	IP-to-Radiology	IP-to-IP	Other
No.	13	8	4	2	2	2
Percentage of total	41.9	25.8	12.9	6.5	6.5	6.5

FIGURE 1

The distribution and frequency of sites implementing the various handoff types. Some sites implemented changes to >1 handoff type. ED-to-IP, transition of a patient from the emergency department to the inpatient unit; IP-to-IP, transition between inpatient units; IP-to-Radiology, transition between inpatient areas and radiology services; Periop-to-IP, transition to/from the perioperative services to inpatient unit; Shift-to-Shift, representing handoffs between nursing caregivers beginning or ending their shift.

TABLE 1 Examples of the Project Change Package Applied Across the Common Handoff Types

Handoff Change Strategy	Handoff Type		
	Shift-to-Shift	ED-to-IP	Periop-to-IP
1. Defined handoff intent	Create a shared mental model among caregivers while maintaining the patient-centered approach		
2. Defined handoff content	Handoff content based on:	Handoff content based on:	Handoff content based on:
	1. Previous handoff safety events	1. Observations of existing handoffs	1. Core clinical assessment (SBAR/head to toe)
	2. Core clinical elements	2. Previous handoff safety events	2. Surgical plan of care
	3. Inclusion of patient/family	3. Conceptual risks	3. I-5 (I know what is wrong, what to do, when to worry, when to escalate, I see what you see)
3A. Standardized tools and methods	5-P structured handoff (patient, plan, purpose, problems, precautions); consensus script	5-P structured handoff (patient, plan, purpose, problems, precautions); consensus script	Structured standardized handoff tool in SBAR format
3B. Standardized format for the handoff	Face-to-face, in the patient room	Real-time, face-to-face handoff	Synchronized, real-time, telephone handoff
3C. Clear and timely transition of responsibility	Handoff concludes with bedside safety checks; patient is safe and responsibility is transitioned	Accepting physician's summary affirms the "acceptance of responsibility" by the inpatient team.	Receiving RN accepts patient via telephone ("I see what you see"). Patient arrives to unit and sending RN is available for questions via telephone.
4. Maximize team effectiveness	Sender/receiver education; active interviews regarding handoff quality and/or failures	Sender/receiver education; active interviews regarding handoff quality and/or failures. Handoff leadership team engaged/available for issues of noncompliance	Sender/receiver education; active interviews regarding handoff quality and/or failures. Collaborative revision of handoff tool; handoff leadership team engaged/available for issues of noncompliance (real-time feedback)

ED-to-IP, transition of a patient from the emergency department to the inpatient unit; Periop-to-IP, transition to/from the perioperative services to inpatient unit; RN, registered nurse; SBAR, situation, background, assessment, recommendations; Shift-to-Shift, representing handoffs between caregivers beginning or ending their shift.

mean of all 3 process measures aggregated according to quarter) improved significantly from 87% compliance (baseline) to 94% (final intervention quarter (95% CI: 91–96; $P < .05$). Staff satisfaction (Fig 4) varied with handoff type and increased from 55% at baseline (95% CI: 53–57) to 70% at the final intervention quarter (95% CI: 68–72; $P < .05$).

DISCUSSION

This multicenter collaborative demonstrated a significant decrease in handoff-related care failures associated with the implementation of a standard handoff process. This association was witnessed across multiple hospitals and multiple handoff types. Although there were a variety of handoff types and settings, some consistent themes across hospitals reporting reduction in handoff failures with sustained or improved satisfaction were noted: (1) they required active participation by both sending and receiving teams; (2) there were discrete times and mechanisms set aside for the receiving team to ask questions; (3) a proscribed script of important handoff elements was available; and (4) a "read back" summary of basic issues and next steps was accessible (except for the inpatient-to-radiology handoff type).

Previous studies have shown increased provider satisfaction, decreased distractions, and decreased adverse events in single centers, but none (to our knowledge) has demonstrated a decrease in handoff-related care failures across multiple hospitals and multiple handoff types.[8,9] Given the
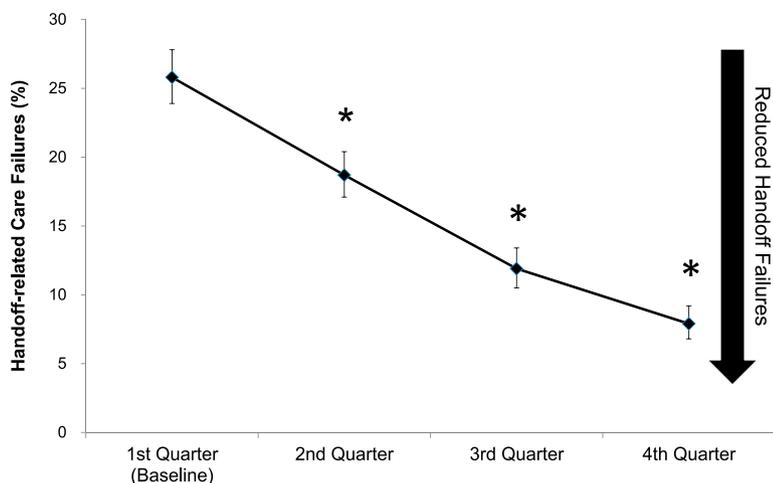

FIGURE 2
Collaborative-wide aggregate percentage of handoffs with an associated handoff-related care failure, including 95% CIs. *$P < .05$.
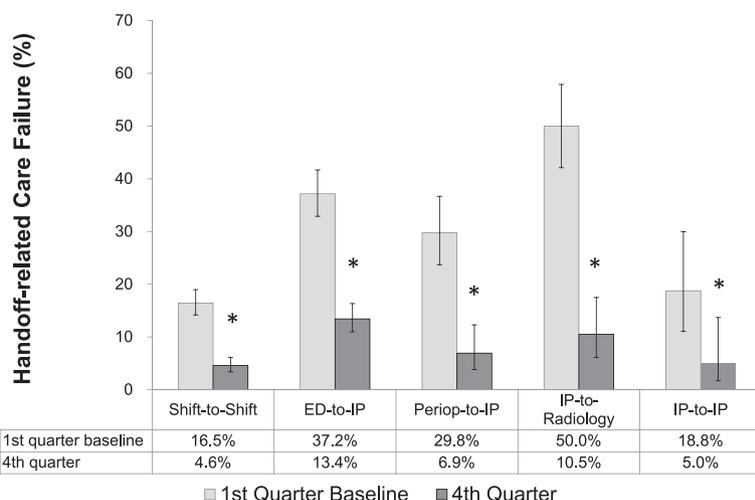
FIGURE 3
The percentage of handoff-related care failures according to handoff type. Failures are reported according to specific handoff types. ED-to-IP, transition of a patient from the emergency department to the inpatient unit; IP-to-IP, transition between inpatient units; IP-to-Radiology, transition between inpatient areas and radiology services; Periop-to-IP, transition to/from the perioperative services to inpatient unit; Shift-to-Shift, representing handoffs between caregivers beginning or ending their shift. *$P < .05$.

increasing recognition of the risk of handoffs in health care, these findings reassure us that large-scale improvements in handoff safety can be achieved rapidly by committed implementation of handoff-related evidence-based best practices in a standard fashion.

One noteworthy finding of this collaborative was that handoff-related care failures decreased in every handoff type studied across the collaborative. Different from the ongoing I-PASS handoff work that focused on resident physician shift-to-shift handoffs, this collabora-

FIGURE 4
The percentage of staff reporting that they were "very satisfied" with the handoff they received. Baseline data were compared with fourth quarter data, and data are grouped according to handoff type. ED-to-IP, transition of a patient from the emergency department to the inpatient unit; IP-to-IP, transition between inpatient units; Periop-to-IP, transition to/from the perioperative services to inpatient unit; IP-to-Radiology, transition between inpatient areas and radiology services; Shift-to-Shift, representing handoffs between caregivers beginning or ending their shift. *$P < .05$.

tive initiative targeted a diverse set of handoff types, such as cross-discipline and nursing handoffs.[16,23] This finding suggests that incorporating the 4 key handoff elements in a standard manner improves the safety of handoffs regardless of handoff type or location. This finding is consistent with high reliability organization theory, which suggests standardization leads to both decreased variability and improved outcomes, regardless of the uniqueness of the location in which it occurs.[24,25]

A second finding of note was that the reduction in handoff-related care failures occurred despite a relatively small improvement in the reported compliance with the 3 critical process components measured (no interruptions/distractions, common understanding of the patient, and formal acceptance of responsibility). Compliance with these 3 process components at baseline was surprisingly high, and the frequency of interview-reported interruptions/distractions actually temporarily worsened during the first 3 months of implementation. We postulate that each of these issues, particularly interruptions/distractions, were so ubiquitous at baseline that providers did not identify them as clear problems before this initiative. We further postulate that recognition of the existence of interruptions and distractions by interviewed providers occurred as the change package elements were implemented. Final reports of distractions were likely much more accurate than baseline reports, as awareness of their existence likely increased during implementation.

Based on a surprisingly high baseline level of provider satisfaction with handoffs, we chose to use provider satisfaction as a balancing measure in this collaborative. We speculate that this high baseline satisfaction level resulted from a lack of awareness of the
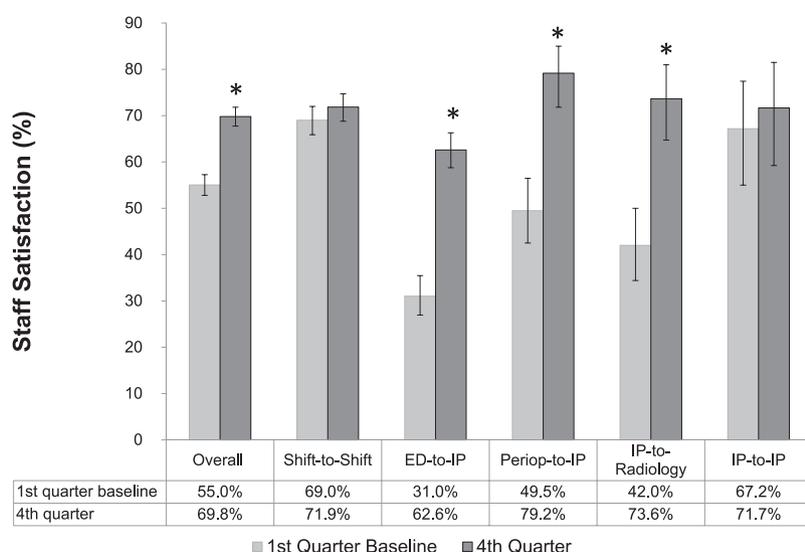
ineffectiveness of the handoff process across the collaborative; however, we wanted to ensure that a new and standard approach to handoffs at least maintained those high levels of satisfaction. Fortunately, provider satisfaction with the handoff process did not decline and actually increased during the implementation period. This increase is consistent with previous single-site studies that have successfully implemented a standard handoff process.[26]

The present study did not directly measure patient harm but rather a predicate marker of harm: handoff-related care failures (essentially handoff errors). High reliability organization theory contends that errors result from process failures which eventually lead to harm.[24,25] Using a similar logic, we speculate that a reduction in errors occurring from improved handoff processes will translate to a reduction in handoff-related patient harm.

Limitations of this study exist. First, this was a pre–post study, and thus we were unable to control for certain biases. For example, concurrent local initiatives, the Hawthorne effect, or unrecognized secular trends relevant to handoff outcomes could have affected handoff-related care failures, although we know of no such trends. Second, change package components implemented at each site varied on the basis of local culture and interpretation of need. Hence, the specific components of the handoff used at each site varied. Third, all data reported were obtained by convenience sampling and reported by local data collectors independent of the handoff process. Methods of data collection likely varied between sites, and no validation or quality control of interview data was undertaken centrally. Fourth, data obtained via interview, particularly when identical questions were asked repeatedly to the same providers, could be biased in the direction of either positive (ie, by interviewees possibly feeling compelled to give the "right answer") or negative (ie, by interviewees who did not care for the rigors of the standard handoff) improvement. Finally, as described earlier, this study measured errors related to handoffs and did not directly measure harm.

CONCLUSIONS

This study found a significant decrease in handoff-related care failures after implementation of a standardized evidence-based handoff process in a multisite pediatric study. Improvements were accomplished across multiple hospitals and handoff types without negatively affecting caregiver satisfaction. Future research related to handoffs in health care should focus on the effect of reliable handoffs on patient harm and clinical outcomes.

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