Robert P. Foglia, MD, FACS[1,2], Juan E. Ruiz, MHA[2], Lorrie S. Burkhalter MPH[2]

[1]UT Southwestern Medical Center, Department of Surgery

[2]Children's Medical Center/Children's Health System, Pediatric Surgery

*Corresponding author: Robert P Foglia, MD, FACS, Department of Pediatric Surgery, Children's Medical Center, 1935 Medical District Drive, Dallas, TX 75235, Tel: 214 456-6040; E-mail: Robert.Foglia@childrens.com

Research Article

An Evolutionary Change in First Case on Time Starts Using Perioperative Process Improvement, Communication and Enhanced Data Integrity

Abstract

Background: First Case on Time Starts (FOTS) are an important Operating Room performance metric. The study aim is to show how implementation of process improvement (PI) solutions and an electronic health record (EHR) led to a progressive, significant, and sustainable improvement in FOTS.

Methods: FOTS were tracked in the Main OR Suite (MOR) at Children's Medical Center Dallas, from January 2007 through March 2014. Approximately 17,000 scheduled first cases were evaluated. Significance was set at $p < 0.05$.

Results: FOTS were 12% in 2006. An OR Collaborative Redesign, implementation of a preoperative clinic and a change the preoperative phone call increased FOTS to 32% by early 2009. In 2009, an EHR was implemented. The EHR, its ability to identify specific accountability for delay (surgeon, anesthesiologist, and nurse, patient, other) and improved data integrity, increased FOTS to 60% by 2012. Using enhanced communication methods such as real time communication to staff, and data socialization, FOTS further improved to 80% by 2014.

Conclusion: A series of process improvement solutions and an EHR implementation resulted in sustainable improvement. With tactics such as sharing the data promptly, pinpointing and addressing outliers, and aligning performance to annual goals, our MOR experienced a greater than six-fold improvement in FOTS.

Introduction

The primary goal of all OR (Operating Room) and perioperative team members is a safe efficient OR with excellent outcomes. This requires the orchestration of a multidisciplinary team of physicians, nurses, technicians, ancillary staff and resources, to have a seamless and efficient operative and perioperative work flow [1]. First case delays effect subsequent OR cases, can increase OR staffing costs, decrease family satisfaction, and set a negative tenor for the day [2-4].

First Case On Time Starts (FOTS) are an important OR performance metric commonly discussed at hospital OR Committee meetings, and often used for productivity evaluation at national organizations [5]. FOTS are a measure of how well ORs function by determining if the first case of the day in each room started at the time listed on the OR schedule. Providers must work in concert with the patients and families to ensure the following events occur in an efficient manner and the information is collated: the patient's history and physical is obtained and recorded; consultative notes, laboratory and radiology results, where applicable, have been reviewed; the parent's or guardian's consent to the operation is documented; the patient's preoperative medication administered; the OR room and surgical equipment is configured properly; and the patient and all OR team members arrive to the OR as scheduled.

Background

Children's Health is a private, not-for-profit, health system serving patients in North Texas. It is the primary pediatric teaching facility for the University of Texas Southwestern Medical Center. In the perioperative environment, staff includes 120 surgeons and proceduralists, 50 anesthesiologists, and 320 perioperative team members. Facility resources consist of 32 ORs at two campuses. Annual OR volume in 2013 was 27,200 cases for the system, and 13,500 cases for the Main OR (MOR) Suite in 16 rooms.

In 2006, baseline FOTS in the MOR suite was 12% due to factors including: patients arriving late, nothing by mouth (npo) violations, poor communication to families, inefficient preoperative workflow (obtaining a patient history and physical exam, laboratory data, and consents not obtained in a timely manner), and staff timeliness. At this time, cancellations of elective cases in the MOR suite were 14% which also contributed to delays in FOTS performance. Separately, but as important, data collection was manual, laborious, and occasionally yielded incorrect information. Surgeons then had skepticism about the validity of the data. Also, an employee satisfaction survey in 2006 ranked the MOR in the lowest decile in the hospital. There was unanimity among perioperative leadership that these metrics were unacceptable. Their marked improvement would result in better patient, family, and staff satisfaction. Also, it would allow for greater OR case capacity. A OR collaborative redesign occurred in 2007. Multiple areas of focus were discussed and implemented to improve perioperative performance.

The aim of this study is to show how implementation of process improvement (PI) solutions and an electronic health record (EHR) was associated with a progressive, significant, and sustainable improvement in FOTS.0

Methods

First case starts were tracked in the MOR Suite from January 2007 through March 2014. Approximately 17,250 scheduled first cases were evaluated. "Scheduled" cases were defined as elective (non-urgent) cases, posted for the Monday through Friday OR schedule and booked at Least one day prior to the OR date. The schedule for the next elective day is finalized at noon the prior business day. First cases included were those scheduled at the usual OR start time that day or within the next one hour, i.e. 07:30 to 08:29. Add on cases, which are defined as urgent cases or cases added to the OR schedule on the same day the case was performed, were excluded the analysis. The definitions applied for FOTS are listed in Table 1. For each *First Case*, *Patient In Room Time* was compared to the *Scheduled Case Time*. If the *Patient In Room Time* was at or before the *Scheduled Case Time*, the case was coded as an *On-Time Start*. Conversely, if the *Patient In Room Time* was after the *Scheduled Case Time*, the case was coded as a *Late Start*. A *Grace Period* of 5 minutes was added to the *Scheduled Case Time* when analyzing the data. When delays occurred, data was tracked by service, provider, and reason. As a result of the collaborative redesign we implemented a preoperative clinic in mid-2007. In that clinic, the patient and parents were seen by a member of the anesthesiology team, a generic consent for anesthesiology was discussed, and an advanced practiced nurse (APN) performed a full history and physical examination on the patient if one had not been done in the surgery clinic. If the patient was identified to have one or several comorbidities, the APN obtained a consultative letter in regard to the patient's status.

Results

In February 2007, an OR Collaborative Redesign forum was held. This included 85 perioperative personnel consisting

Table 1: Definition of First Case On Time Start.

Term	Definition
First Case	The first elective case scheduled in the OR room for the day.
Patient In Room Time	The time when a patient is wheeled into the OR for an operation.
Scheduled Case Time	The time when a case is posted to start on the OR schedule.
Grace Period	An additional period of 5 minutes added to the Scheduled Case Time.
On-Time Start	The Patient In Room Time occurs at or before the Scheduled Case Time plus Grace Period.
Late Start	The Patient In Room Time occurs after the Scheduled Case Time plus Grace Period.
% FOTS	Percent of total number of On-Time Starts divided by the total number of First Cases.

of not only surgical, anesthesiology, and nursing leadership, but also schedulers, supply chain personnel, OR circulators, and scrub technicians, and secretaries from surgical and OR services. Sixteen areas of focus were developed, including opening a preoperative clinic, addressing OR throughput and utilization, using the EHR, and improving communication and collaboration among the OR team members and with families.

After the OR Collaborative Redesign, we implemented two process improvement (PI) projects, a preoperative clinic and a change in the preoperative phone call to parents. Neither of these projects increased staffing costs. Personnel were reallocated from the preoperative area to the preoperative clinic, which is in a different area of the hospital. After opening the preoperative clinic, approximately 400 elective cases for the MOR were seen per month. This has increased to approximately 600 patients a month in the last several years. Approximately 70% of elective cases are seen in the perioperative clinic. These patients are directed to that clinic by the surgeon, either because the planned operation is complex or the patient has co-morbidities.

The timing of preoperative phone calls was moved from 24 to 48 hours before surgery. The caller, now a nurse, would verify with the parent the child's current medical status, and any new medications or problems since the preoperative visit. By April 2009, there was a decrease in the cancellation rate the day of surgery from 14% to 5%. In addition, FOTS improved from 12% to 32%, and then began to plateau (Figure 1).

EHR implementation occurred in May 2009 at which time FOTS were 31%. After implementation, FOTS declined to a nadir of 18% by the end of 2009. From that point onward, there was a progressive and significant increase in FOTS, reaching 32% by 12 months after the EHR implementation and then improving to over 40% by 15 months after EHR was in place. Again, there was a flattening in the performance curve staying in the 40% range for the next 6-8 months (late 2010) (Figure 1).

By the second quarter of 2010, there was a comfort level with the EHR, not only for data collection, but also for meaningful data usage to potentially further improve performance. Previously, the case was simply defined as starting on time

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or was delayed. We felt that the EHR would be a powerful tool to identify the delay cause [6]. These delay causes were listed in the EHR as a pull down menu format (Table 2). For example, a patient arriving to the hospital late, or an NPO violation, was considered a "Patient delay", while a lack of an interpreter in the preoperative area, or lack of supplies in the OR, was categorized as an "Other delay". Other delays were due to the surgeon, anesthesiologist, or nurse. The reason for delay (surgeon, anesthesiologist, nursing, patient, or other) for each case was attributed by the circulating nurse for that room, documented in the EHR and time stamped.

The information extracted from the EHR for one representative month, June 2010, identified delays and showed to whom delay was attributed. In this month, 150 (57%) of the 262 FOTS were delayed. The reasons for delay showed, from a provider standpoint, that the surgeon accounted for 30% of the delays, anesthesiologist 17%, and nursing 10%. Non provider delays were caused by "other" in 33%, and "patient" in 10% of the cases (Table 2). Further analysis identified 76% of surgeons' delays were attributable to the surgeon being either late to the OR, or the surgeon having an incomplete or missing consent. 53% of anesthesiologists' delays were caused by the anesthesiologist being late to the OR, or late in ordering preoperative medication in the EHR. The time from deciding the patient needs a pre-operative medication to its administration was approximately 15 minutes. In addition, we felt it would be of value to ascribe the surgeon and anesthesiologist delays by individual provider. Five surgeons, 7% of 71 surgeons tracked, accounted for 29% of all surgical delays, and four anesthesiologists, 8% of 51 anesthesiologists

tracked, accounted for 45% of all anesthesiology delays. Within 10 months, we saw an increase in FOTS from approximately 40% to 60% by the first quarter of 2012.

For the next year, FOTS was flat in the 60% range through the end of 2012. At this point, there was a redoubling of efforts to improve on-time performance. There was real time feedback to surgeons regarding delays. An email was sent the morning of the operation to the surgeon asking for possible reasons for their case delay. The FOTS data, individual service performance, and reasons for delay were shared, promptly and in multiple venues, such as OR committee, leadership meetings and posting in the OR lounge. Additionally, FOTS performance was aligned to annual department goals, and perioperative nursing leadership gave awards and accolades to the top tier FOTS staff. These efforts resulted in FOTS increasing to 80% by March 2014. In early 2010, 43% of cases started on time. By 2014, 80% cases started on time (p<0.001) (Figure 1). From 2006 to 2014, there was over a six-fold improvement in FOTS from 12 to 80%. Physicians and staff attitudes had evolved to the point that there was little or no concern regarding data integrity. Also, by 2014 the employee satisfaction survey showed that the MOR was now in the middle third of all hospital areas for satisfaction.

Discussion

Prior to the OR redesign, obtaining the patient's history and physical and the overall workup was cumbersome and disjointed. A preoperative clinic, staffed by members of the anesthesiology team and preoperative APNs, was implemented in 2007. An evaluation of the patient was carried out, an informed consent for anesthesia was reviewed with the parent, and issues with the comorbidities addressed, several days to weeks prior to the surgery date. Consequently, the workflow the morning of surgery became leaner and more efficient, and the process of communicating to patients and families prior to surgery improved.

Another process change made was the timing and messaging of preoperative phone calls. Originally, a secretary called the parent the day before surgery and told the parent what time to come to the hospital, and explained NPO requirements. Some patients came to the preoperative area the morning of surgery running a high fever, taking new medications, or having been seen in the Emergency Department recently. This caused cancellations and/or FOTS delays. After the OR redesign, the timing of preoperative phone call was moved to 48 hours before surgery. A nurse asked the parent if the child had any new medical problems subsequent to their visit with the surgeon and the preoperative clinic. This call provided a screening of the patient's status, and identified potential cancellations. The surgeon would be notified of a cancellation and the OR schedule reordered. By doing this, two days prior to surgery, it gave the surgeon the chance to add other cases. The preoperative clinic and restructure of phone calls in 2007 had a positive impact on case cancellations, which decreased to 5%, and improved FOTS to 32%.
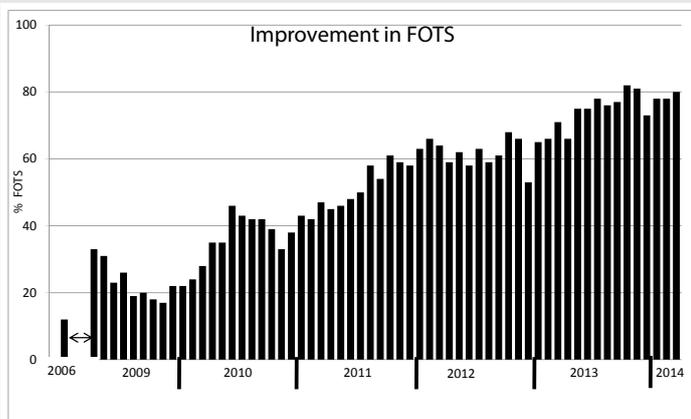

Figure 1: Improvement in FOTS.

Table 2: Delay by Reason and Service.

Surgeon (30%)	Anesthesiologist (17%)	Nursing (10%)	Patient (10%	Other 33%)
-Late to OR	-Late to OR	-Nurse Not Available	-Late Arrival	-Interpretereeded
-Incomplete or No Consent	-Late Ordering PreOp Medication	-Medication Given Late	-NPO Violation	Room Setup
-Incomplete or No H&P	Additional Labs, Tests, etc.	Transport	Illness	Supplies
	Equipment Set-up			Lab Results

It is generally recognized that an EHR implementation is associated with a decrease in user efficiency for approximately six months. In fact, FOTS performance initially decreased from 31% to 18%. Subsequently, there was significant improvement, and it then continued to rise to 40% by late 2010. In addition, the EHR and "time stamping" data led to a much-improved level of data integrity.

By the fall of 2010, the FOTS data had "plateaued" at approximately 40%. The preoperative clinic, phone calls, and the EHR all had added to an improved metric but further solutions were needed. The remedy was to use the EHR (EPIC Systems, Verona, WI) and other database programs (Profitability after Surgery Compass, Advisory Board, Washington, DC) to change "data" to "usable information".

The EHR provided an opportunity to examine the delay cause by service, provider, and reason. Using this methodology, the data was reviewed for 2010. Each category had a menu of delay reasons. Surgeon and anesthesiologist delays together, accounted for 47% of all tracked delays. The two most common delay reasons accounted for over 50% of surgeon and anesthesiology delays. Another perspective would be to assess the provider delay by individual practitioner. For the first time, the delay data by reason, provider or service was available. These data were reviewed at the weekly OR Executive Committee, and with the Service Chiefs, at the monthly OR Committee, and with perioperative nursing leadership. Outlier surgeons and anesthesiologists were responsible for a disproportionate number of delays in their respective areas. Service leaders then had discussions with the poor performers. This information played a substantial role in improving FOTS performance from 40% in late 2010 to the 60% range in 2011.

Performance then plateaued again (April 2012 to March 2013). It was important that FOTS regain priority for OR stakeholders. In an effort for improvement, the data was promptly shared with physicians and staff. This included daily emails sent to physicians by the OR surgical director which required 10 minutes of work effort daily. Data was also posted in other venues, such as the Main OR and OR lounge. Surgeons and anesthesiologists are often competitive. They do not want to be viewed as poor performers when compared to their peers. Therefore, having them see credible data, showcased in public, was felt to be an effective method to drive behavioral change. Using tactics such as socializing credible data promptly and incentivizing positive behavior, FOTS became a more visible OR priority that received important buy-in and collaboration from hospital and medical staff. With enhanced communication, FOTS increased to 80% buy March 2014.

There was a "learning curve" with efforts to improve on time performance. In each instance, we identified a problem preventing timely starts. A solution was formulated and implemented. We repetitively saw an improvement and then a plateau. This is not all that surprising. We expected to see improvement but could not predict the degree of success. With reaching an asymptote, we then assessed the information and implemented or developed new work flows, tools, or communication techniques. Although, we were unable to predict the amount of improvement with each intervention, the overall improvement to 80% FOTS is gratifying.

Conclusions

Our collaborative OR redesign and subsequent leadership input provided focused strategies to address FOTS issues such as inefficient processes, operations management solutions, and perioperative data integrity. Implementation of the preoperative clinic and pre op phone call process changes contributed to an improvement in provider workflows the morning of surgery. The EHR provided time stamped data that improved data integrity and physician buy-in of the data. Using tactics such as sharing the data promptly, pinpointing and addressing outliers, aligning performance to annual goals, and rewarding top performers, our MOR experienced a greater than six-fold improvement in FOTS. In addition, collaboration among OR stakeholders and communication to patients and families has appreciably improved.

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