OR First Starts Case Study

University of Missouri Health
One Hospital Drive
Columbia, Missouri 65212

Primary Contact:
Robert P. Zitsch III, MD, FACS
William E. Davis Professor and Chair, Department of Otolaryngology — Head and Neck Surgery
Director, Operating Room Operations Committee
University of Missouri Health
zitschr@health.missouri.edu

Secondary Contacts:
Douglas S. Wakefield, PhD
Director, Center for Health Care Quality
University of Missouri Health Care
wakefielddo@health.missouri.edu

Matthew W. Waterman
Director of Surgical Services
University of Missouri Health Care
watermanm@health.missouri.edu

Donald S. Baker
Business Technology Analyst
University Hospital Surgery Services
bakerds@health.missouri.edu

Michael Brown, MD
Anesthesiologist
University of Missouri Health Care
brownmic@health.missouri.edu

Executive Summary

University of Missouri Health, a comprehensive academic medical center that includes MU Health Care, MU School of Medicine and its University Physicians practice plan, MU Sinclair School of Nursing, and MU School of Health Professions, has a mission to advance the health of all people, especially Missourians, through exceptional clinical service, which supports the academic and research mission of the University of Missouri.

MU Health recognizes that an electronic health record (EHR) is essential to its mission and has had an EHR infrastructure since 1996. Consisting of five hospitals and more than 50 clinics staffed by more than 550 university physicians, MU Health Care has the only Level 1 trauma center in mid-Missouri. Our health system offers primary, secondary and tertiary services to central Missourians in a 25-county service area with a population of 776,861.

In 2009, we identified a trend of delayed Operating Room (OR) first starts. We achieved on-time first starts an average of only 21 percent of the time. The complexity of choreographing an on-time first start was overwhelming. We turned to the data available across numerous information technology (IT) solutions to isolate problems, make process changes, and track first-start leading
and lagging indicators. As we streamlined our processes, we then used IT to improve communications (pre-, intra- and post-procedure), minimize delays and manage results, both in the OR and for our patients.

Over the past 12 months, we are now averaging 77 percent on-time OR first starts at the main University Hospital, up from 21 percent in fiscal year 2009. Meanwhile, since then our first start volumes have increased by more than 18 percent across the health system.

**Local Problem**

On any given day, our health care system has between 20-30 first-start surgeries, or surgeries that are scheduled to begin at the same time. Because ORs represent a critical source of patient care services, income generation, and are a source of high costs for hospitals, it is imperative that we minimize the number of first-start delays.

Depending on the extent of delays in starting these first cases of the day on time, there can be many serious side-effects such as:

- Subsequent rippling delayed starts for remaining cases scheduled for that day
- Case cancellations that result in unnecessary rework in getting them rescheduled
- Poor surgery block time utilization
- Extended OR hours that cause unplanned overtime costs
- Dissatisfied providers and OR staff members

Delays are caused by a variety of factors, including the following:

- Staff and/or equipment availability issues
  - Lack of Communication among team members
  - Little accountability for personnel being late
- Inefficient block scheduling
- Case being bumped because of other emergency cases
- Changes in patient clinical status or preference
- Patients not being present at the correct time or not following pre-surgery orders

While we cannot always make scheduling changes to reflect emergencies or changing patient conditions, we can reduce delays related to our policies, procedures, and how we have designed our processes to ultimately change our culture to one of personal accountability and rich in communication. With these goals in mind, our institution embarked on a multi-year initiative to reduce the percentage of first-start delays in our OR.
Figure 1 below tells the story of declining on-time performance for a portion of fiscal year 2009, when we initiated our improvement efforts. During this timeframe, we averaged approximately nearly 18 minutes of delay per delayed case, and we totaled 3,000-4,000 of delayed minutes each month, valued at $189,000 - 252,000, based upon our estimated MU Health Care cost of $63 per minute.

![Figure 1: University Hospital Percent On-time First Starts](image)

**Design and Implementation**

In view of these disappointing statistics, we began our journey to improve on-time first starts in 2009. The Cerner Millennium EHR and PowerChart had been functioning since 1997, and University Hospital implemented the department-specific solution, SurgiNet, in 2004. Although it had been implemented for nearly 5 years, we were underutilizing the solution to our disadvantage.

**Step 1: Defining a first-start delay and calculating baselines**

Our operational definition of a delayed start is as follows: Wheels-in Time being more than five minutes later than the scheduled start time (to include a five-minute grace period). Based on this metric and using EHR time stamps, our baseline for fiscal year 2009 was calculated at 21 percent on time first starts.
Step 2: Process analysis and redesign

Through the Operating Room Oversight Committee (OROC), our hospital system’s leaders chartered the First Start Improvement Team in 2009. The committee oversees all operating room activities, and it sets policies and procedures governing all OR facilities.

We use PDSA (Plan-Do-Study-Act) and lean frameworks to conduct systematic process analysis and testing of interventions. This work is supported by an evolving HIT and analytic infrastructure. This infrastructure, in turn, supports an increasingly extensive array of analyses of processes, development and testing of a number of interventions, as well as long-term, ongoing monitoring—all of which our senior leaders strongly supported.

Instrumental to our success is the use of data from both direct observations and a variety of information technologies to:

- Provide baseline and post-implementation measurements
- Communicate to key stakeholders what is needed when
- Support ongoing monitoring and continued process improvements

The project’s intended goal and our leaders’ expectation is to consistently achieve 80 percent on-time first starts across the health system. The surgical services department strives to achieve 100 percent on-time first starts and analyzes all variance.

How Health IT Was Utilized

During our improvement process and design, we used the following IT systems:

- **Kronos** – Identified time delays, staff members were clocking in from areas remote from the ORs.
- **Cerner Millennium EHR** – Timing of anesthesia residents’ day-of-surgery notes, combined with observations, led to requirement of when these residents needed to be in the OR and for the identification of procedures, which should or should not be First Starts.
- **Instacount** – This solution supported preparation of correct surgical equipment and supply trays for delivery to ORs.
- **Cerner Millennium SurgiNet** – We employed electronic posting and automated electronic case tracking boards for intra-OR communications, case status boards in waiting areas for communications with patients’ families, automated daily reports, and bi-weekly run chart summaries for key stakeholders.
Automating Data Transmissions and Communications

Today, we use IT in a highly integrated manner to help sustain our on-time start percentages. Figure 2 provides an overview of key areas in which we currently use automatic data transmissions and communications.

Figure 2: MUHC Information Technology Enablement of First-Stat Operating Room (OR) Related Communications

Steps 1-3 describe pre-op processes and communications. Step 4 focuses on day-of-surgery processes and communications, and Step 5 addresses reporting.

1. **Registration**: Once the patient and surgeon have decided that a specific surgical procedure is necessary, we register the patient in our registration system (IDX).

2. **Scheduling**: The registration system automatically provides the information needed to schedule a date and time. The scheduler enters this information into our EHR (PowerChart), which automatically feeds the surgery IT system (SurgiNet).
3. **Pre-surgical notifications:** SurgiNet sends pre-surgical notifications and prompts to several groups prior to the day of surgery:
   a. OR Management identifies types of rooms, beds, staff, and equipment needed.
   b. The Sterile Processing Department’s Instacount system identifies provider-specific surgical trays and supplies that need to be in the assigned room on the day of surgery.
   c. Anesthesia information system (SurgiNet Anesthesia) generates:
      i. Required pre-surgical assessments
      ii. Additional clinical consultations (as needed)
      iii. Patient consents
      iv. A list of next-day, first-start patients
   d. Pre-Op anesthesia nurses contacts these next-day patients to:
      i. Answer any questions
      ii. Reiterate key instructions (e.g., NPO (nothing by mouth) after midnight, stopping medications)
      iii. Ensure patients are planning to arrive on time

4. **Day of Surgery:** There are extensive data feeds from the surgery information system to populate tracking boards:
   a. OR patient tracking boards for OR staff members (Appendix, Figure 9)
      i. Use of the electronic tracking boards in ORs has been particularly helpful. For every scheduled case, we track the status of specific readiness information using a red/green “stop-light” type report. Patients cannot be wheeled back to the specific OR room until the room, the surgeon and the anesthesiologist are ready (green light). (Appendix, Figure 10)
ii. The tracking boards (Figure 3) now provide a status for each scheduled procedure at a glance. This allows OR staff members to shift resources to address specific areas that may be falling behind (red lights).

Figure 3: University Hospital OR Tracking Board

b. Additionally, OR tracking boards for families are placed in common waiting areas. Family members receive a number (instead of a name) to track the status of their loved one throughout the surgery and post-op process. (Appendix, Figure 11)

Reporting: The surgery information system collects information about all first starts in terms of being on-time or delayed; a primary reason for the delay selected from a defined list, as documented by the care team; and any free-text responses captured to further explain delays. The system automatically relays this report to key stakeholders including C-suite and Director level executives, OROC executive committee, and surgical department chairmen every day at 1300 hrs. (Appendix, Figure 12) for all first starts. In addition to the information contained in the report OR staff in each hospital follow-up and report specific
details about the cause of each first start delay (i.e., names of specific equipment, supplies, staff, care processes, or patient factors involved in the delay). Daily reports facilitate rapid identification of and interventions to reduce future first start delays. Weekly and monthly reports as shown in Figures 4-6 provide valuable summaries and trend analyses. When we detect a dip in performance we review the delay reasons to evaluate if the delays are due to special or common cause factors. For example, when some of our top delay reasons over 3 months time were “consent missing” and “surgeon or anesthesiologist unavailable” (Appendix, Figure 13), we examined the consent documentation process and targeted communications to individuals who were late due to personal reasons versus being late because they were providing emergent care to another patient. Because we tracked delay reasons, we can identify repetitive patterns involving individuals, or processes of care, implement interventions, and track subsequent results. (Appendix, Figure 14). Thus, what started out as an improvement “project” has evolved into a “new way of managing”.

Reports of corrective actions are received by:

a. Executive Committee of Medical Staff  
b. Daily Operations  
c. Monthly Global Operating Room Operations Committee

We also report at the Bi-Monthly Operating Review for Surgery Services, where On-time First Starts is a key metric. (Appendix, Figure 15)

Value Derived

Since 2009, we have had steady and sustained progress toward our goal of 80 percent on-time first starts. Our average on-time OR first starts for the last four quarters was 77 percent compared to fiscal year 2009 of on-time first starts of 21 percent. Although still shy of our 80 percent on-time goal, we are pleased with our progress. (Figure 4 shows data by month.)

1. Across our most recent 3 years of results we have a soft cost savings of $141,241 per month, based on a monthly savings of 2,248 minutes and our estimated OR cost of $62.83 per minute.
2. Block utilization (the room time used during a case or cases, divided by total allocated amount of time for a surgeon or group) has improved from 77 percent to 87 percent while volumes have increased by 22 percent since 2010. (Appendix, Figure 16, Figure 17)

3. EHR satisfaction among surgeons and anesthesiologists has improved by 9.7 percent since 2010. (Appendix, Figure 18)

4. Surgical Care Improvement Project (SCIP) measure compliance has improved from 90 percent to 99.4 percent since 2010.

5. When an on-time start is not achieved, patient and staff delay times have been reduced. The average number of minutes of delay per case has decreased to about 6 minutes in fiscal year 2015 from about 18 minutes in fiscal year 2009. (Figure 5)

By 2012, we had moved same-day surgeries to Missouri Center for Outpatient Surgery (MCOS), elective orthopaedic cases to Missouri Orthopaedic Institute (MOI), and nearly all pediatric and OB/GYN cases to Women’s and Children’s Hospital (WCH). These changes left the most complex cases at University Hospital, where our study began.

Fortunately, we have been able to spread the lessons learned and interventions to decrease first-start delays to our three other surgical services locations with similar results (Figure 6). Through the combination of a continual focus on improvement, strong organizational governance and leadership, and our ability to leverage data from our IT systems into actionable data, today, across the four OR sites, we typically have about 25 first-start cases, and all are consistently near our target of 80 percent on-time first starts.
Figure 4: Summary of University Hospital Daily On-Time First Start Percentage (2009-2015) (Target = 80%)

Figure 3: Total Delay Minutes per First Start Case by Year
UH Main OR, July 2008-March 2015

Figure 5: Total Delay Minutes per First Start Case by Year
UH Main OR, July 2008-March 2015

Total First Start Cases    Minute Delay per Case
Lessons Learned

Our project has been largely successful through the combination of a continual focus on improvement, strong organizational governance and leadership, our ability to leverage data from our IT systems into actionable data (by digitizing data to generate real-time reporting through dashboards and same-day reporting for late start reasons), and to replicate our success across other sites.

Continual Focus on Improvement

We remain focused on reducing first-start delays from organization-wide monthly operation reports as well as daily departmental reports and a commitment to documenting and tracking variance.

Communication is critical. Organizations need to understand and make transparent to all process owners what it takes to achieve an on-time start. Achieving on-time first starts requires an exacting choreography of many different individuals (Figure 8), who, in a timely and correct manner, complete a complex set of sequenced and interdependent tasks. Examples of some of the tasks required for completion on day of surgery are shown in Figures 7 and 8.
Selected Examples of Tasks That Must be Correctly Completed to Ensure an On-time First Start

- Surgeon: Right procedure for specific patient, site marking, correct history and physical, consent, pre-surgery workup, and results from workup are available
- Sterile Processing Department: Right Preference Card used to prepare correct surgical trays, medications, supplies
- OR Management: Right procedure posting used to determine room, bed, equipment, and staffing requirement
- Anesthesia: Right patient and procedure to ensure correct consent, pre-surgery workup, and results from workup are available
- Patient: Right pre-op instructions to ensure NPO status, and arrival at correct place and time
- Final Communications for Wheels In: Required communication among surgery case team that surgeon, anesthesiology, and room are each ready before patient can be taken into the OR.

Strong Organizational Governance and Leadership

Our On-time First Start reports get attention every day from our chief executive officer, surgery chairs, and other key leaders in part because our surgical services are financially important to our organization’s growth and sustainability. The Systems Governance Committee provides final oversight over the structure and functioning of the Operating Room Operations through reporting and monitoring progress.

Leverage Data from Our Information Technology into Actionable Data

IT represents an essential component of “on-time” starts. Today, we have a highly integrated approach that uses IT to help sustain and improve our on-time start percentages. As previously
described, we use IT throughout the process to pull key “levers” from registration, scheduling, pre-op communications, intra-op communications to both team and family members, and reporting.

Replicate Success

Our initial improvements at University Hospital have now been replicated across other surgical service sites, including Missouri Orthopaedic Institute, Women’s and Children’s Hospital and Missouri Center for Outpatient Surgery. (Figure 7)

Challenges:

Defining an On-Time First Start grace period

Initially using the difference between scheduled start time and wheels-in time to determine if there was a delayed first start was helpful. However, it became apparent that we might be introducing a measurement error because there can be inadvertent delays in entering the exact Wheels-in Time in the EHR. Because staff and physicians were going to be held accountable for on-time first starts, we subsequently decided to add a five-minute grace period to allow for delays in data entry.

Time Clock Placement

Staff members were clocking in “on time”, but the time clock was closer to the parking garage than it was to the surgery services area. Upon initial analysis, we didn’t understand how staff members were late to the area. Our solution was to simply move the time clocks closer to surgery area.

There’s Always More to the Story

Users document delays by selecting a primary reason from a list of 57 possibilities. Although the user can select only one reason, he or she can document additional details in email that display on the report reviewed by management. The full truth always comes out in the emails and has been central in how we understand delays and possible ways to improve processes and/or communications.

Next steps

While we continue to improve on-time first starts, our next step is to evaluate ways of improving time lag between “wheels in” to the first incision of the surgery to further increase productivity and efficiency.
Financial Considerations

The team used the existing EHR and other supporting IT solutions as the primary point of intervention and data collections; there were no software or hardware costs associated with these changes nor are there ongoing costs related to these changes. The OR First Start committee estimated a MU Health Care cost per minute for operating room time of $62.83 Decreasing the frequency of delayed first starts as well as decreasing the average length of delay resulted in a calculated soft value of $1.8 million in fiscal year 2015.
Appendix

Figure 9: University Hospital Case Tracking Board Notifications

Figure 11: Patient/Family Waiting Room Tracking Board
**Figure 12: Daily Report**

**OR First Starts by Facility**

*Daily Case Overview*

**Criteria:**

08/28/2016

Case Priority is "Elective"

Scheduled Start Time is 07:00, 07:15, 07:30, and 07:45 on Monday, Tuesday, Thursday, and Friday

Scheduled Start Time is 08:00, 08:15, and 08:30 on Wednesday

### Main OR

<table>
<thead>
<tr>
<th>OR Suite</th>
<th>Service</th>
<th>Outcome</th>
<th>Sched Start</th>
<th>Wheels In</th>
<th>Delay</th>
<th>Delay Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOR 07</td>
<td>OR-Thoracic</td>
<td>On Time</td>
<td>7:00 AM</td>
<td>6:55 AM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOR 10</td>
<td>OR-Thoracic</td>
<td>Late</td>
<td>7:00 AM</td>
<td>7:07 AM</td>
<td>2</td>
<td>Surgeon - MSP</td>
</tr>
</tbody>
</table>

**Figure 13: Top 10 Delay Reasons in Last 90 Day**

**OR First Starts by Facility**

*Top 10 Delay Reasons in Last 90 Days*

**Criteria:**

10/01/2014 - 01/01/2015

Case Priority is "Elective"

Scheduled Start Time is 07:30, 07:15, 07:30, and 07:45 on Monday, Tuesday, Thursday, and Friday

Scheduled Start Time is 08:30 on Monday, Tuesday, Thursday, and Friday

### Main OR

<table>
<thead>
<tr>
<th>Delay Reason</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room - Large Setup</td>
<td>12</td>
</tr>
<tr>
<td>Anesthesia - Consent</td>
<td>21</td>
</tr>
<tr>
<td>Surgeon - Consent</td>
<td>15</td>
</tr>
<tr>
<td>Patient - Difficult IV</td>
<td>9</td>
</tr>
<tr>
<td>Anesthesia - Block / Epidural</td>
<td>8</td>
</tr>
<tr>
<td>Patient - Late Arrival</td>
<td>6</td>
</tr>
<tr>
<td>Patient - Psych / Social Needs</td>
<td>6</td>
</tr>
<tr>
<td>Hospital - Transport Issues</td>
<td>5</td>
</tr>
<tr>
<td>Surgeon - Attending Unavailable</td>
<td>5</td>
</tr>
<tr>
<td>Anesthesia - Attending Unavailable</td>
<td>4</td>
</tr>
</tbody>
</table>
Figure 14: Delay Cause Progress Monitoring

Delay Cause: Consent Missing or Surgeon or Anesthesiologist Unavailable

Figure 15: Bi-monthly Operating Review Dashboard

<table>
<thead>
<tr>
<th>Measure</th>
<th>Apr 15</th>
<th>May 15</th>
<th>Jun 15</th>
<th>FYTD15 Actual</th>
<th>FYTD 15 Goal</th>
<th>FYTD14 Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of On-Time First Starts</td>
<td>83.1%</td>
<td>85.7%</td>
<td>85.0%</td>
<td>82.3%</td>
<td>80.0%</td>
<td>78.1%</td>
</tr>
<tr>
<td>Median Turnover Time (820 Cases)</td>
<td>23.50</td>
<td>24.25</td>
<td>26.00</td>
<td>24.4</td>
<td>21.3</td>
<td>24.3</td>
</tr>
<tr>
<td>SCIP Patient Appropriateness of Care Compliance</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>99.8%</td>
<td>90.0%</td>
<td>99.2%</td>
</tr>
</tbody>
</table>
**Figure 16: University Hospital OR Block Utilization Percentage, FY’09 through FY’15**

*Data unavailable*

**Figure 17: Combined Case Volume, FY’10 through FY’15**
Figure 18: Surgery, Anesthesiology, & Orthopaedic Surgery Satisfaction

Surgery, Anesthesiology, & Orthopaedic Surgery Satisfaction
Composite Score

9.7% Increase Since 2010

2010 2011 2012 2013 2014 2015
2.89 2.81 2.55 3.00 3.02 3.17