IX. CINCINNATI CHILDREN'S HOSPITAL MEDICAL CENTER

(Case study, work in progress)

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Summary: *In 2005, the leadership of the Cincinnati Children's Hospital Medical Center (CCHMC) –a nationally recognized as a leader in pediatric health care, with a reputation for excellence in patient care, research and medical education - invited the Program for Management of Variability in Health Care Delivery (MVP) at Boston University Health Policy Institute to asses its patient flow. Based on the assessment, hospital leadership in 2006 invited MVP to lead design and participate in implementation of the MVP variability methodology to optimize CCHMC patient flow and to determine the necessary number of beds for major hospital units to meet current and future patient demand. This work is still in its early stages – only the first out of its three phases has been completed. Nonetheless, some preliminary results of implementation are available.*

Objective of the Phase I (the project is in progress and has three phases):

The issue of timely access to care for emergent and urgent operative procedures is very critical for the operating room (OR) at any pediatric hospital, as it dramatically affects quality of care and both parent and patient satisfaction. Hungry and sick children have difficulty tolerating excessive waiting for a surgery. CCHMC is no exception in this regard.

This project was established as a phased, incremental approach for improving OR scheduling and perioperative service operations and for aligning OR and other

patient demand flows with bed and staffing needs on inpatient units. Because the project is in its early stages, this case study focuses only on Phase I of the project.

The first aim of Phase I was to improve access to the OR based on separating the urgent/emergent cases from the elective schedule, [1,2] thereby reducing waiting times for unscheduled procedures (emergent, urgent semi-urgent, etc.). A secondary goal of this project was to reduce the number of delays and cancellations of elective surgical procedures by designating separate OR(s) for unscheduled procedures.

In an effort to address these problems, CCHMC organized a diverse working group with representatives from surgery, nursing, anesthesia, clinical effectiveness, and IT.

Organization and Leadership:

Cincinnati Children's has 475 registered beds and about 8,469 employees. Cincinnati Children's is the only Level 1 pediatric trauma center in Southwestern Ohio, Northern Kentucky and Southeastern Indiana, with the only pediatric cardiac intensive care unit in the region. In fiscal year 2005 it drew patients from 40 states and 37 countries. In 2005, Cincinnati Children's staff performed 106 transplants. In fiscal year 2005, Cincinnati Children's had 799,917 patient encounters. Cincinnati Children's is the first center in the nation to build an on-site, multidisciplinary child advocacy center with community partners housed together on the main hospital campus. The staff at Cincinnati Children's has doubled in the past six years.

Frederick Ryckman, MD, Clinical Director, Pediatric Surgery; Director, Liver Transplant Surgery; Professor of Clinical Surgery, is the leader of the Project and Uma Kotagal, MBBS., MSc., Senior Vice President, Quality and Transformation, Director, Health Policy and Clinical Effectiveness, is administrative leader of this Project. The core team involved with the project at CCHMC also included: C. Dean Kurth, MD Anesthesiologist-in-Chief, Professor of Anesthesia and Pediatrics; Elena Adler, MD, Associate Professor of Anesthesia and Pediatrics; Kathryn Hays, RN, MSN, Senior Clinical Director, Patient Services for the Operating Room; Cindy Bedinghaus, RN, Senior Clinical Director, Patient Services for Same Day Surgery, PACU, Short Stay; and Peter Clayton, CHE, Vice President, Operations, Surgical Services. This group is supported by the extensive efforts of the CCHMC Center for Health Policy and Clinical Effectiveness. Hospital leadership members were enfranchised in the project, as well as the chiefs of surgery and anesthesiology, and key nursing staff.

MVP faculty participating in the Project: Eugene Litvak, PhD, Founder and Director of the Program for Management of Variability in Health Care Delivery (MVP); Professor at the Boston University School of Management Adjunct Professor at Harvard School of Public Health; Brad Prenney, MS, MPA, Deputy Director of the MVP, Patricia McGlinchey, BS, Program Manager of the MVP; Kathleen Kerwin Fuda, PhD, Data Analysis Manager for the MVP; Osnat Levtzion-Korach, MD, MHA, Clinical Manager of the MVP; and Michael Long, MD, co-founder of the MVP, MVP faculty. Dr. Long has collaborated with Dr. Litvak in the development and practical application of innovative methodologies for cost reduction and quality improvement in health care delivery systems. He currently serves as Program Faculty for the MVP.

Dates of Phase I Implementation:

Implementation of the weekend design started in July 2006 and the provision of separate staffed operating rooms for scheduling of add-on cases was implemented during weekdays as of September 18, 2006.

Process:

Phase I focused on establishing separate OR resources for unscheduled surgical cases in order to assure timely access to surgery for patients with emergent or urgent clinical care needs and to eliminate competition for OR resources from scheduled elective cases.

In order to optimize the design, CCHMC at the request of MVP has developed an urgency based stratified A to E grouping of surgical procedures, with "A" representing the highest urgency. Each urgency classification was assigned a clinically acceptable longest waiting time to access surgical services from the time of case posting in the operating room. For example:

- **A: Cardiac surgery postoperative bleeding with tamponade; Multiple trauma -- unstable or OR resuscitation**
- **B: Acute spinal cord compression ; newborn bowel obstruction**

At the request of MVP, CCHMC has collected and MVP has analyzed extensive hospital data on urgent and elective surgical cases, surgical minutes, and countless other metrics for the period January-March 2006, which allowed them to analyze demand and identify ways to improve patient flow. MVP subsequently completed

the design by determining for each hour of each day (24/7) how many unscheduled rooms need to be staffed to maintain waiting times within clinically required time intervals for each category of urgency.

Preliminary results:

Although it is too early to determine full effect of implementation of the Phase I as there is a need for several months time for the process to become steady-state, some initial results were noted shortly after implementation of Phase I.

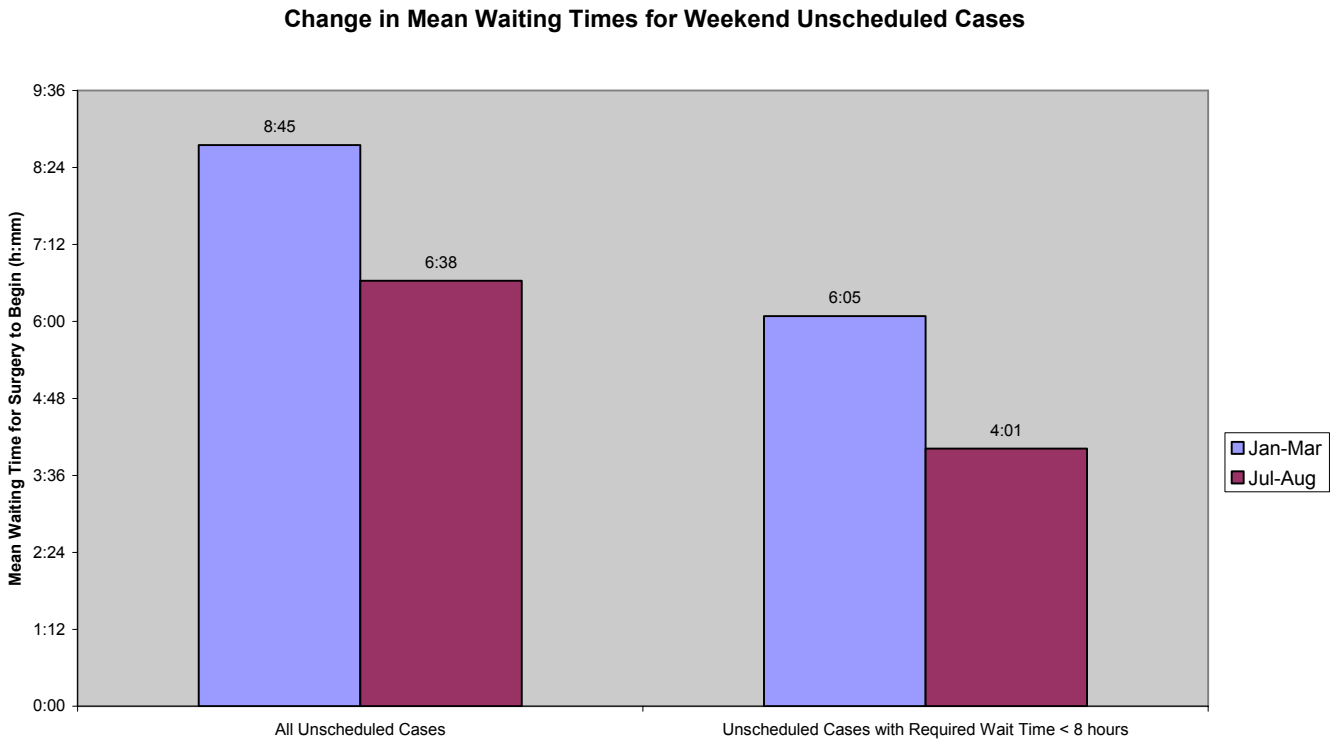
The most important initial accomplishment has been more timely access to surgery for emergent and urgent cases. This came about through implementation of the recommendation to provide separate OR resources for unscheduled (add-on) cases. The benefits associated with Phase I are detailed below, but it is worth briefly summarizing here as well. Wait times for performing add-on cases have improved significantly as reflected in wait times for surgery and through feedback provided by CCHMC personnel. Satisfaction among patients, their families, and providers has also increased as surgeons have been able to perform these cases earlier. Finally, increased efficiency has resulted in a higher OR utilization rate, with a reduction in overtime.

Specific initial results of Phase I include:

Weekend waiting times:

Despite a **37%** increase in the case volume in July-August as compared to January-March the waiting times for unscheduled procedures has been reduced by **34%.**

Below is the graph comparing weekend waiting times for unscheduled cases during the winter of 2006 as compared with July through August of 2006, after the implementation of our methodologies.



Despite an *increase* of 37% in the number of unscheduled cases, implementation of recommended changes *reduced* wait times for all such cases by over 2 hours, or 21%. Wait times for unshceduled cases with a required wait time of <8 hours improved even more, by 34%.

Weekday waiting times:

Despite a **24%** increase in the case volume during September-early October, as compared to January-March, the waiting times for unscheduled procedures has been reduced by **28%.**

Quality of Care, Patient and Staff satisfaction:

In addition, MVP distributed a questionnaire among CCHMC clinicians to assess the impact of Phase I changes (please see Appendix A for responses to the survey).

Responses from surgeons and nurses indicate overwhelming satisfaction with the changes. In addition, many of the respondents note that patient and family satisfaction has markedly improved as a result of the Phase I changes.

Throughput and Efficiency:

In addition to the above improvements, OR throughput and efficiency have increased substantially. The results described below are based on three full months of data following Phase I implementation.

Utilization data indicate that, despite the addition of an additional OR at the time of implementation of the separate add-on rooms (which would tend to depress the overall utilization rate), the utilization rate has in fact increased from the 72% measured before implementation of the add-on rooms, to slightly over 75% by the end of the period reported. This increase in the utilization rate permitted CCHMC to accommodate a substantial increase in total operating hours while simultaneously enjoying a very substantial reduction in OR hours worked beyond prime time, saving the hospital those costs.

Utilization Rate

The benchmark utilization rate of 72% was reported by CCHMC for the 2 month period before implementation occurred (July – August 2006) The estimate of 75% is based on a regression analysis of the weekly data reported through the first week of January 2007 (Figure 1), and represents the results achieved by the end of the period. If the trend continues, of course, future results may be even better.

This 3 point difference in utilization rate achieved is equivalent to a 4.4% increase in overall efficiency, or throughput per hour, in the OR, and takes into account the addition of one room. It was calculated as follows:

[(21 rooms X 75% UR) – (1 room X 72% UR)] / (20 rooms X 72% UR) = 1.04375

In fact, ***this increase is nearly equivalent to the addition of one more operating room to CCHMC's OR (which would increase capacity by 1/21 or 4.8%), without any of the associated capital or operating costs.***

Even if it is assumed that the utilization rate does not continue to increase at the rate suggested by the trend, but stabilizes at 75%, the 4.4% increase in efficiency has substantial financial implications. For example, approximately 22,800 cases were performed at CCHMC in FY06. If the OR had been 4.4% more efficient during that year, it could have performed an additional 998 cases *using the same resources* (time, staff, and rooms). Obviously, an additional thousand cases, multiplied by the average net revenue per case, would create substantial additional revenues annually, most or all of which would drop to the bottom line. Analyzed another way, if the increased efficiency were used not to carry out *more cases* of the same case mix, but instead the same number of cases but with a *higher degree of complexity* and therefore reimbursement, then one would expect the reimbursement per operating hour to improve accordingly, with the same overall financial benefit.

Reduction in Overtime

During the period observed, total operating hours (for both prime time and non-prime time), adjusted for turnover time, were increasing (Figure 2), by an estimated 5.7% based on the trend line. This is equivalent to about 41 hours per week. This increase in operating hours was more than sufficient to completely fill the one additional operating room running at the old utilization rate of 72%. If primetime is 38.5 hours/week, 72% of that equals a little less than 28 hours. Therefore, it can be considered that the additional room added was able to absorb only some of the increased demand realized during the period, and other things being equal, that the remainder (about 13 hours) would have been expected to *increase* overtime hours.

In fact, however, there has been a dramatic drop in OR overtime. Overtime hours decreased by an estimated 57% between September 18, 2006 and the first week of January 2007 (Figure 3), from a baseline of 53 hours per week down to 23 hours per week. This means a savings of 30 hours weekly from baseline, and 43 hours (i.e., 30+13) from what we would EXPECT to see. This is possible only because of increased efficiency during primetime hours, and represents a direct cost savings to CCHMC. If OR operating costs are estimated at $250/room hour, then these savings are equivalent to $10,750/week, or $559,000 annually.

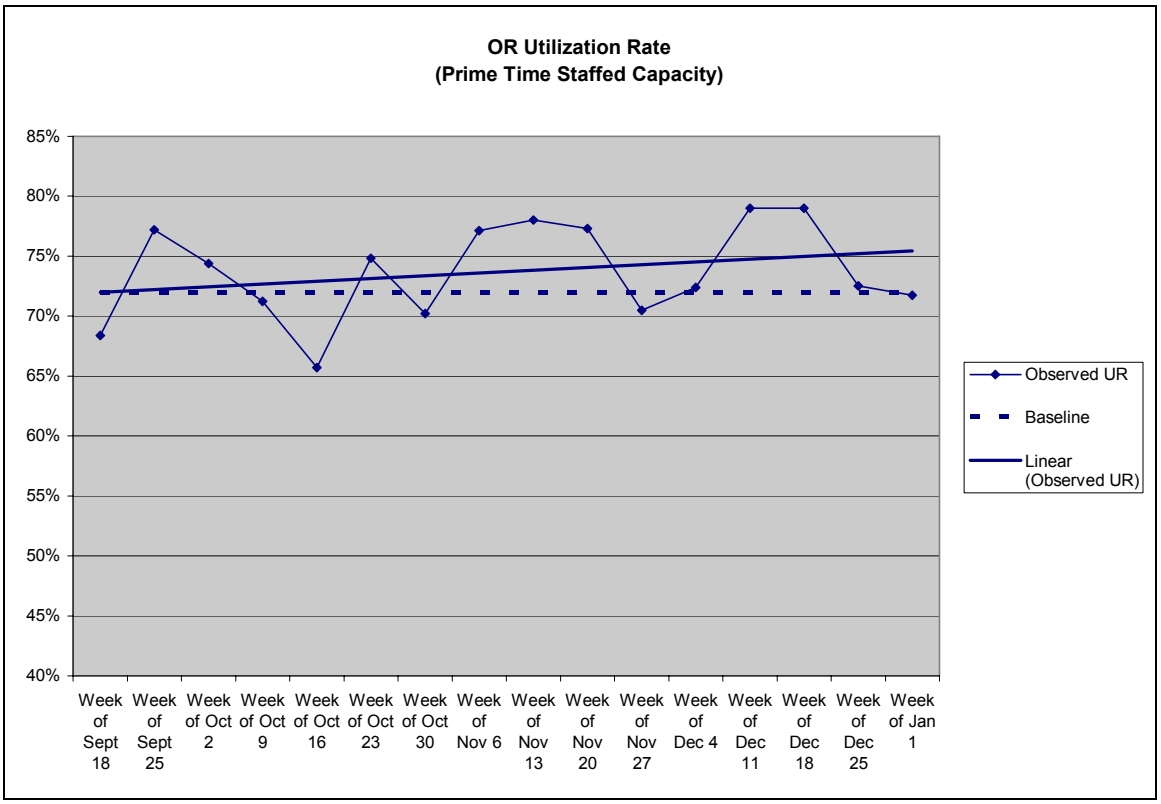


Figure 1

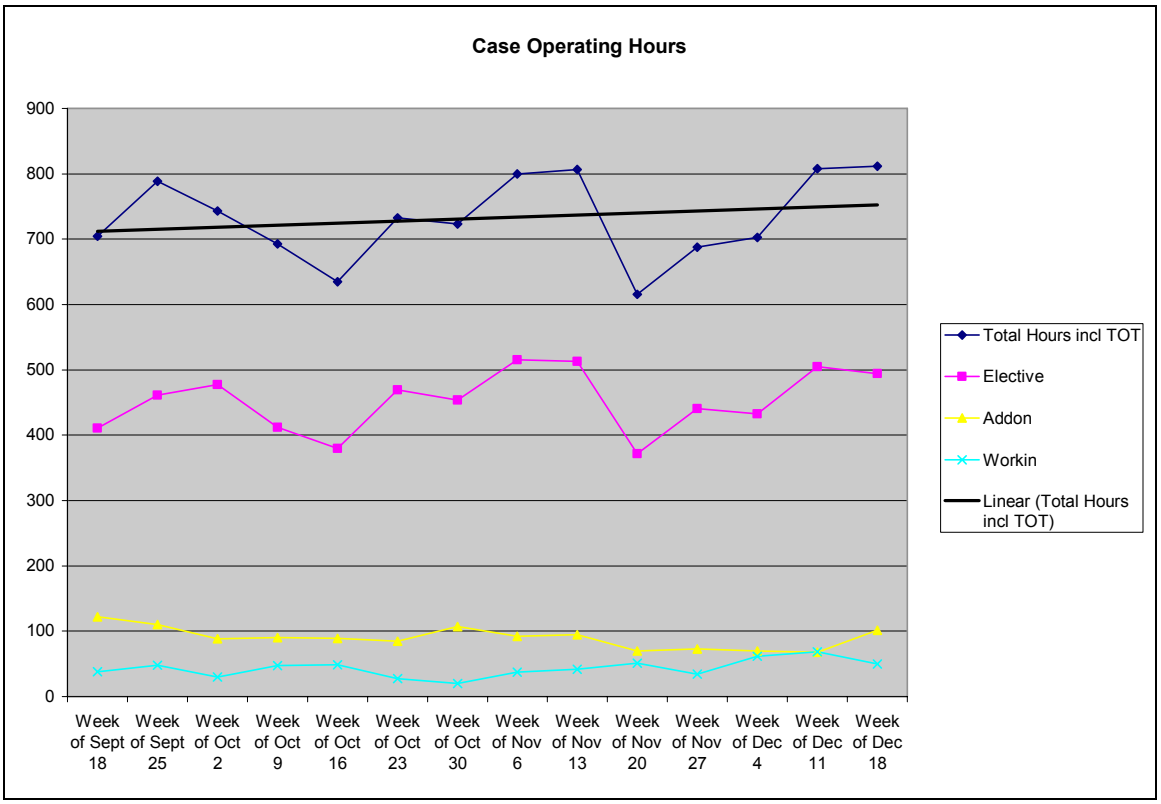


Figure 2

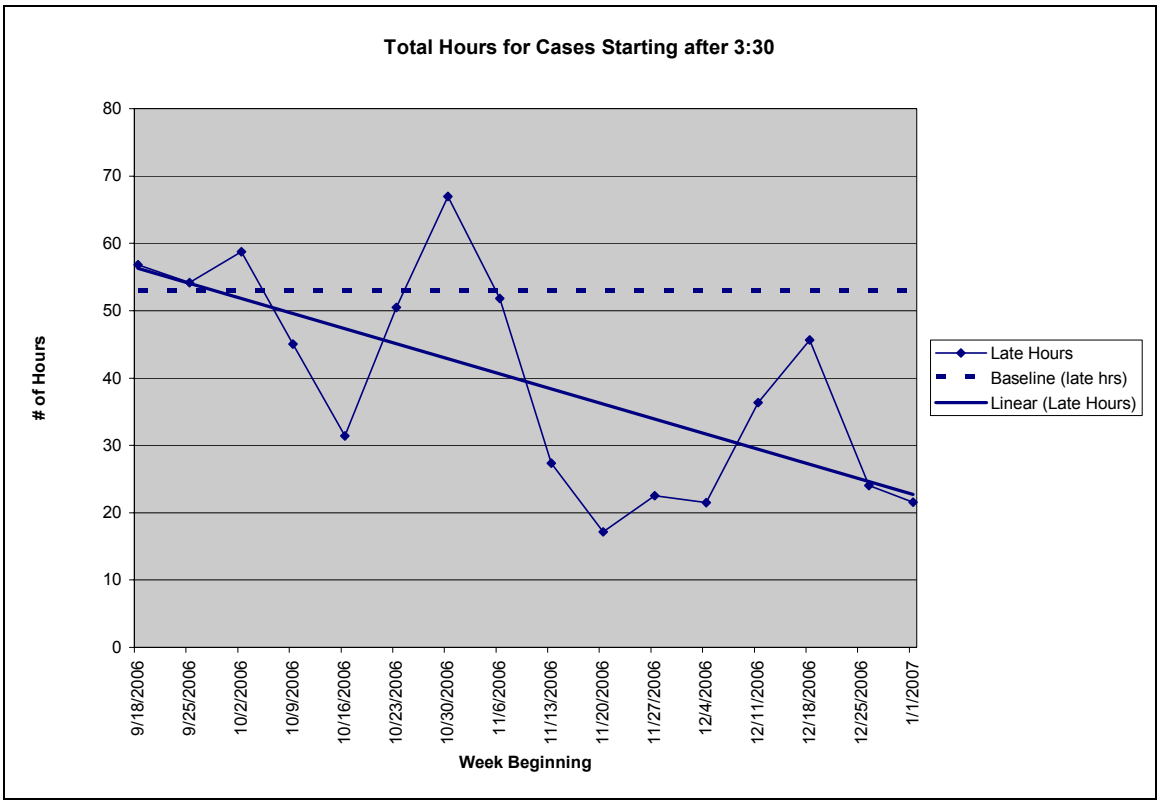


Figure 3

Next Steps

Since the recommendations were implemented, MVP is continuing to evaluate the impact of Phase I based on performance parameters including wait times for surgery, utilization rates, and over time and to refine the evaluation methodology and data requirements. In addition, the model for Phase I has undergone some refinements based on preliminary results. Plans for Phase II of the project are currently underway.

References:

1. Litvak E, Long MC. "Cost and Quality Under Managed Care: Irreconcilable Differences?" *American Journal of Managed Care*, 2000 3(3): 305-312.
2. Litvak E. "Optimizing Patient Flow by Managing its Variability." In Berman S. (ed.): *Front Office to Front Line: Essential Issues for Health Care Leaders. Oakbrook Terrace, IL: Joint Commission Resources,* 2005, pp. 91-111.

Appendix A

Responses to Questionnaire Distributed after Phase I Implementation

1. Did you experience any improvement (or other changes) in your work due to the recent creation of specific rooms for add-on cases? If yes what kind of improvement? Please refer to the weekends (been in place since July) and the weekdays.

"This is the best thing for ortho since I have been here. With the additional add on rooms and our new first available surgeon policy, we almost always get our add-ons done in the early AM, which makes our families very happy. The weekends are unbelievably good. We get our case done early, and patients don't have to wait NPO until the evenings to have their surgery. This has made call much less stressful for my surgeons and myself. The OR is now happy to let us do our add on cases on weekends and the hostility has been virtually eliminated."—Orthopedic Surgeon, Division Director

"It is my impression that we are able to get add on cases accomplished in a more timely manner."—General/Thoracic Surgeon, Attending

"Improved access, less waiting time on weekends and on the weekdays."—Pediatric Surgeon, Attending

"Fewer cases are being left over for the evening."—Orthopedic Surgeon, Attending

"Add-on list tends to run much smoother at this time."—ENT Surgeon, Attending

"I have only had two opportunities to appreciate the impact of this change. In one instance, no add on room was available and both patients had to wait 4 hours until an OR was available. In the other instance, a room was available within 30 minutes." —Pediatric Surgeon, Attending

"The weekends have been much better since we are no longer expected to wait in single file for our add-on cases when there are a large volume of them.—General Surgeon, Attending

"I feel there is an improvement in our time and efficiency when assigning staff. We assign add on staff the day before, instead of "pulling" staff from rooms. Knowing that we are opening 2 rooms in the morning is easier and more predictable."—OR Nurse

2. Is it easier to schedule add-on cases now, compared to the old system? If yes, what specifically is easier?

"Yes. We don't have to fight to get cases added on nearly as much." —Orthopedic Surgeon, Division Director

"Yes. Less delay, less haggling to get cases done." —General/Thoracic Surgeon, Attending

"I believe that we are better able to serve the add on patients now…There are not as many days when there are 12 add-ons at 6:15 in the morning."—OR Nurse

3. Have your add-on patients been able to have their surgeries more quickly than before the changes? If yes how do you think it influences the quality of care? Are there specific examples you can share of add-on patients being able to have their surgeries more quickly after the changes?

"Yes much more quickly. Yes…just look at today. Dr. A was on call last night and had 2 level E patients that needed surgery. The OR offered him a 7:30 start, and because he had a Mason Clinic this AM he asked me to staff cases. Both cases were done by about 11:00 AM, and one patient was able to be discharged. These were difficult ORIF of a GSW to forearm, and an ORIF of an ankle fracture-dislocation. Skilled nurses were available to assist and cases went very well." —Orthopedic Surgeon, Division Director

"Definitely. I think emergency cases now happen in an urgent manner—rather than waiting hours for an OR." —General/Thoracic Surgeon, Attending

"Yes, less waiting, less getting sick while waiting. This is of course better care." —Pediatric Surgeon, Attending

"Add-on patients have been able to get surgery earlier in the day than before. There are fewer complaints about being hungry all day." —Orthopedic Surgeon, Attending

"The family satisfaction with their experience is better than it used to be." —ENT Surgeon, Attending

"In the one instance mentioned above, the change had a significant impact (for the positive) on the quality of care perceived by the attending staff and by the family." —Pediatric Surgeon, Attending

4. Do you think that the change has influenced parents' satisfaction with their child's care? (e.g., as a result of a decreased waiting time for surgery)

"We have not had anywhere near the patient complaints or physician complaints. Physician and Family satisfaction has skyrocketed. As[k] our ortho nurse specialist how much time she had to spend comforting patients and families during the prior all day waiting process." —Orthopedic Surgeon, Division Director

"Yes—more efficient OR means patients get to surgery in a more timely fashion." —General/Thoracic Surgeon, Attending

"Yes." —Pediatric Surgeon, Attending

"As a general rule I believe the new system is satisfying most families and patients."—OR Nurse

5. What impact have these changes had on your or your colleagues level of satisfaction with OR operations? Please describe.

"Less stress, delay, frustration." —General/Thoracic Surgeon, Attending

"Better access, less waiting, can get cases done sooner in general." —Pediatric Surgeon, Attending

"More operations during the day—instead of night time—seems well received so far." —Orthopedic Surgeon, Attending

"Getting the add-on list done during the day has been nice." —ENT Surgeon, Attending

"Considerable impact for the positive." —Pediatric Surgeon, Attending

"The sometimes extreme pressure we felt from dissatisfied surgeons and/or families has seemed to greatly decrease. We have more options now. Earlier, there was no where to go with cases!"—OR Nurse

6. What do you think has been the impact of these changes on other OR professionals (i.e. nurses, anesthesiologists)? Please explain.

"Anesthesia team more willing to do cases knowing we have guidelines—not dependent on surgeon availability or convenience (seems to have been major gripe)." —Orthopedic Surgeon, Attending

"It has likely decreased the number of times they are asked (forced) to stay late." —ENT Surgeon, Attending

"As a general observation, nursing staff "on call" are not staying as late due to add-ons remaining at change of shift."—OR Nurse

7. Are there any other comments you would like to make about the creation of the add-on rooms?

"Let's fine-tune it—but overall a Big Step in the right direction." —Orthopedic Surgeon, Attending

"Don't stop here." —ENT Surgeon, Attending

"…Life just seems to be significantly more peaceful at the front desk since the creation of the add on rooms. This says to me that for the most part, we have surgeons, families, and other staff who are more content. There are always "those days" that are not good, but they seem fewer and fewer as time goes on."—OR Nurse