

Regional Specialty Surgical Practice Efficiencies Gained as a Result of COVID-19

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Abstract

Objective: To identify opportunities for discontinuing elective and nonemergency surgical cases in a regional surgical practice in response to coronavirus disease 2019 (COVID-19).

Patients and Methods: COVID-19 began to affect surgical practices across the United States in March 2020. On March 17, 2020, all elective and nonemergency surgical care was deferred to prepare the Mayo Clinic Health System sites in northwestern Wisconsin for an anticipated surge in patients with COVID-19. When the decision was made to reactivate the surgical practice, several major structural and operational changes were made to the regional surgical practice to optimize efficiencies.

Results: The structural and operational changes implemented during reactivation resulted in improved utilization of surgical resources including improvement in operating room (OR) block utilization, increased available OR time, and increased case volumes.

Conclusion: Surgical and procedural leaders should consider a limited-time deferral of elective surgical cases to implement widespread OR efficiency strategies. The time selected for deferral of surgical cases should target a period of historically low surgical volume to minimize disruption to patient care and impact on overall OR functions.

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On March 17, 2020, all elective and nonemergency surgical care was deferred to prepare the Mayo Clinic Health System (MCHS) sites in northwestern Wisconsin (NWWI) for an anticipated surge in patients with coronavirus disease 2019 (COVID-19). When the decision was made to reactivate the surgical practice, several major structural and operational changes were made to the regional surgical practice to optimize efficiencies.

OVERVIEW OF THE MCHS AND THE NWWI REGION

The MCHS is a group of 19 hospitals and 52 clinics across 3 states within a 120-mile radius of Mayo Clinic in Rochester, Minnesota. The NWWI region of the MCHS consists of 5 hospitals: the 200-bed hub hospital in Eau Claire, Wisconsin, four 25-bed critical access hospitals (CAHs), and

outpatient clinics in several locations. The practice across these sites consists of community-based primary and secondary care, with tertiary specialty care provided at the hub site in Eau Claire. The region employs over 300 physicians and 4000 staff.

BACKGROUND

The surgical and procedural practice in NWWI has delivered high-quality care to patients throughout the region for well over 100 years. The Eau Claire site serves as the regional hub site and is the only level 2 trauma center in NWWI. The regional practice covers 10 surgical specialties that range from basic surgical services consisting of appendectomies, arthroscopic knee procedures, and endoscopy to highly complex operations such as transcatheter aortic valve replacement, craniotomy, and spinal fusion. The practice has 3 surgical locations in the region with operating room

From the Mayo Clinic Health System, Eau Claire, WI.

(OR) capabilities maintained at the hub site in Eau Claire and 2 CAH sites (Table 1).

Annual targets and goals for the regional surgical practice are established by the surgical and procedural subcommittee (SPS). The SPS is responsible for quality, the coordination of surgical and procedural resources throughout the region, accessibility, and expanding surgical services. Operating room efficiency has been the focus of the SPS for many years. This work identified key areas of improvement and opportunity throughout the regional practice. The 2 consistent themes within the initiatives were a mismatch of resources within the surgical services settings and services misaligned to available space, staff, and equipment.

The surgical practice challenges in the pre-COVID-19 era were as follows:

- The identified inventory of surgical cases needing to be scheduled was routinely inaccurate, not timely, and invisible to SPS leadership
- The patient preoperative evaluation process was not standardized, was decentralized, and was performed by several different departments, which led to case cancellations and last-minute order entry on the day of the operation
- Surgical robot transport waste—the region has one surgical robot, which was routinely moved to multiple ORs depending on specialty use and preference
- Operating room assignments could be poorly matched to surgical case type (eg, room size, ability to accommodate specialized staff and equipment)
- Variable and lower than desired utilization of assigned surgical block time

Historically, the team had been unable to make substantial progress in addressing these inefficiencies because solutions to each challenge identified required a major disruption to the current surgical workflow processes and offerings.

As COVID-19 began to affect surgical practices across the United States in March 2020, the NWWI surgical practice was also impacted. In late March 2020, a decision was made to defer all elective and nonemergency surgical care to prepare systems of care to address COVID-19 patient surges. Although well prepared, the NWWI region did not experience an influx of COVID-19-positive inpatients at that time. While the elective

surgical practice was shut down, the regional leadership team discussed the challenges and opportunities associated with reactivating the surgical practice. It was recognized COVID-19 had in fact created an opportunity for the regional surgical practice to incorporate solutions to the long-term challenges as the region reactivated. The shutdown of the elective surgical practice created the perfect environment to implement process and structure changes within the surgical practice to achieve long-term strategic goals of the region.

SOLUTIONS

In March 2020, the severity and effects of COVID-19 became more evident throughout the United States. On March 17, 2020, the MCHS made the decision to defer elective, nonemergency, and nonurgent surgical care until further data related to safe COVID-19 practices could be understood.

In early April 2020, the SPS was charged with developing a regional surgical practice reactivation plan. The practice had been deferring elective and nonemergency care for 3 weeks and had a backlog of elective, nonurgent, and nonemergency surgical cases. The preliminary expectation for a reactivation timeline given to the subcommittee was 2 weeks, but it was clear that time was of the essence because hundreds of patients had experienced delays in receiving surgical care. As the SPS executive team evaluated reactivation options, it became evident that surgical titration due to COVID-19 had introduced several key opportunities to address both the current backlog of cases and long-standing challenges within the regional surgical practice. Changes began with the development and evaluation of the surgical case depot created to inventory the deferred cases and were followed by additional key practice changes implemented to address long-term practice inefficiencies.

Identify and Track Inventory of Deferred Surgical Cases

The creation of this depot and inventory was leveraged as the first surgical improvement opportunity throughout the region and presented the opportunity to more accurately inventory and identify surgical case scheduling in the future. A surgical depot was created in the electronic medical record (EMR) to inventory cases that were on the OR schedule,

deferred during surgical titration, and rescheduled during reactivation. Surgeons and surgical practice leaders were notified that in order to have deferred cases rescheduled, they were required to identify patients and cases within the depot. Cases not inventoried in the depot would risk being lost and not be rescheduled in the future.

Establish a Centralized Preoperative Examination Clinic

A preoperative examination clinic was designed and launched at the 3 surgical locations in the region (Eau Claire, Barron, and Menomonie, Wisconsin) to provide consistency in preoperative examinations, orders, and evaluations and to manage COVID-19 education, screening, and results. Space was identified immediately adjacent to surgical areas at all sites, staff with interest and expertise in this area were identified, a physician leader was identified, and processes and procedures were developed by a work group over the course of 2 weeks. This improvement was based on past institutional experiences¹ and was targeted to result in improved day-of-surgery scheduling accuracy as well as a favorable experience for the patient. Historically, case cancellations the day of surgery were a very rare occurrence, but case delays were a regular phenomenon due to inaccurate or missing orders. Finally, this approach offered additional capacity within the regional primary care practices that had been conducting these evaluations previously.

Identify a Single Robotic OR

The practice of transporting the surgical robot between various ORs wasted resources, reduced the available capacity of surgical robot time, and required additional maintenance and upkeep of the robotic equipment.² The region had been planning the acquisition of an upgraded surgical robot, with the planned arrival occurring in June 2020. In preparation for the arrival of the new equipment, the OR leadership in Eau Claire reconfigured room assignments among the surgical service lines and assigned a single OR to accommodate the robot and all robotic cases. This change eliminated the waste of time transporting the robot between ORs, eliminated the wear and tear of transporting, and decreased the need for

TABLE 1. Mayo Clinic Health System in Northwestern Wisconsin Surgical Sites and Operating Rooms

Site	Operating rooms at site
Eau Claire, Wisconsin	21
Menomonie, Wisconsin (critical access hospital)	3
Barron, Wisconsin (critical access hospital)	2

recalibration of the unit. Additionally, with the arrival of a substantially upgraded surgical robot, a commensurate increase in the demand for use of the robot was planned. This individual location made scheduling OR staff and resources far more efficient and forced a coordinated plan for use of the equipment by the surgical practices interested in expanding their robotic case volume. The alignment of the robotic surgical block schedule creates the opportunity for the SPS leadership to monitor OR utilization and OR turnover times between surgical cases to prepare for expansion of the robotic practice.

Align Case Type to Optimal Surgical Site

Hand and cataract surgical cases were shifted from the regional hub to an MCHS-owned facility operated as a CAH site within the MCHS NWWI region that is conveniently located 20 miles away from the hub just off an interstate highway. The site selected (Menomonie) provides simple travel for patients across the region. The high throughput and volume of hand and cataract cases were easier to schedule at a site with fewer surgical service lines competing for OR time and resources. Before COVID-19, limited hand and cataract surgery had been offered at this CAH site. The lower than optimal case volumes at the CAH contributed to inconsistency of supporting these cases and the ability to retain and recruit a full-time surgeon at this site. Although the CAH site was largely equipped to perform these operations and had ready capacity to support the additional cases being shifted, several key operational changes needed to occur in order to support the shift of hand and cataract cases. Specific surgical equipment, pharmaceuticals, and supplies needed to be transported between the hub site and the CAH site. Alterations to the EMR and supply software needed to be built to support patient care, billing, and supply inventory. Operating room and surgical

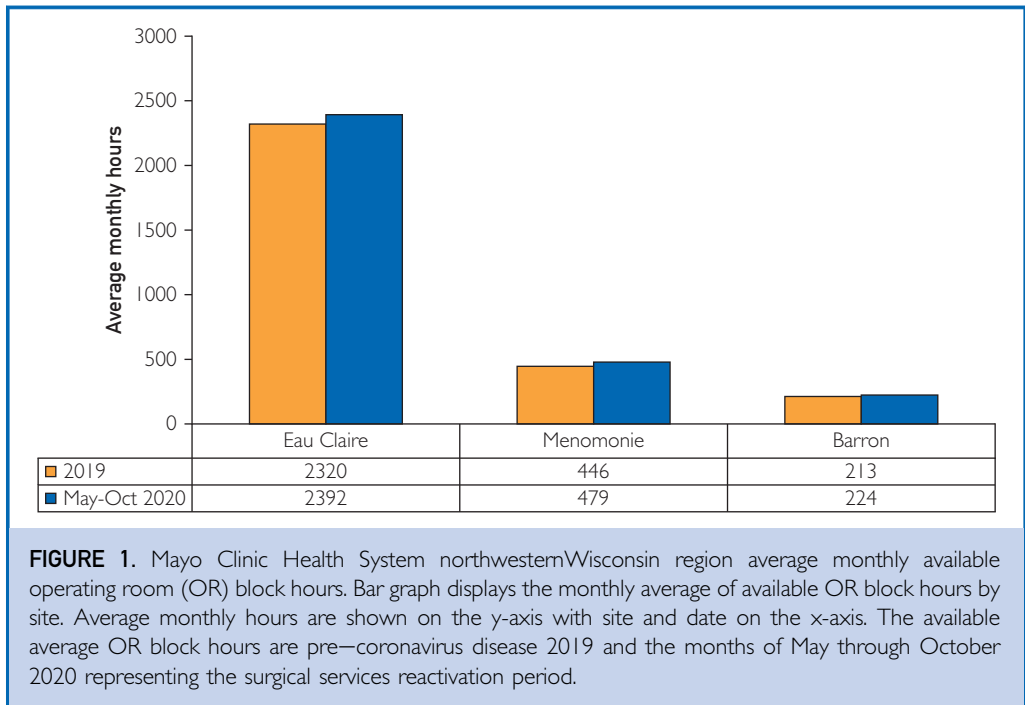


FIGURE 1. Mayo Clinic Health System northwestern Wisconsin region average monthly available operating room (OR) block hours. Bar graph displays the monthly average of available OR block hours by site. Average monthly hours are shown on the y-axis with site and date on the x-axis. The available average OR block hours are pre–coronavirus disease 2019 and the months of May through October 2020 representing the surgical services reactivation period.

preparation and recovery staff traveled to the CAH to support the expanded volumes. The rapid shifting of resources was possible because of several key structural elements within the MCHS. First, the MCHS has a standard pay and benefits structure in place with an

expectation for staff to support the surgical practice throughout the region, which enabled these operational changes. Second, a single courier contractor provides service to all MCHS sites within the region. Alterations to the current courier service were necessary to

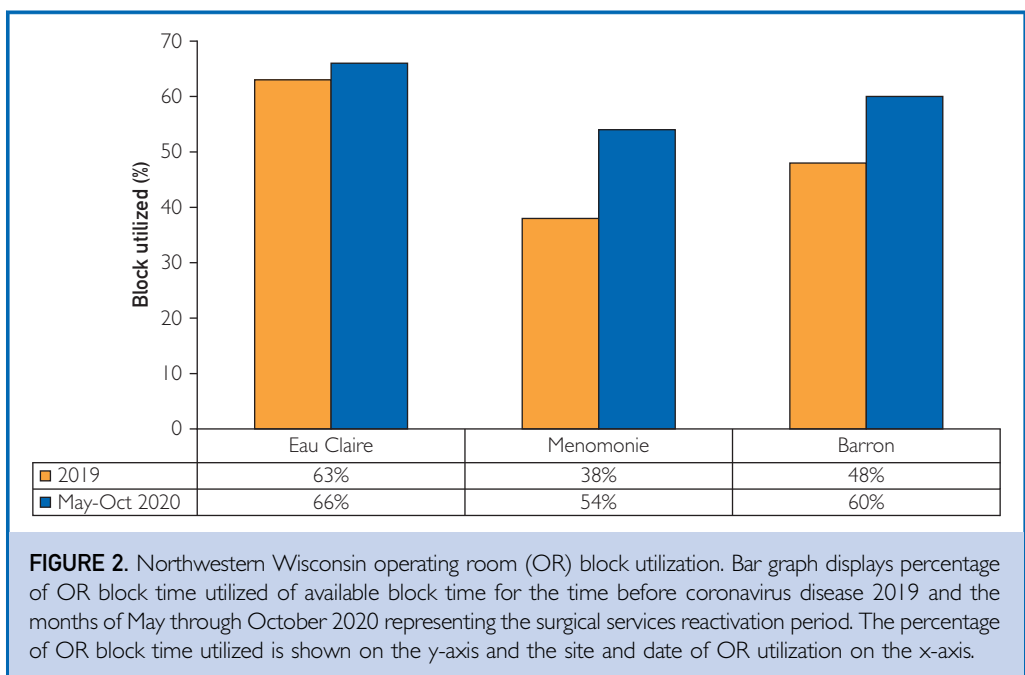


FIGURE 2. Northwestern Wisconsin operating room (OR) block utilization. Bar graph displays percentage of OR block time utilized of available block time for the time before coronavirus disease 2019 and the months of May through October 2020 representing the surgical services reactivation period. The percentage of OR block time utilized is shown on the y-axis and the site and date of OR utilization on the x-axis.

TABLE 2. Surgical Case Volume for Mayo Clinic Health System Northwestern Wisconsin Region, Stratified by Site^{a,b,c}

Site	2019 Pre-COVID-19 (N=14,806)	May-October 2020 surgical reactivation period (N=7062)
Eau Claire hub	11,871 (80%)	5033 (71%)
Barron CAH	926 (6%)	592 (8%)
Menomonie CAH	2009 (14%)	1437 (20%)

^aCAH, critical access hospital; COVID-19, coronavirus disease 2019.

^bData are presented as No. (percentage) of cases.

^cThe data depict the shifting of appropriate case volumes from the hub site to CAHs during the reactivation period of the surgical practice.

support the practice change but were accomplished relatively simply as a result of existing routes between the sites. Third, an integrated EMR supported the clinical practice with standardized documentation. Finally, the shift in this surgical case segment drove favorable reimbursement, and patients benefited by being able to have their procedure at a smaller, easily accessible facility featuring parking at the door and well-labeled directions to appointment suites.

Consolidation and Reorganization of OR Surgical Blocks at Hub Site (Eau Claire)

Moving hand and cataract surgical cases to the CAH created the opening for further consolidation of the OR schedule at the

hub hospital. Previously published findings indicate the effectiveness of lean and six sigma approaches to address surgical inefficiency,³ with several interventions focused on surgical schedule consolidation and reduction of variability. Applying these methods, historical block utilization trends by specialty were analyzed by the SPS leadership and reallocated to each surgical practice. The individual surgeon assignment within the block was the responsibility of surgical and operational leadership of each specialty department. Reallocation and assignment of OR block time required a change management plan including town hall meetings and open forums to incorporate surgeon questions and feedback. Weekly stakeholder

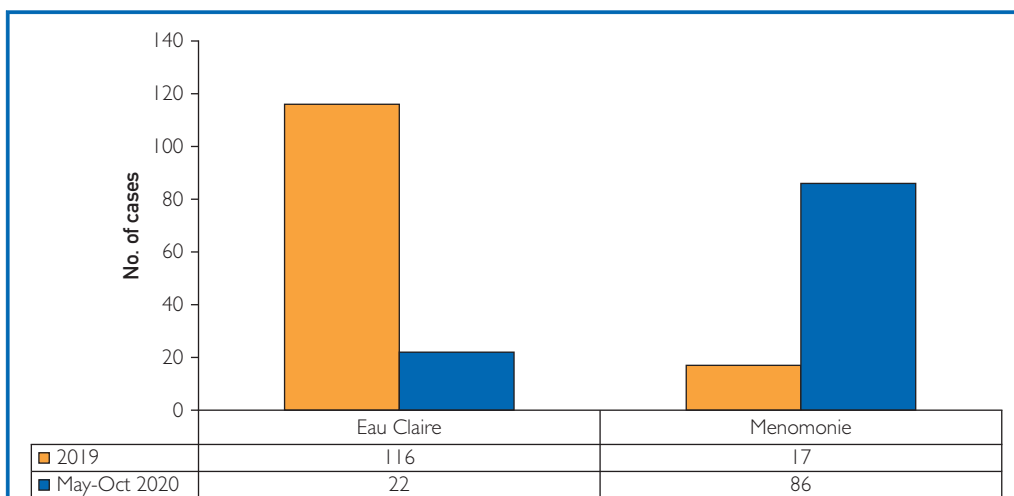


FIGURE 3. Eau Claire and Menomonie monthly average cataract volume. Bar graph illustrates the number of cataract cases on the y-axis and the site and date of cases on the x-axis. The data depicts the shifting of cataract case volumes from the hub site to the critical access hospital during the reactivation period of the surgical practice.

updates were held to review data including block utilization by specialty and add-on case trends. The reorganization and repositioning resulted in the closure of several ORs, which maximizes efficient use of resources and utilization and preserves space for future surgical growth.

RESULTS

The period May through October 2020 was used to evaluate reactivation optimization because there was a substantial surgical titration in November and December 2020 in response to a COVID-19 surge in the region.

Available Block Hours and Block Utilization for NWWI

For Eau Claire, the average monthly available OR block hours increased by 3% (from 2320 to 2392) during the COVID-19 reactivation, and block utilization improved from 63% (1461462 of 2320) to 66% (11597 of 23922) for an increase in utilization of 3%. In Menomonie, the average monthly available OR block hours increased by 7% (from 446 to 479), and block utilization improved from 38% (169 of 446) to 54% (259 of 479). For the Barron site, the average monthly available OR block hours increased by 5% (213 to 224), and block utilization improved from 48% (102 of 213) to 60% (134 of 224)¹⁻³ utilization. Thus, both available OR block hours (Figure 1) and utilization (Figure 2) improved at all 3 surgical sites.

Optimization of CAHs

The reactivation of the surgical practice created opportunities to optimize surgical and procedural practices at the CAH sites. Compared with 2019, the data for the time period May through October 2020 shows a shift of cases to the Menomonie and Barron sites (Table 2). Eau Claire performed 80% of operations in NWWI in 2019 (11,871 of 14,806) and during reactivation in 2020 performed 71% of the cases for the region (5033 of 7062). Menomonie's caseload increased from 14% of cases for the region in 2019 (2009 of 14,806) to 20% of cases after reactivation (1437 of 7062). In 2019, the Barron site performed 6% of the cases for the region (926 of 14,806), which increased to 8% of the cases postreactivation (592 of 7062).

Cataracts

A major contributor to case increase is the shift of cataract cases to a CAH with an eye care center of excellence model. All cataract operations, except for those in patients with medical complications, are performed at the CAH site.

In 2019, the hub averaged 116 cataract cases per month, and there was an average of 17 per month at the CAH. In May 2020 during surgical reactivation, the cataract cases were moved to Menomonie except for those in patients with medical complications. This move inverted the monthly average of cataract cases per month between the hub and CAH to an average of 22 cases and 86 cases, respectively, for the May through October 2020 period (Figure 3). A financial analysis of cataract cases performed between June and August 2020 demonstrates a favorable net operating income per case performed at Menomonie vs the hub site.

CONCLUSION

Prior to the COVID-19 pandemic, the NWWI regional surgical practice experienced challenges quantifying surgical case backlog and cases pending, inconsistent preoperative processes, OR utilization, service line location optimization, and efficient use of surgical robotic equipment. The ability to implement widespread changes prior to the COVID-19 pandemic was stalled due to physician concern regarding the long-term impacts of substantial disruption to their practice. The resistance was largely related to surgical schedule interruption and how those changes would impact other areas of the practice such as outpatient clinics and coverage of any inpatient hospital services. Over the course of a 2-week period when elective surgical cases were deferred, regional teams assembled to create and implement a reactivation plan that addressed these issues and made structural changes to the practice that resulted in major improvements in efficiency. The experience of the surgical practice titration and reactivation in response to the COVID-19 pandemic led our team to conclude that if multiple structural and functional opportunities for improvement exist simultaneously in the OR setting, leaders should consider a limited-time deferral of elective surgical cases to implement multiple changes. The selected time for deferral should be targeted to a period of historically low surgical volume to

minimize the disruption to patient care and to minimize the impact on overall OR functions.

Abbreviations and Acronyms: CAH = critical access hospital; COVID-19 = coronavirus disease 2019; EMR = electronic medical record; MCHS = Mayo Clinic Health System; NWWI = northwestern Wisconsin; OR = operating room; SPS = surgical and procedural subcommittee

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