# Enhancing Efficiency and Communication in Perioperative Services Through Technology

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Every driver dreads construction and detour signs. Likewise, patients seeking healthcare do not want to see a sign reading "Please excuse our delays." Unfortunately, delay is a common experience in Perioperative Services for both patients and providers. Poor communication in the perioperative area not only contributes to delay and frustration, but also wastes time and resources that needlessly increase costs. Healthcare organizations are challenged to increase efficiency and reduce costs while providing safe, technologically advanced patient care. Perioperative Services at the Greenville Hospital System (GHS) in Greenville, South Carolina, is using technology to drive efficiency, broaden communication, and gain both real-time and retrospective data for decision-making.

Patients obviously expect good surgical outcomes, but feedback from patient satisfaction surveys informs us that they also desire a safe, efficient facility that employs competent professionals with excellent communication skills. To improve these qualities, GHS Perioperative Services and Integrated Business Systems & Services (IBSS) partnered to develop OR-MAX. Greenville Memorial Hospital (GMH), where OR-MAX was deployed, is a 746-bed, Level 1 Trauma Center with 30 Operating Rooms completing 20,000 plus cases per year. OR-MAX is a computerized system that identifies a patient's location within the perioperative continuum using a Radio Frequency Identification Device (RFID), active sensors and passive portals. Manufacturing companies and airlines have used similar technology developed by IBSS for more than 20 years. The information gathered through the use of RFID tags and portals is electronically passed to the OR-MAX system. This computerized information is continuously updated and triggers messages linked to several view options. Since staff and physicians have been able to visualize information on the OR-MAX monitors, there has been considerable improvement in staff-to-patient response times.

In a 2010 Lean Six Sigma project conducted at GMH, a multi-disciplinary team including surgeons, anesthesiologists, the perioperative administrator, directors, managers, and front line nursing and anesthesia staff collaborated to improve patient preparation time and surgical through-put. The "First Case On-Time Start" project took more than a year

to implement. On average, 151 minutes were spent preparing a patient for surgery from the point of entry to surgical incision ("Total Process Time"). On average, 70 minutes were spent on actual preoperative nursing care and preparation ("Value-Added Time"), while 81 minutes were spent on steps of documentation ("Nonvalue-Added Time").

Nonvalue-added time quickly accumulates as nurses communicate via telephone, fax, pagers, and other devices to validate or complete physician orders, consents, test results and nursing documentation. OR-MAX enables Periop staff to gain real-time patient flow information while helping them optimize efficiencies while completing nonvalue-added, but essential, documentation. Surgical information is enhanced using visual cues by OR-MAX to improve real-time communication and providing analytical data, which assists Periop leaders in decision-making. Inefficient time spent on patient preparation also reduces the ability to schedule or surge additional case volume.

**Table 1: Value Stream Map**

| Metric | 2010 Six Sigma Project | Current State | % Change | Increase/Decrease |
|---|---|---|---|---|
| Total Process Time (Patient entry to incision) | 151 Minutes | 128 Minutes | 15% | Decrease |
| Total Value-Added Time | 70 Minutes | 70 Minutes | 0% | Neutral |
| Total Nonvalue-Added Time | 81 Minutes | 58 Minutes | 28% | Decrease |
| Process Cycle Efficiency (VA Time/Total) | 46 % | 55 % | 20% | Increase |
| Time Before Anesthesia visit | 7 Minutes | 5 Minutes | 29% | Decrease |
| Time before CRNA visit in Preop | 12 Minutes | 5 Minutes | 58% | Decrease |
| Time before Initial Patient/RN Interaction | 17 Minutes | 2 Minutes | 88% | Decrease |
| Time before surgeon visit in Preop | 29 Minutes | 12 Minutes | 59% | Decrease |

During the implementation phase of the Six Sigma Project, the use of OR-MAX programming and strategically placed monitors used for visual cues caused a 15% reduction in Total Process Time. The use of OR-MAX shaved 23 minutes off the 151 minutes previously required to prepare a patient for surgery. (See Table 1.)

OR-MAX uses several methods to obtain information:

- **RFID band**: Each surgical patient receives a case number, which is associated with an RFID tag. Preoperative nursing staff attaches this band to the patient/chart upon the patient's arrival.

- **Passive Portal**: A doorway that uses RFID signaling to automatically advance patient flow in the OR-MAX program as an active patient RFID tag passes through the portal.

- **Active:** Information documented by staff into other integrated/interfaced documentation programs i.e., scheduling, OR documentation, anesthesia documentation system or the OR-MAX program registering the beginning or completion of an event or task related to patient care.

- **OR-MAX Management Control:** This allows OR-MAX administrators access to change case scheduling times, add or cancel cases, adjust OR times, push or pull cases through each area of Periop and manage case flow based on information entered and gained through OR-MAX.

- **Staff Management Model:** OR-MAX allows staff to be assigned to a specific OR room. Surgeons and anesthesiologists also can be assigned in the same way. OR-MAX delivers several views of the system depending on organizational needs.

- P**reoperative View:** The Preoperative view of OR-MAX allows staff to visualize a patient's readiness, displayed through the completion of a "checklist" including the status of Physician Orders, Consent, History and Physical (H&P) documentation, patient-site marking and nursing assessment completion. The Preop checklist is displayed using colored icons that disappear when nursing completes the task and enters the information in a touch-screen handheld device or computer.

- **OR Control View:** The OR control area has a view of the overall schedule of each Operating Room, delineating patient name, physician assignment, and procedure type along with surgical time. The staff at the "Control Desk" also can view the Preoperative and Postoperative system screens to enhance decision-making of patient flow to and from the Operating Room. Previously, each area within Perioperative Services had to

communicate through phone calls or voice-over IP devices. With OR-MAX, updates are viewed as they occur, diminishing the teams' sense of "working in silos."

- **Core View:** In a large hospital such as ours, a central view located in the OR Core is highly useful for the OR Coordinators managing the cases coming through. This view helps staff understand what milestone or event the OR room is hitting, assists them in anticipating turnover, or alerts them to send for the next patient.

- **Postoperative View:** OR-MAX uses a display and a signaling mechanism with the Postoperative view. Patients are observed in OR-MAX by bed assignment and with the use of a flashing patient case number. The PACU is then alerted when a case in the OR is nearing completion. Using the information streaming from OR-MAX, Post Anesthesia Care leaders can adjust staff to flex up or down to accommodate volume changes.

- **Family View:** Families can track their loved ones throughout the Periop continuum by using a case number given to them upon admission. This display is updated each time a milestone is reached. For example, when a patient who has an associated RFID bracelet passes through the passive portal between the OR and the Post Anesthesia Care Unit. As milestones are reached a change in the case color can be observed on the waiting room monitors improving family communication and satisfaction.



- **Anesthesia View:** The anesthesia view of OR-MAX is based on their caseload for the day. The display represents case number, OR room, case start time, and the MD name assigned to the room. This view readily shows the number of rooms that one anesthesiologist is signed in to and signals the anesthesiologist if he or she is signed into more than four rooms at a time.

- **Surgeon View:** The OR-MAX screen designed for surgeons displays information by the surgeon's name, patient name, OR Room, and staff assigned to that room.

- **Staff View:** This view shows the OR schedule by room, surgeon name, case start time, the patient's initials, and checklist status, including the completion of H&P, Physician Orders, surgical consent, and patient assessment.



OR-MAX is programmed to deliver messages to physicians, staff and family using different methods of communication. It updates information via a monitor display and can send a text to cell phones, voice-over IP devices, and pagers. OR-MAX is a Web-based product therefore allowing individuals' access using any computer or programmed handheld device. Using OR-MAX in the Preop area, nurses can efficiently document preset tasks such as the completion of a patient's assessment, or account for a patient's H&P, Physician orders, labs and other items. OR-MAX can alert Surgeons and Anestheologist of a patient's arrival in Preop and the Operating Room, minimizing phone calls and improving staff satisfaction. As milestones are completed in the Operating Room, the OR-MAX monitor in the PACU displays the case advancement. For instance, the display information flashes in the PACU when a patient is emerging from Anesthesia, allowing the PACU time to prepare for a patient's arrival. OR-MAX also communicates surgical progression to family members in the waiting area by changing a patient's case number display to a different color.

Data elements reported by OR-MAX can assist Periop management in maximizing staff efficiency and Operating Room utilization. OR-MAX is capable of displaying configurable data in a dashboard format. For instance, IBSS can configure a dashboard to include scheduled case total versus an actual case total along with the percentage of total volume. A dashboard can also display the case cancellation rate and cases started on time. The Preop department can use OR-MAX data to trend the number of total patients and the percentage of patients prepared on time. For the Operating Room, OR-MAX trends the Operating Rooms on-time starts, OR utilization, plus procedure and room turnover. OR-MAX helps PACU leaders manage staff by trending the percentage of nurse-to-patient ratio based on acuity.

Manufacturing industries and airlines have benefited for decades by using IBSS technology in systems similar to OR-MAX to streamline their process flow and enhance quality and communication, which has reduced costs.

Greenville Memorial Perioperative Services has gained efficiency by reducing the "nonvalue-added" time patient spends in preop. OR-MAX has aided Perioperative Services in breaking down silos by enhancing communication among staff, physicians, patients and families. Real-time and retrospective data accumulated in the OR-MAX program also can be used by Periop leadership to make informed decisions and drive process improvement. Increasing efficiency and enhancing communication are important goals in Perioperative Services at GHS and using technology such as OR-MAX is helping us achieve this commitment to our patients, surgeons and Perioperative staff.

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