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The operating room (OR) is responsible for significant hospital and practitioner revenue in US hospitals. However, the OR is also well recognized as a high-cost, high-risk environment, whose resources are often perceived as poorly utilized. The goal of OR management is to create a safe, efficient, and structured environment at minimal cost. OR management is responsible for the coordination of the components of the surgical suite to optimize patient outcome and surgeon access and minimize patient delay while maximizing resource efficiency (personnel, equipment, and time) and maintaining an effective workplace for all personnel (surgical, nursing, and anesthesiology). Effective OR management has become vital for stability and success as hospitals struggle in a declining revenue environment.

Basic Principles of OR Management

The foundation for effective OR management is created by an engaged OR/Surgical Services Committee charged with decision-making authority for the OR. This committee is generally comprised of representation from surgery, OR nursing, anesthesiology, and the administration. Effective OR management requires integrated strategic (long-term), tactical (mid-term), and operational (short-term) decision-making. Operational decisions made the day of surgery are most effective when previous strategic and tactical decisions

have been made with the goals of patient safety and OR utilization and efficiency within the OR suite. The OR manager must be armed with structured decision-making algorithms that prioritize decisions on the day of surgery with these same goals in mind. Confusion and conflict between the OR's components are best avoided when these decision-making algorithms have been delineated and understood by all parties prospectively.

Strategic decisions include the number of operating rooms or additions of operating rooms, size, structure, and location of preoperative holding areas and postanesthesia recovery areas, recruitment of surgical subspecialists, orientation of support areas (blood bank, pharmacy), and relative location of ICUs or offsite procedural areas that impact anesthesiology coverage (GI lab, cardiac catheterization lab). Strategic decisions are costly and must consider overall impact on operating room function.

Tactical decisions made months in advance include allocation of OR time and development of staffing schedules. Particular consideration to specialty equipment and provider staffing is essential to avoid costly equipment duplication and assure adequate specialty resource coverage.

Operational decisions deal with the day-to-day management within the OR and begin with final staffing assignments the day prior, with coordination of subspecialty staffing and equipment needs. Priority-based decisions made the day of surgery focus first on patient safety and quality of care delivery, followed by surgeon access, operating room efficiency, and reduction of patient wait times. Other priorities, including education and professional satisfaction, should also be considered. Recently, authors have modeled OR operational decisions utilizing gaming and queuing models or algorithms based on cost implications. This information allows the OR/Surgical Services Committee to develop informed algorithms used by the OR management team to effectively manage the dynamic environment of the OR to address overall daily surgical demand.

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Operating Room Performance Metrics

Typical OR performance metrics include on-time starts, turnover time, gap or idle time, OR utilization, and OR efficiency (Table 56.1). The relative value for improvement in each of these measures is institution specific. Efforts for improvement should evaluate each within a given site. On-time starts, idle time, and OR efficiency have the greatest value for improved performance and also pose the greatest challenges.

When comparing on-time starts between institutions, it is important to note that “start time” is often defined differently. Wheels-in time, prep/position time, and incision time each have been used as the defining event for a start time. However, a standard definition must be used for comparative metrics. Historically, the standard has been wheels-in time. However, this does not align with the primary purpose of an OR or capture periods of costly delays that often occur after the patient crosses the OR threshold. Incision time includes variables such as prep and positioning that are often difficult to account for in planning for a standard start time. Prep/position time is the time that all components of the OR converge: anesthesiology has completed induction, OR nursing is prepared, and the surgical team is ready. For this reason, prep/position time sets timing expectations for each component of the OR team.

OR efficiency relates to how well OR resources are utilized in completing the actual caseload and can be translated to costs using simple formulae. Underutilized time is the

amount of allocated time not used to perform OR workload, while over-utilized time exists when OR workload exceeds allocated time, resulting in overtime or other premium costs. Over-utilized time costs between 1.5 and 2 times underutilized time. Therefore, a goal for the OR manager must be to reduce over-utilized time. The cost of these inefficiencies can be calculated as follows:

$$\text{Inefficiency(\$)} = \left[\begin{array}{l} (\text{cost per hour of under – utilized time}) \times \\ (\text{hours of under – utilized time}) \end{array} \right] + \left[\begin{array}{l} (\text{cost per hour of over – utilized time}) \times \\ (\text{hours of over – utilized time}) \end{array} \right]$$

An effective OR manager has the authority to manage these inefficiencies by shifting caseload into gaps that develop in the schedule. This idle time often represents the bulk of inefficiency in the OR with attempts to managed this time difficult due to conflict with surgeons from changes in anticipated surgical start times. However, in an environment of limited OR personnel resources, shifting caseload to reduce idle time can reduce over-utilized time and reduce the queues that can develop with restriction of resources later in the day.

Table 56.1 Basic definitions

Case duration	The time from when the patient enters the OR to when the patient exits the OR
Turnover time	The time from when a patient exits the OR to when the next scheduled patient enters
Idle time	Time where the OR is staffed and available but there is no surgery
OR workload	The total hours of surgical time, including turnover time
Utilization	Workload/available time—can be reported as block utilization, primary time utilization, or overall utilization
Underutilized OR time	The positive difference between allocated OR time and OR workload
Over-utilized OR time	The time that the OR runs past scheduled OR time. Many employees collect overtime pay
Inefficiency of use of OR time	Inefficiency of use of OR time (\$) = (cost per hour of under-utilized OR time) × (hours of under-utilized OR time) + (cost per hour of over-utilized OR time) × (hours of over-utilized OR time)
OR efficacy	The value that is maximized by minimal inefficiency of OR time

Operating Room Information Systems

The OR manager relies on effective information management and communication governed by clearly defined rules and priorities in the dynamic OR environment. Informational management and communication can be complex and expensive, with RFID (radio frequency identification) tracking of patients, patient tracking boards, OR cameras, and automated notification systems. Also, simple vigilance, rounding, and effective direct communication by the OR manager can be equally effective as these newer modalities. Further, models for decision-making by the OR manager have been developed to make critical operational decisions to minimize over-utilization. Currently, priority-based algorithms are being developed for automated case management decisions. These tools may help the OR manager to more effectively manage the complex dynamic OR environment.

Challenges in OR Management

Allocation of OR Time

Currently, block scheduling is the most common methodology for allocation of OR time. However, the introduction of service-specific staffing has resulted in many institutions adopting this methodology or blending basic concepts of this

methodology into their OR allocation methods. The relative benefits of each allocation method are institution specific; however, service-specific staffing is becoming increasingly recognized for its benefit in personnel efficiency.

Block scheduling relies on the allocation of a set number of set-sized blocks determined by OR and anesthesiology staffing capabilities. Allocation of OR blocks is made to surgeons and services based on requests and hospital priorities. Maintaining the block generally depends on a defined level of utilization. Block scheduling attempts to shape the caseload to available overall resources distributed evenly throughout the week (e.g., within the five available ORs, five 10 h blocks are created each day for a total of twenty-five 10 h blocks per week).

Alternately, service-specific staffing approaches allocation of OR resources based on *expected* surgical case volume. Tactical planning by an OR allocation committee assigns first case starts by service or surgeon with the length of allocated time determined by historic caseload length. The resultant schedule is staffed to most efficiently manage its size and shape. While the number of rooms running and length of schedule may vary by day of the week, the resultant schedule is built to match expected caseload. When viewed from an efficiency standpoint (matching resources to actual caseload), with block scheduling, surgeons are responsible for efficiency by fully filling their “blocks,” while with service-specific staffing, managers are responsible for efficiency by staffing to match service need.

Case Scheduling and Emergent Case Management

Effective scheduling within allocated time relies on accurate projection of case length and required resources (Fig. 56.1). Many institutions have computerized the scheduling systems to limit case duration bias and prevent overlap of cases requiring specific equipment or other resources. The impact of emergent or urgent caseload must be considered within the overall availability of OR resources. The most effective way to manage this caseload is dependent on individual hospitals and OR conditions. Emergent cases can be accommodated within the elective schedule by moving or “bumping” cases. Urgent cases can be performed after completion of the elective schedule. “Holes” can be built into the elective schedule based on expected urgent and emergent caseload. Finally, specific ORs can be designated solely for the anticipated urgent/emergent caseload. Determining the best methodology relies on utilizing priority-based queuing models with evaluation of expected case flow. Effective urgent/emergent case flow management can significantly improve overall OR efficiency and utilization by limiting the impact of these cases on the elective schedule and appropriate resource allocation for expected non-elective caseload.

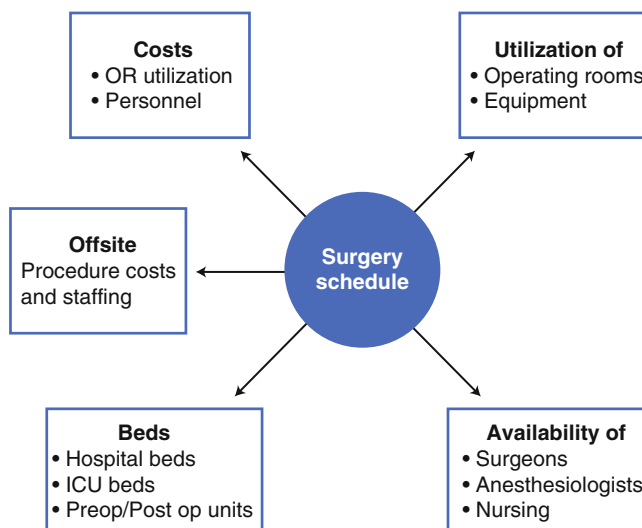


Fig. 56.1 Factors in scheduling

Constraints of Effective Operational Management

There are several constraints to effective operating room management that are common in the average US hospital. These include competing goals, incentives, priorities, and expectations of the OR’s components (surgery, anesthesiology, and OR nursing). All components tend to focus on individual performance rather than the overall goals and priorities of the OR, and mismatched goals and incentives often lead to conflict. For example, prepaid or hourly workers gain control of the workday by maintaining inefficiencies. This may be reflected in the end of shift slowdowns or longer turnovers. Incentive workers (surgeons and anesthesiologists) gain control with greater efficiency, pushing for faster turnovers and more cases. This leads to conflict and disruption of teamwork within the OR. Further, while the OR manager concentrates on overall OR efficiency and effectiveness, surgeons may view efficiency as individuals, pushing for that second room, or otherwise willing to sacrifice the OR’s overall efficiency for their own cause. These are common areas of conflict within the operating room, and the OR manager must be charged with the authority- and priority-based algorithms to prevent disruption of the OR by these conflicts.

Summary

Effective OR management requires an insightful and informed Surgical Services/OR decision-making team and an operational OR manager armed with effective information management and priority-based management algorithms and skilled in conflict mitigation. Anesthesiologists are positioned well to take the lead in this role. The success of an Anesthesiology

department is tied to the success of the operating room with incentives directly aligned with the hospital. Inefficient utilization of allocated surgical time impacts costs for both the hospital and anesthesiologists. An anesthesiology-led OR management environment focusing on patient care and surgical access, while improving OR efficiency and reducing costs, can change the perception of our specialty from that of a necessary cost to a partner in success.

Further Reading

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