

**Mitigating Agency Problems and Enhancing Cash Flow in the Hospital
Operating Suite using Optimal Scheduling Techniques**

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Introduction

Hospital administrators, like financial professionals in all industries, are seeking ways to increase cash flows from assets in place. Operating suites within hospitals have the potential to generate larger cash flows by paying greater attention to how scheduling of cases is performed. Problems in realizing optimal scheduling are often the result of agency issues between the various constituents that work within the operating suite, each having a different profit objective.

The goal of hospital administrators is to maximize positive cash flows from the operating suite assets, while ensuring the needs of the various groups of medical personnel (surgeons, anesthesia, and operating room crew) involved are met. The operating rooms themselves represent a fixed cost that is relatively high. Thus it is important for the hospital to deploy these resources optimally in tandem with the variable labor costs involved. Depending on how contracts are designed, the operating room crew consisting of nurses and techs are usually employed by the hospital, thus representing variable labor costs to the hospital. From the viewpoint of hospital administration these are costs to be minimized.

Anesthesia groups are frequently contracted by the hospital to perform anesthesia services rather than being employed by the hospital. The hospital administration negotiates these contracts for multi-year periods, locking in a fixed cost to the hospital. The anesthesia group then bears the risk of cash flow variability depending on how anesthesiologists and nurse anesthetists are utilized in meeting the needs of the surgical schedule.

Surgeons represent the third primary group and are often viewed by administrators as the key to the success of an operating suite, as they provide a revenue stream to the hospital. As a result, surgeons may be given more latitude when scheduling cases, even if their requests inconvenience the other two groups and are financially detrimental to the hospital. Keeping specific surgeons is often considered paramount to other considerations and exerts a strong influence in how the hospital structures the operating suite schedules.

It is important to emphasize that each hospital is unique in terms of the assets in place, personnel employed, and the culture. All of these variables influence how contracts are designed, which in turn plays into the design of the scheduling algorithm that is employed in the operating suite. Using our approach to scheduling, the agency problems between the three primary groups (hospital, outside contracted anesthesia groups, and surgeons) can be minimized while increasing sustainable cash flows over the long-run. Other scheduling approaches currently in

use tend to enhance the bottom line in the short-run through a one-time increase in cash flows.

Scheduling of cases

An obvious place to start in determining how to increase cash flow in the operating suite is to examine how cases are scheduled. Programs based on traditional statistical methodology are employed by most hospitals to aid in scheduling. When finding the statistically optimal schedule, many subtle but important variables are excluded. The culture of each individual operating suite will dictate how the optimally determined schedule is changed to meet the needs and desires of participating medical personnel from the various disciplines. As a result, the schedule that is finally followed may contain several changes, which result in under-optimization of the operating suite assets, including personnel.

By becoming more discerning about the impact of various operating suite cultural norms and integrating them consciously into the schedule, it is possible to develop a new paradigm that will enhance the return on investment in the operating suite. The overriding managerial question is that of who has control over the schedule in the operating suite. This is often determined by the cultural structure of the hospital. Does the hospital administration run the scheduling board for the benefit of the hospital in terms of potential profit? Is it the surgeons who dictate which cases will be done and when? Or are cases performed when all members of the team are available, thus causing delays for various groups and loss of revenue to the hospital itself? Other factors come into play, such as whether everyone in the operating suite employed by the hospital or if certain physician groups have contracted with the hospital to provide services. Surgeons often have privileges at more than one hospital, and can perform surgery where it is more convenient and beneficial for them. Even if an operating suite is ostensibly run to maximize the dollar benefit to all participants, there are often small but significant practices that can prevent this from actually occurring.

The typical surgical case

First, it is important to understand the time line of a typical surgical case in order to better grasp how the various groups that compose the team can perceive time differently. This difference in time perception can significantly impact the cash flows to the operating suite. Profits from the operating suite can increase significantly when the assets in place can be utilized more effectively by correcting time misperceptions among the different groups involved.

The onset of a case can be viewed as when the operating room crew begins to set up a room for a specific case. This marks the start of the time that this particular room will be unavailable for other uses – it has become dedicated solely for this one operation and will not be otherwise available until the surgery is finished and the room cleaned. Set-up involves bringing in various pieces of equipment depending on the specific operation to be performed; the required time for this can be estimated fairly accurately from past history.

Greater variability is introduced in the next stage – when the patient enters the room and is prepped for surgery. This can be defined as the pre-incision period

and may overlap the setup-period. For some hospitals, the entry of the patient into the operating room is also defined as the start-time for the case. If this is true, then any variability in the pre-incision period will not affect start-time. For other hospitals however, this start-time may not occur until the surgeon enters the room and actually makes the first incision. Most surgeons prefer this definition of start-time. As a result, the hospital bears the cost of pre-incision variability. Depending on the type of case, this variability can be enormous. It is this discrepancy that offers an opportunity for administrators to make their scheduling of operating suites more efficient and profitably sustainable over the long-run.

Another time demarcation occurs when the surgeon is closing the wound. In some situations, someone other than the surgeon closes, leaving the surgeon free to start another case in another operating room. As we will see later, this has significant implications for operating room usage in terms of being able to flip rooms for the benefit of both the hospital and the surgeon.

Finally, the case is considered finished when the patient is rolled out and the room is cleaned and made ready for the next start-up. One goal of most scheduling programs is to minimize this time between the finish of one case and the start of another in order to maximize utilization of the rooms and personnel.

The time line of the typical surgical case delineated above highlights the importance of knowing the exact definition of start-time in a given hospital, as it is a critical factor in understanding which party is bearing the cost of time during a given surgical procedure. Furthermore, any deviation in actual times from anticipated times can prove to be costly to both the hospital and to surgeons. The impact of the first case running over time has a greater impact on revenues and costs than a case running behind later in the day. The trickledown effect of starting each subsequent case later may lead to canceling cases or paying overtime in order to complete the schedule for the day. This results in increased costs to the hospital and/or lost revenue, due to poor and unsustainable asset utilization. The most critical scheduling then occurs at the start of the day to ensure greater efficiency throughout the remainder of the schedule. As surgeons are instrumental to all cases, it is imperative to have buy-in by surgeons. A schedule that can meet a given surgeon's preferences and be financially beneficial to the hospital is far more sustainable over the long-run than one that is motivated solely by profit for the hospital or one that caters only to surgeons' demands.

Start-times

By establishing and enforcing a specific start-time for first surgeries of the day, a hospital administration has the ability to better utilize both the rooms and equipment, as well as the personnel involved. Suppose that a 7am start time is established, defined as when the surgeon is present and ready to cut. This means that the patient and the operating room crew, including anesthesia, have already performed all their respective tasks necessary for the surgeon to begin, which we referred to as the set-up period and pre-incision period. Depending on the type of case, this could take as much as two hours or as little as half an hour. If the surgeon is indeed ready at 7am, then the hospital will have utilized both employee time and room time efficiently. However, if the surgeon is tardy, then the hospital bears the

costs of paying for non-productive time for the operating crew as well as anesthesia related charges. The surgeon generally is not penalized – he or she has effectively shifted the cost of being late to the hospital. It should be emphasized that this is not a one-time shift of costs, as this first case will create additional costs to the hospital later in the day when employees are kept over time to finish cases, in addition to opportunity costs in lost revenues.

Potential revenue gains from having the initial start-times enforced include the possibility of being able to schedule an additional case in a room later in the day. The key to reducing costs to the hospital for late initial start-times is to have surgeons who are not salaried and employed by the hospital bear the costs of starting late. This will require some negotiating, particularly in situations where the surgeon has other hospitals available. Possible solutions include: (1) offering 7am start-times only to those surgeons who have demonstrated the ability to come in and start on time; (2) schedule only the surgeon's partners to follow him or her in a particular operating room to contain the costs; (3) ask the surgeon to bring his or her own PA to help set-up the room and decrease the precision time; (4) have the surgeon pay for the time that the operating suite crew is waiting on him or her. A fifth possibility that may provide more of a "carrot" solution is to offer the surgeon "flip-rooms" in the afternoon, so they can perform more cases, bringing additional income to both themselves and the hospital.

Flipping rooms

Operating rooms carry high fixed costs for hospitals; thus by minimizing the time they sit idle helps to reduce overall costs. By increasing the use of each room so that the increase in variable costs for personnel is less than the increase in revenues generated, operating suites can contribute a more sustainable cash flow to the hospital. One way to do this is through efficient flipping of rooms, which also benefits the surgeons who participate.

To illustrate how flipping of operating rooms works, we will use the example of one surgeon who typically works from 7am until 4pm in surgery. If his or her cases normally range around one hour from incision to close and require an average of an hour and a half per case for set-up and clean-up in the same room, then the surgeon would be able to perform four cases on a given day. The room would be fully utilized, as would the operating suite personnel. There would however be down time for both the surgeon and anesthesia while the room is prepared and cleaned.

If another room is simultaneously made available to the surgeon, then it is possible for this same surgeon to perform seven of the same cases in the same period of time as above. As the surgeon closes on the case in the first room, the patient in the second room is ready for the first incision. This scenario represents the extreme case of the surgeon working continuously throughout the day without a break, which can be adjusted to allow for a break or breaks as needed.

Even with the increased need for operating suite personnel in setting up and cleaning up two rooms, the increase in revenue exceeds the additional variable labor expense and operating rooms are used to their full capacity. By having more rooms available for flipping, schedules can be adjusted to meet surgeons'

preferences for increased or decreased time between cases. In any case, it becomes a win/win situation for all concerned: the hospital experiences a sustained increase in revenues, surgeons are able to increase their income and potentially reduce the time spent at the hospital, and other operating suite personnel are fully utilized.

Going beyond the scheduling program

As can be seen from the foregoing discussion, it is possible to increase cash flows from the operating suite by taking into account the cultural milieu of a hospital to minimize agency costs between the various participants. Scheduling cases so that surgeons' preferences are taken into account, while simultaneously maximizing use of fixed assets and personnel at the hospital can prove financially beneficial on a sustainable basis for all parties involved.