Using your EMR to Improve Operational Efficiency

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More and more hospitals and hospital systems are investing in electronic medical records (EMRs). With all of the recordkeeping, most institutions are sitting on mounds of data, typically warehoused, ripe for data mining for knowledge acquisition and outcome improvement. One area that lends itself to this is the operations of surgical services. This purpose of this talk is to show how an EMR can be used to improve operational efficiency of the OR suites.

Introduction: Businesses thrive when income is greater than the expenses. Generally an operating room gains revenue for operating, while it is loses revenue when it is not operating. This cost has been estimated at $10-$30 per minute. Operative time is typically defined as in room till out of room. Non-operative time can be summed up as time prior to the start in the room for the day, turnover time the time between sequential cases, and down time. Surgical cases are typically scheduled by surgeon or service into reserved time or blocks. On the Schedule, everything looks clean and neat, however what occurs on the day of surgery is any thing but.

The goal is to minimize the non-operative time and increase throughput or the number of patients that can be operated on in a given amount of time (improve efficiency). To this end what is required is to remove redundant processes, and employ parallel processes as opposed to serial processes wherever possible, to reduce the time between cases and therefore maximize the operative time. The goals of the operating suite and the anesthesia service are the same, improving the efficiency of operating room throughput will improve anesthesia group productivity.

First case start time, turnover time and block utilization are three common measures of operating room efficiency. The anesthesia EMR is able to typically record the first two but an OR system or nursing EMR is required to obtain block utilization measures, because it is dependent on the surgical schedule information.

Datasources: Depending on the hospital, there may be an EMR for Anesthesia (also referred to as an Anesthesia Information Management System or AIMS), or an OR Information System, which handles scheduling, doctor preference cards, and nursing documentation. Our institution has had the Compurecord Anesthesia EMR since October 1997, and has recently gone live with our second OR EMR, and is now using EPICs Optime Operating room system. Mining the data obtained from each operative encounter can provide a wealth of knowledge about efficiencies in the operative suite.

Typically data is gathered real time as the cases are occurring and then packets of data are passed to long term storage environments and become available for query. In our situation, we are able to have near real-time case information data from our anesthesia information system, while our operating room system information is data warehoused. The data is still accessible but usually with some assistance from our strategic analytics group, or report writers.

The advantage of the EMR is that data on every case is collected real time or near real-time. Reporting can thus occur near real time. Process feedback can be set up at any desirable interval, daily, weekly, monthly etc. Employing a person or persons to record as many data points times or abstracting such data points from medical records from multiple ORs to a database or spreadsheet is near impossible. The EMR is able to allow the macro view of analyzing aggregate data over time and the micro view by aiding in identifying exceptional outliers.

Start Times: The start time of the first case of the day is always a favorite measure of OR efficiency. If the first case gets in on time, then every case thereafter will be on time. If the first case is late, then all the cases will be delayed. Well…maybe. Surgical services are complex beasts with many moving parts and as such there are numerous reasons for cases to not quite get out of the blocks. Certainly the emotional well being of the surgical suites are ensured with prompt case start times.

A computerized case tracking system is essential to understanding the factors that impair cases from starting on time. We use the time the patient crosses the threshold into the room as this documented start time, as recorded by either the OR system or our anesthesia system. What measure should be used to monitor starts? Average start time, Median start time, or percentages of cases starting by …are all useful, but whichever measure is used needs to be decided on and tracked to know how the measure is doing.

Timed events such as Start Time demonstrate a right skewed distribution, with very few cases starting prior to the event, with most cases clustered close to but after the scheduled time with progressively fewer cases straggling in at later times. The average start time can be tracked by months or weeks but as a measure can be adversely affected by terribly late cases. The median start time for a month can be used, is less affected by late cases, but has less power as a measure of central tendency the less numbers of cases are performed. Some authors have used a logarithmic transform of the skewed data for statistical purposes, but most institutions find this cumbersome for routine reporting.

Percent of cases in by say, 5 10 15 or 30 minutes can also be used and tracked. What ever measure is used it is much facilitated by a dispassionate recording system as opposed to manual scribes. While just knowing that you are being measured may improve times temporarily (ala Hawthorne effect), true improvement requires process change, in order for the change to be sustainable. This would include allowing and encouraging entrance into the rooms prior to the scheduled time, limiting redundant processes and roadblocks to entry, better staffing for complex set ups to name a few.

We have recently used weekly percent of cases in the OR by 5 minutes of the start and have shown some success. Whether any changes to process are effective will take tracking over time which electronic systems are able to do.

Turnover Times: Turnover time (TT) is one of the more emotional topics in the operating rooms. Even the definition of the TT can cause a fight. The surgeon typically thinks of anytime he/she is not operating as TT, while anesthesia and nursing are more comfortable with the use of room time as the definition of TT. Its very mention is liable to generate heated conversations, and yet it is a very measurable parameter and a useful measure if used in an educational as opposed to punitive way. TT are never zero can never be negative. Increased turnover times are usually a symptom of process failure rather than the disease.

We use the AACD room time definition, which is the difference between the time out of one patient and the time in of the next for sequentially scheduled cases in a given room. If there are service or surgeon changes we don't consider that sequentially scheduled. The reason for this is when aggregate data by service or surgeon is used to you attribute the bad turnover time to the first case service or the second case service.

As with all timed events TT also shows a right skewed pattern, and there are significant differences between services as case requirements differ. It makes no sense to compare the turnovers between ear tubes and spine fusions. The information systems allow looking at aggregate data for TT by rooms, services, surgeon, anesthesiologists, and even nursing teams, and it is useful for looking at outliers. If there are patterns noted then processes can be altered with positive change noted for the parameter.

Block Utilization: Block Utilization (BU) is defined as the total case time scheduled in block divided by the allotted time, expressed as a percent. The blocks of time allotted, are like recurrent table reservations at a fine eating establishment. While commonly used as a measure of the surgeons schedule stewardship of OR time, there are limitations to what BU can tell us. For example, a low BU may be due to excessive turnover times while high BU may be due to inefficient surgeons, and it varies significantly with the surgical specialty. Therefore a given BU may require interpretation. BU is often employed to answer the question of who needs more block, even when the BU for a given service is low.

To better answer the question "who needs more block" we have utilized BU and another parameter, scheduled time not in block (SNIB). All cases are scheduled or unscheduled. Of the scheduled cases they are either scheduled in block or not in block. Presumably if a service has high BU, and a lot of cases scheduled out of block then they may be candidates for more block. Likewise if they have a low BU and low SNIB they probably don't need more block, or need to use there existing block better. After looking at the profiles of the services we chose a BU of 60% and a percent scheduled out of block of 20% as markers of good performance. We have tracked this for several years now and it has been quite helpful at determining what to do best with the services. In our most

recent quarter we have had six of ten services in the greater than 60% range, with low out of block scheduling.

Conclusions: Activities of the operating rooms are very measurable. The EMR is well suited to provide the raw information used for improving the efficiency of operating rooms. The EMR allows for analysis of summaries of aggregate data, over any time interval needed. The EMR also allows the data mining to expose recurrent outliers. Once information is available, it is necessary for perioperative committees to decide what parameters are to be tracked and how (i.e. statistical process analysis). When process changes are undertaken the EMR will show whether they have been effective.

Suggested Reading:

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Macario A, Are your hospital operating rooms “Efficient”? A scoring system with eight performance indicators. Anesthesiology 2006; 105: 237-240

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