Harnessing the Power of IT to Drive Greater Return from your Perioperative Solution

An ROI White Paper
By using a best-of-breed perioperative information system, hospitals can experience over $2.2 million in measurable benefits from operational efficiency gains, optimized financial performance and improved clinical care in the first year of implementation – all this while generating a positive return in 7.5 months and an ROI of 484% within three years.

– Hobson & Co. July 2008

Introduction

Hospitals nationwide are facing the two edged sword - financial pressures to maintain or increase their revenue despite mounting cost containment efforts from government and insurers and health care delivery pressures to improve or at least maintain the quality of services provided to patients. Perhaps more than any other service area, perioperative services influences a hospital’s financial and clinical health. In fact, for many hospitals the OR generates between 60-65% of all revenues and around 45% of all expenses.

Given the clinical and cost complexities of the OR, a specialized or best-of-breed perioperative information system can provide many benefits and operating efficiencies to a hospital and contribute significantly to its overall success. The following study based on research conducted by Hobson & Company, a financial research firm specializing in determining ROI for information technology solutions, has identified and quantified the value and ROI benefits hospitals are realizing from the use of specialized preoperative information systems.

Methodology

This study, commissioned by Surgical Information Systems (SIS), a leading provider of comprehensive perioperative solutions for healthcare organizations, was conducted in 2008 with OR managers, physicians, other clinicians, and IT staff in 7 hospitals. The purpose of the study was to specifically identify areas of value these hospitals had derived from their perioperative information systems, quantifying these benefits whenever possible to establish a financial ROI.

Executive Summary

Given the complexities that make up a hospital’s perioperative environment, such as managing physicians and nurses, accounting for and controlling supplies and implants, maintaining schedules that maximize room utilization, improving patient safety, and ensuring compliance, it’s natural that competition for perioperative software solutions is at a high.

The many solutions already in the marketplace include both HIS and best-of-breed vendors. But, given the current economic climate, it is important to reassess existing systems. Reimbursements are down, costs are up, and new safety standards are all forcing the OR to lean toward being a cost center rather than a profit center. Perioperative service line directors are being asked to provide measurable results in hard numbers to account for high patient, implant and supply costs and slow turnover times. Without the streamlined processes or consistent meaningful data provided by a single database software system, it is difficult to measure these results in hard numbers.

With a single database system, greater efficiencies are achieved throughout the perioperative environment. With these efficiencies, ranging the entire spectrum from PAT Scheduling to Pre-Op to PACU to Anesthesia, financial performance is optimized and clinical outcomes improved. When used systematically throughout the entire service line, this perioperative automation software leads to measurable results.
The challenges facing perioperative environments are:

- OR efficiency is limited by insight into scheduling, turnover times, and cancelled cases, as well as time consuming patient documentation.
- Optimal financial performance is jeopardized by complicated charge capture and manual billing processes which delay cash flow.
- Adverse outcomes and treatment costs are difficult to evaluate due to lack of timely and complete patient data.

Our summary conclusion:

The value of a focused surgical information system is immediate and demonstrable. A. average hospital with 8,000 procedures per year and 12 ORs can experience $2.2m in operational efficiency gains, optimized financial performance, and improved clinical care in the first year of implementation using a specialized perioperative system like Surgical Information Systems (SIS).
Key Challenges Facing Perioperative Environments

After interviewing Anesthesiologists, Directors of Surgical Services, RNs, Physicians, and IT/IS Project Managers at a number of hospitals across the U.S., three key challenges were identified for the perioperative environment:

Challenge 1: Reduced OR efficiency due to limited insight into scheduling, turnover times, and cancelled cases, as well as time consuming patient documentation.

The Solution: Automate the scheduling process

Surgical procedures contribute a majority of a hospital's revenue but yet, departments within Perioperative Services are often plagued with inefficiencies. Lack of coordination and insight into scheduling leads to under-utilized OR suites, long turnover times, and inefficient use of surgeon block scheduling. Industry statistics point out that hospitals typically only use 57%-68% of their OR capacity. Under utilization of OR Rooms during normal staffed hours is an inefficient use of labor cost that can exceed $3m per year (increased overtime and decreased staff satisfaction).

“We were forced to cancel cases at the last minute due to equipment conflicts that should have been identified in advance.”

- Director, Surgical Services

OR Directors often don't have the data necessary to fully understand the causes and the impact of inefficient scheduling. As a result, OR's remain empty when surgeons don't utilize their block time and long turnover times force case delays, resulting in extra overtime to cover these late cases. Development of an effective OR scheduling program improves case start times, maintains efficient utilization of resources, improves productivity and decreases cost per case.

Inherent scheduling inefficiencies also impact pre-admission testing and, consequently, day-of-surgery cancellations and delays in patient preparation. Case scheduling and pre-admission testing are often not integrated, resulting in inefficient pre-admission testing processes. Interviewees often cited the fact that they had little insight as to the causes of day-of-surgery delays and cancellations, but believed that at least 25% of these cancellations are due to lack of pre-admission testing. There is a huge impact on the hospital every time a day-of-surgery cancellation: the hospital loses revenue and patient satisfaction drops.

Reduce clinical documentation time

Throughout the entire perioperative process, from pre-op and anesthesia to PACU, documentation is time consuming. After a nurse has completed patient care, they must then complete the patient’s chart. If this documentation is delayed, the patient data may be forgotten and the chart may be incomplete. Errors are more likely and overtime costs are incurred.

Immediate access to anesthesia information.

Without a single focused database, anesthesia inefficiencies can also impact the hospital’s bottom line. A patient’s previous medical records are typically reviewed prior to administering anesthesia for the current procedure. If an old anesthesia record is needed for consultation, it may take significant time to locate if stored in archives, resulting in a delayed or cancelled surgery. Again, this impacts both the hospital’s revenue and patient satisfaction.
**Challenge 2:** Optimal financial performance is jeopardized by complicated charge capture and manual billing processes which delay cash flow.

The Solution:

**Automate the charge capture process**

The OR charge capture process is typically manual and prone to errors and omissions. Each interviewee told similar anecdotes about circulating nurses, in charge of critical patient care, being responsible for tracking and charging supplies and implants used during procedures. This manual, paper-based process usually involves nurses affixing stickers removed from the supply and implant packaging onto charge sheets, implant records, physician progress notes, and their scrubs to later transfer to the implant log. Stickers invariably fall off, are misplaced, or charged to the wrong patient, creating opportunity for errors in documentation and lost charges. To highlight the severity of this problem, one hospital ran an experiment where the nurses had to take every item used during a procedure and put it in a bag. They then compared what was in the bag to the charge sheet and found a 30% discrepancy.

Capturing all drugs and correct dosages used during a procedure is also a challenge. Often times, anesthesia charts are incomplete or illegible, making it hard to accurately bill for the entire charge of the anesthesia by the pharmacy.

“We very rarely billed for anesthesia on an itemized basis, due to lack of detailed information.”

- Pharmacy Manager, Top US Hospital

**Reduce billing documentation time**

In addition to lost charges, late billing also impacts the hospital’s bottom line. Like the charge sheet, the billing process is equally arduous. The many variables to be calculated for a bill may include acuity level, room time, anesthesia time, specific payer’s rules, chargeable supplies and implants. Complex cost structures and markup formulas make bill completion time consuming and a backlog develops, resulting in late revenue and delayed cash flow. Some hospitals take up to 20-30 days from the date of a procedure to complete a bill.

“Our internal finance goal was to complete a bill within 15 days of a procedure, but it was consistently taking 30 days.”

- Director, Surgical Services, Top US Hospital

**Challenge 3:** Adverse outcomes and treatment costs are difficult to evaluate due to lack of timely and complete patient data.

The Solution:

**Simplify report generation through “on demand” queries from a common database**

OR Directors and Nurse Managers spend a significant portion of their day responding to internal and external requests for patient information. These requests originate from physicians needing previous medical record information or quality data for a departmental meeting. Requests also originate from discharged patients with concerns over their clinical care or financial questions. One OR Director estimated that she spent over 2 hours a day answering patient and physician questions that required her to pull and review patient charts and decipher mostly illegible handwriting. Independent research with other OR Directors confirms that this is the norm.

Understanding patient trends and adverse outcomes is virtually impossible with a manual paper based system, however it is a requirement for multiple compliance entities such as Joint Commission and CMS.
Adverse outcomes such as the percentage of hypothermic patients, surgical site preparation, appropriate antibiotic administration, and medication reconciliation must be tracked. It is hard to uncover causes of adverse outcomes or affect change without appropriate perioperative-focused analytical tools. For example, Bairhugger estimates that over 70% of surgeries result in hypothermia. A hospital can reduce this number by analyzing trends of anesthesiologist, which is very difficult with a paper-based system.

“We knew we had to address the number hypothermic patients but we had no way of knowing what percentage of our patients developed hypothermia or if there were “repeat offenders” (Anesthesiologists) contributing to the problem.”

Clinical Analyst, Top Medical Center

Key Sources of Value
The value of perioperative automation software, such as SIS, is immediate and demonstrable. Based on interviews with administrators and clinicians at a number of US hospitals, the value falls into three main categories:

- Increases Efficiencies
- Optimizes Financial Performance
- Improves Clinical Outcomes

Each value area can be further broken down into a set of specific benefits. A sample of the benefits for and the annualized financial benefits for each are summarized in Figure 1 below and are fully explained and supported in the following section.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>SPECIFIC BENEFITS</th>
<th>ANNUALIZED FINANCIAL BENEFITS FOR AN AVERAGE HOSPITAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increases Efficiencies</td>
<td>• Increases case volume with better scheduling and reduced turnover time</td>
<td>$720,000</td>
</tr>
<tr>
<td></td>
<td>• Reduces time to complete charting/documentation throughout the perioperative environment</td>
<td>$444,000</td>
</tr>
<tr>
<td></td>
<td>• Reduces the number of cancelled cases</td>
<td>$406,000 includes anesthesia</td>
</tr>
<tr>
<td>Optimizes Financial Performance</td>
<td>• Increases charge capture</td>
<td>$369,000 includes anesthesia</td>
</tr>
<tr>
<td></td>
<td>• Improves cash flow with automated charging processes</td>
<td>$108,000</td>
</tr>
<tr>
<td>Improves clinical care</td>
<td>• Improves outcome analysis</td>
<td>$32,000</td>
</tr>
<tr>
<td></td>
<td>• Decreases adverse outcomes</td>
<td>$120,000</td>
</tr>
<tr>
<td></td>
<td><strong>Total Annualized Benefits:</strong></td>
<td><strong>$2,199,000</strong></td>
</tr>
</tbody>
</table>

FIGURE 1: VALUE AND SPECIFIC BENEFITS
The average hospital used in calculating the financial benefits in Figure 1 is based on the following demographic profile which was used to calculate the potential value of each specific benefit contained in the value sources described below.
Profile of the average hospital:

- Number of ORs = 12
- Number of Procedures per year = 8,000
- Average revenue per procedure = $5,000
- Percentage of cancelled cases day of surgery = 7%
- Average reimbursement rate = 45%
- Estimated annual lost charges on equipment, room, and supplies = $1,500,000
- Average turnover time between patients = 30 minutes

Value Source #1: Increases efficiencies

1. Increases case volume with better scheduling
   Interviewees from multiple hospitals indicated that manual scheduling gives them little insight into the efficiencies of the OR. They had a difficult time determining if they were maximizing throughput based on surgeon procedure times, block utilization times, case conflicts and other metrics. An integrated perioperative software solution automates patient scheduling. Intelligent data is available to determine the most efficient scheduling to maximize throughput. Hospitals using an automated patient scheduling system saw results ranging from an extra case per day to a 10% increase in overall annual cases.

   “SIS’s built in efficiencies helped us double volume by only increasing capacity by 20%”
   - Director, Surgical Services, Major US Hospital

   For the average hospital which performs 8,000 procedures per year, with average revenue of $5,000 per procedure, an increase of just 2 more cases a week due to more efficient scheduling, results in incremental revenue of $520,000.

   Impact for average hospital: $520,000 annual incremental revenue

2. Increases case volume with reduced turnover time
   Another way to increase annual case volume is to decrease the turnover time between patients by using analytics to understand the process components that lead to lengthy turnover times. Isolating the root causes of delays and working with staff to make changes on a daily basis by analyzing the individual steps throughout the process leads to higher efficiencies and can increase case volume on a daily basis. One hospital saw a decrease in turnover time from 30 minutes to 21 minutes after implementing an OR analytics software. Another hospital increased the percentage of cases that had a turnover time of less than 30 minutes from 42% to 68%, and as a result, increased their case volume by 5%.

   “Same day information about turnover time allows us to make real changes in performance”
   - Clinical Analyst, Major US Hospital

   For the average hospital which performs 8,000 procedures per year, with average revenue of $5,000 per procedure, an increase of 0.5% more cases annually due to more data regarding turnover time, results in incremental revenue of $200,000.

   Impact for average hospital: $200,000 annual incremental revenue
3. **Reduces time to complete charting/documentation throughout the perioperative environment**

Clinical documentation is a time consuming manual process. Nurses can spend at least 30 minutes per patient in each of Pre-Op, PACU, and Anesthesia. Often times these charts are not completed by the time the patient moves to the next care event. Automated Perioperative software with pre-defined wizards for clinical pathways prompts nurses to document necessary data fields and pre-populates common fields, resulting in accurate and complete documentation at the end of each care event.

For the average hospital which performs 8,000 procedures/year, the benefits span multiple areas:

- **Pre-Op:** No longer does a nurse manager need to finish incomplete patient charts for nurses who have been assigned new patients (typically around 20% of the time). Clinical productivity could improve by $77,000.

- **PACU:** Chart completion time decreases by 15 minutes per patient in the PACU. Clinical productivity could improve by $68,000.

- **Anesthesia:** For CRNAs, documentation time is reduced by 10 minutes in both Pre-Op and PACU. Clinical productivity could improve by $298,000.

**Impact for average hospital:** $444,000 annual productivity improvement

“Our nurses would never want to go back to a paper-based documentation system”

- PACU Nurse Manager, Major Mid-Atlantic Hospital

4. **Reduces the number of cancelled cases caused by no Pre-Admission Testing**

Integrating the pre-admission testing (PAT) schedule with the surgical schedule allows the hospital to schedule PAT appointments in a timely manner. Without appropriate PAT, many cases are cancelled or postponed day-of-surgery, resulting in lost revenue and empty ORs.

For the average hospital which performs 8,000 procedures per year, with average revenue of $5,000 per procedure, a decrease by 50% in day-of-surgery cancellations due to no PAT can result in incremental revenue of $350,000.

**Impact for average hospital:** $350,000 annual incremental revenue

5. **Reduces the number of cancelled cases caused by no Anesthesia chart**

All previous anesthesia records are stored on a common database, giving every clinician immediate access to patient history. If an old record is needed for an impeding procedure, the information can be pulled up immediately, and there is no delay, or possible cancellation, due to the medical team awaiting a patient chart from medical records or from archives.

For the average hospital which performs 8,000 procedures per year, a 2% reduction in day-of-surgery cancellations due to limited access to old anesthesia record results in incremental revenue of $56,000.

**Impact for average hospital:** $56,000 annual incremental revenue
Value Source 2: Optimizes Financial Performance

1. Improves charge capture
Charges for time, supplies, and implants are generated automatically from clinical documentation and pick sheets of actual usage using a sophisticated rules-based charging system during the intraoperative phase of care. These charges are much more accurate than the traditional “sticker” process. Often missed implant charges for small, high dollar items like mesh, stents, and screws that can cost $200 - $1,500 per patient are fully captured. All charges are stored in a common database that is then used to generate bills.

“Surgeries are chaotic enough. Nurses don’t want to worry about tracking implants.”
- IT Project Manager, Major US Hospital

For the average hospital which has estimated lost charges for equipment, supplies and room of $1,500,000 per year, and a reimbursement rate of 45%, a reduction of 25% of lost charges yields incremental revenue of $169,000.

Impact for average hospital: $169,000 annual incremental revenue

2. Increases drug reimbursement for Anesthesia
Automated Anesthesia software accurately tracks and records all procedures and events as they happen, improving the drug capture.

For the average hospital which performs 8,000 procedures per year, a 5% increase in drug reimbursement yields incremental revenue of $200,000

Impact for average hospital: $200,000 annual incremental revenue

3. Improves cash flow with reduced late charges
The perioperative software described above takes the time notations and charges from the clinical documentation and automatically generates bills. Billing managers are freed up from the time consuming process of sorting through all the variables that make up a bill and the backlog of unbilled procedures is reduced. Hospitals interviewed typically found that they could generate bills 10-15 days faster, increasing accounts receivables, and adding to the hospital's bottom-line. For hospitals that already have a billing system in place, perioperative software streamlines the OR charge review process and saves significant time, usually 1-3 days faster.

“An outside audit of our revenue cycle and billing process found that we had a tremendous advantage in revenue capture using an integrated OR automation software.”
- Director, Surgical Services, Major US Hospital

For the average hospital which performs 8,000 procedures per year, with average revenue of 5,000 per procedure, a faster bill generation of 7 days, results in incremental revenue of $108,000. A 1-day faster bill generation, results in incremental revenue of $15,000.

Impact for average hospital: $108,000 annual incremental revenue
Value Source 3: **Improves Clinical Care**

1. **Improves outcome analysis**
   A single database of patient information, procedure details and patient care allows nurse managers and other administrators' immediate access to key analytics. This immediate access enables them to quickly address questions from patients and internal constituents and act upon the information. Perioperative automation software stores accurate and up-to-date information to address clinical, operational and financial questions from wherever they may originate.

   "Drill-down analytics are the single most important weapon in my arsenal."
   - Director, Surgical Services, Major US Hospital

   For the average hospital, 2 nurse managers can improve total productivity by $32,000 with easy access to patient data and analytics.

   **Impact for average hospital:** $32,000 annual productivity improvement

2. **Decreases adverse outcomes**
   Trending data on adverse outcomes, sorted in a multitude of combinations including surgeon, date, time, and procedure, was believed to be an important tool to change behavior and address regulatory guidelines. Hospitals typically use drill-down analytic tools from integrated perioperative automation software to make measurable updates to best practices. One hospital cited that following the Surgical Care Improvement Project guidelines to reduce the number of hypothermic patients, they used the perioperative automation software's analytics tool to determine that 38% of their patients were hypothermic – a number they had never been able to easily calculate. They could tie the hypothermic temperature back to the anesthesiologist assigned to the case and were able to reduce that number to 6% in one month. Continued use of the analytical tool now has them at a 1.9% rate.

   "We use Analytics to help identify and reduce causes of adverse outcomes"
   - Director, Surgical Services, Major US Hospital

   For the average hospital which performs 8,000 procedures per year, a 10% reduction in the number of hypothermic patients results in incremental revenue of $120,000 as a result of reduced number of days of hospital stay.

   **Impact for average hospital:** $120,000 annual incremental revenue
Overall Value

For the average hospital, the 10 implementation benefits add up to an annual savings of $2.2 million. The hospital's three year investment of $1.33m generates a positive return in 7.5 months. The three year net present value (NPV) and return on investment (ROI) are strong at $4.3m and 484%, respectively. The key financial metrics for the average hospital were calculated by standard methods and are shown below. The NPV calculation assumes a 10% cost of capital.

<table>
<thead>
<tr>
<th>FINANCIAL METRIC</th>
<th>3-YEAR VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Payback (months)</td>
<td>7.5 months</td>
</tr>
<tr>
<td>NPV</td>
<td>$4,324,000</td>
</tr>
<tr>
<td>ROI</td>
<td>484%</td>
</tr>
</tbody>
</table>

The chart below shows the extent to which each value driver contributes to the total value of perioperative automation software. For the average hospital, increasing efficiencies and optimizing financial performance represent the majority of the value.

![Pie Chart Display of Value Drivers](image)

- Increases Efficiencies: 7%
- Optimizes Financial Performance: 24%
- Improves Clinical Care: 69%
Based on the benefits described in the previous section, the breakdown of revenue and productivity benefits is pictured below.

![Graph showing Productivity Gains and Revenue Benefits](image)

**FIGURE 4: BAR CHART DISPLAY OF REVENUE, PRODUCTIVITY AND COST BENEFITS**

**Opportunity for Perioperative Automation Software**

To dimensionalize the opportunity for perioperative automation software, the pre- and post-implementation productivity gains are outlined below.

As shown in the previous section, productivity gains represent 24% of the value. Many areas of clinical care are affected by automation improvements.

<table>
<thead>
<tr>
<th></th>
<th>PRE-IMPLEMENTATION</th>
<th>POST-IMPLEMENTATION</th>
<th>HOURS GAINED</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRNA</td>
<td>$892,800</td>
<td>$595,200</td>
<td>2,667</td>
</tr>
<tr>
<td>PACU Nurse</td>
<td>$246,338</td>
<td>$123,169</td>
<td>2,000</td>
</tr>
<tr>
<td>Nurse Managers</td>
<td>$58,195</td>
<td>$2,530</td>
<td>801</td>
</tr>
<tr>
<td>Pre-Op Nurses</td>
<td>$54,250</td>
<td>$27,125</td>
<td>700</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$1,252,583</strong></td>
<td><strong>$748,024</strong></td>
<td><strong>6,168</strong></td>
</tr>
</tbody>
</table>

**FIGURE 5: TABULAR DISPLAY OF ANNUAL EFFICIENCY GAINS**
Perioperative automation software has a direct impact on the financial performance of the hospital. Making changes to scheduling and turnover times, and avoiding cancellations due to better PAT and access to anesthesia charts, optimizes case load and contributes additional revenue.

<table>
<thead>
<tr>
<th></th>
<th>PRE-IMPLEMENTATION</th>
<th>POST-IMPLEMENTATION</th>
<th>ADD’L REVENUE</th>
<th>ADD’L CASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case volume revenue - Better scheduling</td>
<td>$40,000,000</td>
<td>$40,520,000</td>
<td>$520,000</td>
<td>104</td>
</tr>
<tr>
<td>Case volume revenue – Improved turnover times</td>
<td>$40,000,000</td>
<td>$40,200,000</td>
<td>$200,000</td>
<td>40</td>
</tr>
<tr>
<td>Additional revenue – fewer Anesthesia cancellations</td>
<td>NA</td>
<td>$56,000</td>
<td>$56,000</td>
<td>11</td>
</tr>
<tr>
<td>Additional revenue – Fewer PAT cancellations</td>
<td>$350,000</td>
<td>$700,000</td>
<td>$350,000</td>
<td>70</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$80,350,000</strong></td>
<td><strong>$81,476,000</strong></td>
<td><strong>$1,126,000</strong></td>
<td><strong>225</strong></td>
</tr>
</tbody>
</table>

**Conclusion**

Pressure on hospitals to reduce costs while maintaining or improving their quality of care will remain an ongoing theme for the foreseeable future. The effective use of information technology in key areas like the OR is essential to relieve the pressure on every hospital’s bottom line. As shown here, significant financial gains and positive ROI returns from perioperative information system investments can be achieved quickly with a complete payback possible within less then a year and they are sustainable over time.

Perhaps more importantly, in addition to these financial benefits, such systems also bring efficiencies to the perioperative arena that result in improved healthcare delivery and improved patient safety.
About SIS
SIS provides software solutions that are uniquely designed to add value at every point of the perioperative process. Developed specifically for the complex surgical environments, all SIS solutions – including anesthesia – are architected on a single database and integrate easily with other hospital systems. SIS offers the only surgical scheduling system endorsed by the American Hospital Association (AHA), and a rules-based charging system that has been granted Peer Reviewed status by the Healthcare Financial Management Association (HFMA).

For more information, please visit www.sisfirst.com

About Hobson & Company
Hobson & Company helps early stage technology vendors and purchasers uncover, quantify and validate the key sources of value driving the adoption of new and emerging technologies. Our focus on robust validation has helped many technology purchasers more objectively evaluate the underlying business case of a new technology, while better understanding which vendors best deliver against the key value drivers. Our well researched, yet easy-to-use ROI and TCO tools have also helped many technology companies better position and justify their unique value proposition.

For more information, please visit www.hobsonco.com