Evaluating and Improving the Perioperative Process: Benchmarking and Redesign of Preoperative Patient Evaluations

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Abstract
This study examines industrial and operations management practices of continuous process improvement, process benchmarking, and process reengineering to evaluate and improve the perioperative process within a hospital environment. This paper identifies how dynamic technological activities of analysis, evaluation, and synthesis applied to internal and external organizational data can highlight complex relationships within integrated processes to yield improved capabilities. The identification of existing process limitations, potential process capabilities, and subsequent contextual understanding are contributing factors that yield a redesign of preoperative patient evaluations within a hospital’s perioperative process. Based on an 84-month longitudinal study of a large teaching hospital, this case study investigates the impact of integrated information systems to identify, qualify, and quantify process redesign practices that improve perioperative efficiency and effectiveness. Theoretical and practical implications and/or limitations are also discussed for practitioners and researchers alike.

1. Introduction

From an operational perspective, a hospital’s perioperative process requires multidisciplinary, cross-functional teams to maneuver within a complex, fast-paced, and critical environment—the hospital environment [15]. A hospital’s perioperative process provides surgical care for inpatients and outpatients during preoperative, intra-operative, and immediate post-operative periods. Accordingly, the perioperative sub-processes (e.g. preoperative, intra-operative, and post-operative activities) are sequential where each activity sequence paces the efficiency and effectiveness of subsequent activities. As a result, the perioperative process is tightly coupled to patient flow, patient safety, patient quality of care, and stakeholders’ satisfaction (i.e. patient, physician/surgeon, nurse, and perioperative staff).

Similarly from a hospital’s financial perspective, the perioperative process is typically the primary source of hospital admissions, averaging between 55 to 65 percent of overall hospital margins [17]. Given the rising cost of healthcare, the public demand for healthcare transparency and accountability, and the current economic environment—managing and optimizing a flexible, cost effective perioperative process are critical success factors (CSFs), both operationally and financially, for any hospital.

This study highlights continuous improvement, benchmarking, and reengineering practices within a hospital’s perioperative process. The case results are facilitated by empowered individuals driven by integrated internal and external organizational data. The investigation method covers the longitudinal study of an integrated clinical scheduling IS (CSIS) within the perioperative process of a large, teaching hospital. The implementation of an agile CSIS and subsequent contextual understanding of the perioperative process and its sub-processes prescribed the need to redesign the preoperative patient evaluation. Specifically, the extension of best-practices internally and from four leading hospitals’ preoperative assessment clinics (PAC) provide the framework for redesigning preoperative patient evaluations to create a comprehensive preoperative assessment, consultation, and treatment (PACT) clinic. The planning and development of the redesigned PACT clinic provides change dynamics for evaluation and improvement to the overall perioperative process. This case study also identifies the complex dynamics associated with the hospital environment, the perioperative process, and its sub-processes.

The following section reviews previous literature on process redesign, perioperative performance metrics, and preoperative patient evaluations. Following the literature review, we present our methodology, case study background, as well as an analysis of the observed effects from the continuous improvement and benchmarking redesign efforts. By identifying a holistic framework for analysis, evaluation, and synthesis between internal processes and external best-practices, this paper prescribes an a priori environment to support process improvement, benchmarking, and reengineering. The conclusion also addresses study implications and limitations.
2. Literature Review

Industry competition, first mover advantage on innovations, and/or adaptation of better management practices drive process improvements. Traditionally, the hospital environment lacked similar industrial pressures to apply new managerial practices that embrace cost effectiveness. However, hospitals and specifically perioperative management currently face increasing pressure to provide objective evidence of patient outcomes in respect to organizational quality, efficiency, and effectiveness [6]. Business process redesign can offer the framework for process improvements, but clinical quality standards must be preserved.

Administrators and medical professionals must focus on both the quality of care as well as management practices that yield cost effectiveness. To this end, industrial and operations management practices borrowed from total quality management provide a framework to provide process redesign [23]. Measured utilization is not a result from the lack of research as an extensive body of knowledge exists concerning the application of industrial and operations management approaches in healthcare [4], [13]. Moreover, the literature suggests that such management interventions can yield positive results with significant variations in implementation success.

2.1 Process Redesign

Specifically, this study examines process redesign approaches over continuous process improvement, process benchmarking, and process reengineering [23]. Continuous process improvement is a systematic approach toward understanding the process capability, the customer’s needs, and the source of the observed variation. The incremental realization of improvement gains occur through an iterative cycle of analysis, evaluation, and synthesis or plan-do-study-act that minimize the observed variation. Continuous process improvement encourages bottom-up communication at the operational level from within the organization. Tenner and DeToro [23] notes how continuous process improvement can be categorized as an organizational response to an acute crisis, a chronic problem, and/or an internal driver. The continuous process improvement rewards are low (i.e. between 3 to 10 percent) with low risk, longer duration, as well as moderate costs and implementation difficulty [23]. Camp [5] defines process benchmarking as finding and implementing best practices that lead to superior performance as opposed to benchmarks that are metric standards or key performance indicators (KPIs). Process benchmarking encourages the imitation or adaptation of external best practices coupled with internal expertise.

Process benchmarking requires more resource allocations versus continuous process improvement, and a higher degree of understanding about the targeted process. As a result, management can under-estimate the resource requirements necessary for process benchmarking success and the literature supports several multi-step benchmarking frameworks to increase success likelihood. Table 1 adapts Camp’s widely accepted ten-step benchmarking framework [5, p.20], adapted over categories of analysis, evaluation, and synthesis.

<table>
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<th>Table 1 – Benchmarking Framework [5]</th>
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<tr>
<td><strong>Analysis</strong></td>
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<td>1) Identify the benchmark subject.</td>
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<td>2) Identify the benchmark partners.</td>
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<td>3) Collect data.</td>
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<td>4) Determine the gap.</td>
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<td><strong>Evaluation</strong></td>
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<td>5) Project future performance.</td>
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<td>6) Communicate results.</td>
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<td>7) Establish goals.</td>
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<td>8) Develop an action plan.</td>
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<td><strong>Synthesis</strong></td>
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<td>9) Implement plans and monitor results.</td>
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<td>10) Recalibrate benchmarks.</td>
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Hammer [10] summarizes reengineering in his article, “Reengineering Work: Don’t automate, obliterate.” Reengineering offers more radical process redesign, assuming more risk with greater reward potential, when compared to continuous process improvement or process benchmarking [23]. Hammer and Champy [12, p.32] defined reengineering as the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical measures of performance (e.g. cost, quality, service, and speed). Three key terms in this definition differentiate reengineering from continuous process improvement after year; and/or whether management is in control of the process [12]. An alternative to continuous process improvement is process benchmarking, which offers higher rewards (i.e. between 20 to 50 percent) with similar low risk, longer duration, as well as moderate costs and implementation difficulty [23]. Camp [5] defines process benchmarking as finding and implementing best practices that lead to superior performance as opposed to benchmarks that are metric standards or key performance indicators (KPIs). Process benchmarking encourages the imitation or adaptation of external best practices coupled with internal expertise.

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|          | 10) Recalibrate benchmarks.           |
or process benchmarking—fundamental, radical, and dramatic.

Reengineering a process offers the highest reward potential with upwards of 1,000 percent, yet the high potential rewards have very high risk, longer durations, as well as very high costs and the highest implementation difficulty [23]. Reengineering is a project-oriented effort that utilizes top-down improvement, managed by external and internal expertise, to achieve breakthrough improvement. A reengineering project requires extensive resource allocations as opposed to continuous process improvement or process benchmarking, as well as seeking an order of magnitude improvement by questioning the relevance of every activity and reinventing new ways to accomplish necessary work. Consequently, successful reengineering can be illusive. As a counterpoint, Table 2 offers an aggregated listing of CSFs for reengineering success taken from the literature [8, pp. 5-6], [7, p. 52], [14, p. 11], and [23, p. 232].

Table 2 – Reengineering CSFs

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<tr>
<th>1</th>
<th>Effective project management</th>
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<tr>
<td>a</td>
<td>Effective use of teams</td>
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<td>b</td>
<td>Commitment of time and resources by reengineering team members</td>
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<td>c</td>
<td>Clarity of scope and purpose</td>
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<td>d</td>
<td>Establishment of strong communications</td>
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<td>Realistic planning and scheduling</td>
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<td>Effective training and communications</td>
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<td>Senior management commitment</td>
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<td>3</td>
<td>Corporate culture</td>
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<td>Case for action</td>
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<td>5</td>
<td>Early project success</td>
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<td>Information systems</td>
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<td>7</td>
<td>Speed</td>
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<td>8</td>
<td>Experience</td>
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2.2 Perioperative Process KPIs

An integral part of process redesign is information about performance before and after the intervention. Thus performance measurement is an essential requirement for purposeful improvement across all three process redesign efforts (e.g. continuous process improvement, process benchmarking, and reengineering). Early in the IT literature, Ackoff [1] proposed IS design should embed feedback as a control to avoid management misinformation. Zani [28], Rockart [18], along with Munroe and Wheeler [16], proposed the selection and supervision of defined data as KPIs to assist management in qualifying measurement of CSFs and subsequently managing organizational action (i.e. business processes) through IS feedback. Similarly, the perioperative process is becoming increasingly information intensive and doubt exists as to whether perioperative process management is fully understood to meet the increasing hospital environmental demands for value and cost management [6].

KPIs in managing and optimizing a hospital’s perioperative process are monitoring the percentage of surgical cases that start on-time (OTS) and the number of first-of-the-day surgical cases (FCOTS) that start on-time [3]. OR schedules are tightly coupled to an individual OR suite, patient, and surgeon. When preoperative patient evaluations, medical records, or lab tests are not readily available for the time of surgery, the scheduled case is delayed as well as the subsequent scheduled cases in the particular OR suite or for the particular surgeon. Poor KPIs on either metric (i.e. OTS or FCOTS) impacts critical success factors of patient safety, patient quality of care, surgeon/staff/patient satisfaction, and hospital margin [3], [17], and [24]. The Thomson Group [24] also noted that physician/surgeon satisfaction, a CSF for hospital margin, is also impacted by OR suite turnover time between cases and a flexible, efficient perioperative work environment.

2.3 Preoperative Patient Evaluations

Providing effective surgical care demands a high level of planning, scheduling, and proactive efforts to minimize delays or last-minute cancellations of surgical case procedures [22]. Preoperative patient evaluation activities prior to a patient’s entry into the operating room have evolved over the past 60 years and an increasing demand for productivity has forced hospitals to implement safe, efficient, and structured approaches to the preoperative evaluation of surgical patients—preadmission clinics, preoperative assessment clinics (PAC), or preoperative evaluation clinics [26]. The standardization and centralization of the preoperative activities under a PAC increases efficiency over obtaining patient records and medical history; physical examination and assessment of patient health; surgical, anesthesia, and nursing assessments; ordering lab work and tests; as well as documentation and billing [26].

The cost effectiveness from minimizing redundancy, avoiding surgery delays or cancellations, and improved reimbursement coding offset the PAC costs [2]. Bader, Switzer, and Kumar [2, p. S104]
offers the following key points to the establishment of preoperative patient evaluations:

- Standardizing the preoperative assessment processes help ensure that regulatory, accreditation, and payer requirements and guidelines are met.
- Careful triage, based on a patient’s history, can help avoid unnecessary assessment of low-risk patients and ensure that necessary assessments for higher-risk patients are completed before the day of surgery.
- Preoperative assessment and management guidelines for various surgical procedures and patient risk factors should be developed, continuously updated, and made available online to all providers within the institution.
- Electronic medical records allow standardization of patient information, avoid redundancy, and provide a database for research.

3. Research Method

The objective of this study is to examine the perioperative process redesign achieved through continuous process improvement, which led to the process benchmarking and reengineering of the preoperative patient evaluation. To this end, case research is particularly appropriate [9], [27]. An advantage of the positivist approach [25] to case research allows concentrating on a specific hospital service in a natural setting to analyze the associated qualitative problems and environmental complexity. Hence, our study took an in-depth case research approach.

Our research site is a large teaching hospital (e.g. University Hospital), licensed for 909 beds and located in the southeastern region of the United States. University Hospital is one of two magnet hospitals in the state and the U.S. News and World Report recognized University Hospital as a Best Hospital in 17 of the last 19 years. Concentrating on one research site facilitated the research investigation and allowed the continued collection of longitudinal data. This study spans activities from 2004 to 2011. During the 84-month study, we conducted field research and gathered data from multiple sources including interviews, field surveys, site observations, field notes, archival records, and document reviews.

The perspective of this research focused on University Hospital’s perioperative process for its 32 general operating room (OR) suites from November 2004 through April 2011. Perioperative Services is the University Hospital department that coordinates the hospital’s perioperative process across Admissions, PREP having 42 beds, Post Anesthesia Care Unit (PACU) having 45 beds, and Central Sterile Supply (CSS). During this time span, University Hospital’s Perioperative Services broadened its scope to include three other surgical services within the University Hospital System, adding cardio-vascular suites and two off-site surgical clinics for an additional 38 OR suites.

4. Results

Perioperative Services implemented a new CSIS in 2003, after using its prior CSIS for 10 years. The old CSIS and its vendor were not flexible in adapting to new data collection needs of Perioperative Services. Figure 1 depicts University Hospital’s CSIS architecture as of October 2004. University Hospital had six main IS: (1) a large-scale hospital materials management IS, which included pharmacy, material and medical device management (Vendor L); (2) a large scale enterprise resource planning IS (Vendor O); (3) a patient record Admit/Discharge IS (Vendor Q); (4) a cost accounting IS (Vendor T); (5) a financial budgeting IS (Vendor H); and (6) a CSIS (Vendor C) that included three modules for clinical scheduling, routing sheets, and cost data. All IS were integrated with uni-directional constraints placed on sensitive information. The institutional intranet served as portal access to extend each of the six IS. User authentication via the intranet was single entry with particular user-IS rights and privileges negotiated upon authentication.

4.1 November 2004

University Hospital opened a new diagnostic and surgical facility in November 2004, which covers three-fourths of a city block rising 12 stories. Perioperative Services were relocated into three floors, with ORs located over two floors and CSS located separately on the third. The move expanded Perioperative Services to cover an additional floor and nine additional ORs. The new facility housed 40
state-of-the-art OR suites (32 general OR), each equipped with new standardized equipment. Groups of OR suites categorized a surgical specialty, with each particular room among the group containing specialty equipment. Within six weeks of occupying the new perioperative facility, scheduling KPIs reflected chaos. On-time surgical case starts plunged to 18% during December 2004. Within a highly competitive hospital industry, having only 18% OTS was unacceptable as 82% of scheduled surgeries experiencing delays risks patient care and safety.

Perioperative concerns were laid out before a quickly convened executive committee that included the chief executive officer, the chief financial officer, the chief information officer, the chief nursing officer, and top representatives of surgeons, anesthesia, and Perioperative Services. The meeting resulted in a changed management structure and the formation of a cross-functional, multidisciplinary executive team empowered to evoke change. The executive team consisted of surgeons, nurses, anesthesiologists, and perioperative management.

In January 2005, University Hospital’s executive team launched a continuous process improvement effort to address the perioperative crisis through soft innovations [19]. The executive team and numerous task forces, formed to address specific problems and/or opportunities, were chartered to focus on patient care and safety, attack difficult questions, and no issue was “off-limits.” The executive team and task groups were challenged to systematically identify issues and enlist working managers for solutions that would facilitate change and minimize departmental chaos.

Given the slow learning curve associated with the OR relocation disruption, a new KPI was established to track surgical case OTS within 10 minutes. Figure 2 represents the improvement in the surgical case OTS through May 2007.

![Figure 2 – OTS KPIs Dec. 2004 to May 2007](image)

### 4.2 Project IMPACT

Given the state of Perioperative Services in early 2005, streamlining hospital-wide patient flow was virtually impossible without first streamlining patient flow through the OR. The continuous improvement in structural, process, procedural, and cultural changes achieved in Perioperative Services over FY2005 and FY2006 allowed the executive team to move forward in early 2007 to extend the CSIS across University Hospital and address hospital-wide patient flow. The project, labeled IMPACT, had as its goal the improvement of patient flow and patient satisfaction through the multidisciplinary use of patient electronic medical records and tracking technology. The new areas integrating with Vendor-C’s CSIS were Admissions, Perioperative Services (i.e. PREP, PACU, and CSS), and all other ancillary services. The integration and implementation project encompassed 11 task forces covering surgeon’s orders, clinical documentation, electronic medical records (EMR), pharmacy, physician workflow, critical care, knowledge / content, technical metrics, communications, and testing / training / transition [21].

### 4.3 Heuristic OR Scheduling Rules

In May 2007, another continuous process improvement effort deployed the release of block scheduled OR time through heuristic scheduling rules [20]. The block release and heuristic scheduling rules improved the perioperative process planning where OR scheduling yielded a tighter coupling between projected versus actual surgical cases. Between June 2007 and March 2010, over two-thirds of the surgical patients were scheduled during the week of the surgical procedure.

This perioperative process improvement effort has little trade-off to other KPIs of OR suite utilization or FCOTS. OR suite utilization averages between 80 to 85 percent per year with a target of 75 percent. OR suite FCOTS average between 55 to 60 percent each year with a target of 70 percent.

### 4.4 Preoperative Patient Evaluations

Since the OR relocation in 2004, University Hospital has sustained an annual 10% growth in surgical case procedures, with utilization of all OR suites occurring soon after the move. Actual OR utilization in FY2010 was 80.2 percent versus a target of 75 percent. The FCOTS KPI for FY2010 was 55.8 percent versus a target of 70 percent. Upon closer analysis of the surgical case delays, 17.5 percent of surgical delays were preventable through
improved preoperative patient evaluation activity flow and improved electronic integration of preoperative documentation and communication.

Project IMPACT integrated EMR from Admissions through PACU in 2007, but omitted parts of the preoperative evaluation activities. Figure 3 represents University Hospital’s preoperative patient evaluation flow as of FY2010. The patient’s surgery is scheduled before all of the patient’s medical records, evaluation, and assessment information is obtained. Inefficient processes and decision points (see gray areas on Figure 3) delay scheduled surgical case starts on the day of surgery and further delay cases while the incomplete information is obtained. As a result, incomplete patient preoperative evaluation and assessment information delays more than one out of six surgical case starts. Given the growth in surgical cases over the past six years and the flat trend on the FCOTS KPI below the internal target, perioperative management identified the need to address the chronic problems in preoperative patient evaluations.

4.5 Preoperative Evaluation Benchmarking

Between October 2010 and November 2010, committee members visited four leading healthcare institutions in the United States and the three University Hospital sites to gather a transparent, bottom-up view of each institution’s preoperative evaluation process. The four external institutions were (1) Johns Hopkins Hospital in Baltimore, MD; (2) Brigham and Women’s Hospital in Boston, MA; (3) Mayo Clinic in Rochester, MN; and (4) Cleveland Clinic in Cleveland, OH.

General observations from the four external site visits were identified and discussed. The committee agreed that the “glass” at University Hospital is more than half-full. Despite the need to improve the preoperative patient evaluation, University Hospital is doing a good job. The key to redesigning the preoperative patient evaluation is a better integration of care, creating a “clinic without walls” with a strong IT element. The optimal preoperative patient evaluation is highly patient-centered, a collaborative effort among all perioperative stakeholders, and must be an element under the control of Perioperative Services.

Prior to the site visits, the committee developed a set of 51 questions across categories of pre-surgical, pre-anesthesia, and day of surgery evaluations. Professional peers at each benchmarking site provided specific institutional perspectives for each question. These responses along with the committee member’s general observations provided the foundation to refine best practices. “Pearls of wisdom” extracted from the seven site visits were categorized by each of the five PAC goals and recommended as best practice changes.

Process benchmarking identified goal one best practice as the need to create a preoperative

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**Figure 3 – Preoperative Patient Evaluation Flow FY2010**

In June 2010, the executive team formed a nine-member committee/task force consisting of surgeons, anesthesia, nursing, perioperative management, and administration to address the preoperative influence on downstream OR case delays. The committee referenced current preoperative patient evaluation literature [2], [26] and chose a process benchmarking approach to redesign preoperative evaluations around the patient experience, ready clinical access, coordination of perioperative care, operational efficiency, and quality. The committee evaluated the current preoperative evaluation flow (see Figure 3) and established the following goals in which to frame the focus of best practices observed on each site visit: 1. Develop a centralized, comprehensive PAC.
2. Streamline preoperative data entry.
3. Standardize the preoperative clinical process.
4. Complete an appropriate patient evaluation and assessment prior to the day of surgery.
5. Obtain pertinent medical records before the preoperative patient evaluation visit and integrate them into the IMPACT EMR.
assessment, consultation, and treatment (PACT) clinic. The PACT will be under Perioperative Services as a “clinic without walls” to (a) comprehensively evaluate and manage the patient and (b) complete the preoperative history and physical exam (H&P). Preoperative patient flow through the PACT will have same day access to medical/cardiac consultations and diagnostic/cardiac testing, which will require ancillary departments to allocate adequate testing and clinic resources to preoperative patients.

The second goal was to streamline preoperative data entry. The best EMR does not fix a broken paper system, so a best practice of “workstations on wheels” facilitates the incorporation and consistent documentation of patient education and performance measures. The reduction of redundant patient data collection is a best practice realized by optimizing the use and integration of ambulatory and inpatient medical information via IMPACT during the preoperative evaluation.

Goal three was to standardize the preoperative patient evaluation. This goal is achieved by best practices of (a) screening and risk stratification of patients by co-morbidity to determine their needed level of preoperative evaluation, (b) triage surgical patients and allocate appropriate time and resources, and (c) implement a series of clinical care protocols for the most common clinical conditions.

Complete an appropriate patient evaluation and assessment prior to the day of surgery was goal four. The best practices to meet this goal were (a) allot more time for the preoperative assessment of the sickest patients, (b) balance AM versus PM patient flow in the PACT clinic with patients seen in PACT before seeing the surgeon, (c) the PACT appointment is made for all patients with their initial surgery clinic appointment, and (d) allow ample time for the PACT appointment before the scheduled surgical procedure (e.g. AM PACT before PM surgery).

Goal five was to obtain pertinent medical records before the preoperative patient evaluation and integrate them into the IMPACT EMR. As a best practice, external medical records are screened and tagged at the point of receipt versus batch-scanned. Goal five is obtainable with the allocation of sufficient clerical staff utilizing the capacity of the CSIS and IMPACT EMR to store scanned and tagged external medical records.

4.6 Redesigned Preoperative Evaluation

Figure 4 depicts the redesigned preoperative evaluation flow as of March 2011. The committee presented the proposal with the slogan, “It will take a pact to make the PACT.” Essential elements of the flow redesign require all pertinent external records with the initial University Hospital referral as the PACT clinic appointment is made with the initial surgeon appointment. Patient screening and risk stratification occurs by telephone, the Internet, or by the surgical clinic making the referral.

Figure 4 – Redesigned Preoperative Patient Evaluation Flow March 2011

In order to standardize the screening and risk stratification of patients by co-morbidity (e.g. PAC Goal 4), anesthesia rates patients by varying amount of co-existing disease between 1 (i.e. low medical risk) to 5 (i.e. high medical risk) while surgeons rate patient surgical procedures by varying physiologic stress and blood loss between 1 (i.e. low surgical risk) to 5 (i.e. high surgical risk). Three categories determine the standardized evaluation timing before surgery and length of the PACT evaluation:

A) Express = Brief evaluation; day or AM before PM surgery; 30-45 minute appointment; low medical and surgical risk

B) Evaluation DBS = Evaluation at least 24 hours prior to the day of surgery; 45 – 60 minute appointment; low medical and intermediate surgical risk or intermediate medical and low surgical risk
C) Consult PTDBS = Evaluation at least 48 hours prior to the day of surgery; 60-90 minute appointment; high medical and surgical risk

During the PACT and surgical appointment, the preoperative patient receives a focused surgical assessment and the informed consent is obtained by the surgical clinic. During the same visit, a comprehensive preoperative evaluation is performed in the PACT Clinic to include: a complete H&P, confirmed informed consent, optimized medications, and patient education. Prompt cardiac/diagnostic testing or cardiac/medical consultations may also occur during the PACT and surgical appointment.

The redesigned preoperative flow will not adversely affect the surgeon’s professional fee for the initial outpatient surgical evaluation. The last “separate billable event” is the surgery decision. The comprehensive evaluation in the PACT is part and parcel of the global Perioperative Services care and associated billing.

The committee proposed a phased-in timeline by groups of surgical specialties (i.e. orthopedic, vascular, gynecology, etc.). The redesigned PACT clinic implementation plan begins in Q2 of 2011, rolling out five IMPACT waves or one wave per quarter, completing the last series of surgical specialties in Q3 of 2012.

As surgical specialties begin using the redesigned preoperative flow as a PACT “clinic without walls”, University Hospital anticipates numerous advantages and benefits. Direct advantages and benefits include greater accountability to downstream processes and decreased costs from reduced day of surgery cancellations, delays, and non-billable testing. Also, the allocation of resources across a single patient visit for parallel evaluations increases patient access to surgical clinics with shorter patient wait times. The mandatory parallel evaluations before day of surgery affords educated and invested clinicians to provide better coordination of care and reduces unnecessary perioperative testing and consultations. The standardization of patient risk stratification also affords greater quality of care for improved patient satisfaction and clinical outcomes as well as documentation of co-existing diseases. Improvement in documentation also affords indirect advantages and benefits such as higher reimbursement by avoiding CMS nonpayment for “never” events, improved pay-for-performance measures, and enhanced regulatory compliance reporting.

5. Analysis and Discussion

This case study demonstrates the application of managerial practices that embrace integrated IS, empowered individuals, and process redesign. Process redesign practices of continuous process improvement, process benchmarking, and process reengineering improve with experience [23] and this case study exhibits their applicability and success in the hospital environment. University Hospital monitors its perioperative process through KPIs and responds to performance variation via analysis, evaluation, and synthesis. When an acute crisis evolves or chronic problems persist, continuous process improvement practices are applied with measurable success. Beginning with the relocation of Perioperative Services in November 2004, the extension of the CSIS through the Project Impact in 2007, and the adoption of heuristic scheduling rules in May 2007, the perioperative process experienced continuous process improvement.

KPIs of OTS and FCOTS remained consistently below target metrics during FY2008, FY2009, and into FY2010. The analysis of CSIS data identified the upstream preoperative patient evaluation as a major source of OR delays. The improved surgeon flexibility in OR scheduling, especially within the week of surgery, allows process improvement beyond the capability of the preoperative patient evaluation.

Inefficient activities and decision points in the preoperative patient evaluation were inappropriate for continuous process improvement and a process benchmarking approach was chosen. The best practices identified during the process benchmarking site visits afforded University Hospital the opportunity to reengineer their preoperative patient evaluation into a preoperative assessment, consultation, and treatment (PACT) clinic.

As illustrated in our research, University Hospital exhibited process redesign success and monitored performance measures over the 84-month study. Caccia-Bava, Guimaraes, and Guimaraes [4] identified determinants of successful business process redesign (BPR) in hospital environments. University Hospital’s research did identify underlying themes similar to the determinants of successful BPR [4]. The executive team, task forces, and committees were cross-disciplinary, represented perioperative stakeholders, and the stakeholders gained from the improvements. The process used by the committee to choose benchmarking sites and generate the benchmarking site questions was collaborative and open. No issue was above questioning and CSIS data identified the need for the preoperative evaluation redesign. The expertise available during the process redesign efforts was internal and external to the organization. Given the availability of the CSIS and
IMPACT, IT also sufficiently supported the redesign efforts. Lastly, perioperative management and all other surgical team’s management were represented on the committee and process improvement was the motivation.

Commonality also exists between the themes in this case study and the adaptation of Camp’s [5] widely accepted 10-step benchmarking framework. University Hospital’s analysis identified the preoperative patient evaluation; identified best practice partners; coordinated site visits to collect data; and determined the best practice gaps. University Hospital’s evaluation identified the advantages and benefits of a PACT Clinic, communicated the best practices observed in relation to their process benchmarking goals, and developed the reengineered preoperative patient evaluation as a patient-centric PACT clinic visit before the scheduled day of surgery. University Hospital’s synthesis of its reengineered PACT clinic began with its phase one implementation in Q2 2011.

Similar themes in this case study also reflect the reengineering CSFs [8], [7], [14], and [23] that were previously noted from the literature. University Hospital’s senior management commitment to the allocation of resources, delegation of authority, and individual empowerment stands out among the CSFs as well as the multidisciplinary culture within Perioperative Services and the flexibility of the CSIS. University Hospital’s experience gained over continuous perioperative process improvement between 2005 and 2010 was foundational in preparation for its move into process benchmarking and reengineering. With respect to the improved capabilities from the flexible OR scheduling, the inadequacies of the preoperative patient evaluation required action and speed, resulting in University Hospital implementing a reengineered PACT clinic within 12 months of identifying the preoperative patient evaluation inefficiencies.

Overall, the perioperative process redesign efforts, enabled by internal CSIS data and external preoperative best practices, directed the redesign efforts to benchmark and reengineer University Hospital’s PACT clinic. More importantly, the analysis, evaluation, and synthesis skills within the continuous process improvement and process benchmarking efforts focused perioperative staff, anesthesia, surgeons, nurses and top management on the framework to improve perioperative process capabilities and efficiency, while improving the clinical quality standards, capabilities, and effectiveness.

6. Conclusions

Empowered individuals, integrated IS, and a holistic framework for process redesign reengineered the preoperative patient evaluation and improved its capabilities to prevent subsequent downstream surgical case delays. Moreover, the reengineered preoperative evaluation as a PACT clinic has anticipated advantages and benefits for all stakeholders. Low risk patients will have increased access to surgical clinics with shorter wait times and higher risk patients will have more focused preoperative evaluations. The increased quality of care can also improve clinical outcomes. Anesthesiologists and surgeons, as scientists, gained the capability for better efficiencies and flexibility with fewer preventable day of surgery delays, which yield more OR time, better research data, and less scheduling problems. Anesthesiologists and surgeons, as employed professionals, lost no revenue streams in the redesigned PACT clinic model. Nurses and perioperative staff gained increased communication and increased professional awareness. Perioperative Services gained greater accountability to correct upstream and downstream perioperative process problems. Lastly, hospital administration will gain cost effective capabilities from increased documentation and decreased surgical cancellations, delays, and non-billable laboratory testing.

Adopting the holistic framework for process redesign through continuous process improvement, process benchmarking, and reengineering educates hospital stakeholders on the benefits of integrated IS, performance monitoring, and process improvement. The cycle of analysis, evaluation, and synthesis reinforces communication and stimulates individual as well as collective organizational learning.

Our case study contributes to the healthcare IT literature by examining how continuous process improvement, process benchmarking, and reengineering are applicable to the hospital environment and our case study prescribes an a priori framework to foster their occurrence. This paper also fills a gap in the literature by describing how hospital process data is both a performance measure and a management tool. This study was limited to a single case, where future research should broaden the focus to address this issue along with others that the authors may have inadvertently overlooked. The case examples presented in this study can serve as momentum for healthcare process redesign methodology comprehension and extension, while the results should be viewed as exploratory and in need of further confirmation. Researchers may choose to further or expand the investigation; while practitioners may apply the findings to create their
own version of process redesign for improvement and performance monitoring within the hospital environment.

7. References:


