



Surgery Intake and Tracking System Boosts Efficiency, Patient Safety, Bottom Line

Overview

Country or Region: United States

Industry: Healthcare—Provider

Customer Profile

Vanderbilt University, which includes the Vanderbilt University Medical Center (VUMC), employs more than 22,000 people, making it the largest private employer in middle Tennessee. VUMC includes several hospitals and clinics, a medical school, and research facilities.

Business Situation

Paper-based processes for surgical patient documentation and tracking impaired the hospital staff's ability to deliver optimum patient care, operating room efficiency, and hospital profitability.

Solution

VUMC used Microsoft® software to create a multimodule application, used by physicians, nurses, and administrators, that supports the entire continuum of surgical care, from scheduling to billing.

Benefits

- Improved patient care
- Improved profitability
- Data for meeting healthcare initiatives and continued improvement

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Dr. Michael Higgins, Chairman, Department of Anesthesiology, Vanderbilt University Medical Center

Vanderbilt University Medical Center (VUMC) is Tennessee's largest and most prestigious medical facility. A decade ago, its anesthesiologists initiated the development of an easy-to-use, electronic anesthesia documentation solution that has evolved into a comprehensive patient information system specialized for acuity care. Called VPIMS, the solution was developed using Microsoft® software and runs on the Windows Server® 2003 operating system and Microsoft SQL Server® 2005 database software. Using VPIMS, VUMC staff members have been able to improve patient care by having quick access to accurate patient data. The hospital has also improved its bottom line by making staff more efficient, reducing surgery delays, reducing administrative work, and improving billing accuracy. By analyzing data generated by VPIMS, VUMC continues to improve on all metrics.

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Situation

Throughout its 132-year history, Vanderbilt University Medical Center (VUMC) has been a leader in medical education, research, and patient care across the southeastern United States and the nation. At the heart of the medical center is Vanderbilt University Hospital, a 700-bed, tertiary-care not-for-profit center with 58 operating rooms in eight locations. VUMC also includes medical and nursing schools, a children's hospital, extensive biomedical research facilities, and a number of specialty clinics. Combined, Vanderbilt University and VUMC employ more than 22,000 people, and they are the largest private employer in middle Tennessee.

About ten years ago, a group of anesthesiologists at VUMC began to address the issue of patient-care consistency; quality of care had just begun to surface as an important issue across the United States. "We were treating thousands of patients in a large, thriving academic practice, but there was a lot of variability in care," says Dr. Michael Higgins, Chairman of the Department of Anesthesiology at Vanderbilt University Medical Center. "Each physician did things differently, but we had no real data to know which way was best. We wanted to improve care, especially during surgery, but we knew that we had to start collecting data if we were to compare the effects of different medications and anesthetics on different patients."

By identifying and standardizing best practices for patient care, the anesthesiologists hoped to improve not only patient care but also operating-suite efficiency. In most healthcare institutions, the surgical suite represents the largest source of hospital revenue and costs. Inefficient use of a hospital's most-expensive staff and facilities has a huge negative impact on the bottom line.

At VUMC, operating-suite inefficiencies began with paper-based documentation methods for preparing patients for surgery, which sometimes led to delays and cancellations. Usually, a patient was sent to a preoperative center, where a nurse took the patient's past medical and anesthesiology history on a paper-based form. Using this report, the anesthesiologist developed an anesthetic plan, made sure that needed medications were on hand during surgery, and developed a postoperative pain management plan. However, often the paper report wasn't available on the day of surgery or was incomplete.

"Our anesthesiologist spent 30 minutes re-creating the report—not a good use of a highly paid and busy professional's time," explains Dr. Paul St. Jacques, Associate Professor of Anesthesiology at Vanderbilt University Medical Center. "Even if the report did show up, the patient data was sometimes incomplete or illegible, which could result in the surgery being cancelled, resulting in waste of expensive resources."

At the time of surgery, the anesthesiologists might find that they needed additional testing or equipment that hadn't been scheduled, which could also delay or cancel the surgery. The worst case was that the surgery would proceed with insufficient patient data, with the possibility of an adverse outcome for the patient.

Once in the operating room (OR), anesthesiologists, nurses, and surgeons wanted better, more convenient access to patient data, which was difficult to obtain when the data was on paper. In addition, anesthesiologists often manage multiple patients in simultaneous surgeries and had to run from OR to OR to monitor them.

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Nimesh Patel, Director of IT, Vanderbilt University Medical Center

opportunities for process and care improvements everywhere,” Higgins says. “The challenge was how to best collect and share patient information in the surgical suite, to provide a real-time view of what was going on with a patient throughout the process, before, during, and after surgery.”

Solution

Doctors Higgins and St. Jacques turned to a group of engineers within the anesthesiology department for help. This team, headed by Nimesh Patel—who today is Director of Perioperative IT for Vanderbilt University Medical Center—had been working on a variety of data-collection projects for the anesthesiologists.

Rapidly Developed Surgical Tracking System

The doctors explained their vision of an electronic patient information system that would span the surgical process. Patel’s team started by evaluating commercial healthcare information applications, but found none that could be adapted for use in the OR environment. “We wanted a system that collected data on the entire continuum of care, from patient history to post surgery discharge,” Patel says. “There was nothing on the market that had everything we needed, so we decided to create our own.”

VUMC already had a large investment in Microsoft® software, so Patel’s team decided to create its new patient-tracking system using the Windows® 2000 Server operating system, Microsoft SQL Server® 6.5, and the Microsoft Access™ 97 database—software in use in the mid-1990s. The first module, created in just a few months, allowed anesthesiologists to digitally record all patient information during the preoperative evaluation. This early system eliminated paper records at patient intake and the associated rework and delays often caused

by records being unavailable or incorrect on the day of surgery.

“One of the big advantages of using Microsoft software is the ability to deploy something quickly and iteratively—use it, improve it, and keep the cycle going,” Patel says. “Sometimes, in those early days, we’d have daily releases of the solution.”

The team has since upgraded the information management system to run on the Windows Server® 2003 operating system and Microsoft SQL Server 2005 database software, using Microsoft .NET Framework, Web services, and forms technologies as the development environment. “Moving to SQL Server 2005 gave us big performance improvements, and moving to Windows Server 2003 gave us long-term support for our solution, plus the ability to manage upgrades more easily,” Patel says. “Using the .NET Framework, we are able to create many more reusable components to make ongoing development faster and easier.”

VPIMS, a Multimodule Solution

Over a period of ten years, VUMC has expanded its original patient evaluation solution into a multimodule solution, called VPIMS, that supports the entire continuum of surgical care and patient monitoring, from scheduling to billing. Using Microsoft software in an iterative development environment, Patel and staff have been able to incorporate new ideas and capabilities, test them in a live OR environment, and continue to improve VPIMS at a rapid rate.

“Because this was not an IT-driven but a physician-driven solution, we’ve seen a high degree of adoption among the clinical staff,” Patel says. “Microsoft software has been key to our ability to get new modules out quickly, incorporate changes rapidly, and improve the application in an iterative fashion.”

reports are designed to capture key billing information as well as all clinical information and use standard clinical terminology and symbols.

- **Vigilance.** Vigilance evolved out of the need to improve the situational awareness of clinicians managing multiple patients simultaneously. It is a clinical decision-support application that mobile clinicians use to concurrently monitor all stages of care for multiple patients in multiple ORs and within intensive care units. The clinicians have immediate access to vital signs, lab data, and streaming video from the point of care for instant assessment of patient progress. Clinicians can subscribe to a number of alerts in the form of on-screen messages as well as text paging to increase patient safety and respond rapidly in critical situations. A clinician does not need to rely on others to summarize the patient's situation when time is of critical importance; instead, Vigilance presents pertinent patient data along with clinician configurable alerts that can be displayed

on any mobile device (see figure below).

VUMC runs VPIMS on the OQO model O2 ultra mobile PC, which offers complete Windows functionality in a pocket-size form factor, critical for physician adoption. A sliding display with pen tablet capability and ergonomic thumb keyboard facilitate easy data entry. Additionally, the OQO computer can access data networks with built-in WiFi and mobile broadband, so physicians are always connected to patient information.

VUMC has deployed VPIMS in three hospitals, where it's running on more than 1,000 workstations and used by more than 500 people, including anesthesiologists, nurses, surgeons, and administrators. VUMC has also recently made VPIMS available to other hospitals as a commercial product through a third-party reseller, Acuitec.

Benefits

Vanderbilt University Medical Center has improved the workflow for surgeons and anesthesiologists using a multimodule surgical-suite application developed with and running on Microsoft software. VPIMS provides instant access to digital patient information and clinical systems, reduces surgery delays, and improves patient care.

"VPIMS provides real-time information related to the performance of the ORs, and can also track key performance, safety, and efficiency metrics for individual surgeons, procedural areas, and departments," explains Dr. Naji Abumrad, Chairman of the Department of Surgery at VUMC. "This information is extremely powerful in enabling us to review historical performance while, more importantly, improving our processes, clinical outcomes, and overall patient care and satisfaction. This is accomplished without inconveniencing the surgeon or placing any additional tasks into their

Figure 2: Mobile device showing Vigilance.



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Dr. Paul St. Jacques, Associate Professor of Anesthesiology, Vanderbilt University Medical Center

already-full daily workload.” Because of its continued investment in Microsoft software, VUMC has been able to create innovative solutions faster and less expensively.

Improved Patient Care

Using VPIMS, the medical center has been able to make preoperative evaluation forms instantly available to attending physicians so they can deliver the best possible care. “Less time doing paperwork translates into more time for patient care,” Higgins says. “Clinicians can complete tasks faster and more accurately electronically, while following the same processes they already know.”

With digital data on patients and each surgery’s progress, physicians are able to engage in more proactive, timely decision making. “When doctors have all the information they need at the point of care, they don’t waste time walking around looking for patient files or other medical staff,” St. Jacques adds. With the ability to monitor patients remotely, using mobile computers, physicians and clinicians can provide better care for more patients.

Including reminders in the software has also increased patient safety. “When we programmed the information management system with prompts such as, ‘Administer antibiotics before incision,’ we saw infections decrease by 67 percent,” Higgins says. “The magnitude of outcome improvements as a result of simple process improvements was a surprise to us.”

Improved Bottom Line

By using VPIMS, Vanderbilt University Medical Center has been able to maximize surgical-suite throughput while maintaining quality, which is critical to maintaining financial viability. “VPIMS improves OR profitability by allowing us to improve surgical case volume and resource utilization,” St. Jacques says.

“This also helps us alleviate staffing shortages and overtime charges.”

As a result of using VPIMS, the medical center has realized multiple critical operational improvements. For starters, the annual caseload has grown 10 percent annually for several years without the need to hire additional staff. The number of on-time first-case starts has increased by 100 percent since 2002. VUMC hospitals have seen a 65 percent decrease in day-of-surgery delays. They have also seen a 67 percent reduction in the average time to complete and submit an anesthesia chart to billing and a 69 percent decrease in the number of anesthesia charts that need correction or resubmission.

Additionally, the anesthesiology department has realized a 75 percent decrease in the amount of insurance write-offs and a 96 percent reduction in missed and/or under-billing. Due to improved documentation made possible by VPIMS, VUMC has reduced its third-party write-offs to less than 0.1 percent and is driving billing and collection costs to less than 1 percent of operations. “These changes have helped to dramatically improve our bottom line,” Higgins notes.

“Comparable solutions are typically associated with hardware purchases or enterprise solutions and are significantly more expensive,” St. Jacques adds. “Additionally, configuration and support for off-the-shelf packages add significant expenses to the original purchase price.”

Data for Payer Initiatives and Continued Improvement

VUMC is now able to gather deep, qualitative patient data that it can analyze for signs of continuous improvement. VPIMS produces a wealth of data that helps VUMC hospitals support pay-for-quality (P4Q) and pay-for-performance (P4P) initiatives that many

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The VPIMS and Vigilance technologies are commercially available through Acuitec. For more information, contact Acuitec at (205) 266-0848 or visit the Web site at www.acuitec.com

For more information about Vanderbilt University Medical Center products and services, call (615) 322-5000 or visit the Web site at: www.mc.vanderbilt.edu

For more information about OQO products and services, call (877) 676-6688 or visit the Web site at: www.oqo.com

health plans have adopted. The depth and richness of the reporting module not only supports P4Q and P4P initiatives, but also in-depth research and analysis, operational evaluation and improvement, clinical outcomes and tracking, and financial management.

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Microsoft Solutions for the Healthcare Industry

Healthcare and life sciences organizations are under tremendous pressure to meet regulatory requirements, improve patient care, and reduce the time it takes to develop drugs and take them to market. To meet this challenge, Microsoft and its partners have developed cost-effective solutions that enable healthcare organizations to streamline and automate daily processes that improve productivity and deliver information whenever and wherever it is needed. The result is enhanced productivity, safety, and quality.

For more information about Microsoft solutions for the healthcare industry, go to: www.microsoft.com/healthcare

Software and Services

- Windows Server 2003
- Microsoft Server Product Portfolio
 - Microsoft SQL Server 2005

- Technologies
 - Microsoft .NET Framework

Hardware

- OQO model 02 mobile computer