

Customer Solution Case Study



Hospital Provides Superior, Economical Care with Single Software Solution

Overview

Country or Region: Thailand

Industry: Healthcare provider

Customer Profile

Bumrungrad International in Bangkok is the largest private hospital in S.E. Asia. It treats 1.2 million patients annually, 430,000 of whom come from outside Thailand. Annual revenues are U.S.\$270 million.

Business Situation

In 1997, Bumrungrad deployed several UNIX-based software solutions specialised for various areas of the hospital. However, the programs weren't well integrated, were difficult to use, and were slow.

Solution

Bumrungrad has implemented the Microsoft® Amalga™ Hospital Information System, which provides a single integrated database and interface across all hospital departments.

Benefits

- Ability to serve a huge number of patients cost effectively
- Improved productivity, less patient waiting
- Improved patient safety
- Outstanding reliability

“Bumrungrad has outperformed every other listed hospital in the Southeast Asian market since implementing this system. It is a key part of our success.”

Mack Banner, Chief Executive Officer, Bumrungrad International

With medical tourism booming and patient numbers increasing by over 10 percent annually, Bumrungrad International needed a technology infrastructure that would allow it to cost-effectively and efficiently treat more than 1 million patients each year. When the hospital moved into a larger, more modern facility in 1997, it implemented Hospital 2000, now Microsoft® Amalga™ Hospital Information System (HIS). Amalga HIS combines all hospital operations in a scalable solution that runs on Microsoft SQL Server® 2005 database software and the Windows Server® 2003 operating system. Using a single software system for all hospital areas has been instrumental to Bumrungrad's ability to double the number of its patients to more than 3,000 a day, to deliver an average treatment time of 45 minutes, to reduce patient waiting time by 40 percent, and to outperform other hospitals in the region.



Situation

Bumrungrad International is perhaps the world's first truly international hospital. Located in the heart of Bangkok, Thailand, it is a 554-bed advanced facility with more than 1 million square feet (92,903 square metres) and a staff of 3,000 people, including 950 full- and part-time physicians. It serves more than 1.2 million patients annually, 430,000 of whom are international patients from more than 190 countries. Bumrungrad is the largest private hospital in Southeast Asia and a popular destination in the booming medical tourism market. Patients come from all over the world to receive operations and treatment at a fraction of the cost of care in the West.

To accommodate the rapid increase in international patients, Bumrungrad built a new facility in 1997—a modern building with soaring lobby ceilings, a Starbucks, a travel agency, a visa center, and a registration desk with translators fluent in 13 languages. The only element lacking was a technology infrastructure that was expandable enough to keep up with the hospital's rapid growth and cost-effective enough to allow frequent performance upgrades.

Bumrungrad actually opened the new facility with a brand new computer system, but the staff realised too late that the system was not up to the large volume of processing the fast-growing hospital would require. Bumrungrad had purchased several leading, third-party medical software programs running on the Sun Solaris operating system and on databases from Oracle, Ingres, Sybase, and Informix. The IT staff spent months customising and attempting to integrate these systems; however, the systems didn't integrate well, were difficult to use, and delivered poor performance. Data mismatches between the various programs created a climate of mistrust among both clinical and administrative staff members, who complained about the sudden move to a


completely digital environment with software that was slow and difficult to use. The hospital's IT staff knew that things would only get worse as patient volumes increased, so management voted to cut its losses and abandon the new system, even though it was scarcely a few weeks old.

Solution

The responsibility for identifying a new hospital information system was handed to Curtis Schroeder, then Chief Executive Officer, and Linda Lisahapanya, Managing Director, both of Bumrungrad. "We needed to create an environment that would allow our doctors to practice medicine in the best way and create the best possible relationships with their patients," Schroeder said at the time. "We wanted clinical information at the fingertips of our doctors to enable them to make better decisions."

Instead of trying to integrate many of the best departmental systems, as the hospital had tried previously, Bumrungrad wanted a single, integrated solution that would address the needs of the clinical (front office) and administrative (back office) staff using a single database and just one user interface. Physicians, nurses, radiologists, lab technicians, and pharmacists would use the system to access patient records, make treatment notes, and collaborate on care. Members of management, operations, and accounting staff, would use the same system to handle billing, stock management, supply-chain activities, and other operational issues. Such a system would eliminate integration work and data integrity worries and dramatically reduce the cost of maintaining the technology over the long run.

Bumrungrad evaluated hospital information systems from other vendors, but in the end joined with Global Care Solutions to deploy its Hospital 2000 suite, which was acquired by Microsoft in October



2007 and redesigned as the Microsoft® Amalga™ Hospital Information System (HIS). Bumrungrad is currently using Amalga HIS, a fully integrated hospital information system that includes registration, clinical systems, patient and bed management, laboratory, radiology, picture image archiving, pathology, pharmacy, financial accounting, stock management, and human resources systems.

Amalga HIS has a robust three-tier architecture designed using the Microsoft .NET Framework, the Windows Server® 2003 operating system, and Microsoft SQL Server® 2005 database software. With this scalable architecture, Bumrungrad has been able to incrementally increase the use of Amalga HIS among its staff at minimal cost. Amalga HIS includes a new user interface as well as new features in areas such as medication management, computerised physician order entry, and clinical documentation.

Bumrungrad initially installed Hospital 2000 on a single Dell quad-processor server computer. However, the Intel-based hardware is so economical that the hospital has upgraded its servers three times since the initial installation, moving up every three years to more powerful processors. Today, Bumrungrad's entire data center consists of a single rack of two Dell PowerEdge 1950 servers configured in a cluster acting as the database server, each with two quad-core Intel Xeon processors and 32 gigabytes (GB) of RAM. It stores all of the facility's data—1.8 terabytes of SQL Server data and approximately 20 terabytes of radiology studies—in an EMC CX3-80 storage area network. In addition, there are three application servers, all Dell PowerEdge 1950 computers with two quad-core Intel Xeon processors and 4 GB of RAM.

“With all of our data on one server cluster and storage unit, many would say that we're putting all of our eggs in one basket

or that we've created one big single point of failure,” says Chang Foo, the hospital's Head of Information Technology. “However, by building our solution on low-cost Microsoft software and Intel hardware, it's cost-effective to have a complete backup data center, which would not have been affordable with the proprietary UNIX-based systems and multiple databases. The technology was too fragile, and budgets would have been unobtainable.”


“What we tried to do is have a system that's integrated from beginning to end, with all the data in one place,” says Mack Banner, now Chief Executive Officer of Bumrungrad. “A common database allows the departments to work together and be more efficient.”

Because of the urgent need to remove the failing Solaris-based systems and get the new software in place as soon as possible, Bumrungrad elected to unplug the old and switch over to the new, all at once (as opposed to a gradual, department-by-department migration). “We turned on the new system instantly after we switched off the old one; there was no parallel operation,” says Foo. “It was a challenge preparing the hospital staff of approximately 3,000 people, but we provided training and performed a very methodical data migration.”

The hospital went live with Hospital 2000 in December 1999 and never looked back. In addition to upgrading its system hardware to handle increased usage, Bumrungrad regularly upgrades to the latest software release for increased functionality. The Amalga HIS architecture enables upgrades to both the client and server software without interrupting user operations.

Benefits

Bumrungrad Hospital has experienced double-digit growth for the past six years and become one of the largest private



clinics in the world. Its single software solution has been instrumental in enabling the hospital to keep pace with blistering growth while continuing to offer exceptional service at cost-effective prices. By building its IT infrastructure on Microsoft software and Intel hardware, Bumrungrad can afford to maintain a duplicate data center for disaster recovery and to refresh its hardware and software every three years to gain exponential performance surges.

Serving a Huge Number of Patients Cost-Effectively

In Thailand, patients have the opportunity to use public hospitals and see well-qualified physicians at little or no cost. Private hospitals like Bumrungrad have to compete on efficiency and value. “A hospital’s information system is the single most important factor in delivering on this expectation,” Banner says. “There’s no conceivable way that a hospital could cope with 3,400 patients in one day, 50 percent without appointments, and deliver a total treatment time of 45 minutes and an accurate demand bill at the time of service without a system like Amalga HIS. This is a very competitive system in a very competitive healthcare environment. Bumrungrad has outperformed every other listed hospital in the Southeast Asian market since implementing this system. It is a key part of our success.”

Lisahapanya adds that “In 1999, before Amalga HIS, patient volumes were at our limit of 1,500 per day. Even if we had the patients, we could not process them. Today, we see over 3,000 patients per day, thanks to Amalga HIS.”


Using Amalga HIS, Bumrungrad has the unique ability to handle the immense patient volumes that generate the volume necessary to maintain competitive pricing. Hospital prices at Bumrungrad are typically 10 to 25 percent of those in the United States and Europe and 20 to 30 percent less than in Singapore.

Since implementing Amalga HIS, patient volumes have doubled. During the same period of time, administrative staff numbers have been reduced. “The only way this doubling of patients and lowering of administrative staff could be achieved was by computerisation,” says Lisahapanya. This has a direct impact on the bottom line, doubling revenue using the same building, medical equipment, and administrative staff. Bumrungrad management attributes much of this revenue increase to the computer system.

Improved Productivity, Less Patient Waiting

Bumrungrad has closely tracked the operational impact of Amalga HIS. The system achieved the following efficiency measures in its first three years:

- Time to retrieve a medical record decreased from 25 minutes to virtually instantaneous.
- Patient waiting times decreased by 39 percent from 28 to 17 minutes per patient.
- Laboratory processing time decreased from 14.5 to 3 minutes per sample.
- Radiology processing time decreased from 57 to 18 minutes per study.
- Outpatient pharmacy dispensing time decreased by 50 percent from 20 minutes to 10 minutes.
- Outpatient bill preparation time decreased from 22 to 8 minutes.
- Accounts receivable days reduced from 15 to 10.
- Numbers of paper forms stocked decreased from 395,616 to zero.
- Stock turnover per year increased from 11.89 to 23.52 due to real-time stock control and automated reordering.
- Days to prepare the monthly accounts decreased from 30 to 4.
- 10,000 square feet (929 square metres) of medical records storage space was converted to a revenue-producing paediatric center that treated over 110,000 children in 2003.

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- 129 full-time-equivalent savings attributed to Amalga HIS.

“Amalga HIS has allowed us to manage scheduling demands, multiple languages, and medical records so efficiently that the average waiting time for our 3,200 daily patients to see a doctor is only 17 minutes. And over half of these patients arrive without appointments,” Banner says. “Amalga HIS is key to our service delivery, medical quality, and financial performance.”

All these efficiencies have produced sizeable savings. For example, the hospital has been able to eliminate U.S.\$295,000 annually in radiology film costs; it now stores 250,000 radiology studies per year on hard disks costing \$26,000.

Improved Patient Safety

Using the new medication management functionality in Amalga HIS, Bumrungrad has been able to increase patient safety by having real-time access to information to assist decisions at the time of prescribing, including detection of drug-to-drug, drug-to-allergy, and drug-to-food conflicts. Because of the integrated database, the entire patient medical record is available to the prescriber, including information from previous visits or scanned information from other systems. The medication administration functionality is bar-code enabled to ensure the medication “rights,” including right patient, drug, dose, route, and time.

“You see doctors flipping through charts but unable to find the information that they need,” says Dr. Mondej Sookpranee of Bumrungrad International. “With the new system, they have every piece of information at their fingertips. It helps me be more confident.”

Outstanding Reliability

Bumrungrad did away with paper backups, so the hospital needs exceptional uptime from its computer system. In addition to

using the failover clustering features of SQL Server, the hospital uses the disaster recovery option in Amalga HIS, which creates a secondary server infrastructure that can be used if access to the primary system is interrupted. Amalga HIS also includes the ActiveCare system monitoring facility that proactively sends system operational statistics to support personnel to detect any problems.

Another reliability improvement comes from the Dell PowerEdge server computer’s ability to employ the synchronous database mirroring ability of SQL Server. The outstanding performance of the quad-core Intel processors adds negligible transaction delays for mirroring. “Because the main site and disaster recovery site are synchronised in real time, we can have rapid failover and be confident that the hospital will have continuous access to its data,” Foo says.

Regular Performance Boosts

Because the Microsoft software and Intel hardware are more cost-effective than proprietary UNIX-based systems, Bumrungrad is able to refresh both hardware and software every three years, which keeps performance responsive and takes advantage of new software features. In 2007, the hospital migrated to its current Dell PowerEdge 1950 servers with quad-core Intel processors and realised a three-times performance gain.

“We had expected improvements in the order of tens of percent. However, we were astonished at the three-times performance gain of the combined architecture of Intel quad-core processor technology, Windows Server 2003, and SQL Server,” Foo says. “The most satisfying aspect of the results was that the performance increases measured at the server and database layers were actually reflected right through to what the end user saw.”

The current Bumrungrad system processes over 1.9 billion database transactions per



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year. The system sees peak loads sustaining 250 transactions per second between 8:00 A.M. and 12:00 P.M. with a performance load of approximately 25 percent CPU utilisation. Bumrungrad will keep growing in patient base and computerised medical management and will continuously improve and upgrade PCs, servers, and storage.

The hardware and software are so easy to maintain that Bumrungrad needs an IT staff of only 15 people, who are responsible for the system 365 days a year, 24 hours a day. "Refreshing our technology every three years allows us to take advantage of plummeting server and storage prices and regular performance increases," Foo says. "It's a very cost-effective way to run a data center."

Amalga Hospital Information System

Created specifically for emerging and developing markets, Microsoft Amalga Hospital Information System is a highly scalable, intuitive healthcare solution that manages all hospital functions in one affordable, integrated system. Amalga HIS helps improve operational efficiency across the organization, resulting in improved throughput, provider collaboration, and patient experience.

About Us

Our vision: to improve health around the world through software innovation.

Microsoft is committed to improving health around the world through software innovation. Over the past twelve years Microsoft has steadily increased its investments in health, with a focus on addressing the challenges of health providers, health and social services organizations, payers, consumers and life sciences companies, worldwide. Microsoft closely collaborates with a broad ecosystem of partners and develops its own powerful health solutions, such as Amalga and HealthVault. Together, Microsoft and its industry partners are working to advance a vision of unifying health information and making it more readily available, ensuring the best quality of life and affordable care for everyone.

For more information about Amalga and other Microsoft solutions for the healthcare industry, go to:

www.microsoft.com/amalga

Software and Services

- Microsoft Amalga Hospital Information System
- Microsoft Server Product Portfolio
 - Windows Server 2003 R2
 - Microsoft SQL Server 2005
- Technologies
 - Microsoft .NET Framework

Hardware

- Two Dell PowerEdge 1950 server computers, each with two Intel Xeon quad-core processors
- Dell/EMC CX3-80 storage area network that contains 1.8 terabytes of SQL Server 2005 data, and 20 terabytes of radiology report data

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