

Case Study

Intel® Xeon® Processor

Intel® Centrino®

Mobile Technology

Intel® Pentium® 4 Processor

Digital Health

Care Transformation

Integrated Digital Hospital



Banner Health.

“Hospitals have to change or they won’t survive. You can’t provide a quality experience for patients and providers if you stay in the paper world. In the short run, you take a financial hit, but this study shows us that in the long run, care transformation pays for itself.”

Ron Bunnell
Executive VP and CAO
Banner Health

Healing Environment, Proven Value

IT-enabled care transformation at Banner Estrella enhances patient care and nets a \$1.6M annual impact

Like many healthcare leaders, Phoenix-based Banner Health is convinced that comprehensive, IT-enabled care transformation is the right thing to do. Now, thanks to a benefits realization study conducted with Intel and Cerner, Banner has proof that it delivers solid financial value, too.

Banner implemented a far-reaching care transformation initiative at its newest hospital, Banner Estrella Medical Center (BEMC), which opened in February 2005. BEMC not only earns the highest patient satisfaction ratings in the 20-hospital Banner Health system, but also has one of the shortest average lengths of stay (ALOS), fewer adverse drug events (ADEs), and lower costs for overtime, document storage and more.¹ Analysis using the Intel® Healthcare IT (HIT) Economic Model identified an annual bottom-line impact of \$1.6 million adjusted for case mix.² Banner Health aims to extend care transformation across its 20-hospital, seven-state network by the end of 2008.

Challenge

- **Transform patient care.** Banner Health wanted to use the opening of BEMC to undertake a holistic care transformation initiative that could be adopted in franchise-like fashion at all its facilities.
- **Make the changes work for physicians and staff.** With private practice physicians and a competitive labor market, Banner Health wants care transformation to provide a more satisfying experience for clinicians as well as patients.
- **Scale the success.** Banner Health operates in some of the nation’s fastest-growing regions. The company needs to grow so it can keep pace with population increases and maintain market share.

Solution

- **Embrace holistic change.** Drawing on the efforts of 300 clinicians from across the organization, Banner Health identified and standardized best practices, and used culture change, workflow redesign and HIT to implement them at Banner Estrella.
- **Embed process changes in robust, flexible technologies.** Banner mapped its workflow to powerful digital technologies, including the Cerner Millennium* suite with Intel® technology-based front-end and mid-tier servers, workstations and tablets.
- **Analyze the impact.** Banner Health collaborated with Intel and Cerner to measure the results of care transformation at BEMC. The findings are helping Banner sustain momentum as it moves forward.

1. Compared to a weighted average of eight other Banner hospitals that have not fully implemented care transformation.

2. Pre-tax cash flow or Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA). Savings did not consider infrastructure costs.



Banner Estrella's healing environment is supported by Intel® technologies and Cerner Millennium* solutions.

Assessing the Situation

At Banner Health, every employee's business card carries the company's mission statement: Making a difference in people's lives through excellent patient care. "Rule number 1 is: Do what's best for the patient," says Judy Van Norman, system director of care transformation at Banner Health. "Rule number 2 is: See Rule number 1. When there's a decision to be made, we look at the patient impact."

When Banner prepared to open a new acute-care hospital in Phoenix's fast-growing west valley area, the company optimized every aspect to enhance patient care. From earth-tone color scheme to peaceful music to all-private rooms, each element of 172-bed Banner Estrella Medical Center is designed to foster a healing environment. Even *Newsweek* has taken note, commending BEMC for its "serene ambience."

Information technology is a critical part of the healing environment. Electronic medical records (EMRs), computerized physician order entry (CPOE), decision-support software (DSS), and picture archiving and communications systems (PACS) provide information that is viewable and sharable through an investment in servers, client devices and access points. Implemented as part of a care transformation initiative that includes culture change and workflow redesign, Banner Estrella's HIT solutions help BEMC deliver a patient experience that is calmer and quieter, safer and shorter, and more efficient and economical.

Consistent Clinical Excellence

Banner approached the opening of its new hospital knowing that digital technologies were an enabler, and not a complete solution. "Automation

gives you an opportunity to improve the nurse and physician workflow and exploit the computer's ability to store and organize information," explains Joel McAlduff, MD, system director for medical informatics and clinical innovation. Dr. McAlduff, who was the physician lead for CPOE, says, "The issue very quickly moved from how physicians enter orders, to how they take care of patients using EMRs, CPOE and a paper-light workflow."

Or, as emergency department physician David Cohen, MD, puts it, "It's not just a matter of putting down the pencil and picking up the mouse. Care transformation radically changes your entire workflow."

To prepare for such extensive change, Banner Health brought together 300 clinicians from across its enterprise to collaboratively analyze workflow and agree on evidence-based best practices. Although the near-term focus was Banner Estrella, the team was establishing clinical standards that would soon apply across Banner's 20 disparate and widely distributed hospitals.

As it approached transformational change, Banner was helped by having strong leadership, a single board of directors for its 20-hospital network, and a corporate culture that takes a franchise approach to organizational consistency. "If we're going to implement care transformation at all our hospitals by the end of 2008, we can't give everyone the option to do it their own way," says Banner CEO Peter S. Fine. "Our processes need to be consistent so we can produce consistent outcomes and deliver a consistent, high-quality clinical product at all our hospitals. That's how we do the best job for the patient, and how we grow."

"Patients start healing sooner. They experience higher quality care and fewer errors."

Charlie M. Agee, MD
Chief Medical Officer
Banner Estrella Medical Center



“Intel is our foundation. Their technologies are very important to us for desktops, servers and notebooks, and their multi-core architectures and energy efficiency are a big plus as we design a new corporate data center to carry us through the next decade.”

Michael Warden
Senior VP and CIO
Banner Health

Designing Change

In the two years preceding Banner Estrella’s opening, Banner clinicians and informaticists worked side by side to analyze workflow and map Banner’s needs to the capabilities of Cerner Millennium* and other HIT applications. Nurses designed the nurses’ portion of the EMR. Physicians, despite being private-practice medical staff with no financial incentive in seeing care transformation succeed, reached consensus on evidence-based order-sets. Clinicians of all stripes developed a deeper awareness of how they could work together to improve patient care, and their deep involvement in the process helped increase acceptance and adoption of the new approaches.

The team focused on moving information as close to the point of decision-making as possible. “You want to give the information to the person who’s making the decision rather than having to rectify it on the back end,” Van Norman says. An Intel® Pentium® 4 processor-based nurse’s workstation faces every two patient rooms, enabling clinicians to keep a sharp eye on patients while staying close to information. Intel processor-based tablet PCs and computers on wheels, coupled with wireless infrastructure, allow for mobile access to critical patient information at the time and location where it is required. BEMC has 1.8 client PCs per patient, to ensure that clinicians don’t have to compete for access to information.

With sound planning, extensive training and plenty of support, BEMC opened to patient satisfaction ratings that are the highest in the Banner network. Now, Banner is applying the learnings from Banner Estrella across its enterprise.

Spotlight: Banner Health

- \$3.3 billion company and one of the largest US nonprofit healthcare systems
- 20 hospitals and other facilities in Alaska, Arizona, California, Colorado, Nebraska, Nevada, and Wyoming
- 27,000 employees
- 3,065 licensed acute hospital beds
- 187,588 annual admissions excluding newborns
- 31,141 annual births

Delivering the Solution

Implementing care transformation at one hospital is hard. Doing it across 19 more in just over two years is even more daunting. To deeply understand what the care transformation initiative achieved at BEMC, Banner Health worked with Intel and Cerner to quantify some of the benefits and determine their dollar value. They used the Intel HIT Economic Model, a patent-pending tool for measuring an HIT investment’s success in improving business value drivers such as patient safety, quality of care, labor productivity, labor satisfaction, revenue enhancement, cost optimization and patient access.

“We believe our total cost for care transformation will be around \$100 million,” says Dennis Dahlen, Banner Health’s senior vice president for finance. “We’ll gladly spend it because care transformation will pay for itself. But before we get too far on the other 19 hospitals, we want to know how care transformation is really working.”

Key Technologies

- Cerner Millennium* solutions for electronic medical records, computerized physician order entry, pharmacy workflow and more
- Zynx Health ZynxEvidence* reference source
- HP servers powered by the Intel® Xeon® processor and running Microsoft Windows* for front-end and mid-tier applications
- Tablet computers based on Intel® Centrino® mobile technology
- Computers-on-wheels and nurses' workstations based on the Intel® Pentium® 4 processor
- Vocera Communications System wearable VoIP phones

Integral Answers

- Banner Health developed a clinical strategy primarily based on an integrated suite of Cerner clinical applications, with a focus on delivering information close to the point of decision. Cerner Millennium solutions share a common database and similar build methodology, minimizing integration challenges and helping Banner Health scale its information infrastructure across multiple sites.
- Reliable, high-performance Intel* technologies give clinicians ready access to digital information and run a wide range of healthcare applications. For ongoing needs, Intel® dual-core processors enhance scalability, manageability and energy efficiency.

Together, Banner Health, Intel and Cerner examined data relating to key performance indicators from January–June 2006, the most recent period for which data was available. Cerner handled much of the data collection and interviewed dozens of clinicians to capture their insights into the impact of care transformation. “The benefits realization study was a very collaborative effort and a great sharing of viewpoints,” recalls Van Norman. “When we were working, you couldn’t tell who represented which organization—we all challenged our assumptions and took a skeptical approach to the data.”

Financial Impact

Since they couldn’t do “before and after” analysis of a new hospital, the team compared BEMC to a virtual hospital based largely on the weighted average of eight Banner Health hospitals that had not completely implemented care transformation. Analytical adjustments were made to consider differences in case mix and reimbursement mix. The team looked at 10 key indicators, and identified, conservatively, \$1.6 million in annual impact to the bottom line.

The greatest monetary impacts resulted from improvements in ALOS, reductions in pharmacy costs, and net revenue increases from a drop in the number of patients who left the Emergency Department without treatment (LWOT). ALOS, adjusted for case mix, was 7 percent lower than at the virtual hospital, and pharmacy costs, also case-mix adjusted, were 18 percent lower.

On a percentage basis, the most significant savings came from document storage costs per 1,000 admissions, which were cut 96 percent, and from the avoidance of ADEs. Even compared to facilities that had front-end pharmacy alerts in place but did not have CPOE, BEMC had 84 percent more therapy changes per 1,000 acute admissions, helping BEMC avoid the cost and resources (and its patients avoid the time and pain) of treating potential ADEs.

“We welcome having a player of Intel’s heft and credentials interested in healthcare. Healthcare needs companies like Intel, HP and Cerner to help us get the job done.”

Dennis Dahlen
Senior Vice President of Finance
Banner Health

“Nurses have time to develop more empathy with the patient. They can listen more closely without feeling stressed out because they’re not getting their charting done. It’s a wonderful feeling.”

Debbie Carter, RN
Deployment Manager
Banner Estrella Medical Center

Other benefits contributing to the total:

- Overtime expense was 5 percent lower because nurses complete charting and shift transition duties more efficiently.
- Forms costs were more than 40 percent less because the information is stored digitally.
- Bills spent a day less in Accounts Receivable, allowing quicker payment.
- Retention of first-year nurses was higher, reducing the costs of recruiting, hiring and training new employees, as well as the costs associated with temporary staffing.
- The cost of medical-related insurance claims per 1,000 acute admissions (adjusted for case mix) was 72 percent lower.

“We are a data-driven organization,” says Ron Bunnell, executive vice president and chief administrative officer for Banner Health.

“The benefits realization study validates the investment of time, energy and money we’ve made. It is helping us continue to maximize the benefits and improve our processes, which creates a better work environment and a better experience for the patient.”

Since this was a retrospective study, only associations and not causal relationships can be established between care transformation and the financial results achieved. Savings do not consider infrastructure costs such as data center and network hardware.

Doing a Better Job for the Patient with CPOE

Conversations with Banner clinicians deepen the understanding of care transformation’s impacts and technology’s role in helping BEMC patients receive higher-quality, more efficient care.

“Orders are dispatched with more immediacy because of the technologies,” says Dr. McAlduff. “They’re more likely to be the right orders because physicians are following evidence-based order sets, and they’re alerted to any incompatibilities or allergies. Test results come back faster because we’ve removed the delays that are inherent in a paper system. Handwriting errors and unapproved abbreviations—both big sources of error—are eliminated. And when treatment guidelines change, we can embed them into the system and change our practices quickly.”

Physicians say the tools help them do a better job for their patients. “Your brain can remember most things most of the time,” says Charlie M. Agee, MD, BEMC’s chief medical officer. “When you have a system that prompts you for the correct medications, doses and frequencies, it takes care of a lot of the rote memory work. It frees up brain cells so you can use your clinical acumen more creatively to optimize the care of this particular patient.”

The same principle applies to other types of clinicians. “Pharmacists don’t have to scratch their heads trying to figure out what the doctor has written,” John Placko, RPh, director of pharmacy at BEMC, says. “They’re free to focus on what’s going on with the patient and the appropriateness of the therapy. That reduces errors and generates savings in the long run, and enables pharmacists to make a more valuable contribution.” Pharmacy costs have also been impacted by process changes and by the standardization of care sets, among other factors. “Care sets help reduce inventory costs because we’ve lowered the number of items we need to order,” says Placko.

All these elements contribute to the reduction in average length of stay—a key indicator of higher quality, more efficient care. ALOS reduction also helps patients avoid adverse drug events and acquired infections.

More Satisfying Ways to Work...

BEMC clinicians say the IT-rich Banner Estrella environment and the cross-enterprise care transformation process foster a more holistic, team-oriented approach to patient care—one they believe improves outcomes and enhances job satisfaction. “Physicians, nurses and ancillary services at Banner Estrella are more tightly integrated,” says Placko. “We all have a better understanding of how we impact each other. It’s a whole different mindset, and very beneficial for the patient.”

Clinicians collaborate more effectively in real time. “In the paper world, there’s one chart,” Dr. Agee says. “With the EMR, we can have a hospitalist, a radiologist and a consultant all looking at the chart at the same time, to improve on outcomes in a quicker fashion. You can also sit down with the patient, use a tablet or COW to show them their radiological studies in real time, and make decisions together right at the bedside.” Everyone from respiratory therapists to dietitians can engage with the patient sooner and be a better informed partner in patient care.

...and to Improve Care

Nurses see care transformation as a tremendous resource to make them better, more efficient care givers, according to Diane Drexler, RN, chief nursing officer at BEMC. “Because of the EMR, nurses have the whole picture,” she says. “They can develop a better plan of care and intervene more effectively for their patients because they’ve got all the information at their fingertips. Nurses can utilize resources more effectively and move the patient along in their recovery more quickly. If they call a physician, they’re not scrambling to find the chart when the physician calls back.”

Nurses also say they can manage their time more effectively, which relieves stress and enhances care. “Nurses have time to develop more empathy with the patient,” says BEMC deployment manager Debbie Carter, RN. “They can listen more closely without feeling stressed out because they’re not getting their charting done. It’s a wonderful feeling.”

Physicians enjoy having more flexibility in how they work. “I love that I can check on patients from my office,” says BEMC chief of staff Jon A. King, MD. “I can use a tablet and check on them while I’m walking over to see them. I can see whether consultants have seen the patient and what they’ve ordered without having to go to the hospital. I can sit in one spot and check on all my patients, without running around chasing charts. It gives me a level of comfort in the care I provide that I didn’t have before.”

BEMC clinicians agree that the HIT investments contribute to the high patient satisfaction scores. “As a patient, you don’t have to answer the same questions repeatedly—we enter the data in the chart, and all the people caring for you can see it and add to it,” Carter says. “The environment is quieter and more peaceful—we’re using wearable Vocera VoIP phones, so you don’t have all these doctors getting paged and people running around asking, ‘Where’s the chart?’ When you’re released, your films are on a CD, so you don’t have to make arrangements for another physician to access them. Your prescriptions are printed from the electronic medical record, so there’s less chance of errors at the neighborhood pharmacy. It’s definitely a smoother process.”

The net effect is clear. “Patients start healing sooner,” says Dr. Agee. “They experience higher quality care and fewer errors.” Staff satisfaction in general is higher at BEMC, and, as the HIT economic analysis showed, nurse turnover in the first year is lower.



“I love that I can check on patients from my office. I can use a tablet and check on them while I’m walking over to see them...I can sit in one spot and check on all my patients, without running around chasing charts. It gives me a level of comfort in the care I provide that I didn’t have before.”

Jon A. King, MD
Chief of Staff
Banner Estrella Medical Center



“Care transformation has become a selling point for us. The vast majority of physicians and nurses who are here regularly say they would never go back to a paper environment.”

Charlie M. Agee, MD
Chief Medical Officer
Banner Estrella Medical Center

Sustaining Momentum

As Banner Health extends IT-enabled change to existing hospitals, the benefits realization study helps the organization build momentum and enlist support. “Care transformation is hard work,” says Van Norman. “As people comprehend how much disruption it causes, the benefits realization study helps us demonstrate why we’re doing care transformation and why it’s in everyone’s best interest.”

The success of Banner Estrella is pivotal in building the willingness to change at Banner Health’s other facilities. “Banner Estrella is our prototype and test bed,” Van Norman adds. “Now, when I talk with the other hospitals, I don’t have to ask them to take my word for anything. I say: The benefits are real—go see them. Go talk to your counterpart at Estrella. Care transformation is not just a concept any more.”

In fact, care transformation has become a powerful recruiting tool. “It’s a selling point for us,” says Dr. Agee. “The vast majority of physicians and nurses who are here regularly say they would never go back to a paper environment.”

Banner sees care transformation as an industry mandate—and tools like the Intel HIT Economic Model as valuable in helping the industry advance. “Care transformation is the right way to improve patient care and employees’ lives,” Bunnell says. “The more we as an industry can measure and report on what we’re doing, the easier it will be to elevate healthcare to another level.”

Return on Investment

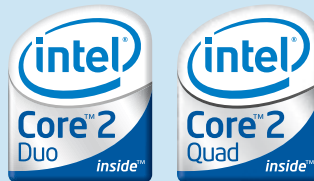
Banner Health's success with care transformation helps ensure that BEMC patients are treated in accordance with the latest treatment guidelines, and receive higher quality, more efficient care. Banner's successful care transformation initiative also enhances the company's leadership position and supports its growth strategy. In its benefits realization study with Intel and Cerner, Banner Health identified \$1.6 million in annual benefits, adjusted for case mix.

Learn more about the HIT Economic model and the Banner Health benefits realization study, and find a healthcare IT solution that is right for your hospital system.

Contact your Intel representative, or visit:
<http://www.intel.com/healthcare/healthit/>

Benefits stemmed from:

- Lower average length of stay
- Lower overtime expenditure per 1,000 admissions
- Lower drug expenditure per 1,000 adjusted admissions (adjusted for case mix)
- Lower form expenditure per 1,000 admissions
- Lower document storage costs per 1,000 admissions
- Greater avoidance of costs for treating adverse drug events per 1,000 acute admissions
- Fewer medical insurance claims per 1,000 acute admissions
- Faster movement of bills through Accounts Receivable
- Fewer nurses leaving voluntarily within the first year of employment
- More Emergency Department visitors treated



Solutions provided by:



Copyright © 2006 Intel Corporation. All rights reserved. Intel, the Intel logo, the Intel. Leap ahead. Intel Centrino, Intel Core, the Intel Core 2 Duo logo, Intel Xeon, and Pentium are trademarks or registered trademarks of Intel Corporation and its subsidiaries in the United States and other countries.

This document is for informational purposes only.
INTEL MAKES NO WARRANTIES, EXPRESS OR IMPLIED, IN THIS DOCUMENT.

*Other names and brands are the property of their respective owners.
0107/SM/CMD/XX/PDF 316318-001US

