Table 1. Value Dials with Representative Key Performance Indicators (continued)

Value Dials	Sample Key Performance Indicators	Measurements
Staff productivity	Increased face time with patients	Percentage change of actual delta increase
	Reduced time spent doing administrative work	Percentage change of actual delta increase
	Reduced number of steps to perform a specific task or medical procedure	Actual delta change
	Reduced time to perform a specific task or medical procedure	Time change
	Clinical staff turnover	Percentage change in turnover
Staff satisfaction	Physician referrals	Percentage change in referrals
	Hours of overtime worked	Percentage change in overtime work
	Internal satisfaction survey scores	Percentage change in scores indicating change satisfaction
	Patient volume	Percentage change in volume
Revenue enhancement	Bed turns per month	Percentage change in bed turns
	Length of stay	Percentage change in length of stay
	Days in Accounts Receivable	Change in days spent waiting for payment
	Number of elective surgeries per week	Percentage change
	Unit cost of diagnostics and treatment	Actual cost change
Cost optimization	Administrative cost of healthcare system	Actual cost change
	Inventory cost	Change in cost of inventory in stock, including drugs and other supplies
	Cost per patient day	Percentage change

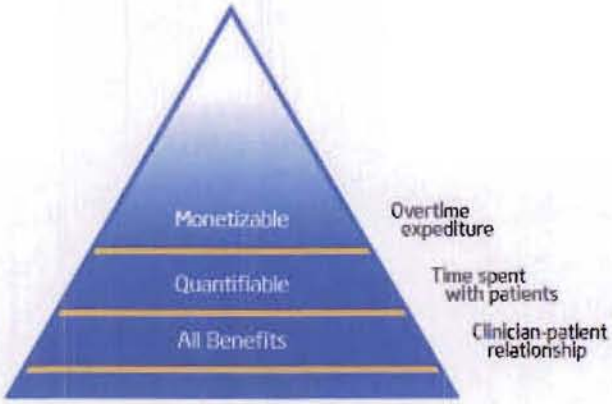
Quantifiable, Monetizable Benefits

The Value Model focuses on quantifiable benefits that produce a measurable financial impact.

The HIT Business Value Model emphasizes quantifiable benefits that produce a financial impact, so many performance indicators also have an associated monetary value. For example, the performance indicator of improved avoidance of adverse drug events can be measured in terms of the number of ADE alerts resulting in therapy changes for a weighted average of the number of acute admissions. The financial benefit can be determined by factoring in the average cost per ADE.

For any given HIT investment, an organization can identify key performance indicators for the value drivers that an investment is intended to address, determine a current baseline, and measure improvements against this baseline. Results can be adjusted for case mix and reimbursement model, to determine financial effects more precisely.

HIT investments produce many benefits that are not quantifiable, and many quantifiable benefits may not be monetizable—that is, they may not have a measurable financial impact. For instance, many clinicians who work in HIT-enabled environments say the clinician-patient relationship is enhanced because clinicians can deliver more efficient, responsive care and spend more time at the bedside. However, an improvement in the relationship would be difficult to quantify, and it would be even harder to assign a dollar value to such improvements. In other words, time spent with patients can be measured but not easily monetized. By contrast, overtime expenditure can be measured, and the financial impact can be clearly identified. Employee satisfaction is quantifiable; improved nurse retention is monetizable.



Not all HIT benefits are quantifiable or monetizable. The Intel HIT Value Model focuses on quantifiable benefits that have a measurable financial impact.

The Value Model's Value

The Intel HIT Value Model starts from Intel's core belief that all IT investments are business investments that should support strategic priorities and deliver a sustainable advantage to the organization. IT should be seen as a value rather than a cost center.

By helping hospital executives and other decision makers discuss and measure the value of HIT investments, the Intel HIT Value Model can assist in turning information technology benefits into a reality. Using the model can generate insights that deliver value throughout the project life cycle:

- **Align HIT investments with strategic goals.** By emphasizing IT's contribution to achieving core clinical and business objectives, the Value Model helps hospitals, governments and other stakeholders use HIT investments to drive improvements to healthcare quality, cost, and accessibility.
- **Improve IT investment strategies.** Making more data-driven investment decisions helps reduce investment risks and identify which investments are likely to deliver maximum value. The information and insight gained can be used to build the business case for HIT investments and secure funding.
- **Enhance project planning.** During project planning, the HIT Value Model can facilitate the process of discussing and clarifying intended outcomes and exploring ways of measuring them. Understanding likely outcomes can help to evaluate competing investment priorities and gain insights into which projects or outcomes are more likely to address your objectives.
- **Improve project management.** Defining a current baseline and specifying the benefits sought helps clarify expectations and enable more effective project management. Measurement of expected and achieved benefits provides the basis for an analytical approach to evaluating pilot studies and full implementation, and understanding their impact. Is the project delivering the expected results? Are you seeing unanticipated benefits? The model won't tell you why the results occurred, but having a clearer picture can provide a starting point for fruitful discussion over how to optimize changes.
- **Inform and educate.** Enlisting the support of clinicians is critical to successful HIT adoption. If the model shows that pilot programs or initial, limited-scope deployments demonstrate objective, measurable improvements, clinicians and other end users are likely to accept the change more willingly.
- **Build on your success.** HIT deployment is a process of continuous improvement. Insights and information gleaned from using the Value Model can prove valuable in communicating your successes—to generate pride in what's been accomplished and build support for subsequent projects.

Evaluating Care Transformation at Banner Health

Banner Health used the Intel HIT Value Model to identify 10 key performance indicators that together produced an annual bottom-line impact of USD1.6 million adjusted for case mix.

Banner Health, a USD 3.3 billion company headquartered in Phoenix, Arizona, used the Intel HIT Value Model to evaluate the impact of a comprehensive care transformation initiative. Banner Health first implemented care transformation at the opening of a new hospital, 172-bed Banner Estrella Medical Center, in February 2005. One of the largest U.S. nonprofit healthcare systems, Banner Health operates 20 hospitals in seven states, and is in the process of replicating care transformation across its network of facilities by the end of 2008.

Care transformation is the name Banner Health has given its holistic change initiative. To develop the initiative, Banner Health brought together 300 clinicians from across their organization to design new workflows and establish standardized, evidence-based order sets. Supporting the new workflows and order sets are HIT investments including EMRs, CPOE, decision-support software, and picture archiving and communications systems (PACS), as well as wireless networks, and Intel® technology-based nurses' workstations, tablet PCs, and servers.

Technology alone doesn't produce transformation. Banner Health built the success of its initiative through strong organizational leadership at multiple levels, deep clinician involvement, and detailed attention to the complex interplay between technologies, cultural readiness, and clinical work practices.

Banner Health's care transformation combines elements of evidence-based best practices, culture change, workflow redesign, and healthcare information technologies across all stakeholders in the patient care experience to achieve an optimal health outcome.

Banner Health worked with Intel and Cerner, two of its key suppliers and trusted advisors, to apply the Intel HIT Value Model. Since we couldn't do a before and after comparison with a new facility, we created a baseline virtual hospital that was a weighted average of eight Banner hospitals and analyzed the 10 key performance indicators listed in Table 2. These 10 indicators produced USD1.6 million in annual bottom-line impact adjusted for case mix.[3] In addition, while patient satisfaction was not one of the performance indicators, it is worth noting that Banner Estrella opened to patient satisfaction ratings that are the highest in Banner's 20-hospital network. Table 3 shows financial, operational and other data used to determine the changes, along with the calculations performed.

Table 2. Changes to Key Performance Indicators at Banner Estrella Medical Center[1]

Key Performance Indicators	Metric description	Economic Impact[2]
Avoidance of adverse drug events (ADEs)	Therapy changes per 1,000 acute admissions	84.5% more
	ADE cost avoidance per 1,000 acute admissions	84.3% higher
Reduction in medication related claims	Medication related claims per 1,000 acute admissions	21.9% fewer[3]
	Cost of medically related claims per 1,000 acute admissions	71.8% lower[3]
Increase in nurse retention	Nurses leaving voluntarily within the first year	15.8% fewer
	Nurse replacement cost avoidance	15.8% lower
Reduction in patients leaving ED without treatment	ED visitors treated per month	1.8% more
	Revenue per month from treating more ED visitors	1.8% higher
Overtime reduction	Overtime expenditure per 1,000 admissions	5.3% lower
Pharmacy cost reduction	Drug expenditure per 1,000 admissions	17.8% lower[3]
Forms elimination	Form expenditure per 1,000 admissions	41.6% lower
Reduction in paper document storage costs	Document storage costs per 1,000 admissions	95.6% lower
Reduction in Accounts Receivable cycle	Days in patient A/R	2.2% fewer

[1] Compared to a mean of eight other Banner Health facilities that had not fully implemented care transformation.
[2] Annualized impact extrapolated from data for January – June 2006.
[3] Adjusted for case mix.

[4] Pre-tax cash flow or Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA). For a fuller discussion of care transformation at Banner Health, see the Intel case study: *Healing Environment: Proven Value: IT-enabled care transformation at Banner Estrella Enhances Patient Care and Nets a USD 1.6 million annual impact.*

Table 3. Financial Impact at Banner Estrella Medical Center

Key Performance Indicators	Data	Calculations
Avoidance of adverse drug events	• Number of ADE alerts resulting in therapy changes • Number of acute admissions	Total benefit: Total # of ADE alert-triggered therapy changes * average cost per ADE Incremental benefit[1]: (# of ADE alert-triggered therapy changes per acute admission at BEMC – mean # of ADE alert-triggered therapy changes per acute admission)* # of acute admissions at BEMC * average cost per ADE
Reduction in medically related claims	• Total medication error-related claims costs • Total number of acute admissions	(Mean medication error-related claims cost/ acute adms – BEMC medication error-related claims cost/acute adms) * # of acute admissions at BEMC
Increase in nurse retention	• Estimated voluntary nurse turnover percentage • Number of nurses with < 1 year of service • Total number of nurses leaving with <1 year of service • Estimated cost of nurse replacement	(Mean voluntary nurse turnover of new nurses (< 1 year of service) – BEMC new nurse turnover) * average replacement cost per nurse

continued on page 14

[1] Incremental benefit is the benefit resulting from car transformation and from the higher level of CPOE adoption at BEMC than at hospitals included in the virtual hospital.

Table 3. Financial Impact at Banner Estrella Medical Center (continued)

Key Performance Indicators	Data	Calculations
Reduction in patients leaving ED without treatment	• Average monthly ED visits • Average LWOTs • Average net OP revenue	BEMC Incremental # of treated patients (Mean % ED LWOTs of Total Visitors – BEMC % ED LWOTs of Total Visitors) * net revenue per outpatient visit
Overtime reduction	• Total overtime expenditure • Total number of admissions	(Mean overtime exps/admission – BEMC overtime exps/admission) * # of admissions at BEMC
Pharmacy cost reduction	• Total pharmacy cost • Total number of admissions • Case mix index	Mean CMI adjusted pharmacy exps/adms – BEMC CMI adjusted pharmacy exps/adms) * # of admissions at BEMC
Forms cost reduction	• Total form cost • Total number of admissions	(Mean form exps/adms – BEMC form exps/adms) * # of admissions at BEMC
Document storage costs reduction	• Total document storage and retrieval cost • Total number of admissions	(Mean document storage/retrieval cost per admission – BEMC document storage/retrieval cost per admission) * total # of BEMC admissions
Reduction in Accounts Receivable cycle	• Days in AR • Net patient AR	Value of fewer days in A/R (182/Days in A/RBE) * (Net Patient A/RBE)*(1+cost of capital)^(Days in A/R saved/365)-1)

Free Resources to Build Your Success

The Intel HIT Value Model provides a practical, industry-proven approach to help evaluate the potential and actual impact of HIT-enabled initiatives.

HIT investments—as part of well implemented initiatives supported by interoperable, standards-based solutions—can positively impact core healthcare objectives such as quality of care, patient safety, and provider productivity. They can also deliver measurable, bottom line value. But in an era of constrained IT resources, HIT must compete with other investment priorities, and multiple HIT-enabled initiatives may compete with each other. The Intel HIT Value Model provides a practical, industry-proven approach that CIOs, CFOs, CMOs, and other healthcare decision makers can use to understand and evaluate the potential and actual impact of HIT-enabled initiatives, and thereby accelerate progress toward achieving the benefits of healthcare IT.

Intel offers a set of free resources based on the HIT Value Model, as well as advisory services to organizations that want to conduct a customized analysis. We can also share best practices on ways to use healthcare information technology to achieve core healthcare objectives. Please contact your Intel representative to see a demonstration of the Intel HIT Value Model.

Learn More

Intel Healthcare Solutions:

http://www.intel.com/healthcare/healthit/hospitals.htm

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http://www.intel.com/healthcare/healthit/hospitals.htm

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White Paper
Digital Health
Mobile Point-of-Care
Value Model

Assessing the Value of Mobile Point-of-Care Solutions for Three Clinical Workflows

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Executive Summary: Streamlining Clinical Workflow

Saint Clare's Health System used Intel's mobile point-of-care (MPOC) value model in a small-scale pilot to identify the business value of investing in MPOC solutions. Two clinical workflows demonstrated broad and significant value from the use of MPOC technologies: bedside charting by rounding respiratory therapists, and dictation of progress notes and other clinical documentation by a select group of physicians who were mandated to use dictation. Rehabilitation therapists had a more static workflow and did not demonstrate business value from the MPOC solution.

The optimized workflows:

- Saved 55 minutes daily per respiratory therapist, producing a 13 percent productivity increase
- Enhanced productivity for administrative staff by 12 percent and for physicians by 2 percent
- Reduced the cost of certain external dictation services by 52 percent
- Improved records compliance by 22.5 points
- Improved staff satisfaction with their tools by 20 percent

Positive impacts were also noted for quality of care.

Analysis with the MPOC value model showed that the increased productivity and reduction in dictation costs would generate significant monetary benefits. The pilot would save $51,000 annually prior to expenses, yielding a three-year net present value (NPV) of $103,000. Large-scale deployment would save over $347,000 annually prior to expenses (see Table 1), yielding a three-year NPV of $619,000. Factoring in expenses, payback would come within one year.

As a result of the pilot and the value model analysis, Saint Clare's is moving rapidly—and with greater confidence in the benefits to be achieved—toward broader MPOC deployment.

Table 1. Annual Gross Savings (Large-Scale Deployment)	
Physician productivity	$56,965
Dictation expenses	$130,604
Administrative productivity	$9,359
Respiratory therapist productivity	$150,150
TOTAL	$347,078

1. Net present value analysis brings forward all costs and savings, and values them in the present day, enabling comparison of projects with different time scales

Data-Driven Decisions to Enhance Clinical Workflows

Would mobile technologies help Saint Clare's enhance care? Would they be a sound investment? What workflows would benefit?

Saint Clare's Health System is northwest New Jersey's largest community health system. A Catholic faith-based organization, Saint Clare's provides compassionate, high-quality care through four hospitals and healthcare facilities. It is a member of Catholic Health Initiatives, a Denver-based ministry with health organizations in 19 states nationwide.

Beginning in November 2006, Saint Clare's Health System successfully deployed a broad suite of Cerner Millennium* electronic medical records (EMRs), including 17 healthcare information technology (HIT) solutions, across all disciplines at its four New Jersey facilities. Since the initial rollout, Saint Clare's physicians and other staff have gone from pre-deployment jitters and uncertainty, to enthusiastic acceptance and growing awareness of the many ways in which HIT can improve the quality, cost, and accessibility of Saint Clare's healthcare services.

With that awareness have come frequent requests for added functionality, including easier access to digital information at the point of care. Saint Clare's had implemented wireless networking at all facilities, and provided access to digital information via stationary PCs and wireless computers on wheels (WOWs). But space and contention created ongoing headaches. Theoretically, WOWs are mobile devices, but in practice, they can be cumbersome to maneuver through crowded hospital rooms and corridors. As a result, many clinicians take handwritten notes at the bedside for later entry into the computer. This creates redundant work, introduces transcription errors, and causes delays in making information available to other members of the care team. In addition, clinicians often had to line up to access a PC, which impacted productivity and satisfaction and added further information latency.

A solution that relieved contention and offered greater mobility was clearly in order—but which workflows would benefit? Would mobile technologies actually help Saint Clare's deliver higher- quality, more cost-effective care? Would MPOC technologies be a sound investment?

Too often, such decisions are based on instinct and intuition. To take a more informed, data-driven approach, the Saint Clare's leadership team collaborated with Intel Corporation on a small-scale pilot to:

- Evaluate the use of mobile technologies in three clinical workflows.
- Identify and measure the potential business value of investing in MPOC solutions for these workflows.

Identifying Business Value: The Intel MPOC Value Model

Investments in MPOC solutions should improve value dials such as quality of care, staff productivity, cost optimization, and staff satisfaction.

Saint Clare's used Intel's mobile point-of-care value model, a patent-pending tool designed to help healthcare organizations build a quick business case for proposed MPOC investments without having to engage a finance expert and carry out exhaustive ROI analysis. The value model can also be used to identify post-deployment benefits.

The value model is based on an approach that Intel developed to analyze its own IT investment strategies. Intel later used the model with a range of companies and organizations. More recently, clinicians and financial analysts in Intel's Digital Health Group have collaborated with healthcare leaders to adapt it to the needs of the healthcare industry. Intel offers a free, interactive tool, as well as advisory services for organizations wanting to conduct a customized analysis.

The value model starts from Intel's core belief that all IT investments must support strategic goals. Investments in mobile point-of-care technology should improve value dials such as quality of care, workflow optimization (staff productivity), cost optimization, and staff satisfaction.

As a starting point for discussion, the Intel model provides a set of key performance indicators (KPIs) for each value dial. KPIs are observable, quantifiable, operational metrics that can be used to measure meaningful changes. Additional value dials and KPIs can be established to suit institutional priorities.

To use the value model, relevant KPIs are established and a baseline of current performance is measured for each indicator. After pilot or production deployment, changes are measured against the baseline, and the monetary impact is established where possible. Even when institutions do not gather data on actual use, the discussions needed to identify hoped-for business value can be extremely fruitful in aligning IT purchases with important value drivers.

The model emphasizes quantifiable benefits for which a financial impact can be determined, while acknowledging that investments in mobile technologies can also produce many intangible and important gains. Many performance indicators can be applied to multiple value dials, but for determining financial value, each KPI is counted only once.

Respiratory therapists, physicians, and rehabilitation therapists were interviewed and observed as they went through their daily routines—with and without a technology-enabled optimized workflow.

Pilot Overview

Saint Clare's identified three clinical workflows as candidates for a mobile point-of-care solution:

- **Respiratory therapists.** These clinicians conduct rounds to monitor patients with pulmonary difficulties and to administer inhaler and/or respiratory medication and treatments. A mobile device might save time by enabling them to do real-time charting at the bedside.
- **Physician dictation.** Some physicians are mandated to use an external dictation service to document their care. Voice recognition software might provide a more efficient and economical alternative.
- **Rehabilitation therapists.** Rehabilitation therapists deliver physiotherapy and other care. They might be expected to see benefits similar to those of respiratory therapists.

For the pilot, one respiratory therapist and one rehabilitation therapist were equipped with an innovative mobile device called the mobile clinical assistant platform (MCA). Larger than a PDA but smaller and lighter than an ordinary tablet computer, the MCA (Figure 1) was developed by Intel's Digital Health Group in collaboration with clinicians to meet the unique needs of medical professionals in acute care settings. The MCA provides a sure-grip handle for easy carrying, and a sealed case that's designed to be easy to wipe off with disinfectant and shock-resistant if dropped. The device also has built-in capabilities that add value in clinical settings, including a microphone, digital camera, and barcode or radio frequency identification (RFID) reader.

Figure 1. A Mobile Clinical Assistant

Three physicians participated in the pilot, using Nuance® Dragon® NaturallySpeaking® Medical Edition software. Due to temporary technical difficulties, they used ordinary tablets rather than the MCA. However, the dictation workflow would also be a candidate for the MCA once those difficulties are resolved.

The pilot was conducted at Saint Clare's Hospital, Denville, New Jersey. Workshops were held to identify key performance indicators that could be affected, and to choose those for which it was feasible to collect relevant data. Table 2 summarizes the relevant values and KPIs for these workflows.

Participating physicians and therapists were interviewed and shadowed as they performed their jobs, and workflows were modified to incorporate the MPOC solution. Baseline data (the "before" workflow without MPOC technologies) was collected October 15–16, 2007. Participants were trained on the use of the device and software, and data on the MPOC-enabled workflows was collected December 10–11.

Table 2. Relevant Value Dials and Key Performance Indicators for Saint Clare's MPOC Pilot

Value Dials	Key Performance Indicators	Comments
Staff productivity (via workflow optimization)	Respiratory therapist time savings*	Time savings through eliminating duplicate data entry and PC contention
	Physician time savings*	Time savings on dialing the dictation service, dictating, re-dictating, clearing rejections, correcting records, etc.
	Administrative staff time savings*	Health Information Center staff saved time on dictation-related quality assurance tasks
Quality of care	Increased compliance with regulatory mandates	Avoidance of problems stemming from lack of compliance
	Reduction in time spent on administrative tasks	Ability to spend more time on clinical care
	Reduced length of stay	Potential ability to improve clinical decision making, leading to earlier patient discharge through faster information availability
Cost optimization	Reduction in costs for dictation services*	Avoidance of costs for dictation services
	Increases in charge capture	Improvements enabled by real-time documentation
Patient/staff satisfaction	Increases in patient and staff satisfaction	Improvements in the quality and efficiency of care can enhance staff satisfaction and potentially increase staff retention. Patients generally report greater feelings of satisfaction as clinicians spend more time at the bedside.

*These indicators were measured and used to determine the solution's business value.

Pilot Impact

The optimized workflow saved respiratory therapists 55 minutes per day per therapist by eliminating duplicate tasks. The increased productivity delivered a daily financial impact of $83 per therapist.

Respiratory Therapy Workflow

Respiratory therapists (RTs) have a highly mobile workflow, and they achieved huge gains in business value from the mobile point-of-care solution. These therapists conduct patient visits throughout the day, monitoring patients, reading and charting data from clinical equipment, and performing and documenting respiratory treatments. The rooms of pulmonary patients are often crowded with clinical equipment, so rather than maneuvering a PC cart to the bedside, RTs in the pre-pilot workflow made notes on paper and entered them into a PC later.

With the MPOC solution, therapists used the MCA to chart at the bedside (Figure 2). This technology-enabled change allowed RTs to eliminate duplicate data entry and avoid the need to search for a free PC. The time savings for any given patient visit were small, but because RTs see numerous patients, the productivity gains had large multiplier effects. Observations showed that eliminating duplicate data entry saved an impressive 55 minutes per therapist per shift.

In addition to saving time and steps, the optimized workflow meant that status information was entered into the EMR system sooner. By making the data immediately available, the MPOC solution thus enabled more informed decision making.

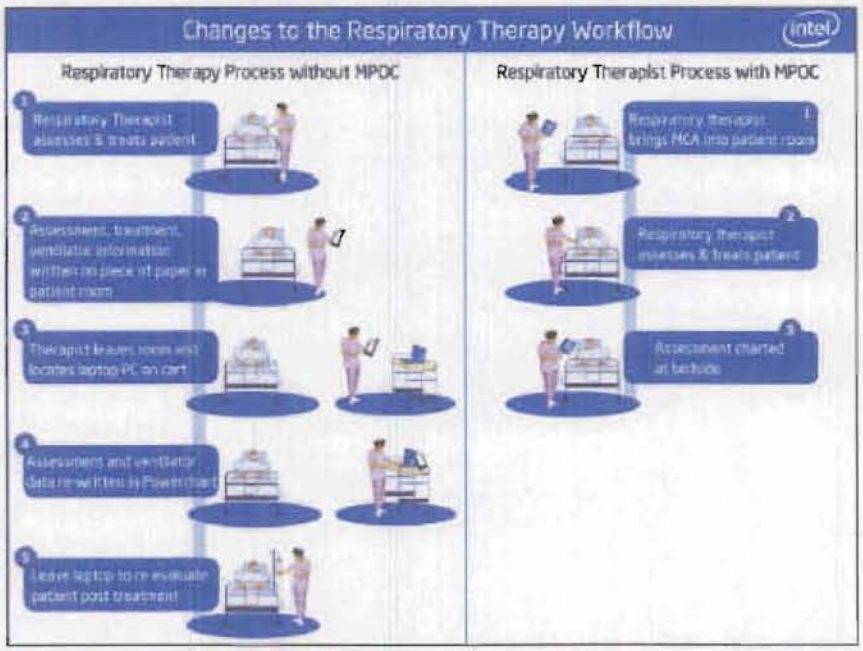

Figure 2. Changes to the Respiratory Therapy workflow

The MPOC solution reduced dictation costs and provided significant productivity gains for the administrative staff managing patient records. Physicians achieved a modest productivity gain that should increase as the environment becomes more fully electronic.

Physician Dictation Workflow

Saint Clare's has system wide dictation expenses of over $600,000, with the Denville facility accounting for more than $300,000. A portion of that cost comes from physicians who, for legibility reasons, are mandated to dictate their patient notes, including discharge summaries, progress notes, and consultation notes.

In the pre-pilot workflow, these physicians captured notes on paper or in memory as they conducted rounds, returning to phones at the nurses' station to call into an external dictation service. The hospital paid a premium for two-hour turnaround, and the transcribed notes were generally returned well within the two-hour limit. Often, however, there were significant gaps in the information.

With the MPOC solution, physicians dictated their notes directly into voice recognition software on a laptop PC. This change created business value in a variety of ways.

Physician Productivity

Physician benefits came from time savings enabled by mobility gains, as well as from the use of the mobile devices rather than the dictation service for dictation. Using a laptop PC, physicians could dictate their notes anywhere—they didn't have to return to the nurse's station to conduct their dictation.

In reality, since many Saint Clare's processes are still paper-based, physicians still returned to the nurse's station for other tasks, so this productivity gain was a modest but significant 2 percent. Physician productivity savings are expected to grow as more processes become fully electronic. Meanwhile, the laptops gave physicians the freedom to input data and view patient record details in the cafeteria, doctor's lounge, or other locations in and outside of the hospital.

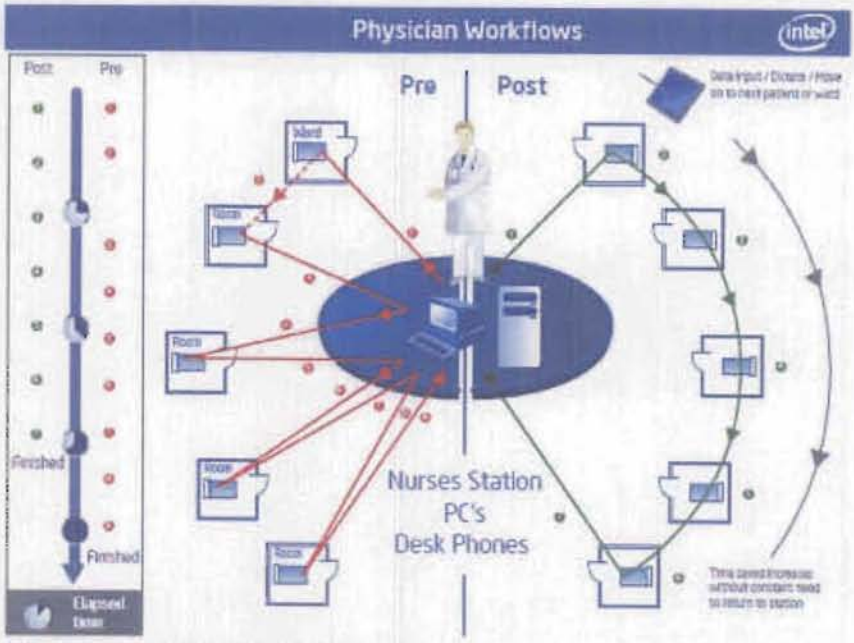

Figure 3. Changes to the Physician Dictation Workflow

Quality of Care

The MPOC solution had several indirect impacts on clinical outcomes. The productivity savings enabled physicians to increase the time spent on clinical tasks. The ability to document progress notes immediately, rather than relying on memory and handwritten notes, can also improve the quality and timeliness of clinical information, which in turn can indirectly affect quality of care.

In some cases, dictation transcribers were not able to capture all data spoken by physicians. This produced "blanks" in the transcription where speech was not clearly understood. Saint Clare's physicians reported that they were impressed with the quality of medical language data captured by the Nuance Dragon medical dictionary. In addition, physicians could monitor the transcription as it took place and immediately repeat words or phrases that were not captured correctly. This increased the overall quality of clinical data.

Compliance with Joint Commission guidelines is an indicator of high-quality care. Lack of compliance can have clear cost implications, as well as influence a hospital's prestige and reputation. The voice recognition solution on mobile technologies improved the ability of Saint Clare's to conform to Joint Commission guidelines on dictation by an average of 22 points (Table 3).

Table 3. Change in Regulatory Compliance

Compliance Aspect	Pre-Pilot	Pilot	Improvement
Unapproved abbreviations	99%	100%	1%
Date/time entry recorded	83%	100%	17%
Corrections made as needed	29%	100%	61%
Progress note legibility	89%	100%	11%

Administrative Staff Productivity

Administrative personnel in Saint Clare's Health Information Center (HIC) are responsible for managing patient records and ensuring compliance with Joint Commission guidelines. This includes verifying patient numbers, clearing rejected dictations, and obtaining time stamps and physician signatures if those are required but were not provided.

The MPOC-enabled dictation solution enhanced HIC staff productivity 1 percent in the pilot as a result of the higher quality of data and a reduction in rework. This figure would scale to a very significant 12 percent on large-scale deployment.

Cost Optimization

Pilot results indicated a drop in dictation expenses of 4 percent from the use of the mobile solution, rising to 52 percent on large-scale deployment.

Rehabilitation Therapist Workflow

The rehabilitation therapists' experience in the pilot reinforced the importance of matching the technology to the workflow. Rehabilitation therapists loved the MCA, but their workflow is relatively static and did not in fact benefit from the use of an MPOC solution.

In contrast to respiratory therapists, who conduct rounds and see large numbers of patients, rehabilitation therapists see patients in the therapists' rooms for treatment, and they see fewer patients in a day. In addition, rehabilitation therapists do not administer medications, so there is less risk from delays in charting. Since so much of rehabilitation therapy is hands-on, therapists tended to put the MCA aside while they interacted with patients, thus losing the benefits of a device that enabled face-to-face conversation and charting.

In short, the MPOC solution produced minimal changes in the rehabilitation workflow and had little impact on the business value dials. The impact of these changes was not formally analyzed or included in the analysis.

Business Value Summary

The pilot team used the Intel mobile point-of-care value model to determine the solution's business value based on four key performance indicators: productivity increases for respiratory therapists, physicians, and Health Information Center staff; and cost optimization on the dictation service. Based on the pilot results, the pilot team extrapolated the results of full-scale deployment. Figure 4 summarizes the identified business value.

Respiratory Therapists

Task	Pilot	Full
Transcribe vitals	55 mins	5 hours
Removal of duplicate task	$83	$413
Daily time save	13%	13%+

5 minute time saving per patient:

Reduction in duplicate data entry
Approx 330 visits (day) x 5 mins =
55 minutes per day per therapist

Per MCA = $83 (day)
Full Potential = $413 (day) with 5 MCAs

Dictation

Task	Pilot	Full
Dictation Service rate #1	$21	$21
Dictation Service rate #2	$18	$338
	$39	$359

Cost Avoidance on less dictation service usage:

Pilot (3) x Savings (per day)
28 x Savings (per day)
Full Potential Dictation approx (Denville)
$130k

HIC Staff Productivity

Task	Pilot	Full
Clearing dictation rejection report	5 mins	30 mins
Check PN create, time stamp & signature	4 mins	2.1 hours
	9 mins	2.6 hours

Admin Time Savings:

Reduced time on above tasks
3 mins per analyst per day
Full Potential 51 minutes of HIC Staff time

$2 per day saving. Full potential $36 per day
Pilot 0.7%, Full Potential 12% productivity increase

Physician Productivity

Task	Pilot	Full
-Walking to/from PC -Dialing dictation -Time for dictation -Redictating -Clearing rejections -Correcting records	$17	$167
	4 mins	2 hours
	2%	2%+

Time saving per physician:

Reduction of task time, change in workflow:
3 (physicians) x 4 (times saving) =
12 minutes per day

Saves 2% of physicians time
4 mins per physician (per day)

Figure 4. Business Value Summary

Net present value analysis showed a value of $57,000 without dictation and nearly $103,000 with dictation. NPV for the large-scale deployment was nearly $619,000. (See Table 4.) Net present value analysis was used because it can account for recurring maintenance and support costs as well as the initial investment. NPV analysis brings forward all costs and savings and values them in the present day, enabling comparison between projects of different time scales. The analysis used a 12 percent hurdle rate (minimum rate of return) over a three-year period, and all productivity savings were cut in half to guard against overstating the expected benefits.

Table 4. Net Present Value Analysis

Scenario	Annual Gross Benefit	Initial Investment	Average Annual Ongoing Expense	3-Year Net Present Value
Pilot—no dictation	$30,030	$8,394	$5,516	$57,013
Pilot with dictation	$50,802	$11,379	$5,516	$102,722
Large-scale deployment	$347,078	$114,440	$79,263	$618,800

Further Gains

Saint Clare's Health System is moving forward with MCA and MPOC deployment, and expects to gain significant economies of scale and additional business value as larger numbers of staff adopt MPOC solutions, and more core processes are brought into the digital environment. For example, lack of information often prevents physicians from discharging patients and leads to longer than necessary patient stays. As more physicians use electronic charting and/or voice recognition software, they'll have more accurate, timelier information that may improve discharge and average length of stay, and enhance both patient throughput and quality of care.

Respiratory therapists are excited about using the MCA in production deployment and are working with IT leaders at Saint Clare's to incorporate it more fully into their workflow. The MCA has a built-in Bluetooth* wireless interface that, along with appropriate software, enables automated reading from diagnostic bedside equipment, further improving workflow and data accuracy. Also of benefit are the use of the MCA's barcoding and RFID reading capability to reduce errors and increase efficiencies in patient identification and medication delivery.

Saint Clare's IT department is being inundated with requests from other groups that see benefits from incorporating the mobile clinical assistant into their workflows. Wound care specialists want to use the MCA and its built-in digital camera to enhance their mobile workflow and improve the charting of wound progression. Admissions staff expect the MCA to help them focus on the patient during the intake interview; they can also use the MCA to take digital photographs for easier patient identification and fraud reduction. Many nurses who now use laptops or WOWs are interested in using the MCA, particularly for workflows where charting is primarily menu-based rather than narrative.

In all cases, the experiences Saint Clare's has gained through piloting the MCA and using Intel's MPOC value model will enable it to proceed with greater understanding of the business value of MPOC solutions and greater insights into how to achieve that value.

Learn More

Intel delivers research-based innovation for health and healthcare. Informed by nearly a decade of ethnographic studies, Intel develops new health technologies and collaborates with healthcare professionals to enable seamless interaction and high-quality information exchange throughout the healthcare system.

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For more about the Intel Healthcare IT Value Model, download the paper, *The Value of Healthcare IT*, http://www.intel.com/healthcare/hit/providers/hit_value_model_whitepaper.pdf.

For more about the business value of IT, see the whitepaper, *Measuring IT Success at the Bottom Line* at http://www.intel.com/it/pdf/measuring-it-success-at-the-bottom-line.pdf and David Sward's *Measuring the Business Value of Information Technology* (Intel Press, 2006, http://www.intel.com/intelpress/sum_bvm.htm).

CATHOLIC HEALTH INITIATIVES

Saint Clare's Health System

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4/08/TC/CHD/PDF 319671-001 US