

What's It Worth?

Oncology Electronic Medical Record and ROI Modeling

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The business of health care requires executive management to look closely at capital expenditures in order to justify expenses affecting the bottom line. As health care organizations move increasingly toward implementing information technology (IT) to improve overall communication, process efficiency, and patient care, financial considerations require that facilities document the return on investment (ROI). As health care facilities increase their use of electronic medical records (EMRs), administrators must rely on financial modeling and analysis to document the investment in the clinical and business practice.

HEALTH CARE MANAGEMENT

Health care expenditures have skyrocketed in the last

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Fig. 1. ROI EMR, Historical Data-Tracking Trend*

	Year 0 2000 Pre-EMR	Year 1 2001 EMR intro	%	Year 2 2002 1st yr EMR	%	Year 3 2003 2nd yr EMR	%
Avg. Annual Charge/Physician	\$4,000,000						
Physicians	4						
Advance Practice Nurses (NP)	1						
FTE Nurses	6						
FTE Clinical Assistants	7						
FTE Supportive Staff, i.e.,Scheduling	3						
FTE Medical Records Staff	3						
FTE Lab	3						
FTE Accounting/Billing Staff	3						
Administration	1						
Ratio of Physician/APN Staff	5.2						
Nursing Overtime Hrs.	500						
Clinic Overtime Hrs. (schedulers, etc.)	300						
Accounting Department Overtime Hrs.	500						
Pt. Office Visits and Consults Only	7,500						
Pt. Infusion Visits	12,000						
Transcription Costs	\$50,000						
Paper, Misc. Supplies	\$100,000						
Total Patient Encounters	15,000						
Net Collection %	0.94						
A/R Days	60						
# of Drug Administrations	12,750						
# of Level 1 Encounters	1,500						
<p>Notes: FTE calculations all include overtime and vacation hrs. paid. Year 0 figures are baseline assumptions for this example. *Outcomes of an oncology facility applying a historical data tracking trend ROI model during an integrated oncology EMR implementation. Abbreviations: APN (advance practice nurse), A/R (accounts receivable), EMR (electronic medical record), FTE (full-time equivalent), NP (nurse practitioner), ROI (return on investment)</p>							
<p>Increase infusion visits44.8% compares pre-EMR to full year of EMR use Decrease billing staff overtime hrs. . . .-63.0% compares yr 1:yr 2</p> <p>Increase level 1 charges22.6% compares pre-EMR to full year of EMR use Scheduling staff reduction due to time attrition-12.9% compares yr 1:yr 2</p> <p>Decrease clinic staff overtime hrs. . . .-27.3% compares yr 1:yr 2 Billing staff reduction due to attrition . . .-5.2% compares yr 1:yr 2</p>							

INFORMATION TECHNOLOGY

decade. U.S. health care spending is currently at \$1.4 trillion, according to the U.S. Department of Health and Human Services.¹ Spending on hospitals and prescription drugs accounts for a large portion of this expense. To manage this big business, facilities must rely on increased productivity and profitability.² However, the National Institutes of Health (NIH) estimates the cost of cancer care to be \$171.6 billion.³ With the increased cost of care, and decreasing reimbursements, executives must closely manage efficiency in work process, productivity in treatment delivery, cost containment in business practice, and positive returns on any capital expenditures, including an EMR investment.⁴

ONCOLOGY EMR TECHNOLOGY

The rise of electronic systems to manage patient care was in large part due to medical reports released from the Institute of Medicine (IOM) and Leapfrog Group⁵ documenting the efficacy of EMRs to pinpoint medical errors and enhance patient safety. Recent regulatory mandates, such as the Health Insurance Portability and Accountability Act (HIPAA), have also contributed to the increased use of EMR patient infor-

mation management systems.

While the health care industry has increased IT spending relative to other business sectors, only 20% of health care providers have an EMR that combines an integrated computerized physician order entry (CPOE) capability and a medication administration record (MAR) component to simultaneously capture patient information and perform practice management functions. The qualitative benefits of using an EMR are well understood, and its use is widely accepted as a way to improve patient care and benefit the business of health care. Nonetheless, 80% of facilities are trying to answer the question of whether a fully integrated EMR is a financially sound investment.

As few as 15 years ago, workstations in every office or clinical area did not have access to an EMR. In fact, less than five years ago, mobile technology barely existed; accessing, downloading, and sending patient information into secure viewing of patient information on a hand-held device or wireless tablet was just beginning.

Some oncology practices may still not have an integrated on-

colony management system with a single patient database. Oncology clinicians are still managing documentation, regimen ordering, and lab results with paper, performing double and triple checks by calculators and staff chasing charts. Often the oncologist may perceive implementing an oncology EMR as time-consuming and continue to hand-write orders. However, the time spent hand-writing or hand-calculating does not include the inherent accuracy of technology.

Oncologists who manage all the aspects of a cancer patient's care, including chemotherapy regimen, education, and physician encounters, must consider their unique cancer patient management challenges prior to implementing the EMR.

A facility should follow three steps when determining whether to implement an EMR:

1. Identify the prob-

Fig. 2. ROI of EMR through NPV, IRR

Model*	2003	2004	2005	2006	2007
Calendar Year	2003	2004	2005	2006	2007
Year into Implementation	0	1	2	3	4
Initial EMR Investment	-\$500,000	\$0	\$0	\$0	\$0
Hardware	-\$250,000	-\$125,000	-\$250,000	-\$125,000	-\$250,000
SW Expansion/Support	-\$75,000	-\$150,000	-\$150,000	-\$150,000	-\$150,000
Network Administrative Fees	-\$50,000	-\$52,500	-\$55,125	-\$57,881	-\$60,775
Implementation Expense	-\$705,000	-\$413,250	-\$412,750	\$0	\$0
Consultation Fees	-\$150,000	-\$75,000	-\$75,000	-\$75,000	-\$75,000
Charge Capture	\$10,000,000	\$12,000,000	\$14,400,000	\$17,280,000	\$20,736,000
Revenue Patient Visits	\$100,000	\$110,000	\$121,000	\$133,100	\$146,410
Infusion Visits	\$4,000,000	\$4,400,000	\$4,840,000	\$5,324,000	\$5,856,400
Staff Attrition	\$0	\$20,000	\$0	\$20,000	\$0
Overtime Hours	-\$10,000	-\$8,000	-\$3,000	-\$3,000	-\$3,000
Supplies	-\$200,000	-\$180,000	-\$160,000	-\$160,000	-\$160,000
Transcription Fees	-\$100,000	-\$80,000	-\$20,000	-\$16,000	-\$16,000
Salaries, Bonuses	-\$8,000,000	-\$9,200,000	-\$10,580,000	-\$12,167,000	-\$13,992,050
Benefits	-\$3,200,000	-\$3,680,000	-\$4,232,000	-\$4,866,800	-\$5,596,820
Accumulative Sum/Year	\$860,000	\$2,566,250	\$3,423,125	\$5,136,419	\$6,435,165
NPV/Year	\$803,738	\$2,398,364	\$3,199,182	\$4,800,391	\$6,014,173
IRR	-1%	30%	21%	17%	14%
EMR Project	? Invest**	Invest	Invest	Invest	Invest
ROI	46%	126%	92%	287%	388%

* The model is made up of basic assumptions as listed in Years 0-4. The DCF assumption is 7%. The model calculates the NPV, IRR, project investment consideration, and the ROI.

** ? Invest is the outcome of the 'If/Then' function calculation in a spreadsheet. (The outcome of '? Invest' means the investment project is questionable to benefit the business and rejection of the investment must be considered.) The project investment should be additionally assessed and take into account other desired outcomes besides the financial outcomes, such as the strategic imperative to achieve the goals to deliver enhanced quality patient care, decrease paper patient charts and paper, streamline management of chemotherapy regimens and dosage calculations integrated with patient and clinic scheduling, accessibility of viewing and documenting on patient charts, adherence to standards and regulations, and increase competitive advantage positioning for the oncology business and clinic practice to attract staff and deliver enhanced productivity, efficiency, and accuracy in oncology patient care.

Abbreviations: EMR (electronic medical record), FTE (full-time equivalent), IRR (internal rate of return), NPV (net present value), SW (software)

INFORMATION TECHNOLOGY

lems in order to determine the amount of capital investment required. Identify the required outcomes and progressively work toward these goals—beginning with the end in mind.⁶

2. Develop a quasi-partnership with health care professionals experienced in implementing an EMR and leading change.
3. Monitor and document the qualitative and quantitative return prior to implementation and at intervals during and after the implementation.

APPROACHING ROI FOR EMRS

Traditionally, health care executives and administrators have not examined the value of implementing an EMR in a rigorous way. Some may have gathered ROI through historical data to track trends, but few—or perhaps none—have applied a financial modeling tool that identifies the internal rate of return (IRR) or net present value (NPV) to project ROI.

Another ROI approach is to capture the productivity of the business practice through EMR implementation and use. While the benefits to patient care are obvious, implementing a system can be challenging. A health care professional's learning curve can slow the way patient treatments are ordered, documented, and communicated; at the same time, software development and upgrades can delay the rollout of new features and benefits. Achieving a positive ROI during an EMR implementation is a continual goal that must be recognized as a key aspect of the business of delivering health care.

The methods used to identify the ROI financial modeling tools are presented in three different approaches: historical data tracking analysis, IRR and NPV calculations, and productivity and quality return.

THE BENEFITS OF ROI

Whether oncologists are contemplating implementing an EMR or are moving forward, the bottom line is that an EMR has become a standard operating procedure in the patient record world.⁷

To competitively position health care practices for clinical safety, communication, global access to patient information, as well as recruitment and retention of staff by providing efficient and reliable patient information management systems, it is imperative to recognize the positive aspects of an EMR's ROI. Facilities must quantify the benefits to the bottom line. The EMR is not categorized as an expense if the business practice can demonstrate its validity as an investment.

HISTORICAL DATA TRACKING ANALYSIS

Many administrators use historical data tracking trend analysis when performing an ROI exercise.⁸⁻¹² What should be examined when asked for an analysis of the proposed cost and the impact on the business practice?

Fig. 1 (p. 15) is an example of a historical data model that can capture your ROI. This model makes basic assumptions that link

Fig. 3a. Analysis Considerations

	Year 0	Year 1	Year 2	Year 3
Quantitative Analysis				
# of active patients/month				
Avg. # of patient visits/month				
Avg. # of patient treatments/month				
Avg. # of charges/month				
Avg. # of meds, chemo billed out/month				
Avg. charge/patient visit				
Avg. # of charges accepted				
Avg. # of charges declined				
# of total staff				
Physician				
Advance practice nurse (or nurse practitioner)				
Registered nurse (RN)				
Patient care attendant				
Administrator				
Information system management				
Billing				
Nonclinical staff (scheduling, administrative, etc.)				
Research				
Laboratory				
Pharmacy				
Staff reduction due to attrition				
Average transcription costs/month				
# of copay collections				
Paper supply costs & storage fees (print, copy, folders, office supplies, etc.)				
Revenue % increase				
Cost containment				
Qualitative Analysis				
Est. # of chart pulls/month				
Est. RN time saved/day [in minutes], i.e., global chart viewing, documentation, communication abilities				
Est. physician time saved/day [in minutes] due to global access to information				
Est. scheduling time saved/day [in minutes]				
Est. staff time saved/day due to global access to information & communication abilities				
Revenue % increase due to integrated Electronic Medical Records (EMR) (viewing, scheduling, transcription, ordering, charge capture, reports, etc.)				

Fig. 3b. ROI EMR, Productivity Model, Assumptions

Total Factor Productivity (TFP) Analysis Assumptions	
Revenue	\$10,000,000
Revenue Growth Rate	5%
Revenue Growth Rate with Added Physician/APN	10%
Assets	\$7,000,000
Assets Change Rate/Year ~5 years	1%
Initial Total # of Employees	23
# of Administrators	1
# of Physicians	4
# of Advance Practice Nurses	1
# of Registered Nurses	8
# of Support Staff	8
# of IT Staff	1
Investment in Technology	40%
Debits/Expenses (Inclusive: Salaries, Benefits, Fixed, Variable, Technology)	70%
Change in Debt Rate/Year ~5 years	-3%
Financial Leverage	
Expense/Revenue Ratio	
Gross Profit Margin: Earnings Before Interest & Taxes (Revenue - Debt)/Revenue	
Gross Return on Assets: EBIT/Average Total Assets	
Formula Total Factor Productivity	
revenue/employee - (k * assets/employee) = TFP	
k = constant; Investment in Technology 40%	
Abbreviations: APN (advance practice nurse), EMR (electronic medical record), IT (information technology), ROI (return on investment)	

to the cells within the model. If you were to enter real data into the assumptions, the model would capture your ROI. The model spans the year before the implementation, the year during the initial phase of implementation, and the first full year of use with integrated modules of the EMR capabilities. A fourth year captures the use of all the integrated modules of the technology.

It is important to first look at what exists today or before the implementation of the EMR. The figure lists various situations, such as the number of full-time equivalent (FTE) nurses or the number of patient visits per month over various intervals. To simplify the analysis and account for various fluctuations, divide the yearly number by 12. The historical data tracking analysis highlights four questions that can be answered in the areas of consideration:

1. What existed initially?
2. What needed to change?
3. What changed?
4. What are the identified benefits or weak areas in the practice or facility?

IRR AND NPV

In financial management, ROI is usually thought of as the percentage outcome of the *Return of the Purchase* divided by the *Initial Investment*.¹³⁻¹⁴ In the business sector, the ROI is essentially determined by the same equation; however, the dividend is the *Profit* and the divisor is the *Source of Capital*. When figuring out the ROI over a number of years, the ROI must be calculated in terms of the present value (PV) of dollars, so the formula must have the added component of the discounted cash flow (DCF),

which is sometimes referred to as the discount rate. Dollars in one year or several years to the business practice must be identified in today's dollars or the PV of dollars.

The initial equation to apply in calculating the ROI through readily identified financial management terms is:

$$\text{ROI} = \text{Return/Initial Investment}$$

When taking into consideration the Return as it becomes available over a period of the time, the term Return becomes the NPV. Therefore, the ROI equation essentially becomes:

$$\text{ROI} = \text{NPV/Initial Investment}$$

The NPV yields informational value of the excess received from the investment or the profit, which is over and above the initial capital investment. The NPV equation is the accumulated return, which deducts for the initial investment. The NPV equation is further broken down to the following equation:

$$\text{NPV} = \frac{-C +}{1+r^t}$$

The variable -C is used to represent the initial investment or cost at the current PV of dollars. Add the initial EMR investment figure to the sum of the payments (negatives) and income (positives) each year. The variable is used to represent the sum of the negatives and positives. Divide the sum of the negatives and positives by the DCF, which is indicated by the variable *r* with the *t* exponent representing the length of time.¹⁵

When applying the EMR ROI model, the challenge becomes what to identify as the payments and income each year. Fig. 2 (p.16) gives an example of the ROI EMR template model that yields the NPV and the IRR. Incorporating the IRR in to the NPV model can give you a comparative analysis of other investment opportunity considerations.

PRODUCTIVITY AND QUALITATIVE RETURN

Identifying the productivity of the facility is yet another ROI method of analyzing an EMR investment. This technique examines the ROI analysis more closely than other methods and accordingly provides a more complex spreadsheet. Often executives in practices and facilities express the need and want for EMR capabilities but have difficulty in articulating the actual benefits to the business practice.

Figs. 3a, b, and c show a workbook template containing basic assumptions about a health care practice. The first sheet, *Analysis Considerations* (Fig. 3a, p. 18), lists quantitative and qualitative items and denotes changes and trends over the years. The *Analysis Considerations* are applied after first calculating the productivity factor. The next spreadsheet, *ROI EMR, Productivity Model, Assumptions* (Fig. 3b), contains assumptions in the calculation of transforming the return on information into the return on investment. This spreadsheet provides the assumptions within the financial model, *ROI EMR, Productivity Model*, (Fig. 3c, p. 20). The EMR productivity in this spreadsheet (Fig. 3b and 3c, p. 20) is a template that calculates the bottom line of the productivity each year.

Often with the implementation of an EMR, the standard financial ROI with the NPV cannot be fully calculated because the technology yields qualitative findings. Initially, the ROI may be in

INFORMATION TECHNOLOGY

the form of qualitative returns or a positive return on information.

The productivity model (see Fig. 3c) builds on a basic concept noted from an incorporated formula to equate the Total Factor Productivity (TFP), which is an algorithm used in research to offer an explanation as to why some countries are wealthier and continue to grow wealthier, due to their implementation of technological progress.¹⁵ Research analysts have calculated the formula with Fortune 100 companies. This template takes the TFP formula a step further and applies it within a financial model for a health care practice. The model incorporates basic assumptions. The cells are linked within the assumptions to the financial model spreadsheet so that individual facilities can apply their own numbers into the assumptions in order to evaluate their productivity factor and other financial leverage aspects.

The productivity analysis yields a percentage. Make sure that you understand and can identify the area(s) contributing to the productivity or lack of productivity. *The Analysis Considerations* section (see Fig. 3a, p. 18) provides a method

of identifying what has changed; it is a tracking tool to capture both quantitative and qualitative documentation. Productivity is related to revenue, assets, and consideration of the investment in technology as the outcome of productivity. Usually, productivity is configured with labor, and productivity is considered the output of labor. However, the labor factor does not give credence to the money invested in technology; therefore, the outcome of applying technology to increase the aspect of productivity provides the rationale that productivity is due to both labor plus technology.

Upon evaluating the productivity factor, use the *Analysis Considerations* spreadsheet to identify the rationale for the outcome of the productivity factor. The answers to realizing the quantitative and qualitative ROI of EMR through productivity lie first with identifying the source of productivity. This model can also be used to apply the formula in a regression analysis or a global view of past occurrences.

(continues on page 37)

Fig. 3c. ROI EMR, Productivity Model

Model	2002	2003	2004	2005	2006	2007
Calendar Year						
# of Years	0	1	2	3	4	5
Timeline	Prior to EMR	EMR Implementation	Year 1 EMR	Year 2 EMR	Year 3 EMR	Year 4 EMR
Revenue	\$10,000,000	\$11,500,000	\$12,075,000	\$13,886,250	\$14,580,563	\$15,309,591
Change in Revenue (%)	0%	15%	5%	15%	15%	5%
Change in Revenue (\$)	\$0	\$1,500,000	\$575,000	\$1,811,250	\$694,313	\$729,028
Revenue per Employee	\$400,000	\$425,926	\$464,423	\$514,306	\$520,734	\$546,771
Change in Revenue per Employee	0%	6.09%	8.29%	9.70%	1.23%	4.76%
Assets	\$7,000,000	\$7,070,000	\$7,140,700	\$7,212,107	\$7,284,228	\$7,357,070
Change in Assets (%)	0%	1%	1%	1%	1%	1%
Change in Assets (\$)	\$0	\$70,000	\$70,700	\$71,407	\$72,121	\$72,842
Assets per Employee	\$280,000	\$261,852	\$274,642	\$267,115	\$260,151	\$262,753
Change in Assets per Employee	0%	-6.93%	4.66%	-2.82%	-2.68%	0.99%
# of Total Employees	25	27	26	27	28	28
# of Physicians	4	5	5	6	6	6
# of Administrators	1	1	1	1	1	1
# of APN	1	1	1	1	2	2
# of RN	8	10	10	11	11	12
# of IT Staff	1	1	1	1	1	1
# of Support Staff	10	9	8	7	7	6
Physician/NP:FTE Ratio	4.00	3.50	3.33	2.86	2.50	2.50
Debits (or use the term Expenses)	\$7,000,000	\$7,705,000	\$7,728,000	\$8,470,613	\$8,456,726	\$8,420,275
Expense/Revenue Ratio (Expenses/Revenue)	0.70	0.67	0.64	0.61	0.58	0.55
Gross Profit Margin	30%	33%	36%	39%	42%	45%
Gross Return on Assets	43%	54%	61%	75%	84%	94%
Effect of Technology Investment on Productivity	0%	8.86%	6.43%	9.70%	1.23%	4.76%

Abbreviations: APN (advance practice nurse), EMR (electronic medical record), FTE (full-time equivalent), NP (nurse practitioner), RN (registered nurse)

... Oncology EMR

(continued from page 20)

ACCEPTING THE EMR

By continuing to solve our work process challenges within our own comfort zone, we often find ourselves using the same approach used in the past. Fear of change prevents the use of an application that can provide continual advances in better methods to accomplish our work.^{16,17} Innovation and advances in EMR technology are opportunities for the health care administrator to better lead the practice with increased productivity and adherence to regulation while striving to enhance and streamline patient care.⁷

As EMR technology gains widespread adoption as a standard operating procedure, we must continue to pursue ongoing improvements in the work process with cost containment, positive ROI, and patient care delivery with quality, efficiency, and accuracy. Giant leaps in proactively managing the business of health care delivery can be made when we combine an efficient integrated oncology EMR solution encompassing electronic patient charting, CPOE, MAR, and practice management with rigorous ROI modeling to identify the positive qualitative and quantitative outcomes.

In considering a report from the U.S. General Accounting Office (GAO), IT imperatives can contribute exponential cost containment leading to increased savings, as well as increased patient safety with accuracy and efficiency.¹⁸ Even in view of this report, most oncologists fear the initial capital outlay when considering a fully integrated oncology EMR specific to managing the oncology business and clinical process. Spending more dollars in any oncology business practice in the age of the changes to drug reimbursement and decreased revenues is a daunting thought.

EMBRACING THE EMR

Business leaders intuitively know we must spend money to make money. An investment in health care information technology can better position an oncology practice with a competitive advantage, improving staff performance and patient perception.¹⁹ An integrated oncology EMR is an investment to streamline work processes.²⁰

These cost savings and positive ROI provide the practice with increased staff productivity, enhanced documentation efficiency, cost containment, and a streamlined oncology patient care delivery process. This analytic documentation, or ROI modeling of the financial investment in an oncology EMR, enables business and clinical leaders to be in a better position to apply an efficient oncology patient information system and competitive advantage in today's oncology market share while enhancing oncology patient care. ■

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