



# EMR BENEFITS AND BENEFIT REALIZATION METHODS OF STAGE 6 AND 7 HOSPITALS

Hospitals with advanced EMRs report numerous benefits

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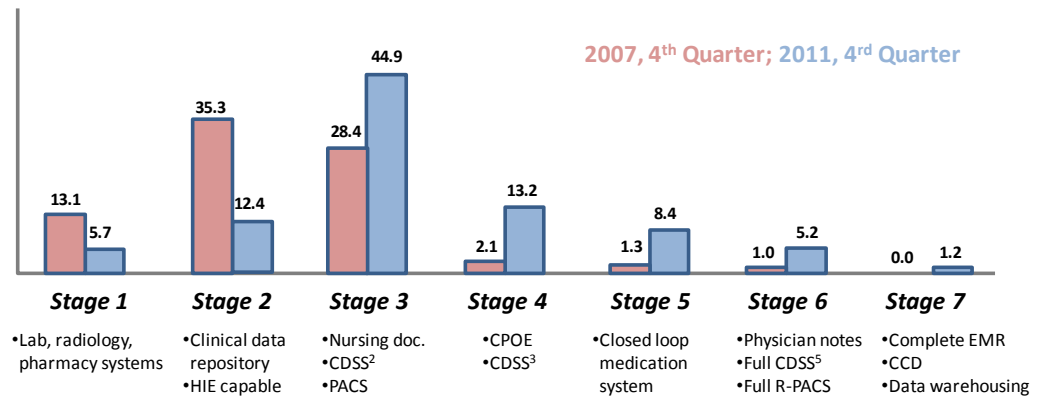
# Introduction

## An Important Question

The major controversy surrounding the accelerating adoption of electronic medical records (EMRs) is the ability of these systems to produce measureable benefits. Some hospitals, mostly academic medical centers, have published dramatic clinical and financial EMR benefits data<sup>1234</sup>. Researchers have aggregated the benefits described in these individual accounts to argue that a complete EMR should produce very substantial benefits for individual hospitals and the healthcare system as a whole<sup>56</sup>.

Others have compared data from large numbers of hospitals with and without EMRs and have found no significant differences in clinical and financial outcomes<sup>789</sup>. One likely explanation for these conflicting reports is that most hospitals with EMRs are still in the process of implementing clinical decision support (CDS) systems. By guiding clinicians to safer, more efficient, more effective care, these systems will arguably drive most of the potential benefits of EMRs. Consequently, most hospitals have little to show for their effort but the higher costs associated with implementation staffing. As shown in Figure 1, relatively few US hospitals have reached Stage 6 and 7 of the EMR Adoption Model (EMRAM)<sup>SM</sup> scale, in which CDS systems have greater ability to drive benefits, and almost all of those hospitals reached Stage 6 or 7 in the last few years<sup>10</sup>.

**Figure 1: Percentage of US Hospitals at Each EMRAM Stage**



<sup>1</sup> Tierney WM, Miller ME, Overhage JM, et al. Physician inpatient order writing on microcomputer workstations. Effects on resource utilization. *JAMA* 1993;269(3):379-83.

<sup>2</sup> Evans RS, Pestotnik SL, Classen DC, et al. A computer-assisted management program for antibiotics and other anti-infective agents. *N Engl J Med*. 1998;338:232-238.

<sup>3</sup> Bates DW, Teich J, Lee J, et al. The impact of computerized physician order entry on medication error prevention. *J Am Med Inform Assoc*. 1999;6:313-321.

<sup>4</sup> Mekhjian HS et al. Immediate benefits realized following implementation of physician order entry at an academic medical center. *J Am Med Inform Assoc*. 2002;9:529-539.

<sup>5</sup> Hillestad R, et al, "Can Electronic Medical Record Systems Transform Health Care? Potential Health Benefits, Savings, and Costs," *Health Affairs*, 24, no. 5 (2005): 1103-1117.

<sup>6</sup> Thompson DI, Classen DC, Haug PJ, EMRs in the Fourth Stage: The Future of Electronic Medical Records Based on the Experience at Intermountain Health Care, *J Healthc Inf Manag*. 2007 Summer;21(3):49-60.

<sup>7</sup> Evidence on the Costs and Benefits of Health Information Technology, Congressional Budget Office, date, <http://www.cbo.gov/ftpdocs/91xx/doc9168/maintext.3.1.shtml>

<sup>8</sup> Authors?, Electronic health records' limited successes suggest more targeted uses, *Health Aff (Millwood)* 2010 Apr;29(4):639-46.

<sup>9</sup> Furokawa MF, Raghu TS, Shao BB, "Electronic Medical records, Nurse staffing, and Nurse-Sensitive Patient Outcomes: Evidence from California Hospitals, 1998-2007," *Health Services Research*, 45, no. 4 (Aug, 2010): 941-962.

<sup>10</sup> See <http://www.himssanalytics.org/home/index.aspx>.

## New Hope for Future Research

Another possible reason why many hospitals do not realize EMR benefits is the lack of attention paid during their EMR implementations to explicit benefits realization and measurement activities. However, there are no studies correlating these activities with achieved benefits across multiple locations.

Past attempts to conduct formal studies of EMR benefits across multiple hospital systems were handicapped by a shortage of willing (and able) participants. The growing number of hospitals with Stage 6 and 7 EMRs, as shown in Figure 2, below, represents a potentially fruitful field for investigation of EMR benefits and their causes. It would be expected that hospitals with more advanced capabilities, especially clinical decision support, would have greater realized benefits.

**Figure 2: Numbers of Hospitals at EMRAM Stages 6 and 7**

EMRAM Stage	2008	2009	2010	2011
Stage 6	28	82	171	277
Stage 7	14	39	52	65

The Meaningful Use incentive program has raised the stakes for EMR benefit realization efforts. While there is not a direct relationship between EMRAM scores and Meaningful Use stages, in general it is possible to "get by" with Stage 4 EMRAM functionality in Stage 1 of meaningful use. Based on the latest definitions<sup>11</sup>, Stage 2 will require something close to Stage 6 EMRAM, and by Stage 3 with increased document exchange and tightening the gap to semantic interoperability, Stage 7 EMRAM will be required for those organizations actively exchanging documents from the point of care.

Will there be a return on the billions of Meaningful Use dollars hospitals have received and will receive from the federal government? *The place to look for early answers is those hospitals that already have the capabilities defined for Stages 2 and 3 of Meaningful Use: hospitals at EMRAM stages 6 and 7.*

This paper presents the results of a study of EMR benefits at Stage 6 and 7 hospitals. Findings from detailed interviews with survey respondents (in process) will be published in the future.

## Survey Methodology

E-mail surveys were sent in November and December, 2011, to the Chief Information Officers (CIOs) of approximately 180 hospitals, or hospital systems with one or more hospitals having achieved Stage 6 or Stage 7 status in the HIMSS Analytics EMRAM database. A total of 33 surveys (18 percent) were completed and returned representing a variety of hospitals; six from Stage 7 hospitals and 27 from Stage 6 hospitals.

The average bed size of responding hospitals is 376, with a minimum of 25 and a maximum of nearly 900. Fifteen percent of responding hospitals have 100 beds or less and another 18

<sup>11</sup> The suggested increase in functionality for meaningful use Stage 2 proposed by the HIT Policy Committee in June 2011

percent have 100 to 249 licensed beds. One-third have 250 to 499 licensed; the remaining third have 500 or more licensed beds.

Nearly half of the hospitals (48 percent) are general medical/surgical facilities; another third are academic medical centers. The remaining hospitals include three pediatric facilities, two long term acute care facilities and a single critical access hospital.

Responding hospitals were geographically spread;18 percent were in the West North Central Region, and 15 percent each in the East North Central and West South Central Regions. The fewest respondents were in the Mountain Region.

This is a survey, not a quantitative study, and has a number of limitations, including:

- The reported results are based on the knowledge and understanding of the participating organizations’ CIOs and those they consulted; we reviewed no supporting data or other documentation of results.
- The 33 hospitals that participated in the survey may not be representative of the other 150 or so organizations with Stage 6 or Stage 7 hospitals.
- We did not collect information about the magnitude of the benefits that were reported – whether the hospital realized, or they believed they realized a small or large improvement.
- Since most hospitals do not track or measure EMR benefits it is possible that realized benefits were not recognized and reported by survey respondents.

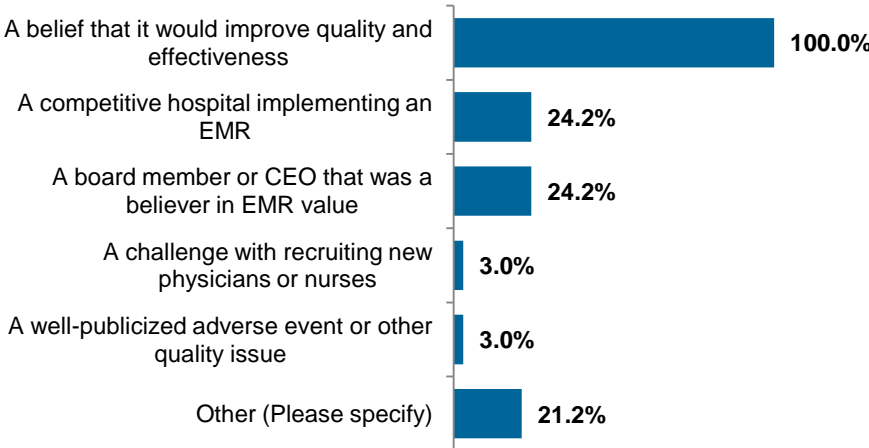
Therefore, we are not suggesting that the survey results are proof of the benefits that Stage 6 and 7 hospitals will achieve. Rather they tell us what types of benefits the participating hospitals targeted, and which they believe they have achieved. They also reveal some of the strategies hospitals used to try to drive value from their EMRs.

## Selected Survey Results

### The Promise of Improved Quality and Effectiveness

The promise of improved quality and effectiveness is a powerful driver for the organizations that responded to the survey. All 33 respondents reported that their EMR purchase was motivated by “a belief that it would improve quality and effectiveness”. Beyond improved quality and effectiveness, competitive pressures and the strategic vision of the Chief Executive Officer (CEO) and/or Board of Directors played secondary roles in the EMR purchase decision.

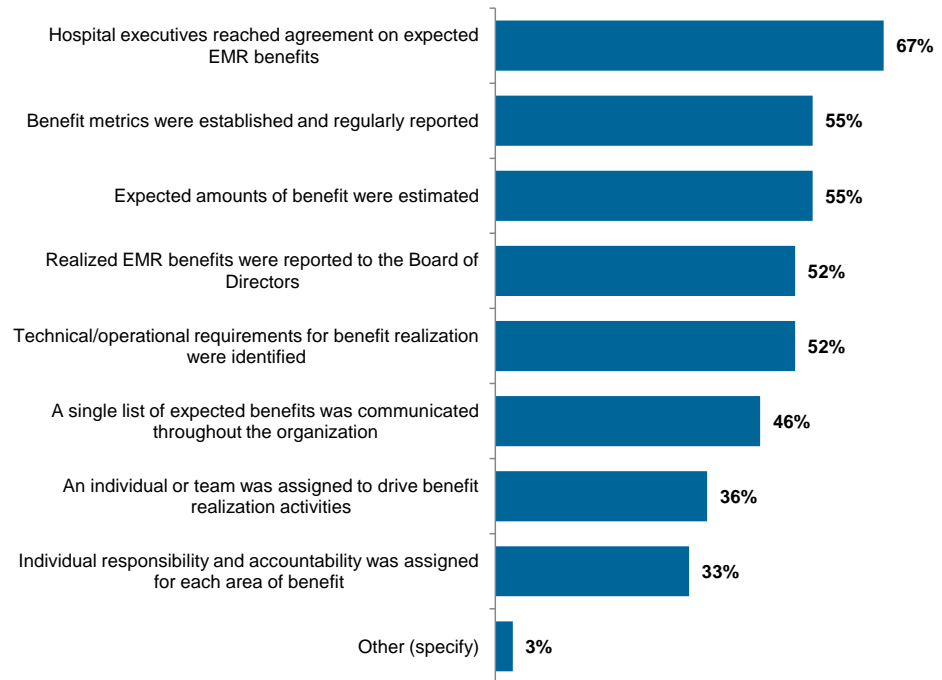
**Figure 3: What were the major drivers that motivated your organization to pursue an EMR?**



## Common Benefit Realization Methods

EMRs are a huge investment for any health care organization. While many hospitals still leave EMR benefits realization to chance, almost all of our survey respondents (94 percent) used at least one explicit method to realize a return on their EMR investment. No one benefit realization method clearly dominated the answers; the most frequently cited method was hospital executive consensus on expected outcomes. Respondents were least likely to cite “Individual responsibility and accountability was assigned for each area of benefit” from among the choices offered them.

**Figure 4: What EMR benefit realization methods were used?**



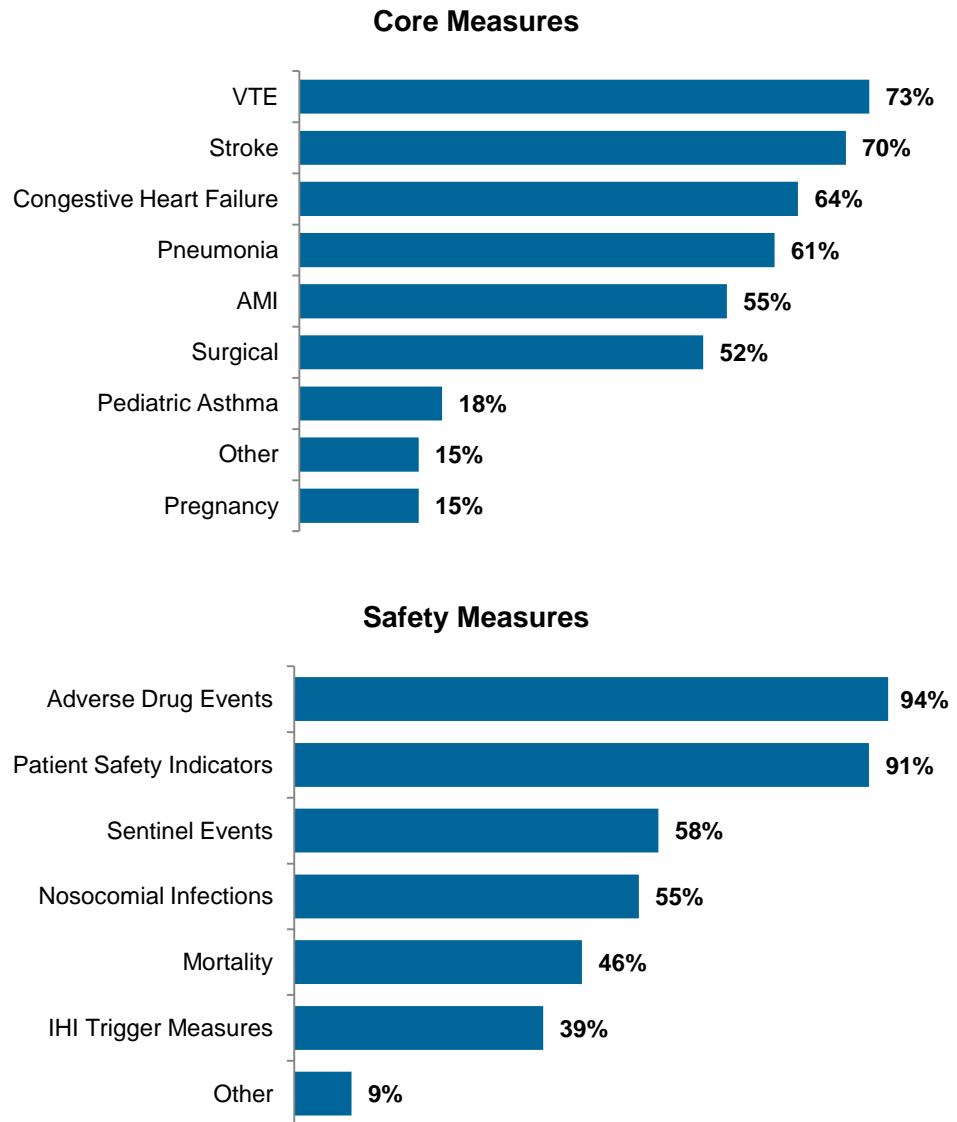
## Clinical Quality Benefit Targets

Respondents were asked to identify the internal and external quality metrics that were targeted for improvement at their organizations. These clinical benefit targets were separated into core measure targets and safety measure targets.

With regard to the core measures, at least half of respondents targeted improvements in quality measures for venous thromboembolism (73 percent), stroke (70 percent), congestive heart failure (64 percent), pneumonia (61 percent), acute myocardial infarction (55 percent), and surgical (52 percent) patients. Respondents were least likely to target pregnancy metrics for improvement (15 percent).

With regard to general safety measures, the vast majority of respondents targeted their EMR implementations to reduce Adverse Drug Effects (94 percent) and other safety indicators (91 percent). A majority also focused on reducing sentinel events (58 percent), and nosocomial infections (55 percent).

**Figure 5: What existing external/internal quality metrics did you target for improvement with your EMR implementation?**



## ADE Incidence Measurement

Most hospitals today use self-reporting to detect Adverse Drug Effects (ADEs). Self-reporting has been shown to under-report actual ADE incidence by ten to one hundred times<sup>12</sup>, and is therefore not an accurate basis for measuring actual reductions in ADEs. Since ADE reduction was a top priority for many responding hospitals we asked whether they used a more accurate method of ADE detection, known as a trigger tool. About half of responding hospitals (49 percent) said they measured their ADE incidence prior to EMR or CDS implementation using a trigger tool. Of those who reported using a trigger tool, 88 percent also reported realizing ADE

<sup>12</sup> Rozich JD, Haraden CR, Resar RK, Adverse drug event trigger tool: a practical methodology for measuring medication related harm, Qual Saf Health Care 2003;12:194-200.

reductions (see Figure 8, below), whereas 71 percent of those who said they did not use a trigger tool, reported the same result. Another quarter said they did not know whether a trigger tool was used. We plan to follow up with respondents to gain additional information about their ADE detection and prevention strategies.

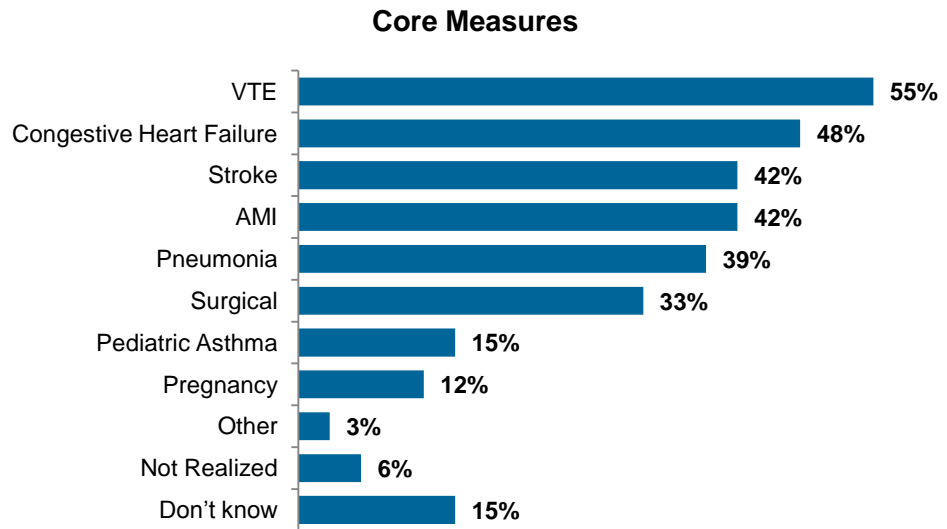
**Figure 6: Did you measure your adverse drug event (ADE) or other adverse event (AE) incidence prior to EMR or CDS implementation using a “trigger tool” (e.g., the IHI Trigger tool)?**

Use of Trigger Tool	Number	Percent
Yes	16	48.5
No	9	27.3
Don't know	8	24.2

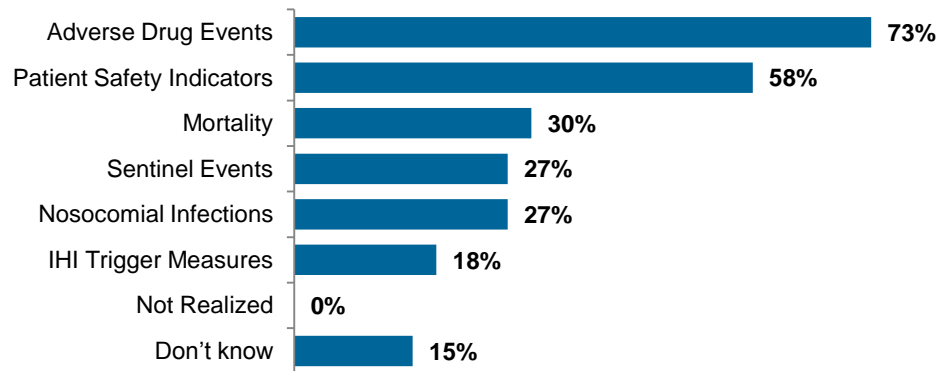
## Reported Clinical Benefits

All respondent hospitals indicated having realized and documented at least one core measure benefit and one safety measure benefit. Seventy nine percent of the respondent hospitals reported multiple core measure and/or safety benefits. The most commonly reported benefits were ADE reduction (73%), improvements in other patient safety indicators (58%), and improvements in VTE (55%), and CHF (48%) metrics.

**Figure 7: Have you realized and documented any of the following benefits as part of your hospital EMR use?**



### Safety Measures



Hospitals that targeted specific quality benefits were reportedly much more successful in realizing those benefits. Over three quarters of hospitals that targeted improvements in pediatric asthma, pregnancy, AMI, CHF and VTE reported achieving those improvements, compared to 0 – 17% of those that didn't target these conditions.

With regard to the safety measures, hospitals that targeted specific improvements were also much more likely to report achieving those improvements, with the sole exception being ADE reductions. Over three-quarters (77 percent) of the hospitals that targeted ADE reductions reported they had achieved some reductions, as did both of the two hospitals that did not target ADE reductions.

It is likely that hospitals which did not target a particular area of benefit did not attempt to measure improvements in that area, so it is possible that some of the non-targeted hospitals achieved some of these benefits but were not aware of it.

**Figure 8: Have you realized and documented any of the following benefits as part of your hospital EMR use?**

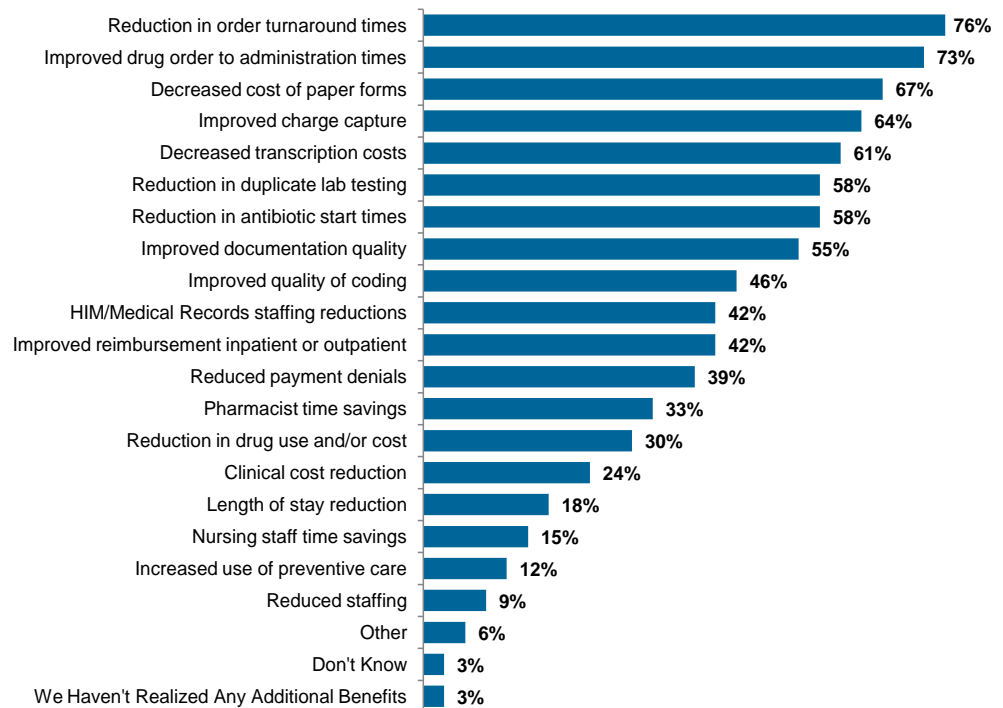
Core Measures	Targeted (N)	Benefited (N)	Benefited (%)	Non-targeted (N)	Benefited (N)	Benefited (%)
Pediatric Asthma	6	5	83%	27	0	0%
Pregnancy	5	4	80%	28	1	4%
AMI	18	14	78%	15	1	7%
CHF	21	16	76%	12	2	17%
VTE	24	18	75%	9	0	0%
Surgical	17	11	65%	16	3	19%
Pneumonia	20	13	65%	13	3	13%
Stroke	23	14	61%	10	1	10%
Other	5	1	20%	28	0	0%

Safety Measures	Targeted (N)	Benefited (N)	Benefited (%)	Non-targeted (N)	Benefited (N)	Benefited (%)
Adverse Drug Events	31	24	77%	2	2	100%
Mortality	15	10	67%	18	2	11%
Patient Safety Indicators	30	19	63%	3	0	0%
Nosocomial Infections	18	9	50%	15	1	7%
Sentinel Events	19	9	47%	14	1	7%
IHI Trigger Measures	13	6	46%	20	1	5%

## Other Reported EMR Benefits

In addition to the previously discussed clinical benefits, responding hospitals reported achieving a number of other operational and administrative benefits. Those most frequently cited included reduction in order turnaround times (76 percent), improved drug order to administration times (73 percent), reduction in the cost of paper forms (67 percent), improved charge capture (64 percent), and decreased transcription costs (61 percent). Only one respondent noted that they had not realized and/or documented any additional benefits.

**Figure 9: Have you realized and documented any of the following benefits as part of your hospital EMR use?**



## Effectiveness of Explicit Benefit Realization Strategies

In order to determine whether an explicit focus on benefits realization affected the number of benefits realized, we compared reported benefit realization rates and the number of explicit benefit realization strategies used by participating hospitals. For clinical benefits, hospitals that used more of these strategies did not report significantly higher numbers of benefits realization than those that used fewer of the strategies. However, for the other EMR benefits reported in Table 9, above, there was a strong correlation (Sig., two-tailed: .001) between the number of benefit realization strategies used, and the number of benefits reported.

It may be that hospitals used other benefit realization strategies that were not part of the survey to help them realize the clinical benefits they targeted. Certainly the fact that these benefits were targeted implies an explicit focus on achieving them. We hope to understand the reasons behind these reported results better through our planned follow up interviews with survey participants.

# Conclusions

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The major conclusions from this survey are:

- Hospitals with advanced EMRs have purchased their EMRs for the specific purpose of improving clinical quality and patient safety.
- Hospitals with advanced EMRs explicitly target clinical objectives such as ADE reduction, core measure improvement and other patient safety improvements; they pursue these objectives with a number of explicit benefit realization strategies.
- Hospitals with advanced EMRs report achieving a broad range of benefits from their EMR implementations, including both clinical quality, patient safety and operational efficiencies.
- Hospitals that target specific areas of benefit are more likely to report achieving those benefits.

This survey is the first to report results from a large number of EMRAM Stage 6 and 7 hospitals. These results paint a very different picture than those from other recent studies of hospitals with EMRs across all EMRAM levels, supporting the conclusion that hospitals with more advanced EMRs may be more able and likely to realize substantial benefits.

We expect to gain greater insight into the validity and magnitude of these reported benefits in individual interviews with survey respondents. These interviews will also focus on specific areas of reported benefit, to identify the metrics, measurement methods, process changes, specific technologies, change management approaches and other facts associated with those benefits. We hope that the findings from these interviews will yield important lessons about how other organizations can estimate, plan for, manage to, realize, and measure specific EMR benefits, including ADE reduction, Core Measure improvements, transcription reductions, improved timeliness of care, improved charge capture, etc.

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