

Hospital IT Expenses and Budgets Related to Clinical Sophistication

Market Findings from HIMSS Analytics



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Executive Summary

An evaluation of US hospital IT operating and capital expenses related to the stages of the HIMSS Analytics EMR Adoption ModelSM (EMRAM) provides insights into spending impacts regarding the adoption of the clinical applications that advance local electronic medical record (EMR) capabilities within these organizations. While not all of the IT costs can be directly associated with the EMR strategies in hospitals, we believe a high percentage of these costs can be allocated either directly or indirectly (e.g. infrastructure upgrades) with their clinical application capabilities. The findings demonstrate higher costs associated with the EMRAM stages associated with physician focused applications, which enforces the need for hospitals to have effective plans and strategies before they embark on the implementation of these sophisticated clinical applications.

Expense Metrics Used for This Research

The research presented in this white paper is based on the expense¹ and budget findings of data captured from self-reported data for 307 hospitals, and not all hospitals reported all expense and budget data. While all of the expenses cannot be associated directly with the clinical applications that are defined in the EMRAM, we believe that the majority of IT expenses are associated with this environment because of the intense focus on improving care delivery and patient safety. Also, the majority of the US IT market uses legacy IT applications for their revenue cycle management, supply chain management, and general financial systems, which tends toward lower IT expenses for these environments.

We encourage the reader to evaluate the sample size for the expense and budget categories to determine the validity of the data for their use. At this point in time, we have fewer than 5 percent of US hospitals that have achieved EMRAM scores above Stage 4 (see Appendix A). While the data is not statistically significant, it does provide what we believe are good directional indicators, for the data from hospitals below Stage 4, for budgets and expenses as hospitals implement increasingly complex EMR environments that are being implemented in US hospitals.

¹ All operating expense figures include depreciation.

Operating Metrics & Ratios

A key IT operating metric that is frequently used to compare the data across different sizes and types of hospitals is what we label as the “operating index” (OI). This is the IT operating expense as a percentage of the total hospital operating expense. The average OI for all hospitals in this study is 2.19 percent (see Table 1). What is also apparent from Table 1 is that the OI average increases as hospitals progress through the EMRAM, except in Stage 5 (closed loop medication administration). We cannot positively infer that Stage 5² has an actual decrease with such a small sample size at this time.

The highest ratios are associated with Stage 4 and 6 which have the greatest impact on physician functions and workflows. Operating expenses may be higher for these stages relative to:

- The use of more consulting services to support planning and implementation of physician IT applications
- The need to hire clinicians into the IT environment to help support the physician use of their IT applications
- Stage 6³ hospitals tend to be larger hospitals in this study

IS Operating Expense / Total Hospital Operating Expense		
Total	Average %	Number
Total	2.19%	262
By EMRAM Stage		
Stage	Average %	Number
Stage 0	1.41%	18
Stage 1	1.81%	31
Stage 2	2.16%	76
Stage 3	2.21%	101
Stage 4	3.05%	22
Stage 5	1.96%	8
Stage 6	3.79%	6
Stage 7	0%	0

table 1

² The average bed size of the Stage 5 hospitals in this study was 282 beds, and the median bed size was 330 beds.
³ The average bed size of the Stage 6 hospitals in this study was 517 beds, and the median bed size was 567 beds.

When we evaluate the OI ratio relative to median values, we find the overall median value to be 1.95 percent, and a similar pattern in median values for all stages (see Table 2).

IS Operating Expense / Total Hospital Operating Expense		
Total	Average %	Number
Total	1.95%	262
By EMRAM Stage		
Stage	Average %	Number
Stage 0	1.31%	18
Stage 1	1.57%	31
Stage 2	1.87%	76
Stage 3	2.03%	101
Stage 4	2.66%	22
Stage 5	1.99%	8
Stage 6	3.17%	6
Stage 7	0.00%	0

table 2

When we evaluate another ratio, total IT operating expense as a percentage of the total hospital revenue, we see almost identical averages and trends relative to the EMRAM (see Table 3).

IS Operating Expense / Total Hospital Operating Revenue		
Total	Average %	Number
Total	2.16%	244
By EMRAM Stage		
Stage	Average %	Number
Stage 0	1.41%	16
Stage 1	1.74%	29
Stage 2	2.14%	73
Stage 3	2.18%	92
Stage 4	2.89%	22
Stage 5	1.91%	7
Stage 6	4.01%	5
Stage 7	0.00%	0

table 3

When we evaluate the total IT operating expense as a percent of the total hospital operating revenue for median values, we see very similar ratio trends across all stages (see Table 4).

IS Operating Expense / Total Hospital Operating Revenue		
Total	Average %	Number
Total	1.91%	244
By EMRAM Stage		
Stage	Average %	Number
Stage 0	1.22%	16
Stage 1	1.41%	29
Stage 2	1.91%	73
Stage 3	1.94%	92
Stage 4	2.55%	22
Stage 5	1.98%	7
Stage 6	3.35%	5
Stage 7	0.00%	0

table 4

If we look at the average (see Table 5) and median (see Table 6) expenses for the total number of hospitals and the stages of the EMRAM model, we find that operating expenses mimic what we saw in previous tables for the mean values, but for the median values we also see a slight decrease in Stage 2. But we believe the differences in values for the median figures from Stage 1 to Stage 2 are not large enough to be indicative of any specific elements in the environment. The highest operating expenses are born by Stages 4 and 6 which have the most substantial physician impacts relative to adopting and using the EMR. We also believe that Stage 4 hospitals have increased operating spends relative to implementing the applications and re-engineering efforts that are needed to successfully achieve their next level—Stage 5 (closed loop medication administration at point of care). Median operating expense numbers will most likely be less than average numbers due to the predominance of hospitals below 300 beds in the US market.

IS Operating Expense			
Total	Median	Mean	Number
Total	\$2,051,140	\$4,696,232	286
By EMRAM Stage			
Stage	Median		Number
Stage 0	\$1,033,092		19
Stage 1	\$2,087,406		35
Stage 2	\$4,051,206		85
Stage 3	\$4,071,141		109
Stage 4	\$11,998,394		24
Stage 5	\$4,927,375		8
Stage 6	\$22,488,389		6
Stage 7			0

table 5

IS Operating Expense			
Total	Median	Mean	Number
Total	\$2,051,140	\$4,696,232	286
By EMRAM Stage			
Stage	Median		Number
Stage 0	\$299,100		19
Stage 1	\$1,200,000		35
Stage 2	\$1,134,000		85
Stage 3	\$2,826,620		109
Stage 4	\$9,633,735		24
Stage 5	\$3,380,770		8
Stage 6	\$14,441,782		6
Stage 7			0

table 6

Capital Metrics and Ratios

Capital expenses and budgets are more difficult to analyze due to the wide variation of cost in vendor solutions in the market, and the supporting infrastructure costs required by different vendor application architectures. The ratio of total IT capital expense to total hospital operating expense has an average of 1.38 percent (see Table 7). We can also see from the table that this ratio increases for all stages of the EMRAM model except for Stage 2 (clinical data repository – CDR) and Stage 5 (closed loop medication administration). A decrease in this ratio for Stage 2 may be related to the following:

- A lower purchase price for CDR applications
- Limited implementation costs for CDRs and little to no process redesign consultancy for implementing a CDR.
- Limited impact to infrastructure requirements or upgrades for Stage 2
- The CDR has been implemented for so long that it no longer has a significant capital component

Again, we cannot positively infer that Stage 5 has an actual decrease with such a small sample size at this time, but if there is a decrease in this capital ratio at this stage, it is most likely due to:

- The capital cost of the key Stage 5 applications (e.g., computerized practitioner order entry or CPOE, pharmacy, and electronic medication administration record) and technologies (e.g., bar code and RFID equipment) are included as part of a bundled application purchase in the early stages of the EMR project(s)
- Mobile wireless devices that support point of care clinical processes are purchased in earlier stages of the EMRAM

It is interesting to note that Stage 1 has the highest percentage for this ratio, which again may be related to contract bundling for EMR applications at the beginning of the EMR project.

IS Capital Expense		
Total	Average %	Number
Total	1.38%	225
By EMRAM Stage		
Stage	Average %	Number
Stage 0	0.98%	12
Stage 1	1.73%	26
Stage 2	1.09%	63
Stage 3	1.54%	90
Stage 4	1.58%	21
Stage 5	1.00%	7
Stage 6	1.27%	6
Stage 7	0.00%	0

table 7

An evaluation of the total IS capital expense to the total hospital operating expense using median values shows similarities to the average values, but we also see a decline in Stage 3 relative to Stage 1 (see Table 8). We believe one of the reasons for the decline of capital expenses in these stages is due to the bundling of the application fees in the vendor contract of which the majority is paid by the hospitals at contract signing.

IS Capital Expense		
Total	Average %	Number
Total	0.94%	225
By EMRAM Stage		
Stage	Average %	Number
Stage 0	0.94%	12
Stage 1	1.12%	26
Stage 2	0.75%	63
Stage 3	0.97%	90
Stage 4	1.37%	21
Stage 5	0.66%	7
Stage 6	1.16%	6
Stage 7	0.00%	0

table 8

An evaluation of the total IT capital costs as a percentage of the total hospital revenues results in an average value of 1.34 percent (see Table 9). These figures show the highest ratios in Stage 1 followed by Stages 3 and 4. Again, we believe this may be related to:

- The bundling of the application costs in the EMR contracts that are recognized at earlier stages of the EMR projects, even though these applications may not be implemented for several months or a few years after the initial contract purchase
- People who are completing the automation in Stage 1 may also be acquiring their EMR applications from the vendor of their ancillary clinical department systems

IS Capital Expense / Total Hospital Operating Revenue		
Total	Median %	Number
Total	1.34%	210
By EMRAM Stage		
Stage	Median %	Number
Stage 0	0.98%	11
Stage 1	1.64%	25
Stage 2	1.03%	61
Stage 3	1.54%	81
Stage 4	1.51%	21
Stage 5	0.58%	6
Stage 6	1.25%	5
Stage 7	0.00%	0

table 9

A review of the median values for total IT capital expense as a ratio of the total hospital operating revenue indicates a total median ratio of 0.87 percent, and a decline in this ratio after Stage 1 until Stage 4. Stage 4 has the highest median ratio across all stages and Stage 6 has the second highest (see Table 10). Again, Stages 4 and 6 are focused on physician applications which may be impacted by the following capital spending:

- A variety of mobile wireless devices may need to be purchased in Stages 4 and 6 to meet the requirements of physicians during order entry and/or documentation functions
- IT infrastructure upgrades may need to be purchased in these stages to accommodate the ability of physicians to have Web access for these functions to support their ability to use these applications from wherever they are

IS Capital Expense / Total Hospital Operating Revenue		
Total	Median %	Number
Total	0.87%	210
By EMRAM Stage		
Stage	Median %	Number
Stage 0	0.77%	11
Stage 1	1.03%	25
Stage 2	0.72%	61
Stage 3	0.94%	81
Stage 4	1.31%	21
Stage 5	0.51%	6
Stage 6	1.05%	5
Stage 7	0.00%	0

table 10

If we look at both the average and median dollar values for the total market and for the stages of the EMRAM, we see lower median values compared to average values. This is to be expected since the larger hospitals will pay more for their EMR environments, which impacts the average values (see Tables 11 and 12). For the average values we see increasing capital costs up to a substantial drop for stage 5 (closed loop medication administration), and then the highest value for Stage 6 (physician documentation).

For the median values we see decreases in Stage 2 and 5 values compared to their previous stages. Again, we can only speculate that the capital costs for these stages have been born in previous stages.

IS Capital Expense			
Total	Median	Average	Number
Total	\$1,162,600	\$2,733,953	247
By EMRAM Stage			
Stage	Average		Number
Stage 0	\$1,150,811		12
Stage 1	\$1,426,679		29
Stage 2	\$2,102,062		72
Stage 3	\$2,643,430		98
Stage 4	\$6,032,277		23
Stage 5	\$1,374,867		7
Stage 6	\$10,221,988		6
Stage 7	\$0,000,000		0

table 11

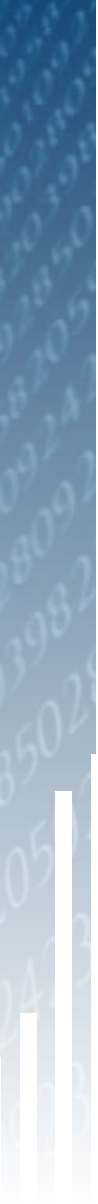
IS Capital Expense			
Total	Median	Average	Number
Total	\$1,162,600	\$2,733,953	247
By EMRAM Stage			
Stage	Median		Number
Stage 0	\$195,000		12
Stage 1	\$661,205		29
Stage 2	\$486,800		72
Stage 3	\$1,349,645		98
Stage 4	\$5,000,000		23
Stage 5	\$1,000,000		7
Stage 6	\$5,424,260		6
Stage 7	\$0,000,000		0

table 12

Conclusion

The majority of the operating expense and capital expense ratios and spending data demonstrate that Stages 4 and 6 of the EMR Adoption Model have the highest figures. Both of these stages have physician impacts relative to application functions and workflows, and most likely require the most operating support as well as IT equipment (e.g., mobile devices, expanded networks, expanded storage, and improved disaster recovery/business continuity) to accommodate adoption by physicians.

While Stage 5 impacts the workflows of physicians, pharmacists, and nurses, the operating and capital expenses for this stage are directionally lower than Stages 4 and 6. We believe that the majority of capital costs for Stage 5 are born in earlier stages of the EMRAM, and the operating expenses are spread among the IT and clinical departments and services within the hospital. But these are currently speculations until we have more hospitals in the US that have achieved Stage 5 capabilities.



Appendix A:



The EMR Adoption ModelSM



EMR Adoption Model SM			
Stage	Cumulative Capabilities	% of US Hospitals 2008 Q2	% of US Hospitals 2008 Q3
Stage 7	Medical record fully electronic; HCO able to contribute CCD as byproduct of EMR; Data warehousing in use	0.0%	0.1%
Stage 6	Physician documentation (structured templates), full CDSS (variance & compliance), full R-PACS	0.9%	1.0%
Stage 5	Closed loop medication administration	1.0%	1.3%
Stage 4	CPOE, CDSS (clinical protocols)	1.8%	1.9%
Stage 3	Clinical documentation (flow sheets), CDSS (error checking), PACS available outside Radiology	32.0%	32.9%
Stage 2	Clinical Data Repository, Controlled Medical Vocabulary, Clinical Decision Support System, may have Document Imaging	33.9%	33.2%
Stage 1	Ancillaries – Lab, Rad, Pharmacy - All Installed	12.6%	12.5%
Stage 0	All Three Ancillaries Not Installed	17.7%	17.1%

Data from HIMSS Analytics™ Database N=5048 N=5050

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Understanding the level of EMR capabilities in hospitals is a challenge in the US healthcare IT market today. The EMR Adoption Model identifies the levels of EMR capabilities ranging from the initial clinical data repository (CDR) environment through a paperless EMR environment. HIMSS Analytics has developed a methodology and algorithms to automatically score the 5,071 hospitals in our database relative to their progress in implementing the components of an EMR and to provide peer comparisons for care delivery organizations as they strategize their path to a complete EMR and participation in EHR initiatives. The stages of the model are as follows:

Stage 0: Some clinical automation may be present, but all three of the major ancillary department systems for laboratory, pharmacy, and radiology are not implemented.

Stage 1: All three of the major ancillary clinical systems (pharmacy, laboratory, radiology) are installed.

Stage 2: Major ancillary clinical systems feed data to a clinical data repository (CDR) that provides physician and other clinician access for retrieving and reviewing results. The CDR contains a controlled medical vocabulary (CMV), and the clinical decision support/rules engine (CDSS) for rudimentary conflict checking. Information from document imaging systems may be linked to the CDR at this stage.

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Stage 3: Clinical documentation (e.g., vital signs, flow sheets) is required; nursing notes, care plan charting, and/or the electronic medication administration record (eMAR) system are scored with extra points, and are implemented and integrated with the CDR for at least one service or one unit in the hospital. The first level of clinical decision support is implemented to conduct error checking with order entry (i.e., drug/drug, drug/food, drug/lab conflict checking normally found in the pharmacy). Some level of medical image access from picture archive and communication systems (PACS) is available for access by physicians via the organization's intranet or other secure networks outside of the confines of the radiology department.

Stage 4: Computerized practitioner/physician order entry (CPOE) for use by any clinician is added to the nursing and CDR environment along with the second level of clinical decision support capabilities related to evidence-based medicine protocols. If one patient service area (not counting the Emergency Department) has implemented CPOE and completed the previous stages, then this stage has been achieved.

Stage 5: The closed loop medication administration environment is fully implemented in at least one patient care service area. The eMAR and bar coding or other auto identification technology, such as radio frequency identification (RFID), are implemented and integrated with CPOE and pharmacy to support the five rights of medication administration, thereby maximizing point of care patient safety processes.

Stage 6: Full physician documentation/charting (using structured templates) is implemented for at least one patient care service area. Level three of clinical decision support provides guidance for all clinician activities related to protocols and outcomes in the form of variance and compliance alerts. A full complement of radiology PACS systems provides medical images to physicians via an intranet and displaces all film-based images. If a hospital has cardiology PACS, extra points are given.

Stage 7: The hospital has a paperless EMR environment. Clinical information can be readily shared via continuity of care (CCD) electronic transactions with all entities within health information exchange networks (i.e., other hospitals, ambulatory clinics, sub-acute environments, employers, payers and patients). This stage allows the healthcare organization to support the true sharing and use of health and wellness information by consumers and providers alike. Also at this stage, healthcare organizations use data warehousing and mining technologies to capture and analyze care data, and improve care protocols via decision support.