HIMSS Analytics

2014 HIMSS Analytics Report

The Perfect Storm: Navigating the Health IT Archiving and Data Management Challenge

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Background and Purpose

"What health information technology (HIT) issues keep you up at night?" This is a question HIMSS Analytics researchers often pose to senior HIT executives in research projects. The simplicity of the question resonates with the executives as there is typically a multiplicity of concerns jockeying for the executive's attention: Meaningful Use, ICD-10 implementation and migration to a paperless environment to name a few. As the Affordable Care Act (ACA), Meaningful Use (American Reinvestment and Recovery Act 2009)[1] and other regulatory initiatives are influencing the healthcare industry, it is understandable that these are critical initiatives for HIT executives to manage. In fact, the 2013 HIMSS Leadership Survey[2] found that many of the top priorities for HIT executives in the next two years include are closely tethered to governmental mandates:

- Achieving Meaningful Use
- Optimizing current system use
- Leveraging information
- Focus on clinical systems
- Completing ICD-10 conversions
- Interoperability
- Exchange info with other entities
- Healthcare consumer issues
- Focus on ambulatory issues
- Securing patient information

But like all "nightmares", it is usually things you don't expect which can be the most paralyzing when they appear. So what issues are on the horizon now that executives should be considering? It is our opinion that managing the exponential proliferation of data (e.g. storage, data back-ups and archiving) is the next "monster" hiding underneath the IT leader's bed.

Consider the following;

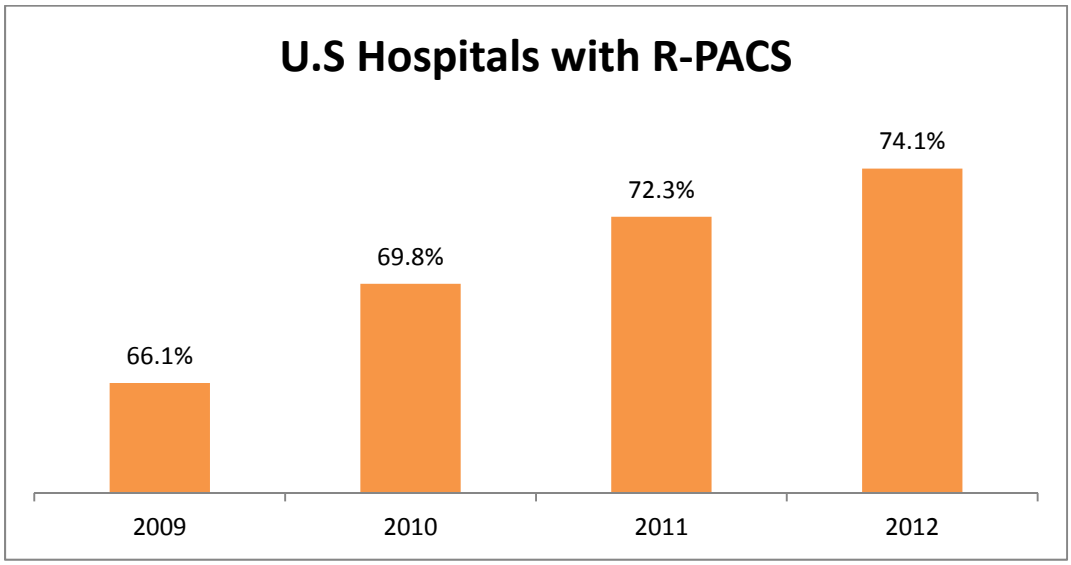
- ICD-10 implementation will increase an organization's data volume as the number of diagnosis codes a hospital manages will more than quadruple from the roughly 14,000 in the ICD-9 system to 68,000 diagnosis codes in the new ICD-10 coding system[3].
- Stage 1 of the Meaningful Use initiative focused on data capture and data sharing, while Stage 2 of Meaningful Use is focused on advanced clinical processes including patient portals[4]. Stage 1 has already impacted the amount of data that a hospital accumulates and this data volume is only expected to increase as organizations satisfy the requirements of successive Meaningful Use stages.
- Healthcare organizations are trying to improve their EMR capabilities. Partially driven by the Meaningful Use initiative or an organization's need to improve patient quality, efficiency and safety, U.S. hospitals have made significant progress over the past few years as it relates to migrating from a paper-based

[1] http://www2.ed.gov/policy/gen/leg/recovery/implementation.html
[2] http://himss.files.cms-plus.com/HIMSSorg/Content/files/leadership_FINAL_REPORT_022813.pdf
[3] http://www.dummies.com/how-to/content/differences-between-icd9-and-icd10-medical-billing.html
[4] http://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/Downloads/Stage2_Guide_EPs_9_23_13.pdf

environment to a digital, paperless environment. The HIMSS Analytics EMR Adoption Model (EMRAM[SM]) [5] for example is a resource that quantifiably measures a hospital's EMR capabilities. According to the 9th edition of the HIMSS Analytics Essentials-Winter 2013 report[6], the EMRAM profile of U.S. hospitals suggests the percentage of hospitals with advanced EMR capabilities have steadily increased during the past seven years. As more organizations enhance their EMR capabilities, the amount of electronic clinical data collected and stored will surely increase.

- The increased use of advanced imaging technologies like the Radiology and Cardiology Picture Archiving and Communication Systems (PACS) have challenged many hospital's data storage capabilities. Use of PACS systems has grown in the last four years, in particular radiology PACS (R-PACS). For example, at the end of 2012 more than 74 percent of U.S. hospitals have an R-PACS solution in place; up from 66 percent four years earlier[7] (see Figure One):

Figure One: U.S. Hospitals with R-PACS



Taken together, the pressures these market trends will have on the management of data in a hospital is very concerning. The healthcare organization's need to resolve the expected accumulation of clinical, financial and administrative data will directly challenge an organization's current and future abilities to store, back-up and archive data.

The purpose of this white paper then is to examine the market's thoughts on the future challenges of data storage, back-up and archiving in U.S. hospitals. It is our hope that the findings of this research study conducted by HIMSS Analytics (and sponsored by Iron Mountain) will encourage U.S. hospital IT leaders to initiate plans for data storage, back-up and archiving.

[5] HIMSS Analytics EMRAM Model http://www.himssanalytics.org/emram/emram.aspx
[6] HIMSS Analytics 9th Edition Essentials Winter 2013 report (to be released January 2014)
[7] HIMSS Analytics 9th Edition Essentials Winter 2013 report (to be released January 2014)

Study Approach and Demographics

In order to obtain the information needed to meet our research objectives, HIMSS Analytics conducted a web-based survey of IT executives (senior and director level information technology (IT) executives) from randomly-selected U.S. hospitals. Executives were e-mailed invitations to participate in the study and data collection occurred in September and October, 2013. The survey contained 29 questions addressing key topics such as data storage, data archiving and disaster recovery/business continuity.

To be eligible to participate in the survey, respondents were required to play a role in at least one of the following areas: disaster planning, purchasing data systems and responsibility of data management for their organization. Respondents indicating they played no role in these activities were excluded from the study. Almost all of the respondents stated they played a role in at least one of these areas. A total of 150 individuals responded to the e-mail invitation and completed all of the survey questions.

Demographics

More than half of the respondents (59 percent) who participated in this study identified themselves as their organization's Chief Information Officer (CIO); an additional 37 percent were identified as Director of IT. The remaining respondents included Vice President of Technology and Chief Technology Officers (CTOs).

Most respondents represented single hospital systems (81 percent); with the remaining 19 percent mentioning that they work for an integrated delivery system (IDS). The overall average licensed bed size for all 150 respondents was 224[8]. The average bed size for single hospital system was 119 licensed beds and the average licensed bed size for the IDS respondents was 653 licensed beds.

For the purpose of this white paper, the bed segmentation has been divided into three categories:

- Under 150 beds (small bed segment)
- 150-500 beds (medium bed segment)
- 500+ beds (large bed segment)

The following is a comparison of the key demographic market segmentations of the sample population (see Table One):

Table One: Key Market Segmentations Compared to HIMSS Analytics Database

Bed Segment	Sample Population	HA Database
Under 150 beds	62%	64%
150-500 beds	30%	32%
500+ beds	8%	6%

[8] For the purpose of this study, those who answered that they were "part of an integrated delivery system" were asked to provide the number of acute licensed beds for all beds throughout their healthcare system.

Most respondents (90 percent) from under 150 bed segment, indicated that they support up to 100 applications[9] while half of the larger bed segment reported supporting more than 100 applications within their organization see (Table Two)

Table Two: Number of Applications Supported

Number of applications supported	Under 150 beds	150-500 beds	500+ Beds	All Respondents
Under 50 applications	58%	2%	0%	37%
51-100 applications	32%	20%	0%	26%
101-150 applications	6%	18%	33%	12%
151-200 applications	0%	31%	17%	11%
201-250 applications	0%	9%	0%	3%
251-300 applications	1%	13%	17%	6%
301-400 applications	1%	2%	17%	3%
401-500 applications	0%	2%	8%	1%
More than 500 applications	1%	2%	8%	2%
N	93	45	12	150

Each respondent was also asked if his/her organization experienced any mergers or acquisitions in the last five years. Most of the smaller hospitals (under 150 beds) reported no activity within the last five years, while more than half of the larger hospitals have reported merger and/or acquisition in the same time period (see Table Three)

Table Three: Merger and Acquisition Activity

Organization Activity	Under 150 beds	150-500 beds	500+ Beds
Acquired by another healthcare organization	0%	7%	0%
Merged with another healthcare organization	0%	2%	17%
Acquired another hospital or other healthcare facility(ies)	9%	13%	42%
None of the above	88%	71%	42%
Other	3%	7%	0%
N	93	45	12

[9] "Application" is defined as applications that are supported by the information technology department and includes clinical, financial, administrative and operational systems.

Data Storage

Data Storage and Access over Time

The first topic this research study explores is the current data storage environments at healthcare organizations. Respondents were asked to estimate the percentage of data accessed across three different primary data types[10] (clinical[11], operational[12] and laboratory) at specific time points. On average, close to 70 percent of respondents reported that clinical, operational and laboratory data types were accessed within six months of the time the data was captured.

Respondents were less likely to report that data is accessed as time progresses see (Table Four). By year three of storage, only 20 percent of data is accessed, and an additional 20 percent of data originally stored is never accessed.

Table Four: Average Percent of All Data Stored Over Time

Data Types	Within six months	Within one year	Within 18 months	Within two years	Within 3 years	Never accessed
Clinical	70%	39%	29%	25%	22%	18%
Operational	69%	42%	31%	26%	23%	16%
Laboratory	71%	38%	28%	24%	22%	21%
Other data types	47%	27%	13%	9%	11%	25%

Data Storage Categories

In order to ensure that respondents had context to the questions in the study, respondents were given a set of data definitions for a number of terms, as outlined below.

- "Active" – data stored onsite for immediate access.
- "Inactive" – data stored for long term compliance reasons that are infrequently accessed.
- "Offline" – data used only for disaster recovery and business continuity reasons

Using these categories, respondents were asked to provide estimates on how much data is stored across three primary data types: clinical, operational and laboratory. Respondents reported that the majority of data across all three types can be characterized as active. On average, more than 70 percent of the total data storage for clinical, operational and laboratory data types were allocated onsite for immediate access ("active"). The amount of "inactive" and "offline" data was also similar by type (see Table Five).

[10] For the purpose of this survey, the clinical, operational and laboratory will be used as the primary data types
[11] Clinical data type will include PACS, EMR, etc. Laboratory was excluded as a clinical data type for this specific study
[12] Includes administrative and financial data

Table Five: Average Percent of Data Stored for Each Data Type

Data Types	Active	Inactive	Offline
Clinical	75%	20%	19%
Operational	71%	20%	16%
Laboratory	71%	16%	15%
Other (please specify)	49%	13%	11%

Respondents from the 150-500 bed segment were more likely than the other bed segments to keep clinical, operational and laboratory data types in the "active" category. In comparison, respondents in the 500+ bed segment were less likely than the other bed segments to keep clinical, operational or laboratory data onsite for immediate access (see Table Six).

Table Six: Average Percent of "Active" Data Stored for Each Data Type-By Bed Segment

Data Types	Under 150 beds	150-500 beds	500+ Beds	All Respondents
Clinical	74%	79%	66%	75%
Operational	71%	76%	56%	71%
Laboratory	72%	76%	47%	71%
Other (please specify)	48%	59%	16%	49%

In follow-up, respondents who indicated that they have "active" data were asked how much data was stored onsite for immediate access. In general, clinical data requires more storage capacity that operational and laboratory data combined. See below for the specific amount of data stored by type:

- For the clinical data type, an average of 43.34 terabytes was stored onsite for immediate access; for larger hospitals (500+ beds) this data was nearly 200 terabyes onsite.
- For operational data, an average of 16.66 terabytes were stored onsite for immediate access , with an average of 65 terabyes for larger bed segments and;
- For laboratory 11.24 terabytes were stored for immediate access, with an average of 28 terabytes for larger bed segments

See Table Seven for differentiation of the average storage amount by bed segment.

Table Seven: Average Amount of Data (in Terabytes) Stored -By Bed Segment

Data Types	Under 150 beds	150-500 beds	500+ Beds	All Respondents
Clinical	12.61	58.34	197.73	43.34
Operational	8.29	17.75	64.73	16.66
Laboratory	7.70	13.58	27.90	11.24
Other	2.39	26.50	42.50	13.26

Contributors to Data Growth

Respondents were also asked identify the biggest contributor to their organization's growth in data. Overall, the majority of the respondents (63 percent), particularly among those in small to mid-size bed segment (less than 500 beds), identified EHR/EMR implementation. Respondents who work for organizations with 150-500 beds also mentioned the increased use of imaging technology (see Table Eight).

Table Eight: Biggest Contributor to the Growth in Data

Percent	Under 150 beds	150-500 beds	500+ Beds	All Respondents
EHR/EMR implementation	76%	40%	33%	63%
Increased use of imaging technology	16%	48%	50%	28%
New data types (digital pathology, genomics, etc.)	2%	5%	8%	3%
Our data storage needs have not grown or remain the same from the previous year	3%	0%	0%	2%
Increased patient population	1%	0%	0%	1%
Scanning	0%	3%	8%	1%
Don't Know	1%	5%	0%	2%
Valid N	**93**	**40**	**12**	**145**

IT Budget Implications

When the respondents were asked what percent of their annual information technology budget is spent on data storage, almost half (46 percent) indicated that more than six percent of their annual IT budget is spent on data storage. Nearly three-quarters (71 percent) of respondents in the 150-500 bed segment mentioned spending five percent or more (see Table Nine).

Table Nine: Percent of IT Budget Spent on Data Storage

Percent	Under 150 beds	150-500 beds	500+ Beds	All Respondents
One to four percent	26%	23%	33%	26%
Five percent	20%	20%	8%	19%
Six-10 percent	19%	33%	25%	23%
More than 10 percent	25%	18%	33%	23%
Valid N	**93**	**40**	**12**	**145**

Data Storage Methods

When asked how data is stored, two-thirds of the respondents (67 percent) use a storage area network (SAN) system, while 100 percent of the large segment (500+ beds) use this technology. Nearly two-thirds of respondents (62 percent) identified using external storage media such as tapes or discs and less than half (45 percent) use network attached storage (NAS) system. Approximately one-quarter use a third party vendor/outsourcing to manage data storage (26 percent) or use cloud computing (24 percent) (see Table Ten).

Table Ten: Data Storage Methods

Data Storage Methods	Under 150 beds	150-500 beds	500+ Beds	All Respondents
We're using storage area network (SAN) system	56%	80%	100%	67%
External storage media (i.e. tape, disc, etc.)	63%	62%	50%	62%
We're using a network attached storage (NAS) system	42%	51%	50%	45%
We're using third party vendors/outsourcing to manage data storage	30%	13%	42%	26%
We're using cloud computing	26%	18%	33%	24%
We're using a direct attached storage (DAS) system	17%	33%	17%	22%
Other (please specify)	2%	2%	0%	2%
N	**93**	**45**	**12**	**150**

Data Replication

While data storage focuses on where the information is kept, data replication is a process that explains how data is shared. All respondents were asked to explain their organization's replication process. Almost half of the respondents (48 percent) stated that they replicate the data center and applications. Sixteen (16) percent stated that they replicate the data center ONLY and eight percent replicate applications ONLY. Two-thirds of the 500+ bed segment (67 percent) and more than half of the under 150 bed segment (51 percent) reported they replicate the data center and applications; these are higher than the 150-500 bed segment (38 percent) (see Table Eleven).

Table Eleven: Data Replication Process

Data Replication Process	Under 150 beds	150-500 beds	500+ Beds	All Respondents
Replicate the data center and applications	51%	38%	67%	48%
Replicate data center only	15%	18%	17%	16%
Replicate the applications only	5%	13%	8%	8%
Other	3%	0%	0%	1%
None of the above	16%	7%	8%	13%
Don't Know	10%	24%	0%	13%
N	**93**	**45**	**12**	**150**

Respondents were also asked if they are currently capable of sharing stored data. Slightly more than one-third of the respondents (36 percent) stated they are capable of sharing data, while another quarter (25 percent) indicated that they currently do not have the capability to share data but plan to do so in the future. Another 26 percent said they are not currently and have no plans to share data.

Data Back-Up

Next, respondents were asked to address specific statements regarding their organization's data back-up approach. Nearly half (42 percent) reported using multiple data backup approaches, including:

- "backing up all data onsite within their facility",
- "replicating data to an offsite data center",
- "sending back-up data offsite (within designated number of miles/region)" and;
- "replicating data on-site".

The most frequently selected single approach was backing up all data onsite; this was selected by 25 percent of respondents.

By organization size, 42 percent of the respondents from 500+ bed segment indicated that they send back-up data offsite (within a designated number of miles or region); while one-third of the 150-500 and 500+ bed segments said they use a combination of different approaches for back-up (see Table Twelve).

Table Twelve: Data Backup Approach

Data Backup Approach	Under 150 beds	150-500 beds	500+ Beds	All Respondents
We use a combination of these approaches	46%	36%	33%	42%
We back-up all data onsite within our facility	29%	22%	0%	25%
We replicate our data to an offsite Data Center	12%	22%	0%	14%
We send back-up data offsite (within a designated number of miles or region)	4%	13%	42%	10%
We replicate our data on-site	4%	2%	8%	4%
Don't Know	4%	4%	17%	5%
N	**93**	**45**	**12**	**150**

Data Archiving

The next series of questions addressed data archiving. Healthcare data archiving is a process by which healthcare data that is not in active use is stored for long-term retention. For most organizations, the retention of this data is necessary to meet regulatory compliance as indicated by several respondents in the study.

Data Archiving Strategy

First, respondents were asked if they have a data archiving strategy in place. More than half (52 percent) stated they do have a strategy in place while 46 percent of the respondents stated they currently do not have a strategy. Those respondents that reported having a strategy were asked what percent of their total data can be classified as "archival". Overall, about one in five (18 percent) said that more than 25 percent of their data is "archival" (see Table Thirteen), in the large segment (500+ beds) this increases to half of the respondents (50%) stating that 25 percent or more of their data as archival.

Table Thirteen: Data Classified as Archival

Data Classified as Archival	Under 150 beds	150-500 beds	500+ Beds	All Respondents
Less than 5 percent	22%	14%	0%	18%
6-10 percent	18%	27%	17%	21%
11-15 percent	16%	9%	0%	13%
16-20 percent	16%	18%	33%	18%
21-25 percent	8%	14%	0%	9%
More than 25 percent	14%	18%	50%	18%
Don't Know	6%	0%	0%	4%
N	**50**	**22**	**6**	**78**

The majority of respondents who have an archive strategy in place created the strategy for compliance (83 percent). Other reasons for implementing an archive strategy can be attributed to record retention/destruction requirements (74 percent), the need to prioritize critical clinical and business data storage onsite for immediate access (71 percent), and data sharing (38 percent).

Respondents who prioritize critical clinical and business storage onsite for immediate access were asked if they established a formal policy. More than half of respondents who indicated they have a formal policy in place noted that this policy is communicated and enforced through audit and training (59 percent). Another 22 percent reported that their policy is documented but not enforced and 13 percent stated it was based on software driven policy enforcement).

The 46 percent of total respondents who do not currently have a data archiving strategy in place were asked to rate the priority of adopting a data archiving policy in the future - using a one to ten scale where one is "low priority" and ten is "high priority". Overall, respondents did not place a high priority on adopting a data archiving policy in the future as the average rating was 5.79. Respondents in the under 150 and 150 to 500 bed segments placed higher priority on creating a strategy than did respondents in the 500+ bed segment.

Disaster Recovery and Business Continuity

In addition to the data storage, backup and archiving strategies, all respondents were asked a series of questions regarding their disaster recovery and business continuity strategies. Approximately two-thirds of respondents noted they have a disaster recovery (69 percent) and business continuity (66 percent) strategy in place. About 17 percent of respondents plan to implement a disaster recovery strategy, and 14 percent said they plan to create a business continuity strategy in the future.

Respondents who have a disaster recovery strategy were asked if their strategy complies with HIPAA guidelines. The majority of these respondents (82 percent) said yes, with another 17 percent planning to meet compliance. Forty-six (46) percent of respondents who characterized themselves as "compliant" reported testing their strategy annually, while 18 percent test compliance every six months. Almost one in five (19 percent) said that they do not test with any regularity; with one respondent who noted that testing is not conducted regularly due to lack of funding.

Virtually all respondents who indicated that they have a business continuity strategy reported that their strategy included protocols for clinical, operational and laboratory data and applications. These respondents were also asked if they have a defined recovery time objective (RTO) and/or a defined recovery point objective (RPO) metrics. RTO is defined as the duration of time and service level within the process that must be restored after a disaster in order to maintain acceptable continuity. Approximately one-third (36 percent) of respondents identified an RTO metric at their organizations. RPO is the maximum amount of time that's tolerable in which data can be lost after a disaster. Less than one-third (31 percent) have an RPO metric.

The strategy for approaching RTO and RPO metrics vary by the department/function. Respondents noted that clinical-based problems demand more immediate attention than non-clinical issues several respondents indicated they must be resolved within a 48 hour time frame. A few organizations stated that they expect to resolve issues within four hours, but included a caveat that the type of issue will determine if the four hours is a realistic time frame. A few other organizations indicated that they hope to achieve RPO or RTO within a 15 minute turnaround time.

All respondents were also asked if their organization experienced a disaster recovery or data loss event in the past five years. Twenty-one (21 percent) stated they have experienced a disaster recovery or data loss event while the majority of the respondents (69 percent) mentioned they have not. The remaining 10 percent did not know or chose not to respond to the question.

Conclusion

In what seems like the convergence of an HIT version of a "perfect storm", today's healthcare industry is expected to achieve Meaningful Use and ICD-10 implementation while keeping updated on technology that will improve patient quality, efficiency and safety. HIT executives are faced with enormous tasks, ranging from overhauling their information systems to renovating their work flow systems to managing additional applications/technology in order to meet the demands of the industry. In addition, they are expected to analyze the data housed in their electronic systems, and translate that data into actionable information.

Based on the HIMSS Analytics EMRAM and the Meaningful Use requirements, the number of organizations that plan to adopt technology will only increase, resulting in continued exponential accumulation of clinical, financial and administrative data. As more organizations continue to compile data volume, the need to properly plan for data storage and archival will become a necessity - given the limited monetary and physical resources of healthcare organizations.

As mentioned earlier, almost half of the respondents said that more than six percent of their annual IT budget is spent on data storage. It is likely that this level of investment will increase as the need to manage and store data will become an urgent issue in the next few years. Each organization will need to determine whether their current level of investment is sufficient to address their growing data storage needs.

The healthcare industry, overall, has not fully embraced the approach of data archiving. With only half of the respondents (52 percent) saying that they have a data archiving strategy in place, healthcare organizations will need to develop a strategy to manage the long-term retention of their data. Data archiving has been known to improve performance and scalability, reduce the amount of hardware required to store data, and increase accessibility to older datasets.

The need to develop a successful strategy to manage data is essential. An increasing number of healthcare organizations are using analytics from current data and archived data to project needs of their patients and streamline their organizational business performance. However, using an onsite storage solution to access data can be expensive and inefficient without a proper strategy. A successful data storage, back-up and archiving strategy can be a significant contributor to improving access to this information.

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