Forward Momentum

Hospital Use of
Information Technology

2005

American Hospital
Association

Summary of findings

The work of hospitals is caring for patients. Every day they strive to improve the safety and quality of that care. Research has shown that certain kinds of information technology (IT) – such as computerized physician order entry (CPOE), computerized decision support systems, and bar coding for medication administration – can limit errors and improve care by ensuring that the right information is available in the right place at the right time to treat patients. IT also can be a tool for improving efficiency. While hospitals have been pioneers in harnessing IT to improve patient care, quality and efficiency, the challenge now is to extend its use and integrate it into routine care processes in all hospitals, big and small, in both rural and urban areas.

To gauge the extent of IT use among hospitals and better understand the barriers to further adoption, the American Hospital Association (AHA) surveyed hospitals in April 2005. The AHA wanted to know where the field is currently, where it is planning to go, and what kinds of measures could help speed adoption. The survey asked about use of specific kinds of IT, financing of IT systems, barriers to greater use, and involvement in arrangements to share clinical information. More than 900 community hospitals – about 19.2 percent of all community hospitals – responded to the survey. This sample fairly represents all hospitals by size, location and teaching status. The technical appendix contains more details on the survey methodology.

Key survey findings include:
- Hospitals are committed to adopting information technology.

- Hospitals use many different kinds of IT.

- Use of IT is evolutionary. The specific technologies and functions used must fit into the priorities of each facility. Hospitals are implementing and/or are planning to implement additional functions over time.

- Hospitals fall along a spectrum of IT use from just getting started to running sophisticated systems. IT use varies with hospital size, teaching status, location, and financial status. Most hospitals are still at the lower ends of the spectrum, but continued evolution will lead to greater use.

- IT is very expensive. The median annual capital investment on IT was over $700,000 and represented 15 percent of all capital expenses. Operating expenses were much higher – $1.7 million, or 2 percent of all operating expenses. Those with more advanced systems – and especially advanced CPOE systems – spend even more.

- The most commonly cited barriers to further adoption of IT are initial investment costs, followed by lack of interoperability with current systems, acceptance of technology by clinical staff, and availability of well-trained IT staff.

- Hospitals are beginning to share electronic patient data with other organizations.

Policymakers and researchers have highlighted the potential of health information technology to improve the quality and efficiency of health care. President Bush has put forth an ambitious goal of having an electronic health record (EHR) for all Americans by 2014. These survey results suggest that accelerating the forward momentum and achieving universal adoption of IT will require a shared investment between providers, payers and purchasers. Hospitals currently bear almost all the costs of IT investment, with no increases in payments. However, many of the financial benefits of IT, such as decreased need for repeat tests, lower readmission rates and shorter lengths of stay, accrue to those who pay for the care. In looking at financing, policymakers should give special attention to less financially stable hospitals, smaller hospitals and those in rural locations.
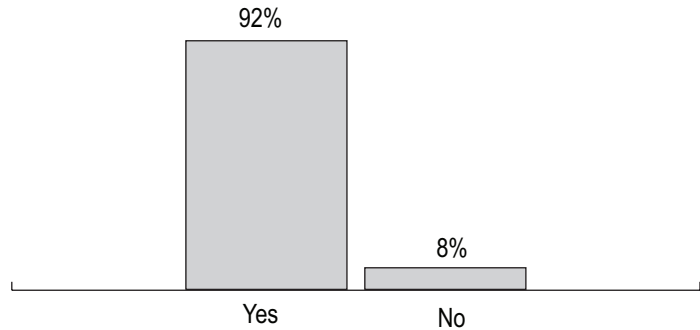
Hospitals are adopting information technology

Hospitals realize the potential of IT to improve the safety and quality of care and are committed to clinical applications. The overwhelming majority of respondents – 92 percent – said they were "actively considering, testing or using ... IT for clinical purposes."

Hospitals are committed to clinical IT

Percent of hospitals actively considering, testing or using IT for clinical purposes

Focusing in on the 8 percent who said they were not even considering clinical IT shows that they were primarily small, rural, non-teaching and non-system hospitals:

- 93 percent have fewer than 200 beds (compared to 71 percent of all hospitals);

- 82 percent are rural (compared to 44 percent of all hospitals);

- 99 percent are non-teaching (compared to 78 percent of all hospitals); and

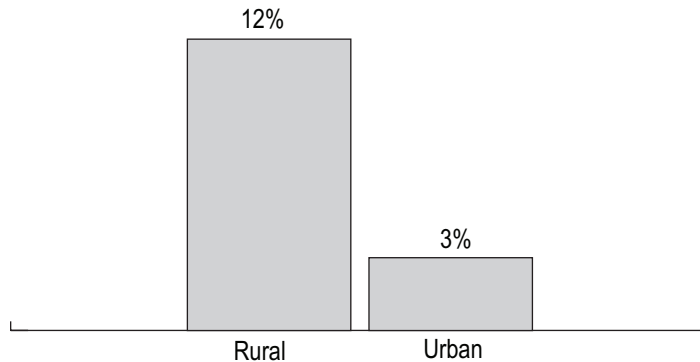- 70 percent are non-system members (compared to 45 percent of all hospitals).
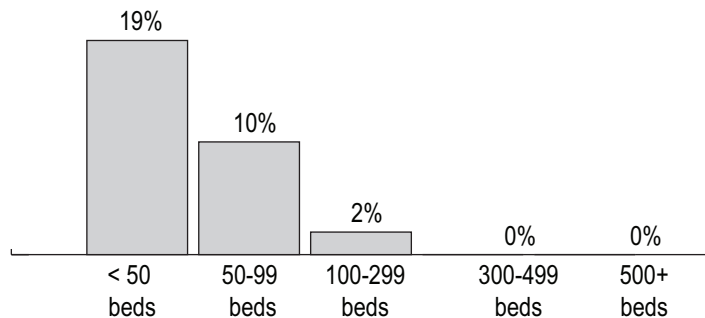
Rural hospitals less likely to be using or considering clinical IT

Percent of hospitals not using or considering use of clinical IT by location

Smaller hospitals much less likely to be using or considering clinical IT

Percent of hospitals not using or considering use of clinical IT by bed size

Hospitals use many different kinds of IT

Hospitals use many different kinds of IT, including administrative systems for billing or scheduling, and clinical systems for maintaining records, storing and viewing images, tracking medications, and other uses. The most often discussed clinical applications are the electronic health record, which provides all of a patient's information through a single point of access, and CPOE systems, which allow physicians to electronically order tests, consults and medications. CPOE systems generally provide advice on best practices or alerts to possible adverse consequences, such as an allergy or a harmful combination of drugs. Ideally, an electronic health record will incorporate CPOE.

However, other technologies also can provide clinical benefits and administrative efficiencies. For example, the survey revealed that more than half of all hospitals have adopted **bar coding** technologies for at least one purpose. Bar coding allows hospitals to match patients to their laboratory specimens and drugs and allows for better management of supplies. Bar coding technologies have created significant safety benefits by matching patients and their drugs before they are administered, to ensure that the right medication is given to the right patient, in the right dose, and at the right time. Almost one-quarter of the hospitals surveyed have fully or partially implemented bar coding for pharmaceutical administration.

The survey also found that some hospitals are beginning to use **radio frequency identification (RFID)**, a new technology for identifying and tracking items. This technology is at an early stage, with less than 10 percent of hospitals having fully or partially implemented it.
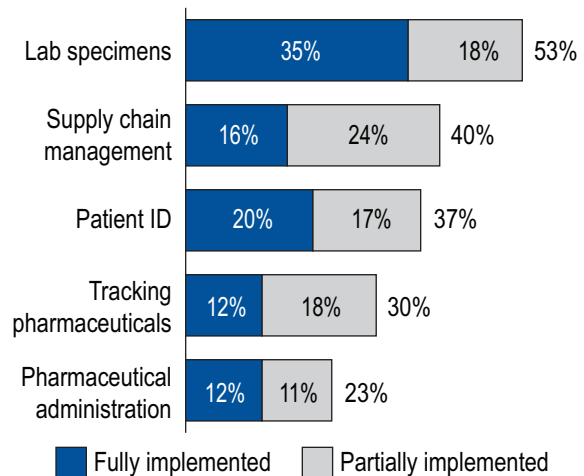
Telemedicine technology allows remote health care facilities to consult with physicians and medical personnel at other hospitals or central facilities, such as regional medical centers, through the use of high-resolution cameras, digital imaging equipment, and high-speed connectivity. This technology can reduce the need to transfer patients and possibly save lives. More than half of hospitals in both urban and rural areas are using telemedicine.

Some physicians have found that using hand-held electronic devices, such as **personal digital assistants (PDAs)**, to access patient information and medical references, and enter orders, can improve their workflow. According to the survey, about 30 percent of hospitals have fully or partially implemented this technology.

Hospitals are adopting bar coding

Percent of hospitals with fully or partially implemented bar code systems for:

	Fully implemented	Partially implemented	Total
Lab specimens	35%	18%	53%
Supply chain management	16%	24%	40%
Patient ID	20%	17%	37%
Tracking pharmaceuticals	12%	18%	30%
Pharmaceutical administration	12%	11%	23%

Hospitals are adopting telemedicine and other technologies

Percent of hospitals with fully or partially implemented systems

	Fully implemented	Partially implemented	Total
Telemedicine	24%	37%	61%
Physician use of PDAs	9%	21%	30%
Radio frequency identification	2%	6%	8%

Use of IT is evolutionary

Implementing electronic health records with computerized physician order entry systems requires significant changes to institutional work processes. Beyond the technological changes, the physicians, nurses, and other hospital staff must incorporate new ways of processing, storing, and retrieving the information they use every minute of every day. Not all implementations are successful, and failure is very expensive. Given the large-scale changes – and large-scale costs – of these kinds of systems, many hospitals are taking an incremental approach. For example, they may implement IT systems in individual departments, working over time to connect them.
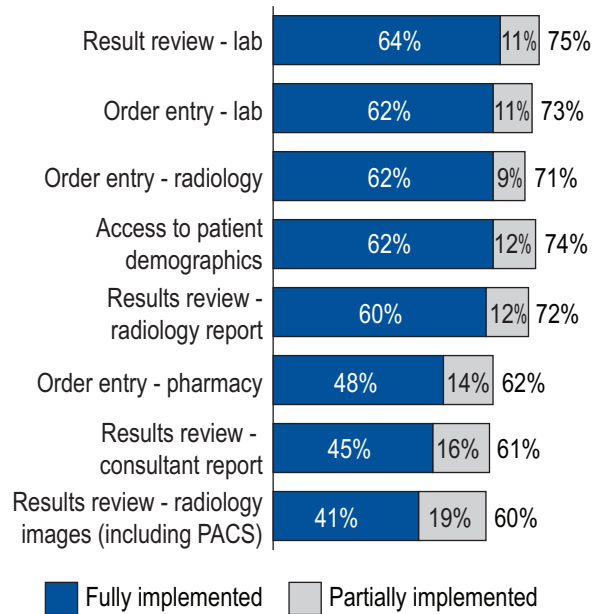
To capture the diversity of EHR use among hospitals, the survey asked about 15 distinct functions of electronic records. In their responses, hospitals may have reported functions of departmental systems, such as a lab system or a pharmacy system, or administrative systems, such as their admission, discharge, and transfer records, as well as full-blown EHRs.

The survey asked about the following EHR functions:
- Access to current medical records
- Access to medical history
- Access to patient flow sheets
- Access to patient demographics
- Order entry of laboratory tests
- Results review for laboratory tests
- Order entry of radiology procedures
- Results review for radiology images, including picture archiving and communications systems (PACS)
- Results review of radiology reports
- Order entry of medications
- Real-time drug interaction alerts
- Back-end drug interaction alerts
- Clinical guidelines and pathways
- Patient support through home monitoring, self-testing, and interactive patient education
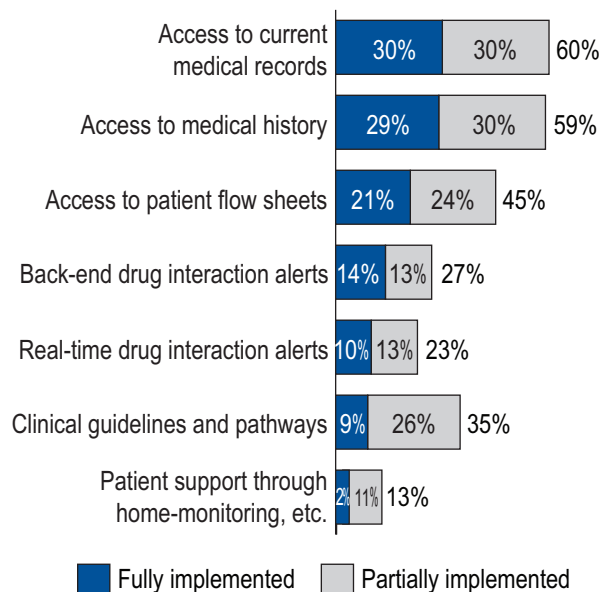
EHR functions used most often

Percent of hospitals reporting that they have fully or partially implemented various EHR functions

Function	Fully implemented	Partially implemented	Total
Result review - lab	64%	11%	75%
Order entry - lab	62%	11%	73%
Order entry - radiology	62%	9%	71%
Access to patient demographics	62%	12%	74%
Results review - radiology report	60%	12%	72%
Order entry - pharmacy	48%	14%	62%
Results review - consultant report	45%	16%	61%
Results review - radiology images (including PACS)	41%	19%	60%

■ Fully implemented ☐ Partially implemented

EHR functions used less often

Percent of hospitals reporting that they have fully or partially implemented various EHR functions

Function	Fully implemented	Partially implemented	Total
Access to current medical records	30%	30%	60%
Access to medical history	29%	30%	59%
Access to patient flow sheets	21%	24%	45%
Back-end drug interaction alerts	14%	13%	27%
Real-time drug interaction alerts	10%	13%	23%
Clinical guidelines and pathways	9%	26%	35%
Patient support through home-monitoring, etc.	2%	11%	13%

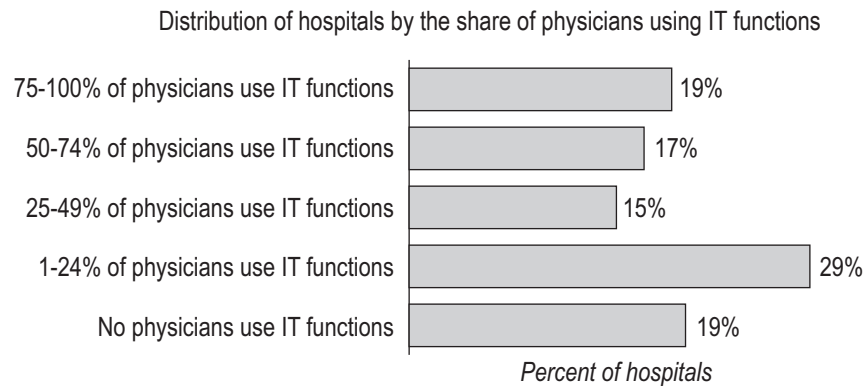■ Fully implemented ☐ Partially implemented

The survey also asked about which staff use the EHR functions available in the hospital, including physicians, nurses, and other clinical staff. Other clinical staff may 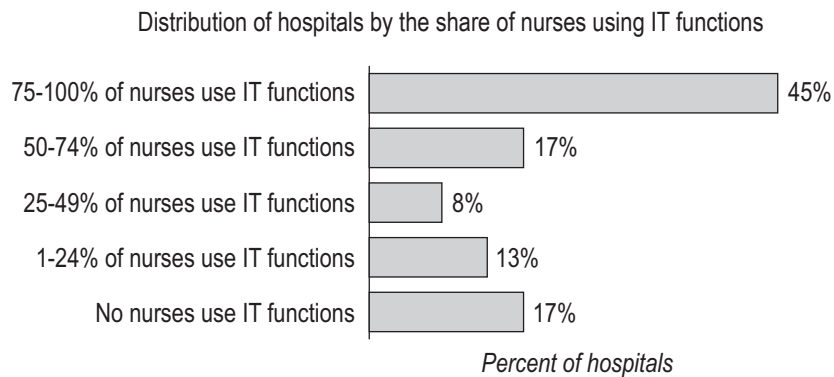include, for example, laboratory technicians and pharmacists who may enter orders placed by physicians and retrieve information. In general, physicians use these systems less frequently than nurses or other clinical staff.
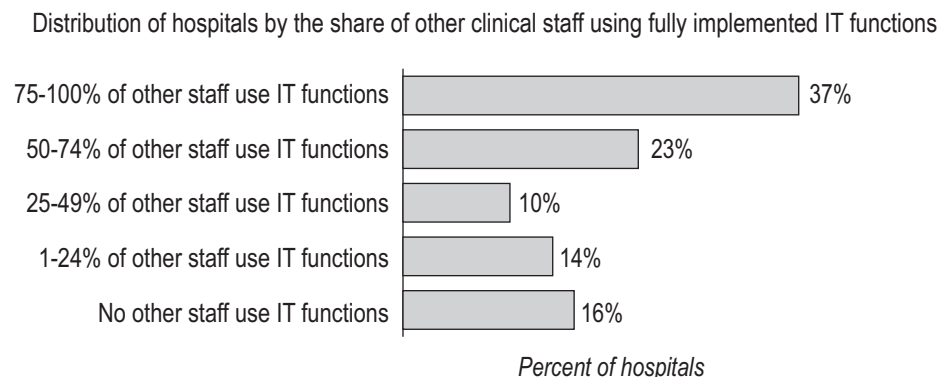
Who uses the IT systems?

Distribution of hospitals by the share of physicians using IT functions

Physicians

75-100% of physicians use IT functions	19%
50-74% of physicians use IT functions	17%
25-49% of physicians use IT functions	15%
1-24% of physicians use IT functions	29%
No physicians use IT functions	19%

Percent of hospitals

Distribution of hospitals by the share of nurses using IT functions

Nurses

75-100% of nurses use IT functions	45%
50-74% of nurses use IT functions	17%
25-49% of nurses use IT functions	8%
1-24% of nurses use IT functions	13%
No nurses use IT functions	17%

Percent of hospitals

Distribution of hospitals by the share of other clinical staff using fully implemented IT functions

Other clinical staff

75-100% of other staff use IT functions	37%
50-74% of other staff use IT functions	23%
25-49% of other staff use IT functions	10%
1-24% of other staff use IT functions	14%
No other staff use IT functions	16%

Percent of hospitals

Note: Based on 816 hospitals with complete information (819 for nurses).

Hospitals fall along a spectrum of IT use

To assess the level of IT use among hospitals, the AHA created four groups of use based on the number of EHR functions that were reported to be *fully implemented* at each surveyed hospital. Hospital IT systems continue to progress, and we anticipate that hospitals will move to higher stages over time. Hospitals fell into four groups of use:
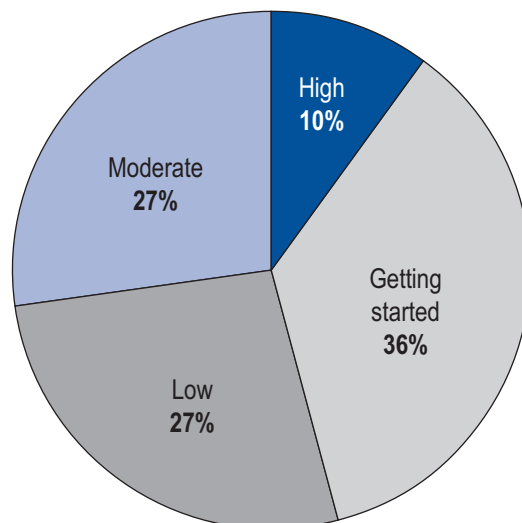
Spectrum of IT use

Level of Use	Getting Started 0-3 Functions (0-25%) Fully implemented	*Stage 1* Low 4-7 Functions (26-50%) Fully implemented	*Stage 2* Moderate 8-11 Functions (51-75%) Fully implemented	*Stage 3* High 12-15 Functions (76-100%) Fully implemented
Functions	• Access to current medical records • Access to medical history • Access to patient flow sheets • Access to patient demographics • Order entry - lab • Results review - lab • Order entry - radiology	• Results review - radiology images (incl. PACS) • Results review - radiology report • Results review - consultant report • Order entry - pharmacy • Real time drug interaction alerts	• Back end drug interaction alerts • Clinical guidelines and pathways • Patient support through home monitoring, self-testing, and interactive patient education	

In looking at fully implemented functions, most hospitals fell into the getting started or low use groups. However, just over one-quarter were in the moderate group, and 10 percent had implemented almost all of the functions of an EHR. If both fully and partially implemented systems are considered, the number of hospitals in the moderate and high groups increases, suggesting forward momentum.

Hospitals vary in their level of IT use

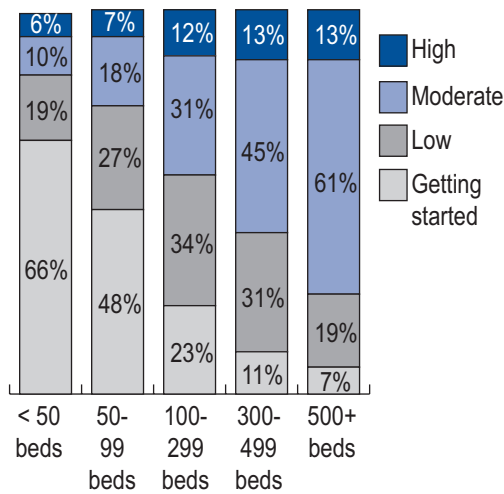Distribution of hospitals by level of fully implemented IT use

High 10%

Moderate 27%

Getting started 36%

Low 27%

Note: Based on 903 community hospitals with complete information.

The level of IT use varies with many different hospital characteristics. The size of the hospital bears a strong relationship to IT use. On average, use increases with the number of beds. The smallest hospitals (fewer than 50 beds) are almost 10 times more likely to be in the getting started group than the largest ones (more than 500 beds). For hospitals in urban areas, almost 50 percent have moderate or high use of IT, compared to 25 percent of rural facilities. Similarly, teaching hopsitals generally have greater use of IT than their non-teaching counterparts. Only 15 percent of teaching hospitals are just getting started, compared to 41 percent of non-teaching hospitals. Hospitals that belong to a system also tend to have greater use of IT.
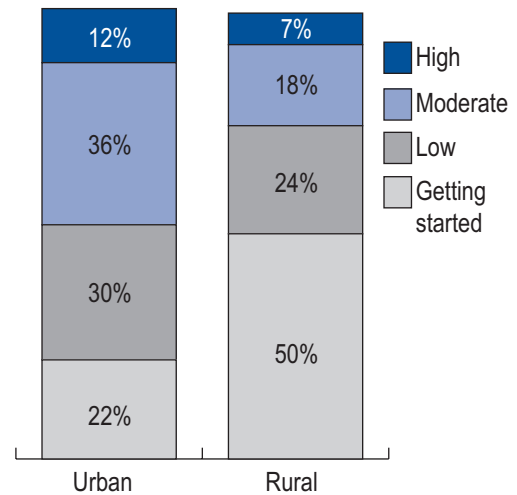
Larger hospitals use more IT than smaller hospitals

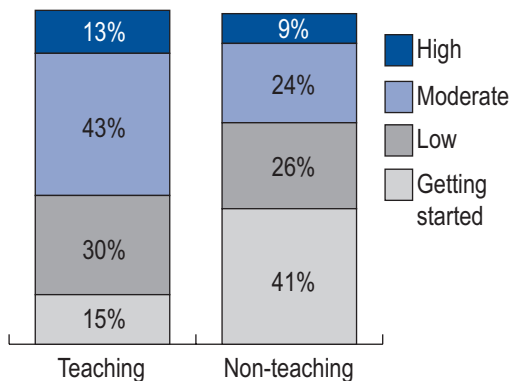Distribution of hospitals across levels of IT use by bed size, fully implemented systems

	< 50 beds	50-99 beds	100-299 beds	300-499 beds	500+ beds
High	6%	7%	12%	13%	13%
Moderate	10%	18%	31%	45%	61%
Low	19%	27%	34%	31%	19%
Getting started	66%	48%	23%	11%	7%

Urban hospitals use more IT than rural hospitals

Level of use of fully implemented IT systems, by location

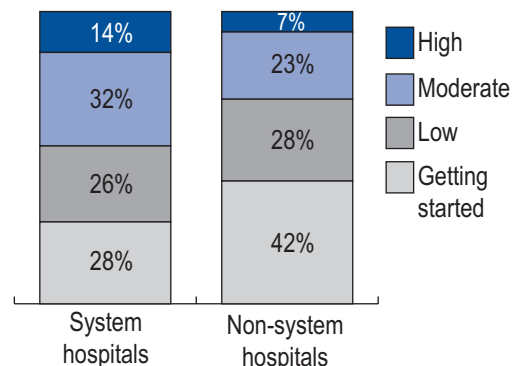|	Urban	Rural
High	12%	7%
Moderate	36%	18%
Low	30%	24%
Getting started	22%	50%

Teaching hospitals use more IT than non-teaching hospitals

Level of use of fully implemented IT systems by teaching status

	Teaching	Non-teaching
High	13%	9%
Moderate	43%	24%
Low	30%	26%
Getting started	15%	41%

Hospitals that are members of systems use more IT than those that are not

Level of use of fully implemented IT systems, by system status

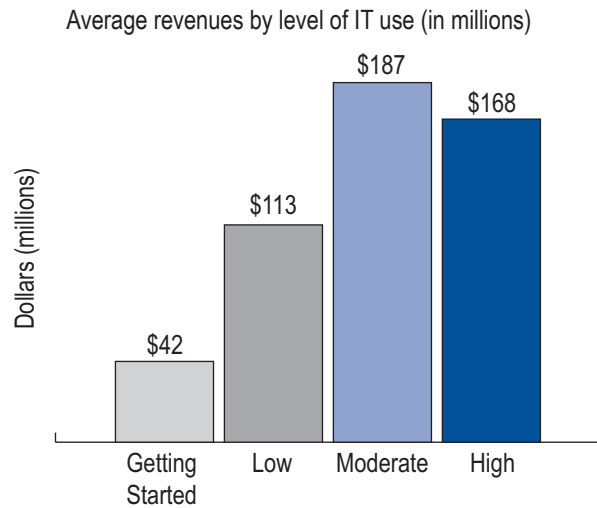|	System hospitals	Non-system hospitals
High	14%	7%
Moderate	32%	23%
Low	26%	28%
Getting started	28%	42%

Note: All charts based on 903 hospitals with complete data. Percentages may not sum to 100 due to rounding

Financial status also helps determine a hospital's IT use: hospitals with larger revenues and better financial standing generally have greater IT use.

Hospitals with greater use of IT have greater revenues, on average

Average revenues by level of IT use (in millions)

Hospitals with positive margins use more IT

Level of use of fully implemented IT systems, by margin level

The spectrum of IT use among hospitals is broad. While most hospitals are located in the low and middle areas of the spectrum, some are located at the far ends of the spectrum:

- Those that have not yet implemented any functions of an electronic health record; and
- Those that have become advanced users of CPOE systems.

The lower end: Sixteen percent of hospitals have not fully or even partially implemented any electronic health record functions. These hospitals are disproportionately:
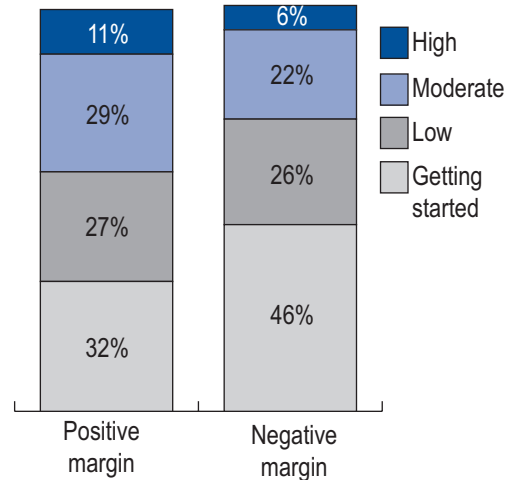
- Small (82% with fewer than 100 beds);
- Rural (75%); and
- Non-teaching (91%).

The upper end: A small subset of hospitals – about 3 percent – are advanced CPOE users with systems that include access to current medical records; order entry for pharmacy, lab, and radiology; results review for lab and radiology; real time or back-end drug interaction alerts; and 50 percent or more of their physicians regularly use the CPOE functions. These hospitals are disproportionately:

- Large (55% with 300 or more beds);
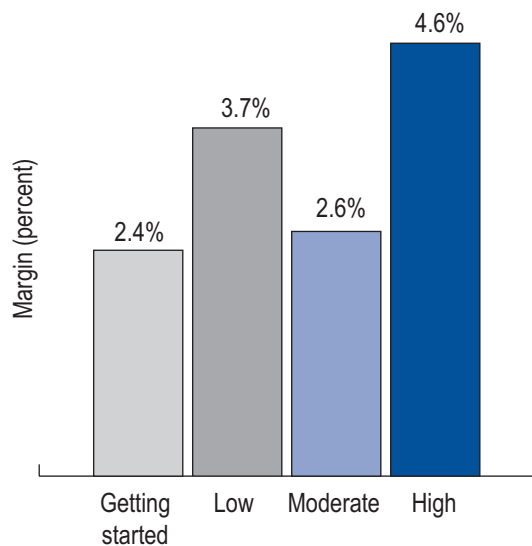- Urban (86%); and
- Teaching (57%).

Hospitals with the greatest use of IT have the highest average margins

Average margin by level of IT use

IT is expensive

IT spending will depend on both hospital size and the technologies deployed. Hospitals use many sources to finance IT, but rely primarily on capital and operating budgets. Capital budgets cover investments in buildings and medical equipment, as well as IT systems, while operating budgets cover staff, supplies, and other daily expenses of running a hospital. Hospitals surveyed reported that operating costs for IT, which represent operating costs for all systems in place, are generally higher than capital spending on IT. Among the hospitals surveyed, median amounts spent on IT last year included:

- More than $700,000 in capital spending, or 15 percent of capital expenses, and
- $1.7 million in operating costs, or 2.0 percent of operating expenses.

Not surprisingly, hospitals with greater IT use have greater expenses, but they are not always devoting a larger share of their resources to the technology. This suggests that IT is a large financial commitment that is most easily met by those with greater resources and access to capital.
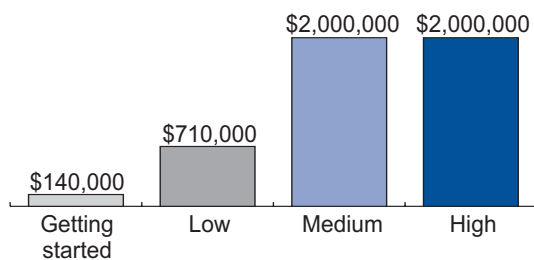
Hospitals plan even greater IT spending over the next three years (median values):

- $2.5 million in capital spending, or 20 percent of capital expenses, and
- $5 million in operating costs, or 2.5 percent of operating expenses.

However, hospitals with less advanced IT systems plan to spend a greater share of their capital resources on IT in the next few years, demonstrating their commitment to moving forward.
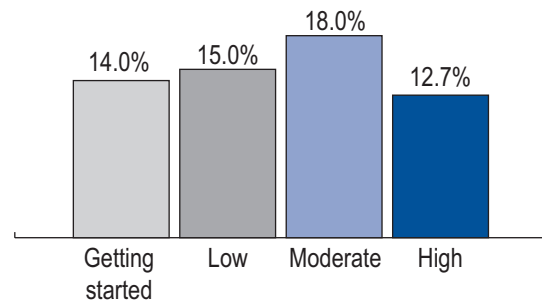
Hospitals with more advanced IT systems make large capital investments...

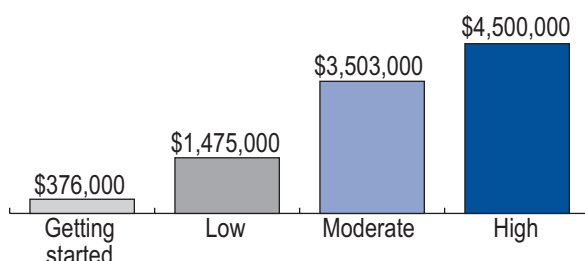Median capital investments on IT in last year by level of use

		$2,000,000	$2,000,000
	$710,000		
$140,000			
Getting started	Low	Medium	High

...but do not consistently spend a greater share of capital on IT

Median share of captial budget spent on IT in last year by level of use

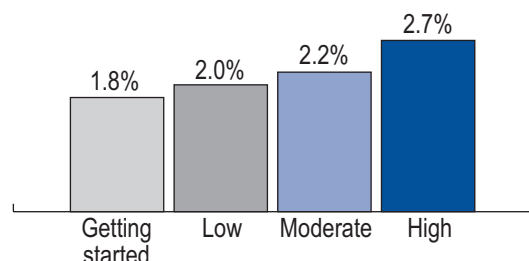|		18.0%	
14.0%	15.0%		12.7%
Getting started	Low	Moderate	High

Hospitals with more advanced IT systems have large operating costs...

Median operating costs for IT in last year by level of use

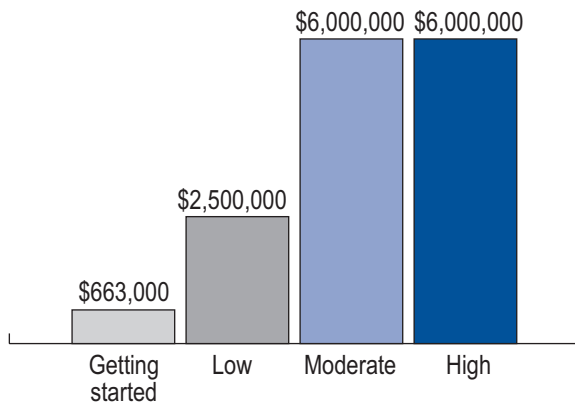|			$4,500,000
		$3,503,000	
	$1,475,000		
$376,000			
Getting started	Low	Moderate	High

...and also, devote a greater share of operating expenses to IT

Median share of operating budget spent on IT in last year by level of use

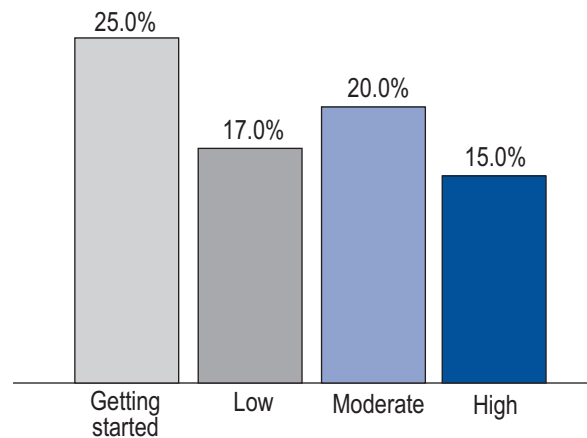|			2.7%
		2.2%	
1.8%	2.0%		
Getting started	Low	Moderate	High

Looking forward, hospitals with more advanced IT systems anticipate continued large capital investments...

Median capital investments on IT over next 3 years by level of use

$663,000 — Getting started
$2,500,000 — Low
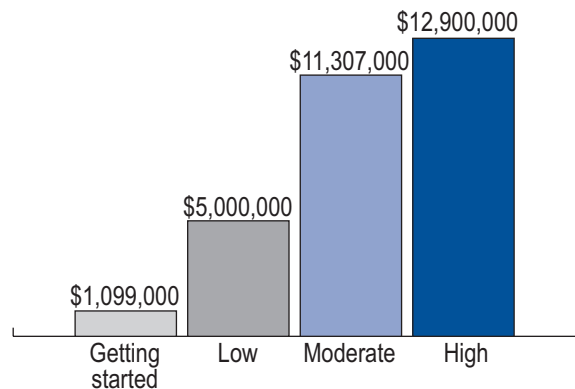$6,000,000 — Moderate
$6,000,000 — High

... while hospitals with less use of IT will devote a greater share of capital spending to IT

Median share of capital budget spent on IT over next 3 years by level of use

25.0% — Getting started
17.0% — Low
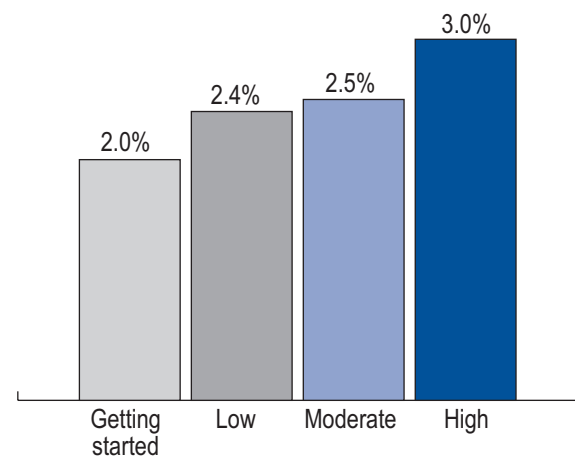20.0% — Moderate
15.0% — High

Looking forward, hospitals with more advanced IT systems anticipate continuing large operating expenses...

Median operating costs for IT in over next 3 years by level of use

$1,099,000 — Getting started
$5,000,000 — Low
$11,307,000 — Moderate
$12,900,000 — High

... and devoting a larger share of operating expenses to IT

Median share of operating budget to be spent on IT in next 3 years by level of use

2.0% — Getting started
2.4% — Low
2.5% — Moderate
3.0% — High

Hospitals with advanced CPOE systems devote the most resources to IT. According to the survey, last year these hospitals spent (median values):

- $7 million in capital investments, or 16.9 percent of capital expenses – almost five times the median for all hospitals.
- $15.4 million in operating costs, or 2.7 percent of operating expenses – almost 10 times the median for all hospitals.

Looking forward, these hospitals anticipate spending the following amounts on IT over the next three years (median values):

- $19 million in capital spending, or 18.8 percent of capital expenses.
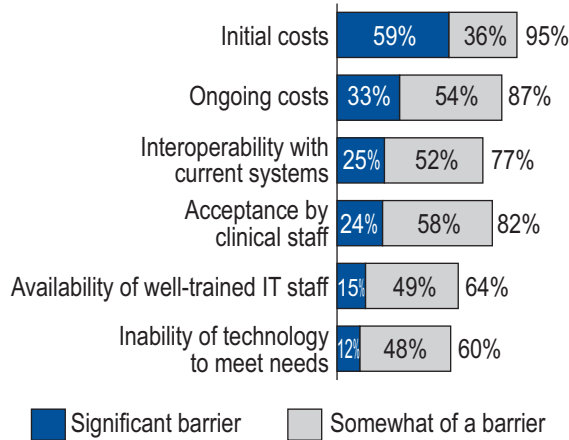- $54 million in operating costs, or 3.0 percent of operating expenses.

Cost is the #1 barrier to greater adoption

Hospitals are committed to the use of IT, but that use is not as widespread as it should be. The survey asked hospitals about the many different barriers to use, including initial costs of deploying IT, personnel needs, and the ability of current technology to meet their needs and those of clinicians. Respondents identified the initial and ongoing costs of deploying and maintaining IT systems as the greatest barriers to IT use, especially among small and rural hospitals.
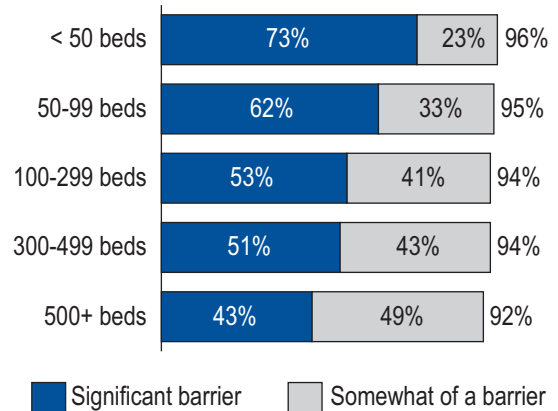
Hospitals report costs as greatest barrier to IT adoption

Percent of hospitals indicating barrier is a "significant barrier" or "somewhat of a barrier"

Barrier	Significant barrier	Somewhat of a barrier	Total
Initial costs	59%	36%	95%
Ongoing costs	33%	54%	87%
Interoperability with current systems	25%	52%	77%
Acceptance by clinical staff	24%	58%	82%
Availability of well-trained IT staff	15%	49%	64%
Inability of technology to meet needs	12%	48%	60%

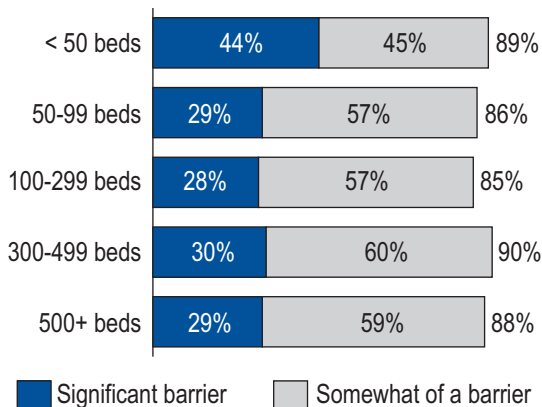■ Significant barrier   ☐ Somewhat of a barrier

Smaller hospitals more likely to see initial costs as significant barrier

Percent of hospitals indicating initial costs are a "significant barrier" or "somewhat of a barrier"

	Significant barrier	Somewhat of a barrier	Total
< 50 beds	73%	23%	96%
50-99 beds	62%	33%	95%
100-299 beds	53%	41%	94%
300-499 beds	51%	43%	94%
500+ beds	43%	49%	92%

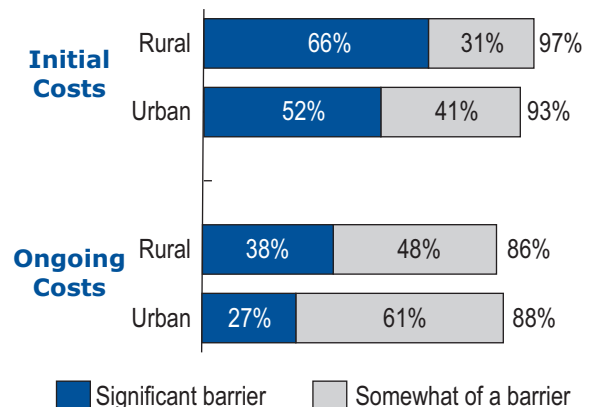■ Significant barrier   ☐ Somewhat of a barrier

While a barrier for all, smallest hospitals are the most likely to see ongoing costs as significant barrier

Percent of hospitals indicating ongoing costs are a "significant barrier" or "somewhat of a barrier" by size

	Significant barrier	Somewhat of a barrier	Total
< 50 beds	44%	45%	89%
50-99 beds	29%	57%	86%
100-299 beds	28%	57%	85%
300-499 beds	30%	60%	90%
500+ beds	29%	59%	88%

■ Significant barrier   ☐ Somewhat of a barrier

While a barrier for all, rural hospitals are more likely to see costs as significant barrier than urban counterparts

Percent of hospitals indicating ongoing costs are a "significant barrier" or "somewhat of a barrier" by location

		Significant barrier	Somewhat of a barrier	Total
Initial Costs	Rural	66%	31%	97%
	Urban	52%	41%	93%
Ongoing Costs	Rural	38%	48%	86%
	Urban	27%	61%	88%

■ Significant barrier   ☐ Somewhat of a barrier

Hospitals are beginning to share clinical data

Among hospitals surveyed, 53 percent reported sharing electronic patient-specific health care information with local or regional partners. This information exchange can take many forms. Some examples include:
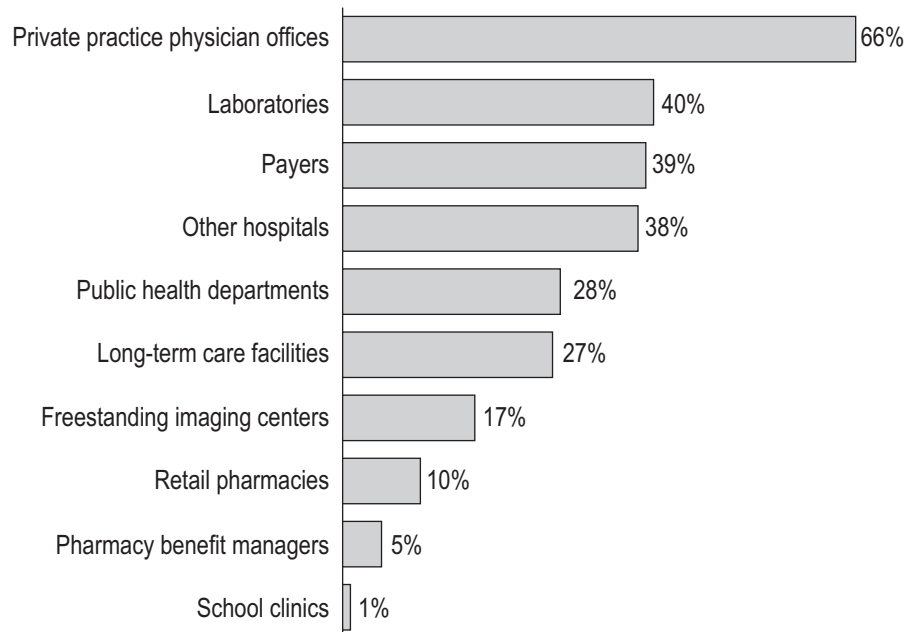
- Web portals giving physicians access to hospital information systems,
- Sharing electronic data with other hospitals or facilities within a system,
- Sharing data with a laboratory,
- Electronic reporting to public health departments, and
- Planned or nascent projects to share information through a regional health information network.

Among those sharing clinical data, hospitals reported that they most commonly share electronic patient information with private practice physician offices and laboratories.

Among those sharing clinical data, hospitals that share electronic patient information most frequently do so with physician offices

Percentages apply to the 53% of hospitals that reported sharing clinical information

Category	Percentage
Private practice physician offices	66%
Laboratories	40%
Payers	39%
Other hospitals	38%
Public health departments	28%
Long-term care facilities	27%
Freestanding imaging centers	17%
Retail pharmacies	10%
Pharmacy benefit managers	5%
School clinics	1%

Conclusion

The survey results indicate that hospitals are committed to using IT, but current use is fairly low. Use of IT varies across hospitals, with some just getting started and others using advanced CPOE systems. Continued adoption will be evolutionary, with hospitals implementing the systems that meet their needs. Building on this forward momentum will require addressing the barriers identified in the survey, beginning with the high costs of implementing and maintaining IT systems. Hospitals are making investments in IT because they see the quality and safety gains that can be realized. However, they need others who will benefit from a wired health system, such as payers and purchasers, to share in that investment. Certain types of hospitals – such as those that are struggling financially, smaller facilities, and those in rural areas – may need more help than others.

Technical appendix

The survey instrument was designed with the assistance of the AHA Member Advisory Group on Information Technology, a group of about 20 hospital chief executive officers and chief information officers. AHA fielded the survey from April to June 2005. All community hospitals – not just AHA members – were asked to respond.

Survey instruments were sent to hospital CEOs by both email and fax. Respondents could either respond via an online Web portal or fax back a paper copy. We made special efforts to ensure that hospitals of all types and from all parts of the country responded. We are thankful to the many state hospital associations that helped recruit respondents.

The following tables compare the survey hospitals to the universe of hospitals by bed size, location, teaching status, and other variables. The comparison statistics come from the 2003 AHA Annual Survey.

Comparison of sample to universe		
Characteristic	**Universe (%)**	**Sample (%)**
Bed size		
<25 beds	6.7	6.2
25-49 beds	19.7	19.7
50-99 beds	21.1	20.3
100-199 beds	23.9	21.8
200-299 beds	12.7	11.7
300-399 beds	7.1	8.5
400-499 beds	3.5	3.6
500+ beds	5.3	8.1
Location		
Urban	55.8	49.1
Rural	44.2	50.9
Teaching status		
Non-teaching	78.1	80.3
Teaching	21.9	19.7
Region		
New England	4.1	4.9
Mid-Atlantic	9.9	10.8
South Atlantic	14.9	19.5
East North Central	15.0	14.5
East South Central	8.7	5.9
West North Central	13.8	21.7
West South Central	15.1	9.1
Mountain	7.1	6.5
Pacific	11.4	7.2
Ownership		
Non-Profit	61.0	67.9
Investor owned	16.1	6.5
State/local government	22.9	25.6
System Membership		
Member	54.5	43.9
Non-member	45.5	56.1

Note: Universe includes all 4,895 community hospitals in the 2003 AHA Annual Survey.
Sample includes 936 community hospitals responding to the AHA Health IT Survey.
Numbers may not sum to 100 due to rounding.

10/05