

Articles

Current status and perceived needs of information technology in Critical Access Hospitals: a survey study

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ABSTRACT

The US Congress established the designation of Critical Access Hospitals in 1997, recognising rural hospitals as vital links to health for rural and underserved populations. The intent of the reimbursement system is to improve financial performance, thereby reducing hospital closures. Informatics applications are thought to be tools that can enable the sustainability of such facilities. The aim of this study is to identify the current use of information and communication technology in Critical Access Hospitals, and to assess their readiness and receptiveness for the use of new software and hardware applications and their perceived information technology (IT) needs. A survey was mailed to the administrators of all Critical Access Hospitals in one US state (Missouri) and a reminder was mailed a few weeks later. Twenty-seven out of 33 surveys were filled out and returned (response rate 82%). While most respondents (66.7%) stated that their

employees have been somewhat comfortable in using new technology, almost 15% stated that their employees have been somewhat uncomfortable. Similarly, almost 12% of the respondents stated that they themselves felt somewhat uncomfortable introducing new technology. While all facilities have computers, only half of them have a specific IT plan. Findings indicate that Critical Access Hospitals are often struggling with lack of resources and specific applications that address their needs. However, it is widely recognised that IT plays an essential role in the sustainability of their organisations. The study demonstrates that IT applications have to be customised to address the needs and infrastructure of the rural settings in order to be accepted and properly utilised.

Keywords: information technology, organisational readiness, rural health, user acceptance

Introduction

In the United States, the Medicare Rural Hospital Flexibility Programme introduced by Congress as part of the Balanced Budget Act of 1997 established Critical Access Hospitals (CAHs), a category of limited service hospitals that are eligible to receive reimbursement for Medicare patients on a reasonable cost basis rather than a prospective payment system basis. This programme resulted from the recognition by the US

Congress of rural hospitals as vital links to health for rural and underserved populations. The intent of the reimbursement system is to improve financial performance, thereby reducing hospital closures. In addition, cost-based reimbursement will enable many hospitals to address deferred capital improvements, including IT needs.

Facilities aiming for a designation as a CAH must meet several criteria established in the legislation as well as those designated by each state. The criteria in the Federal Act specify that the facility must be a non-profit or public hospital that is located in a rural area. The hospital must provide for 24-hour emergency care services and not have more than 25 acute care inpatient beds (originally 15), although it may have up to 10 additional swing beds (beds that are not considered as a part of the acute care hospital services but provide long-term care services).¹ There is a length-of-stay limitation of 96 hours. Additionally, there are location and distance requirements. The hospital must be located in a rural area, and more than a 35-mile drive on primary roads or 15 miles on secondary roads from another hospital.

The purpose of this initiative goes beyond the creation of a cost-based classification; it aims rather to increase access to primary care and emergency services in rural areas, expand the use of technology where applicable, and to provide these services in the most cost-effective manner possible.¹ In the seminal work *Crossing the Quality Chasm*,² the Institute of Medicine listed effective use of information technologies as a healthcare system redesign imperative. Information technology applications can become powerful tools for CAHs, as they can automate processes, bridge geographic distance and increase access to specialised resources. While it is argued that IT can enhance the function of CAH facilities, it is not clear what types of applications and hardware/software products would target specific needs of these facilities. Many of the software and hardware applications developed for large medical centres could fail to address the specific needs of a rural setting. Furthermore, the current infrastructure, IT exposure and background of staff, and limited resources for training and system maintenance and support can all impede the successful integration of IT in Critical Access Hospitals.

An initiative to adopt an IT-based application or to design a new system requires the identification of the specific IT needs of CAHs, an understanding of the existing infrastructure in terms of technology, and a strategy to increase technology acceptance and diffusion. In the theory of diffusion of innovations, Rogers identifies a three-stage process for the spread of any innovation: awareness, trial and adoption.³ An individual or organisation must become aware of the innovation, then try it, and finally decide to adopt the technology. Greer has explored the application of diffusion theory to healthcare organisations and suggested considerations for applying diffusion theory to this setting.⁴ First, the goal is to assess how the responsible individuals within the organisation receive and adopt innovative ideas. Furthermore, she suggests identifying aspects of the organisation that constrain the adoption of innovation, and finally,

determine the interests and values relevant to the innovation.⁴ The level of employees' familiarity with a variety of technologies within a healthcare organisation is often related to or predictive of the organisation's readiness to explore new technological innovations. Empirical evidence indicates that healthcare organisational readiness for new IT is crucial to successful innovation.⁵

Scientific literature is lacking studies exploring IT adoption in rural settings; however, several studies suggest that adoption rates are much lower in rural facilities compared with their urban counterparts.^{6,7} A study conducted by a consortium of US rural health research centres focusing on performance monitoring for the Medicare Rural Hospital Flexibility Program⁸ found that CAHs have relatively high use rates of IT for many administrative and financial applications, such as billing and accounting, but much lower use rates for a number of clinical applications. This report focused primarily on the current situation of IT use and not on needs and expectations, or future planning for IT integration.

Aim

The aim of this study is to identify the current use of ICT in Critical Access Hospitals, but also assess their readiness and receptiveness for the use of new software and hardware applications, and their perceived current and future needs that pertain specifically to the CAH setting. The research questions guiding this project include:

- 1 What technology is currently being used in CAHs?
- 2 What are the needs and priorities of CAHs as they pertain to IT?
- 3 How is technology viewed in this setting, and how challenging will be the acceptance of new technologies by employees in the immediate and long-term future?
- 4 What role does IT play in the current budget and future plan of CAHs?

Methods

For the purposes of this study we conducted a survey study that focused on the state of Missouri. In Missouri, in the autumn of 2005 when the mailing was initiated for this study, there were 33 CAHs (as of July 2006 the number increased to 35 CAHs). These facilities vary in size, ownership, service area, and

amount of time in business. Administrators from each CAH were contacted and asked to participate by filling out a survey. The CAH administrators integrate the function of all units and departments, oversee the procedures, resources and performance of the facility, and provide leadership and decision making for all aspects of the organisation. The project was approved by the University of Missouri Health Sciences Institutional Review Board.

The survey instrument was designed by the research team following the philosophy of organisational readiness scales, specifically, the Organisational Information Technology/Systems Innovation Readiness Scale,⁵ the Organisational and Functioning Readiness for Change Scale⁹ and a scale assessing readiness to adopt telemedicine.¹⁰ These scales focus on motivation of programme leaders and staff, institutional resources and organisational climate, as an important first step in understanding organisational factors related to implementing new technologies into a service. Since our focus was not to assess readiness to adopt a specific system, but rather gain an understanding of the current infrastructure, IT needs and possible barriers to adoption, we selectively chose items from the two instruments and modified them, adding additional ones. The final survey that was developed by the research team was reviewed for face validity by researchers experienced in IT implementation, rural health and

survey development, and modified to improve readability. The final version included 27 items, both open-ended and closed questions, and has a Flesch Reading Ease 41.4 and Flesch Kincaid Grade Level of 10. Items referred to ways in which employees obtain and share information, the existing hardware and software infrastructure, level of comfort in introducing new technologies among employees and administrators, priorities for IT implementation, and current and future IT needs.

The survey was mailed to administrators of all CAHs in the state of Missouri with an enclosed stamped return envelope. A reminder note was mailed out four weeks after the first mailing. One member of the team conducted the data entry, and double data entry was performed by a second member for a subset of surveys to confirm data validity. Survey data were imported into SPSS software for statistical analysis.

Results

A total of 27 surveys were returned (response rate 82%). There was diversity in the size of the participating sites; the smallest employed 30 employees and the largest 359. Tables 1 and 2 show the frequency of responses for the closed question items.

Table 1 Frequency responses (first half of the survey)

Number of employees in the organisation

Min = 30 Max = 359 Mean = 186.52 SD = 91.932

To what extent do employees participate in professional association groups?

Never	0	Often	7 (25.9%)
Occasionally	11 (40.7%)	Regularly	9 (33.3%)

To what extent do employees seek new information about their work (e.g. read journals or newsletters)?

Never	0	Often	9 (33.3%)
Occasionally	7 (25.9%)	Regularly	11 (40.7%)

What sources does your site use when you seek new information? Check all that apply.

Journals	24 (88.9%)
Newsletters	20 (74.1%)
Internet	26 (96.3%)
Conferences	26 (96.3%)
Professional associations	21 (77.8%)
Other	2 (7.4%)

To what extent do you share new information with colleagues?

Never	0	Often	12 (44.4%)
Occasionally	7 (25.9%)	Regularly	8 (29.6%)

Does your institution have an IT plan?

Yes	13 (48.1%)	No	13 (48.1%)	Don't Know	1 (3.7%)
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Table 1 Continued

What is the percent of total institutional budget designated for IT operations and support?

0–5%	15 (55.6%)
5–10%	9 (33.3%)
10–15%	1 (3.7%)
>15%	0
Missing responses	2 (7.4%)

How many desktop computers does your institution have?

None:	0	4–6:	0
1–3:	0	7 or more:	27 (100%)

How many laptop computers does your institution have?

None:	2 (7.4%)	4–6:	7 (25.9%)
1–3:	11 (40.7%)	7 or more:	7 (25.9%)

Does your institution have internet access?

Yes	27 (100%)	No	0
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What type of internet connection do you have?

Dial-up	0
DSL	8 (29.6%)
T-1	13 (48.1%)
Other	1 (3.7%)
I don't know	0
DSL & T-1	3 (11.1%)
DSL & other	1 (3.7%)
Missing response	1 (3.7%)

Do you use e-mail at your organisation?

Never	0
Occasionally	1 (3.7%)
Often	1 (3.7%)
Regularly	25 (92.6%)

Please check all of the devices listed below that you use at your institution.

Photocopier	27 (100%)
Fax machine	27 (100%)
Pager	22 (81.5%)
Cellphone	25 (92.6%)
Handheld computer/PDA	11 (40.7%)
Videophone	3 (11.1%)
Web camera	3 (11.1%)
Laptop computer	24 (88.9%)
Desktop computer	27 (100%)

The highest priorities for CAHs are electronic medical records (EMRs; 63% of respondents ranked it in the top three most important applications for their organisation) and computerised physician order entry systems (CPOE; 63% of the respondents also ranked CPOE as one of the top three priorities). Almost 23% of the respondents ranked telemedicine, bar code systems, automated pharmacy dispensing systems and business systems (addressing financial and human

resource management) as one of the top three most important IT implementations.

Only one respondent stated that it was not likely at all that their organisation would invest in IT in the coming year, whereas the majority (51.9%) stated that it was very likely. The great majority of respondents (77.8%) stated that IT is very important for the sustainability of their institution.

Table 2 Frequency responses (second half of the survey)

Overall, how comfortable have you been with the new technology you are using?

Not Applicable	0
Totally uncomfortable	0
Somewhat uncomfortable	2 (7.4%)
Neither comfortable nor uncomfortable	0
Somewhat comfortable	15 (55.6%)
Totally comfortable	10 (37.0%)

Overall, how comfortable have employees in your organisation been using new technology?

Totally uncomfortable	1 (3.7%)
Somewhat uncomfortable	4 (14.8%)
Neither comfortable nor uncomfortable	2 (7.4%)
Somewhat comfortable	18 (66.7%)
Totally comfortable	2 (7.4%)

How comfortable are you with the idea of introducing new technology to your organisation?

Totally uncomfortable	0
Somewhat uncomfortable	3 (11.1%)
Neither comfortable nor uncomfortable	1 (3.7%)
Somewhat comfortable	12 (44.4%)
Totally comfortable	11 (40.7%)

Which of the following areas do you see IT having the potential to improve?

Check all that apply.

Patient care	24 (88.9%)
Data entry	21 (77.8%)
Data storage and retrieval	24 (88.9%)
Communication with other sites	17 (63.0%)
Patient safety	24 (88.9%)
Automation of processes	25 (92.6%)
Human resources	20 (74.1%)
Inventory	24 (88.9%)
Performance improvement	22 (81.5%)

How would you rate the experience of employees at your organisation, in general, with IT?

No experience at all	1 (3.7%)
Limited	8 (29.6%)
Moderate	9 (33.3%)
Sufficient	9 (33.3%)
Proficient	0

Do you have technical support at your organisation?

Yes	27 (100%)	No	0
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Where does the technical support come from?

Internal	14 (51.9%)	External	6 (22.2%)	Both	7 (25.9%)
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Which of the following applications would be beneficial to your organisation? Check all that apply.

Electronic medical record system	25 (92.6%)
Telemedicine system	15 (55.6%)
Computerised order-entry system	23 (85.2%)
Online access to medical libraries	20 (74.1%)
Expert system	15 (55.6%)
Access drug reference	22 (81.5%)
Online protocols and manuals	20 (74.1%)
Bar coding system	24 (88.9%)
Pharmacy dispensing systems	21 (77.8%)
Business system	16 (59.3%)
Utilisation review	20 (74.1%)
Other	2 (7.4%)

Table 2 Continued

List the three most useful applications from the previous list.

Rankings of applications by any ranking in top 3

Electronic medical record system	17 (63%)
Computerised order-entry system	17 (63%)
Telemedicine system	6 (22.2%)
Bar coding system	6 (22.2%)
Pharmacy dispensing system	6 (22.2%)
Business system	6 (22.2%)

How likely are you to invest in IT in the coming year?

Not likely at all	1 (3.7%)
Unlikely but possible	3 (11.1%)
Very likely	14 (51.9%)
Certainly	8 (29.6%)
Missing	1 (3.7%)

How important is IT for the sustainability of your institution?

Not important at all	0
Not so important	0
Neutral	1 (3.7%)
Important	5 (18.5%)
Very important	21 (77.8%)

While most respondents (66.7%) stated that their employees have been somewhat comfortable in using new technology, almost 15% stated that their employees have been somewhat uncomfortable. Similarly, almost 12% of the respondents stated that they themselves felt somewhat uncomfortable introducing new technology to their organisation.

In order to stay informed, the majority of respondents (21 of 25) indicated they most often read *Modern Healthcare*. When asked about journal sources for keeping up to date with IT, there was no clear consensus on a single source for information, and a number of respondents (7 out of 24) indicated that they did no additional reading for IT news or updates.

In response to their most pressing need for IT, the participant answers largely reflected the prior rankings of IT applications. More than half the respondents (13 of 24) noted that an EMR was their most pressing need for IT investment. Other applications mentioned included CPOE, telemedicine, billing software and wireless networks.

Seven respondents (30%) indicated that financial concerns constrained their investment in IT. Other concerns included staff and clinician acceptance (21%), adequate training (17%), limited technical support or resources (17%), and finding appropriate products (9%).

Despite the diversity in the size of CAH respondents, in a chi-square analysis CAH size (in number of employees) had no significant relationships ($P < 0.05$)

with the current IT resources in use, IT comfort level, forecast IT spending or the perceived benefits of specific IT applications.

Discussion and conclusions

This study provides insight into the current infrastructure and needs of CAHs pertaining to IT use. In general, little is known about the organisational readiness of rural hospitals to adopt patient safety initiatives, or about the limitations of existing software, hardware and human resources infrastructure to support electronic reporting systems in the rural setting.¹¹ Our findings suggest that the challenge is not so much availability of hardware (all facilities have computers) but the need to customise software to address the specific needs of the setting and to train end-users (as is evident by the identified challenges of training and user acceptance). Administrators are in some cases concerned about the level of comfort that their employees have with new technologies. Almost half of all CAHs have no IT plan; some administrators think that it will be unlikely that IT investments will be included in the budget for the upcoming year. In these cases financial concerns constrain their investment in IT, but other factors such as staff and clinician

acceptance, adequate training and limited technical support are also perceived as barriers.

The lack of significant relationships between CAH size (in number of employees) and IT perceptions and use might indicate that CAHs are more alike than unlike. If this is true nationally, then CAH may represent a sizeable market for IT designers to explore. Further research is needed to understand the desiderata of IT features for this type of facility.

This study examines IT use and needs in the CAHs and follows a holistic view of IT (including diverse types of hardware and software applications). Other studies have focused on one specific challenge or concept in the CAH setting (for instance, medication safety¹² or error reporting¹³) and ways in which IT can address or support those. Our focus was the entire potential of informatics tools in the CAH setting, but also the set of challenges associated with the use of IT (training, human resources, infrastructure, attitudes, and so on).

A significant number of hospitals in the United States are making the conversion to a critical access designation (approximately 1279 of 5000 hospitals in the US and 35 of approximately 150 hospitals in the state of Missouri). This indicates that about 20–25% of all US hospitals fulfilled the criteria of a CAH designation and have made the conversion. These trends suggest that it is time for informatics system designers and vendors to focus on the specific needs of rural healthcare settings. The traditional notion of rural hospitals acquiring resources to purchase commercially available systems that have been designed originally for large urban centres is problematic. The challenges are not only the differences in infrastructure, prior experience with systems, and levels of training between urban and rural sites, but also different procedures and data flow structures.

Future work should highlight how these differences need to be reflected in the system design of applications targeting rural settings.

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CONFLICTS OF INTEREST

None.

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