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Health Informatics Integrated System Post- Implementation Evaluation

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Keywords: health informatics; evaluation, postimplementation.

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Health Informatics Integrated System Post-Implementation Evaluation

Sajeesh Kumar PhD [α], Anne L. Pedigo [σ] RN MSN [ρ]

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I. Health Informatics Integrated System Post-Implementation Evaluation

When one speaks of a successful health information technology(HIT) system implementation, there are several dimensions that go into determining that success. While the satisfaction of the workforce is very important, it is only one dependent factor tied to how well the healthcare process has succeeded. How well current practices are redesigned to take advantage of the technologyis a factor. Quality of the data is another influence. Confidence in the documentation and the information it contains us an important aspect. How a system will work through barriers and enable facilitators are other dimensionsof a success implementation. Measurement of improvement to patient care is another facet. So many characteristics go into determining a successful implementation. Finding the right instruments to put into position before, during and after an HIT system implementation is an ongoing task that continually needs to be evaluated. As with the integrated systems, implementation standards need to be studied and enhanced to strive for even better success. A well designed process should allow for success that is on par or surpasses the importance of the former.

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II. Background

A little over a decade ago, the Institute of Medicine put forward that improved patient safety, efficiency of health care delivery competences and quality of care would be realized by make use of an effective integrated HIT(*Crossing the Quality Chasm: A New Health System for the 21st Century*, 2001). More recently, government incentives and mandates have been placed on healthcare institutions advocating for their adoption of HITsystems (DHS, 2010). While there are legislative whys and wherefores that go into the need for an HIT system, the drive to have a system that helps the patient and staff needs to be the driving force in the desire to find mechanisms which encourage a positiveand effectiveapplication.

The purpose of the research topic of interest is to identify elements necessary for a successful HIT system implementation at acute care hospital sites. The research study will help determine what critical elements are necessary to have in place in order for healthcare facilities to have a successful transition from an older medical record system to a new electronic medical record (EMR) system.

The research study will evaluate what operations should be set in place by healthcare facilities before transitioning to an HIT system. Moreover, the research will focus on possible ways to prevent issues that may develop during and from the implementation of the new electronic system. The study will survey employees of healthcare facilities who have already transitioned to an HITsystem and examine how they believe the implementation process could be been improved.Furthermore, barriers to a successful HIT system implementation will be attempted to be identified. As a final point, information found in the study will be used to synthesize material and identification of possible gaps in research.

Information found in the literature review was employed to integrate data and identify gaps in present research such as the need for greater variety of positions giving feedback. While several of the recommendations for successful implementation were

similar, some studies had opposing views of nurses' attitudes after implementation. The type of support by the healthcare facility before and after implementation may have been a factor in these findings. Moreover, in the majority of studies, nurses were the population studied and findings were based on these responses.

Although in all five articles the implementation of a comprehensive HITsystem was being evaluated, rarely was health care personnel who work outside of direct patient care evaluated. No staff within areas such as admissions or billing was interviewed (Table 1).

Table 1

Summary of Literature Reviews

Author, Year Published	Research Objective	Study Design, Method, Time Frame, Sample and Response Rate	Instrument Used in Study	Analytical Technique	Key Findings and Limitations
(Kirkendall, Goldenhar, Simon, Wheeler, & Andrew Spooner, 2013)	Examination of perceptions, expectations and experiences in regards to the transition from a CPOE system to a fully integrated HIT SYSTEM by healthcare employees within an inpatient setting.	Design & method: One pre-implementation and one post-implementation online surveys Time frame: January 5-9, 2010 (5-day pre-implementation survey; Open for 5 days) and January 10-February 10, 2011 (1-year post-implementation; Open for 1 month) Sample: 751 5-day pre-implementation survey; 1,954 1-year post-implementation survey (Nurses, prescribers, staff positions and other inpatient staff personnel) Response rate: 5-day pre-implementation survey (5.2%); 1-year post-implementation survey (13.6%)	7-factor structure Information Systems Expectations and Experiences (I-SEE) survey which assessed 1) Provider-patient communication, 2) Inter-provider communication 3) Inter-organizational communication 4) Work-life changes 5) Improved care 6) Support & resources 7) Patient care processes Administered online via REDCap.	Construct validity and reliability was assessed with current & previous results. Exploratory factor analysis resulted in a 7-factor structure giving better reliability & validity. SAS statistical software was utilized.	Key findings: 1) Nurses had less positive attitudes about the transition than non-nursing respondents. 2) Differences diminished after implementation. 3) Nursing scores increased significantly for job satisfaction, quality & safety of patient care, organizational support for transition and the rights of patient care but did not increase significantly for communication at 1 year post survey. Limitations: 1) Survey was administered only 5 days prior to rollout which could have influenced motivation to complete survey. 2) Response rate was fairly low. 3) Possibility of some staff having prior HIT SYSTEM experience in outpatient setting. 4)
(Spetz, Burgess Jr, & Phibbs, 2012)	Identification of influences and tactics ssociated with successful implementation of hospital-	Design & method: Qualitative retrospective-mixed-methods of semi-structured	A semi-structured interview guide was developed from a review of the literature of technology implementation	A thematic analysis was performed with initial cods drawn from the content of the interview	Key findings: Five broad themes stemmed from interviews that affected the success 1) Organizational stability and implementation team leadership

	based information technology systems by patient-care providers and IT staff within an inpatient setting.	interviews Time frame: June 2006-September 2007 (15-month period) Sample: 118 interviews (Nurses, pharmacists, physicians, IT staff and senior management) Response Rate: Not discussed in article if anyone refused interview.	and the effects of IT systems and suggestions from an Advisory Committee consisting of VA medical, pharmacy, nursing leaders and representatives of the VA headquarters.	guides.	2) Implementation timelines 3) Equipment availability and reliability 4) Staff training 5) Changes in work flow Limitations: 1) A retrospective analysis is limited to the memories which may be inaccurate or biased. 2) Furthermore, some staff are no longer available to interview. 3) In addition, the analysis was conducted by only one investigator which may decrease reliability. 4) Lastly, the VA is unique and experiences may differ from that of a freestanding hospital. 5)
(Laramee, Bosek, Shaner-McRae, & Powers-Phaneuf, 2012)	Comparison of attitudes before implementation and 6 & 18 months after implementation of a comprehensive HIT SYSTEM of nurses within an inpatient setting.	Design & method: One pre-implementation and two post-implementation online surveys Time frame: December 2008 (6-months pre-survey; Open for 4 weeks); December 2009 (6-months post-survey; Open for 4 week); December 2010 (1- months post-survey; Open for 4 week) Sample: 312 6-month pre- survey, 410 6-month post-survey & 262 18-month post-implementation survey (RNs, LPNs, APRNs and Management) Response rate: 6-month pre-survey (18%). 6-	Modified Nurses' Attitude Toward Computerization Questionnaire which reflected the HIT SYSTEM rather than the computer with an open-ended question added for the 6-month post-implementation survey and one multiple choice question & an open-ended question added for the 18-month post-implementation survey. All administered online via REDCap.	Data were analyzed using STATA 10.1 software. Descriptive analysis and χ^2 were used to analyze demographic variables. Two-tailed *t* tests were used to compare differences between 3 time periods. A modified Colaizzi's method was used for qualitative analysis.	Key findings: 1) Attitudes became less positive after implementation. Pre-implementation (74.2%), 6 months post-implementation (65.9%) & 18 months post-implementation (67.7%). 2) Nurse age & years of experience affect attitude negatively. 3) Documentation improved despite workload impact. 4) Implementation process was a challenging and dramatic change. Limitations: 1) Description of experiences of nurses at one medical facility, generalization to other HIT SYSTEM implementations is limited. 2) Internal validity may be compromised due to the low respond rate & potential selection bias associated with those who did complete survey.

		month post-survey (24%); 18-post-implem survey (15%)			
(A. S. Laramee, Bosek, Kasprisin, & Powers-Phaneuf, 2012)	Exploration of factors and strategies believed to be effective in creating positive attitudes and overcoming barriers leading to previous successful application of HIT SYSTEM in preparation of upcoming new implementation at a rural academic medical center.	Design & method: Descriptive exploratory qualitative research design using semi-structured focus groups interviews Time frame: December 2008 (6-months pre-implementation survey; Open for 4 weeks); December 2009 (6-months post-implementation survey; Open for 4 weeks); December 2010 (1- months post-implementation survey; Open for 4 week) Sample: 40 self-selected members in 11 focus groups (RNs, MDs, managers, nurse educators, unit secretaries, techs, dieticians)	Focus group interviews were conducted using semi-structured questions. A seven-item questionnaire was developed & distributed to staff to validate themes identified in focus groups.	Audiotapes were analyzed utilizing the intuit, analyze & describe method. Triangulation of interdisciplinary team and two clinical departments increased breadth of data. At least two researchers analyzed data from each group.	Key findings: Four major themes found to be fundamental to successful implementation of HIT SYSTEM 1) Reduce unrealistic expectations & fears related to individual competency with initial work with HIT SYSTEM. 2) Allow staff time for individual pursuit of learning about the HIT SYSTEM& their skills in using the system. 3) Clear processes for using the HIT SYSTEM are needed. 4) Make the HIT SYSTEM support individuals accessible 24/7 and make it customer-focused. Limitations: Limitations were not discussed in article. Assurance was given regarding the reliability and validity of the qualitative data analysis.
(Ward, Vartak, Schwichtenberg, & Wakefield, 2011)	Assessment of impact of workflow and patient care from the employment of an HIT SYSTEM on nurses within a rural referral hospital.	Design & method: Two pre-implementation paper surveys and one post-implementation online survey Time frame: No specific date is given; Day one of training expectations	7-factor structure Information Systems Expectations and Experiences (I-SEE) survey which assessed 5) Provider-patient communication, 6) Inter-provider communication 7) Inter-	Cronbach α was greater than .70. Confirmatory factor analysis was steady with a priori expectations. Descriptive analyses were used to examine characteristics	Key findings: 1) Eight of the 47 survey items decreased significantly from the first survey to the last. 2) 37 survey items decreased significantly from the second survey to the last. 3) Nurses with previous HIT SYSTEM experience expressed more positive responses than nurses with no previous HIT

		survey & last day of training survey 3-month pre-implementation; 6-months post-implementation survey Sample: 1,395 anonymous staff, mostly RNs & LPNs over all 3 survey admins. Response rate: Although it was stated that there was a possible 2,700 employees, the break-down per survey was not stated.	organizational communication 8) Work-life changes 9) Improved care 10) Support & resources 11) Patient care processes Administered online via REDCap.	of job categories, work units & survey responses.	SYSTEM experience. 4) Nurses with more years' experience were less positive of HIT SYSTEM perceptions. Limitations: 1) Study focused mainly on feedback of nurses at a single hospital. 2) Due to use of survey of perceptions, response biases may have been demonstrated.

III. Methodology

The methodology of the research study is partedinto its research design, population, and data collection procedures. Additionally, the suitable data collection instrument is determined based on the research design and population. Applied to the study will be the appropriate data analysis.

A prospective post-implementation survey was used as the research method on the comprehensive HIT system within the facility healthcare system. The intent of the design was to help describe the current views of the healthcare staff in relation to the quality of the system, the implementation and its current operation.

Research was conducted at two acute care hospitals that recently rolled out the EMR system within the last year. The study population was end usersof the integrated system within the Continuum of Care departments ofacute care hospital sites in Temple, Texas. The first facility is a 64-bed pediatric specialty care and teaching hospital. The second is a 636-bed specialty care and teaching hospital. The health information technology employed was the commercial software system, Epic. The execution of the research study used the direction laid out in Health Informatics Research Methods: Principles and Practice (Layman, 2009).

a) Data Collection Procedures

Data collection was performed by anonymous submission online via REDCap(REDCap, 2009). Notification was given through the employer email system with permission from management. A cover letter was included stating participation was voluntary and not part of an institutional initiative (Figure 1). After one week, a reminder email was provided to the same staff. At the end of fourteen days, the link to survey was ended.

Figure 1 : Cover Letter introducing Epic System Post-Implementation and Use Assessment Survey

The following survey is intended to help understand staff perceptions and attitudes regarding the quality of the new electronic medical record system, Epic. In addition, the study will conduct a benefits evaluation to appreciate the quality of the information provided by the system, as well as, the level of satisfaction amongst end-users.

Only respond to this survey if you use the Epic system as part of your usual job responsibilities AND work mainly in a hospital setting.

Participation in survey is completely voluntary. No Protected Health Information is asked. The survey is being conducted for research purposes only and it is not a Baylor Scott & White institutional initiative. All submissions are anonymous and will be maintained on a secure autonomous website.

The survey will take approximately take 15-20 minutes to complete.
Thank you in advance for your participation.

Please follow the link to access online survey.

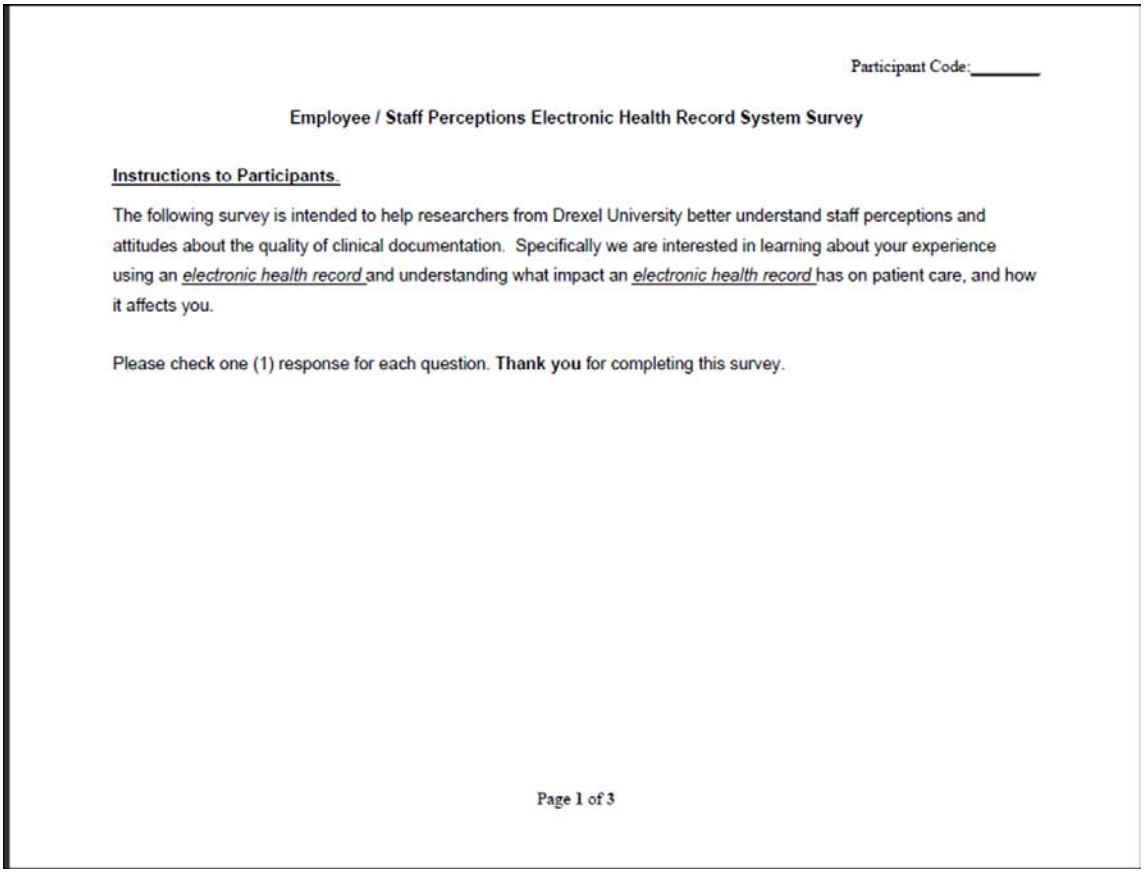
https://pedsredcap.uthsc.edu/redcap/surveys/?s=4q4p5ZVb9S

Any questions regarding the survey, please send your inquiries to apedigo@sw.org.

b) Data Collection Instrument

Several articles found during the literature review presented instruments that were further evaluated in formulation of a suitable questionnaire for the research study.The data collection instruction employed was shaped from the merging two public surveys: the Health Information Technology Reference–Based Evaluation Framework and the Canada Health Infoway System and Use Assessment Survey(Sockolow, Weiner, Bowles, & Lehmann, 2011) (Canada Health Infoway, 2007)(Figures 2 and 3). Both surveys were available for public use. Neither survey required permission to use in forthcoming studies. The combined survey measured structural quality, quality of information logistics, effects on quality of processes, effects on outcomes and quality of care, unintended consequences or benefits and barriers or facilitators to clinician's adoption (Figure 4).

Figure 2 : Health Information Technology Reference–Based Evaluation Framework



Participant Code:_____

Employee / Staff Perceptions Electronic Health Record System Survey

Instructions to Participants.

The following survey is intended to help researchers from Drexel University better understand staff perceptions and attitudes about the quality of clinical documentation. Specifically we are interested in learning about your experience using an *electronic health record* and understanding what impact an *electronic health record* has on patient care, and how it affects you.

Please check one (1) response for each question. **Thank you** for completing this survey.

Page 1 of 3

Participant Code:_____

Your Job Title _____ Date _____

Have you had prior experience outside of your facility with any electronic health records or computerized provider order entry systems? No____ Yes ____ If yes, about how many years of experience _____

Years working in healthcare _____

Would you rate your computer knowledge as below average; average; above average; advanced?_____

Your Age_____ Gender_____

Please indicate the extent to which you agree with the following statements regarding the **electronic health record.**
Please check only one (1) response per item.

	Strongly Disagree	Moderately Disagree	Mildly Disagree	Mildly Agree	Moderately Agree	Strongly Agree
1. The *electronic health record* is consistently available	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
2. The *electronic health record* is subject to frequent system problems	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
3. The *electronic health record* is user-friendly	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
4. Sufficient support is available to use the *electronic health record*	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
5. The *electronic health record* features enable me to perform my work well	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
6. Patient care data being recorded is accurate and valid	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
7. Patients have concerns about the *electronic health record* security or confidentiality	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
8. Patient care services are provided in a timely manner	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
9. Patient care orders in the *electronic health record* are appropriate	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
10. The *electronic health record* contributes to the safety of patients	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
11. The *electronic health record* supports effective communication between most team members about patient care	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
12. The *electronic health record* contributes to patient outcomes	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

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Participant Code:_____

	Strongly Disagree	Moderately Disagree	Mildly Disagree	Mildly Agree	Moderately Agree	Strongly Agree
13. The *electronic health record* contributes to patient's knowledge of their health condition	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
14. The *electronic health record* is worth the time and effort required to use it	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
15. Overall, I am satisfied with the *electronic health record*	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
16. I think patients are satisfied with clinicians using the *electronic health record*	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
17. My department had a role in introducing the *electronic health record* at my facility	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
18. People who use the *electronic health record* should have had more to say about its design	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
19. I have first hand knowledge that problems with the *electronic health record* interfere with patient care	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
20. A reason for my facility's adoption of the *electronic health record* was the system's ability to exchange patient information with nursing homes and hospitals	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
21. Sufficient resources are provided for me to learn to use the *electronic health record*	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
22. Part of the increase in costs of healthcare is because of computers	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

23. What worked well or what are your concerns related to the system:

Thank you for completing this survey.

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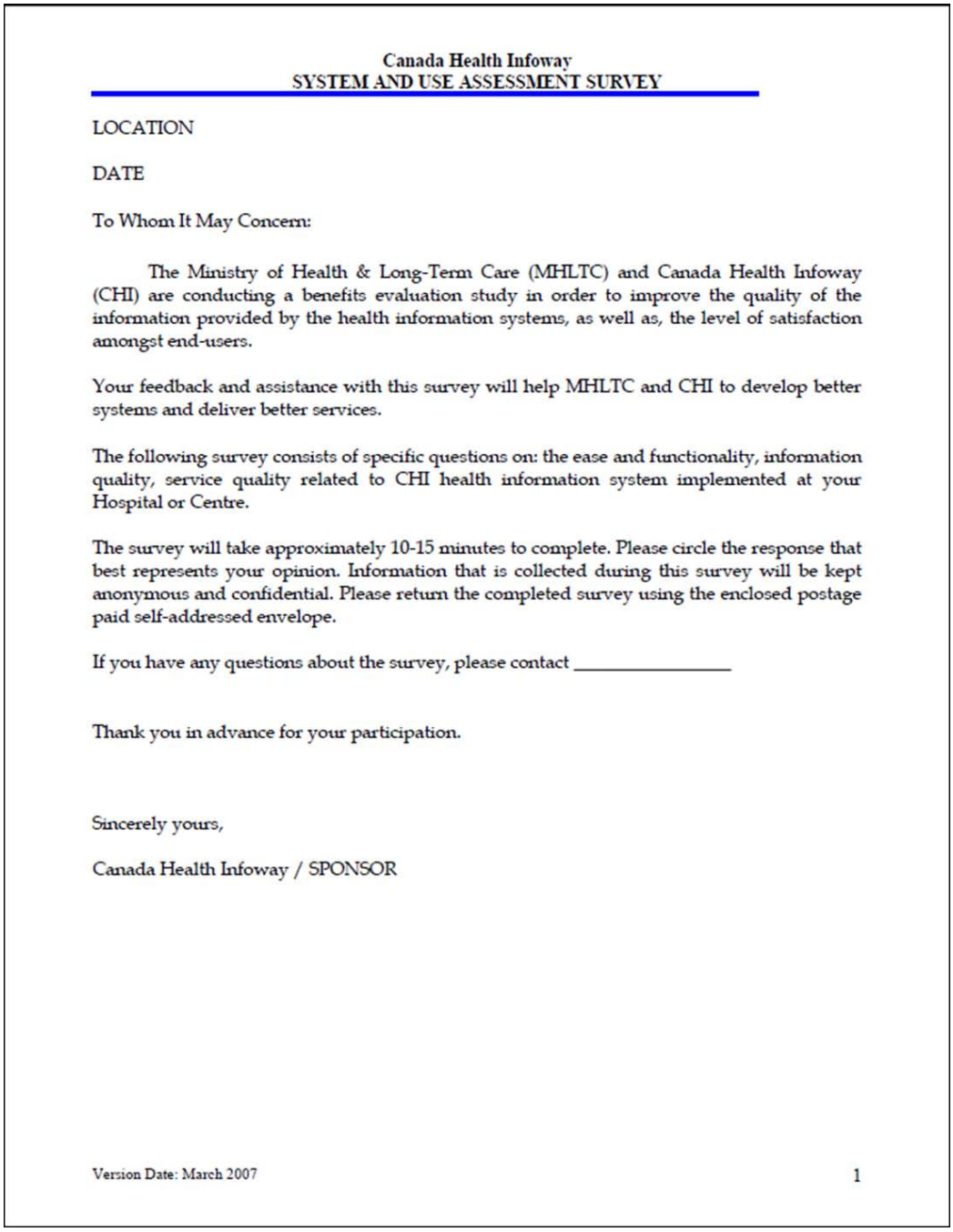
Figure 3 : Canada Health Infoway System and Use Assessment Survey



Canada Health Infoway
SYSTEM AND USE ASSESSMENT SURVEY

LOCATION

DATE

To Whom It May Concern:

The Ministry of Health & Long-Term Care (MHLTC) and Canada Health Infoway (CHI) are conducting a benefits evaluation study in order to improve the quality of the information provided by the health information systems, as well as, the level of satisfaction amongst end-users.

Your feedback and assistance with this survey will help MHLTC and CHI to develop better systems and deliver better services.

The following survey consists of specific questions on: the ease and functionality, information quality, service quality related to CHI health information system implemented at your Hospital or Centre.

The survey will take approximately 10-15 minutes to complete. Please circle the response that best represents your opinion. Information that is collected during this survey will be kept anonymous and confidential. Please return the completed survey using the enclosed postage paid self-addressed envelope.

If you have any questions about the survey, please contact _____

Thank you in advance for your participation.

Sincerely yours,

Canada Health Infoway / SPONSOR

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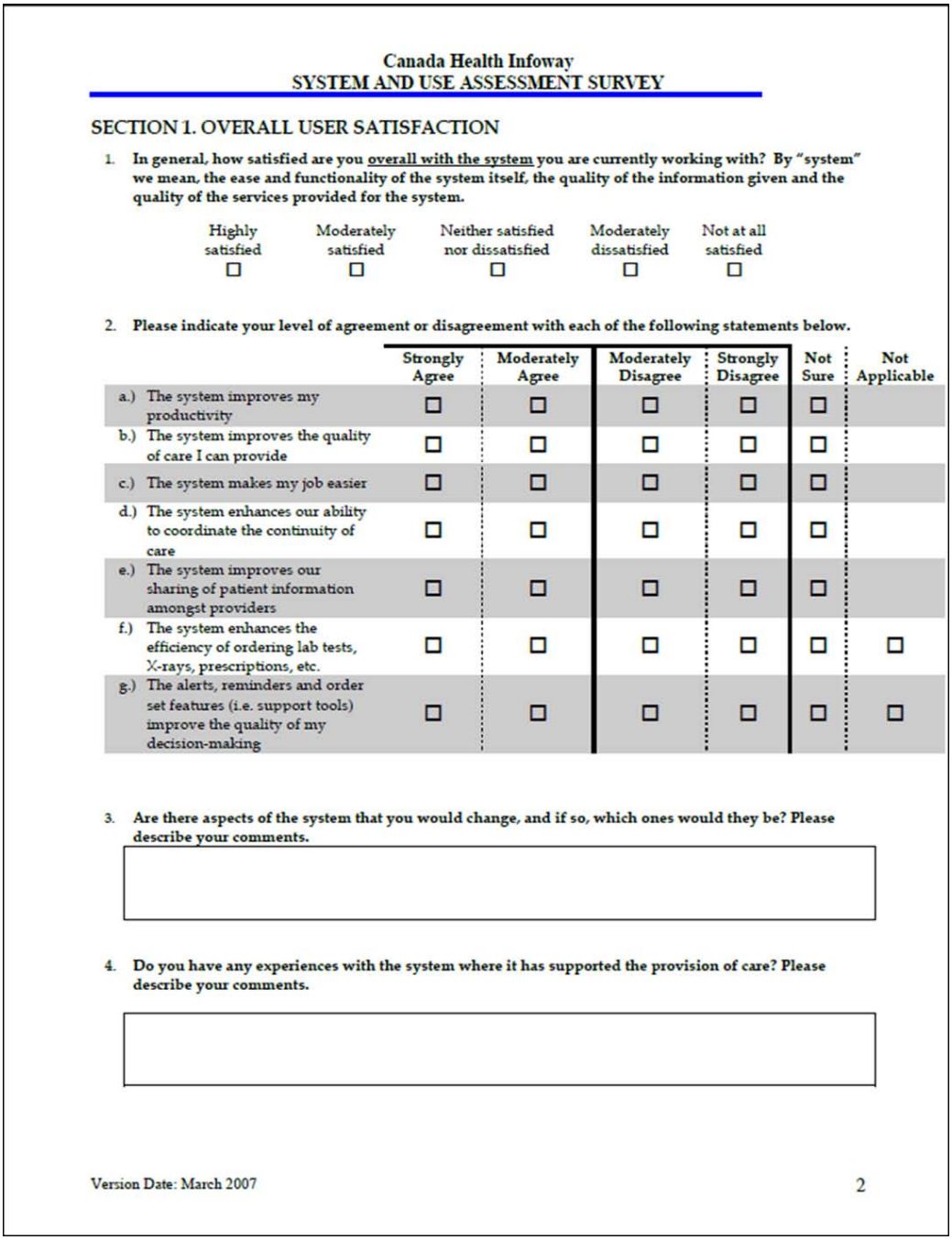

Canada Health Infoway
SYSTEM AND USE ASSESSMENT SURVEY

SECTION 1. OVERALL USER SATISFACTION

1. **In general, how satisfied are you overall with the system you are currently working with? By "system" we mean, the ease and functionality of the system itself, the quality of the information given and the quality of the services provided for the system.**

Highly satisfied	Moderately satisfied	Neither satisfied nor dissatisfied	Moderately dissatisfied	Not at all satisfied
☐	☐	☐	☐	☐

2. **Please indicate your level of agreement or disagreement with each of the following statements below.**

	Strongly Agree	Moderately Agree	Moderately Disagree	Strongly Disagree	Not Sure	Not Applicable
a.) The system improves my productivity	☐	☐	☐	☐	☐	
b.) The system improves the quality of care I can provide	☐	☐	☐	☐	☐	
c.) The system makes my job easier	☐	☐	☐	☐	☐	
d.) The system enhances our ability to coordinate the continuity of care	☐	☐	☐	☐	☐	
e.) The system improves our sharing of patient information amongst providers	☐	☐	☐	☐	☐	
f.) The system enhances the efficiency of ordering lab tests, X-rays, prescriptions, etc.	☐	☐	☐	☐	☐	☐
g.) The alerts, reminders and order set features (i.e. support tools) improve the quality of my decision-making	☐	☐	☐	☐	☐	☐

3. **Are there aspects of the system that you would change, and if so, which ones would they be? Please describe your comments.**

4. **Do you have any experiences with the system where it has supported the provision of care? Please describe your comments.**

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Canada Health Infoway
SYSTEM AND USE ASSESSMENT SURVEY

SECTION 2. SYSTEM QUALITY

5. **Based on your experiences to date with the system, how acceptable is the quality of the system itself (as described by the specific characteristics listed below)? Would you say it is;**

Highly acceptable	Moderately acceptable	Neither acceptable nor unacceptable	Moderately unacceptable	Not at all acceptable
☐	☐	☐	☐	☐

6. **Please indicate your level of agreement or disagreement with each of the following statements below.**

	Strongly Agree	Moderately Agree	Moderately Disagree	Strongly Disagree	Not Sure
a.) The system is easy to use	☐	☐	☐	☐	☐
b.) The response time is acceptable	☐	☐	☐	☐	☐
c.) The system is integrated with my workflow	☐	☐	☐	☐	☐
d.) The system security is acceptable	☐	☐	☐	☐	☐
e.) The system features enable me to perform my work well	☐	☐	☐	☐	☐
f.) The system is reliable in its performance	☐	☐	☐	☐	☐
g.) Overall, the quality of the system is excellent	☐	☐	☐	☐	☐

SECTION 3. INFORMATION QUALITY

7. **In general, when thinking about the quality of the information provided by the system, do you find the quality of the information to be;**

Highly acceptable	Moderately acceptable	Neither acceptable nor unacceptable	Moderately unacceptable	Not at all acceptable
☐	☐	☐	☐	☐

8. **Please indicate your level of agreement or disagreement with each of the following statements below.**

	Strongly Agree	Moderately Agree	Moderately Disagree	Strongly Disagree	Not Sure
a.) The information is complete	☐	☐	☐	☐	☐
b.) The information is quickly provided	☐	☐	☐	☐	☐
c.) The information provided is accurate	☐	☐	☐	☐	☐
d.) The information provided is relevant	☐	☐	☐	☐	☐
e.) The information is available when I need it	☐	☐	☐	☐	☐
f.) The format and layout of the information is acceptable	☐	☐	☐	☐	☐

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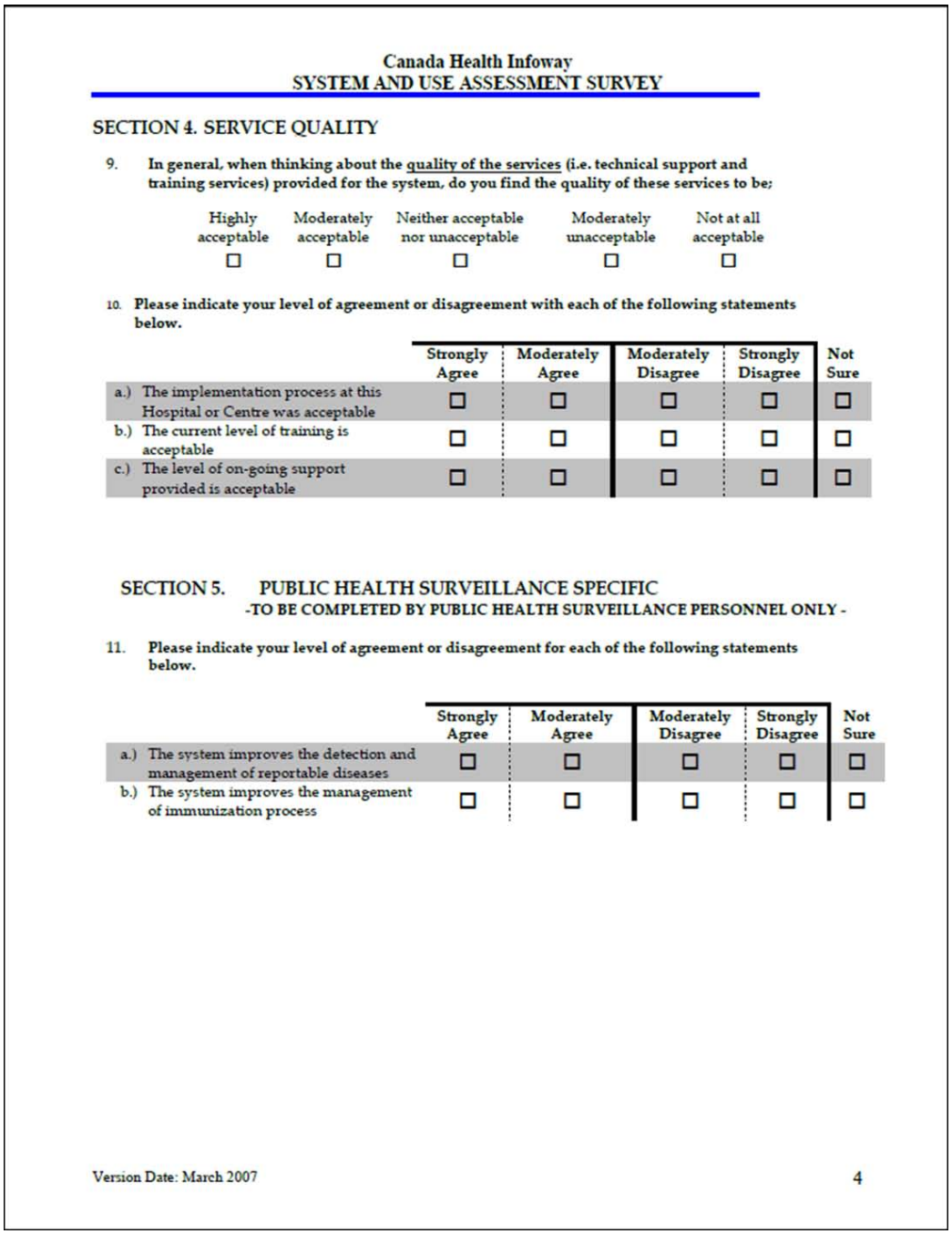

Canada Health Infoway
SYSTEM AND USE ASSESSMENT SURVEY

SECTION 4. SERVICE QUALITY

9. **In general, when thinking about the quality of the services (i.e. technical support and training services) provided for the system, do you find the quality of these services to be;**

Highly acceptable	Moderately acceptable	Neither acceptable nor unacceptable	Moderately unacceptable	Not at all acceptable
☐	☐	☐	☐	☐

10. **Please indicate your level of agreement or disagreement with each of the following statements below.**

	Strongly Agree	Moderately Agree	Moderately Disagree	Strongly Disagree	Not Sure
a.) The implementation process at this Hospital or Centre was acceptable	☐	☐	☐	☐	☐
b.) The current level of training is acceptable	☐	☐	☐	☐	☐
c.) The level of on-going support provided is acceptable	☐	☐	☐	☐	☐

SECTION 5. PUBLIC HEALTH SURVEILLANCE SPECIFIC
-TO BE COMPLETED BY PUBLIC HEALTH SURVEILLANCE PERSONNEL ONLY -

11. **Please indicate your level of agreement or disagreement for each of the following statements below.**

	Strongly Agree	Moderately Agree	Moderately Disagree	Strongly Disagree	Not Sure
a.) The system improves the detection and management of reportable diseases	☐	☐	☐	☐	☐
b.) The system improves the management of immunization process	☐	☐	☐	☐	☐

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Canada Health Infoway
SYSTEM AND USE ASSESSMENT SURVEY

SECTION 6. SYSTEM USAGE

12. **In a typical day, how many times do you 'use' the system?**

_____ Number of times, a day

Always .....☐ Rarely .....☐

13. **In a typical week, please indicate the number of days in which you use the system.**

_____ Number of days, a week

14. **Please estimate what percent of your patients do you use the system?**

_____% patients **(FILL IN)**

Don't know .....☐

15. **How likely are you to recommend the system to other healthcare providers at other Hospitals or Centres?**

Definitely	Probably	May or may not	Probably Not	Definitely not
☐	☐	☐	☐	☐

16. **Given a choice, would you like to increase or decrease your future use of the system that you are currently working with? Would that be a significant or moderate increase / decrease, or would you like your future use to stay the same?**

Significant Increase	Moderately Increase	Moderately Decrease	Significant Decrease	REMAIN THE SAME
☐	☐	☐	☐	☐

SECTION 7. OTHER COMMENTS

17. **Do you have any other comments you would like to make regarding the system ?**

_____

_____

_____

_____

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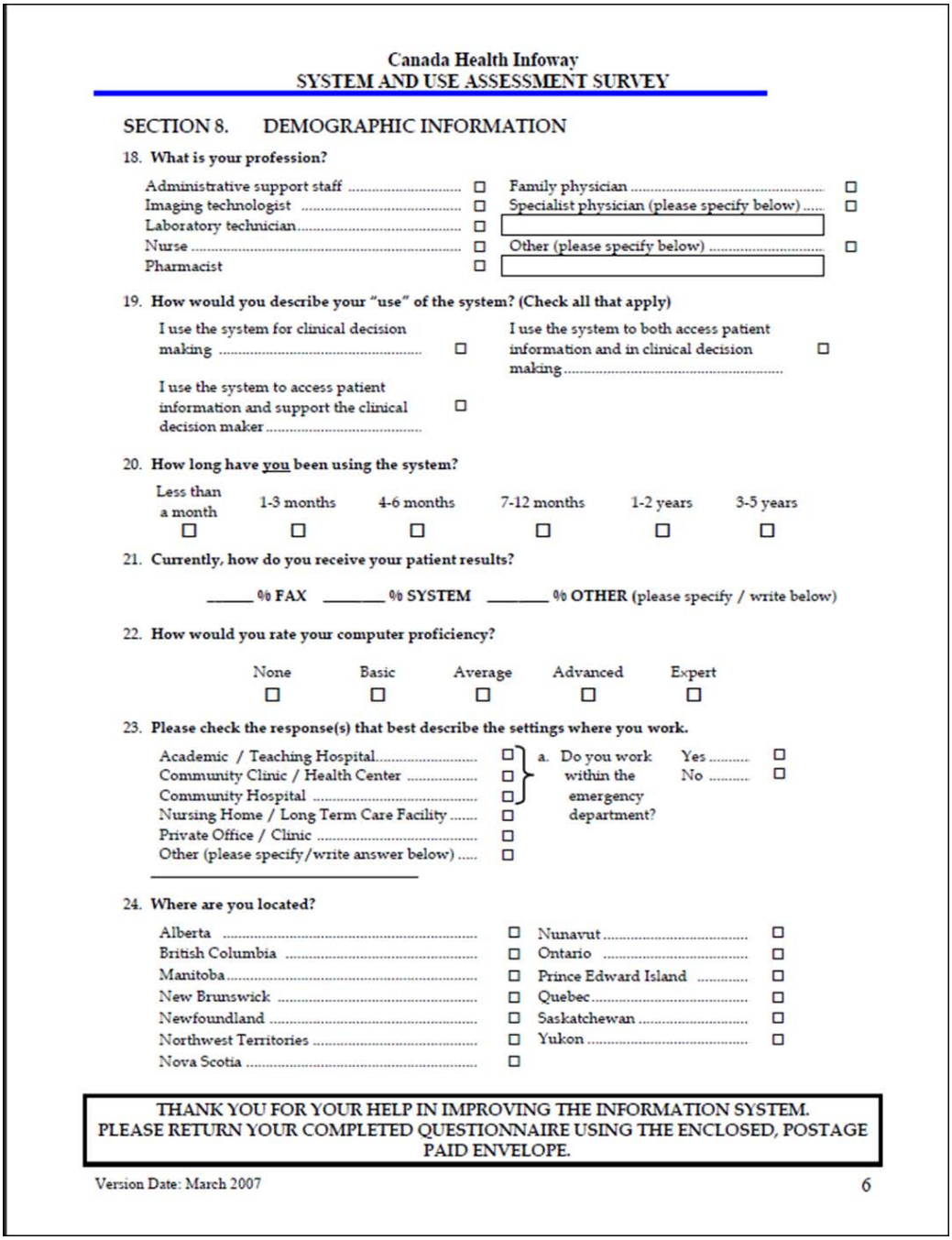


Canada Health Infoway
SYSTEM AND USE ASSESSMENT SURVEY

SECTION 8. DEMOGRAPHIC INFORMATION

18. What is your profession?

- Administrative support staff ☐
- Imaging technologist ☐
- Laboratory technician ☐
- Nurse ☐
- Pharmacist ☐
- Family physician ☐
- Specialist physician (please specify below) ☐
- Other (please specify below) ☐

19. How would you describe your "use" of the system? (Check all that apply)

- I use the system for clinical decision making ☐
- I use the system to access patient information and support the clinical decision maker ☐
- I use the system to both access patient information and in clinical decision making ☐

20. How long have you been using the system?

Less than a month	1-3 months	4-6 months	7-12 months	1-2 years	3-5 years
☐	☐	☐	☐	☐	☐

21. Currently, how do you receive your patient results?

_____ % FAX _____ % SYSTEM _____ % OTHER (please specify / write below)

22. How would you rate your computer proficiency?

None	Basic	Average	Advanced	Expert
☐	☐	☐	☐	☐

23. Please check the response(s) that best describe the settings where you work.

- Academic / Teaching Hospital ☐
- Community Clinic / Health Center ☐
- Community Hospital ☐
- Nursing Home / Long Term Care Facility ☐
- Private Office / Clinic ☐
- Other (please specify/write answer below) ☐

a. Do you work within the emergency department? Yes ☐ No ☐

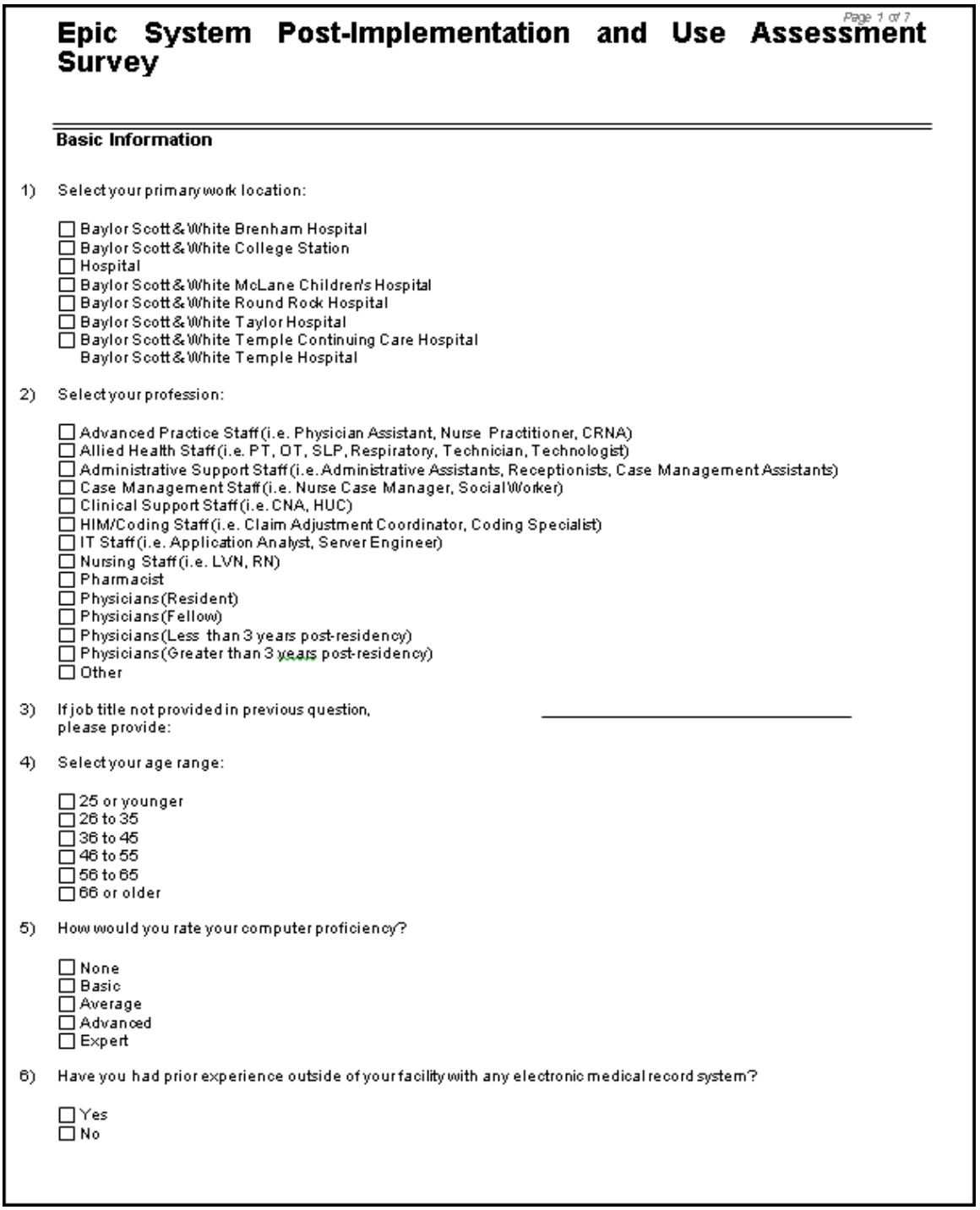
24. Where are you located?

- Alberta ☐
- British Columbia ☐
- Manitoba ☐
- New Brunswick ☐
- Newfoundland ☐
- Northwest Territories ☐
- Nova Scotia ☐
- Nunavut ☐
- Ontario ☐
- Prince Edward Island ☐
- Quebec ☐
- Saskatchewan ☐
- Yukon ☐

THANK YOU FOR YOUR HELP IN IMPROVING THE INFORMATION SYSTEM. PLEASE RETURN YOUR COMPLETED QUESTIONNAIRE USING THE ENCLOSED, POSTAGE PAID ENVELOPE.

Version Date: March 2007 6

Figure 4



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Epic System Post-Implementation and Use Assessment Survey

Basic Information

1) Select your primary work location:

- ☐ Baylor Scott & White Brenham Hospital
- ☐ Baylor Scott & White College Station
- ☐ Hospital
- ☐ Baylor Scott & White McLane Children's Hospital
- ☐ Baylor Scott & White Round Rock Hospital
- ☐ Baylor Scott & White Taylor Hospital
- ☐ Baylor Scott & White Temple Continuing Care Hospital
- Baylor Scott & White Temple Hospital

2) Select your profession:

- ☐ Advanced Practice Staff (i.e. Physician Assistant, Nurse Practitioner, CRNA)
- ☐ Allied Health Staff (i.e. PT, OT, SLP, Respiratory, Technician, Technologist)
- ☐ Administrative Support Staff (i.e. Administrative Assistants, Receptionists, Case Management Assistants)
- ☐ Case Management Staff (i.e. Nurse Case Manager, Social Worker)
- ☐ Clinical Support Staff (i.e. CNA, HUC)
- ☐ HIM/Coding Staff (i.e. Claim Adjustment Coordinator, Coding Specialist)
- ☐ IT Staff (i.e. Application Analyst, Server Engineer)
- ☐ Nursing Staff (i.e. LVN, RN)
- ☐ Pharmacist
- ☐ Physicians (Resident)
- ☐ Physicians (Fellow)
- ☐ Physicians (Less than 3 years post-residency)
- ☐ Physicians (Greater than 3 years post-residency)
- ☐ Other

3) If job title not provided in previous question, please provide: _____

4) Select your age range:

- ☐ 25 or younger
- ☐ 26 to 35
- ☐ 36 to 45
- ☐ 46 to 55
- ☐ 56 to 65
- ☐ 66 or older

5) How would you rate your computer proficiency?

- ☐ None
- ☐ Basic
- ☐ Average
- ☐ Advanced
- ☐ Expert

6) Have you had prior experience outside of your facility with any electronic medical record system?

- ☐ Yes
- ☐ No

7) If answer to previous question is "Yes", how many years experience do you have working with an electronic medical record system?

- ☐ Less than 2 years
- ☐ 2-5 years
- ☐ More than 5 years

8) How long have you been using the current Baylor Scott & White Epic system?

- ☐ Less than a month
- ☐ 1-3 months
- ☐ 4-6 months
- ☐ 7-11 months
- ☐ 1-2 years

EPIC SYSTEM QUALITY - Please read each statement and indicate the response that is closest to your belief.

	Strongly Agree	Moderately Agree	Mildly Agree	Mildly Disagree	Moderately Disagree	Strongly Disagree	Not Sure
9) The system is easy to use.	☐	☐	☐	☐	☐	☐	☐
10) The system is reliable in its performance.	☐	☐	☐	☐	☐	☐	☐
11) The system is consistently available.	☐	☐	☐	☐	☐	☐	☐
12) The system's response time is acceptable.	☐	☐	☐	☐	☐	☐	☐
13) The system supports effective communication between team members.	☐	☐	☐	☐	☐	☐	☐
14) The system's ability to exchange patient information with other systems is acceptable.	☐	☐	☐	☐	☐	☐	☐
15) The system has been integrated appropriately with my previous workflows.	☐	☐	☐	☐	☐	☐	☐
16) The system features enable me to perform my work well.	☐	☐	☐	☐	☐	☐	☐
17) The system security is acceptable.	☐	☐	☐	☐	☐	☐	☐

18) Based on your experiences to date with the Epic system, how acceptable is the quality of the system itself as described by the specific characteristics listed above?

- ☐ Highly Acceptable
- ☐ Moderately Acceptable
- ☐ Neither Acceptable nor Unacceptable
- ☐ Moderately Unacceptable
- ☐ Not at all Acceptable

19) Comments related to Epic's System Quality
(If possible, please provide which question number the comment is related to.)

EPIC INFORMATION QUALITY - Please read each statement and indicate the response that is closest to your belief.

	Strongly Agree	Moderately Agree	Mildly Agree	Mildly Disagree	Moderately Disagree	Strongly Disagree	Not Sure
20) The information provided is relevant.	☐	☐	☐	☐	☐	☐	☐
21) The information provided is accurate.	☐	☐	☐	☐	☐	☐	☐
22) The information is complete.	☐	☐	☐	☐	☐	☐	☐
23) The format and layout of the information is acceptable.	☐	☐	☐	☐	☐	☐	☐
24) The information is available when I need it.	☐	☐	☐	☐	☐	☐	☐

25) When thinking about the quality of the information provided by Epic in general, how do you find the quality of the information to be?

- ☐ Highly Acceptable
- ☐ Moderately Acceptable
- ☐ Neither Acceptable nor Unacceptable
- ☐ Moderately Unacceptable
- ☐ Not at all Acceptable

26) Comments related to Epic's Information Quality
(If possible, please provide which question number the comment is related to.)

EPIC SERVICE QUALITY - Please read each statement and indicate the response that is closest to your belief.

	Strongly Agree	Moderately Agree	Mildly Agree	Mildly Disagree	Moderately Disagree	Strongly Disagree	Not Sure
27) The implementation process at my facility was acceptable.	☐	☐	☐	☐	☐	☐	☐
28) The current level of training at my facility is acceptable.	☐	☐	☐	☐	☐	☐	☐
29) The level of on-going support provided at my facility is acceptable.	☐	☐	☐	☐	☐	☐	☐

30) When thinking about the quality of the services (i.e. technical support and training services) provided for Epic in general, how do you find the quality of these services to be?

- ☐ Highly Acceptable
- ☐ Moderately Acceptable
- ☐ Neither Acceptable nor Unacceptable
- ☐ Moderately Unacceptable
- ☐ Not at all Acceptable

31) Comments related to Epic's Service Quality
(If possible, please provide which question number the comment is related to.)

EPIC CLIINICAL QUALITY - Please read each statement and indicate the response that is closest to your belief.

	Strongly Agree	Moderately Agree	Mildly Agree	Mildly Disagree	Moderately Disagree	Strongly Disagree	Not Sure
32) The system contributes to improved patient outcomes.	☐	☐	☐	☐	☐	☐	☐
33) The system contributes to the safety of the patients.	☐	☐	☐	☐	☐	☐	☐
34) The system contributes to the patient's knowledge of their health condition.	☐	☐	☐	☐	☐	☐	☐
35) The patients are satisfied with the clinicians using the system.	☐	☐	☐	☐	☐	☐	☐
36) The patients have concerns about the system's security and confidentiality.	☐	☐	☐	☐	☐	☐	☐
37) The patient care data being recorded is accurate and valid.	☐	☐	☐	☐	☐	☐	☐
38) The patient care services are able to be provided in a more timely manner.	☐	☐	☐	☐	☐	☐	☐
39) The selection of patient care orders in system is appropriate.	☐	☐	☐	☐	☐	☐	☐
40) The system contributes to improved clinical documentation.	☐	☐	☐	☐	☐	☐	☐

41) Based on your experiences to date with the Epic system, how acceptable is the clinical data of the system itself as described by the specific characteristics listed above?

- ☐ Highly Acceptable
- ☐ Moderately Acceptable
- ☐ Neither Acceptable nor Unacceptable
- ☐ Moderately Unacceptable
- ☐ Not at all Acceptable

42) Comments related to Epic's Clinical Quality
(If possible, please provide which question number the comment is related to.)

GENERAL COMMENTS

43) What specific features of Epic are especially appreciated?

44) What specific aspects of Epic could be improved on by the vendor?

45) Do you have any lessons learned since the Epic system implementation?

46) Do you have additional goals related to Epic that you or your department have not yet completed?

47) Have there been any unexpected benefits gained for your department or the organization since implementing Epic?

c) Data Analysis

Statistical software, SPSS,was utilizedto create various types of statistical analyses, including descriptive statistics such as the standard deviation to responses. Furthermore, descriptive analysis was used to examine characteristics of survey responses (IBM SPSS Statistics, 2013).

IV. Results

The following results describe the response rate and break down the demographics of the respondents.

a) Response Rate of Population

The response rate was determined to be 37.78%. One hundred seven possible respondents were emailed a cover letter and link to the autonomous website. Again, one week later the same cover letter and link were emailed to the same one hundred and seven staff members. The link was terminated one week later. In total, thirty-four valid surveys were completed.

b) Representativeness of Population

The staff ranged in age from younger than twenty-five to greater than sixty-six. The largest number of respondents was present in the fifty-six to sixty-five year age range (32.4%). The majority stated their computer proficiency as average (61.8%) and had prior EMR experience (55.9%). (Figure 5, 6 & 7; Table 3).

Figure 5 : Pie Chart of Age Range

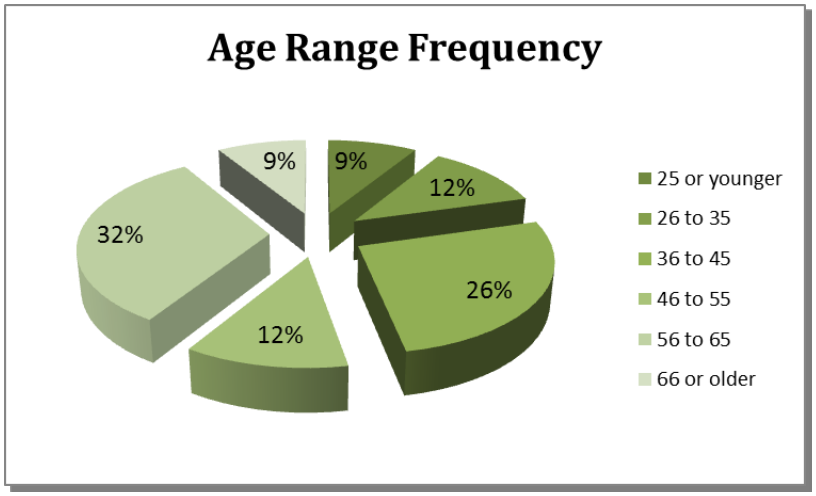
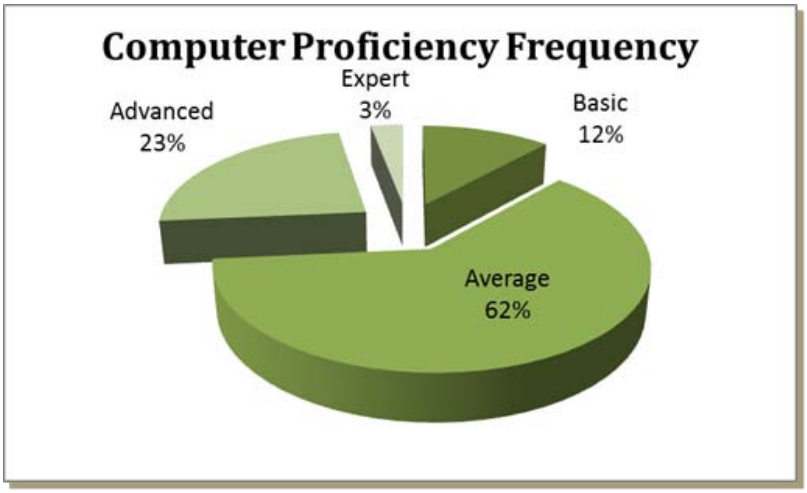


Figure 6 : Computer Proficiency Frequency



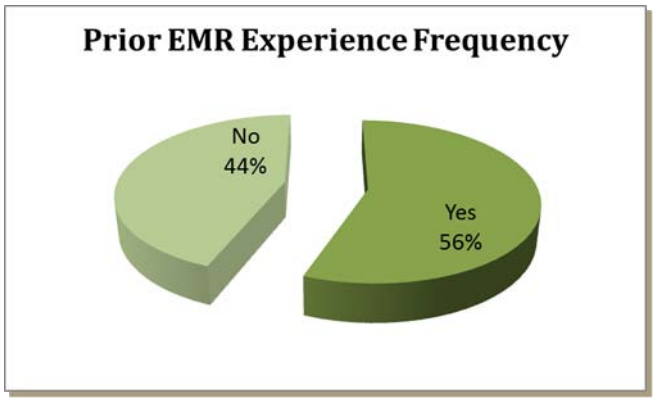


Figure 7 : Prior EMR Experience Frequency

Table 3 : Staff Demographics

Profession

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Administrative Support Staff	2	5.9	5.9	5.9
	Case Management Staff	29	85.3	85.3	91.2
	Other	3	8.8	8.8	100.0
	Total	34	100.0	100.0	

Age Range

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	25 or younger	3	8.8	8.8	8.8
	26 to 35	4	11.8	11.8	20.6
	36 to 45	9	26.5	26.5	47.1
	46 to 55	4	11.8	11.8	58.8
	56 to 65	11	32.4	32.4	91.2
	66 or older	3	8.8	8.8	100.0
	Total	34	100.0	100.0	

Computer Proficiency

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Basic	4	11.8	11.8	11.8
	Average	21	61.8	61.8	73.5
	Advanced	8	23.5	23.5	97.1
	Expert	1	2.9	2.9	100.0
	Total	34	100.0	100.0	

Prior EMR Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	19	55.9	55.9	55.9
	No	15	44.1	44.1	100.0
	Total	34	100.0	100.0	

Years w/ EMR Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 2 years	5	14.7	23.8	23.8
	2-5 years	7	20.6	33.3	57.1
	More than 5 years	9	26.5	42.9	100.0
	Total	21	61.8	100.0	
Missing	System	13	38.2		
	Total	34	100.0		

Current Baylor Scott & White Epic Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than a month	1	2.9	2.9	2.9
	1-3 months	1	2.9	2.9	5.9
	4-6 months	1	2.9	2.9	8.8
	7-11 months	26	76.5	76.5	85.3
	1-2 years	5	14.7	14.7	100.0
	Total	34	100.0	100.0	

c) Research Questions

In developing an understanding of the attitude of the staff, the quality of the system, its information and the service provided regarding the HIT system were measured. Additionally, the particular aspects of the clinical data were analyzed. A five-level Likert scale was utilized to measure the employee'sstance on the quality of the HIT system, the information within the HIT system, the service provided to support the HIT system and particular aspects related to the clinical information of the HIT system.

In regard to the quality of the system, a majority of the staff strongly agree that the system is consistently available (47.1%) and has acceptable security (50%). As for the system appropriatelyintegrating with previous workflows, the employees were mostly divided between mildly agree (26.5%), moderately agree (29.4%) and strongly agree (29.4%). None of workers disagreed in a majority to any of the aspects measured related the quality of the system. The remainder moderately agreed that the system was easy to use (70%), its performance was reliable (44.1%), had acceptable response time (47.1%), provided effective communication between team members (41.2%), had acceptable exchange of information with other systems (38.2%) and enabled staff to perform work well (38.2%). (Figure 8; Table 3)

Figure 8

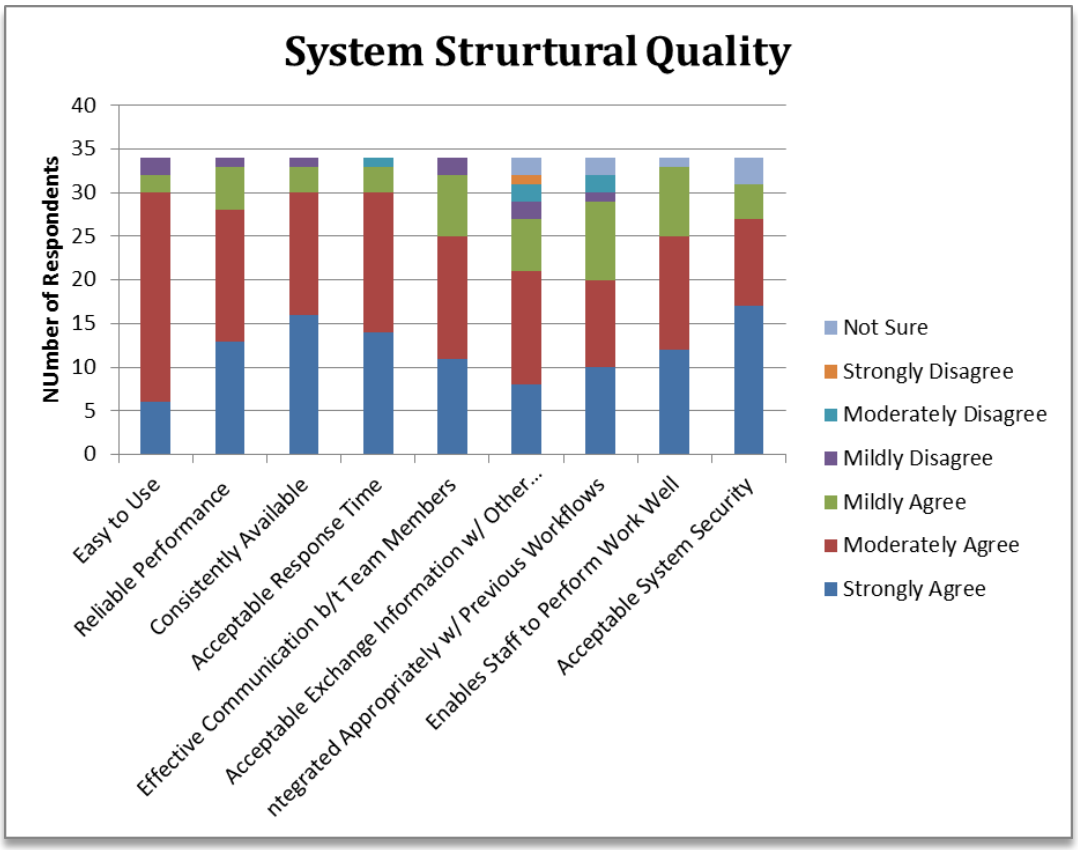


Table 4 : Epic System Quality

System - Easy to Use

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	6	17.6	17.6	17.6
	Moderately Agree	24	70.6	70.6	88.2
	Mildly Agree	2	5.9	5.9	94.1
	Mildly Disagree	2	5.9	5.9	100.0
	Total	34	100.0	100.0	

System - Reliable Performance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	13	38.2	38.2	38.2
	Moderately Agree	15	44.1	44.1	82.4
	Mildly Agree	5	14.7	14.7	97.1
	Mildly Disagree	1	2.9	2.9	100.0
	Total	34	100.0	100.0	

System - Consistently Available

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	16	47.1	47.1	47.1
	Moderately Agree	14	41.2	41.2	88.2
	Mildly Agree	3	8.8	8.8	97.1
	Mildly Disagree	1	2.9	2.9	100.0
	Total	34	100.0	100.0	

System - Acceptable Response Time

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	14	41.2	41.2	41.2
	Moderately Agree	16	47.1	47.1	88.2
	Mildly Agree	3	8.8	8.8	97.1
	Moderately Disagree	1	2.9	2.9	100.0
	Total	34	100.0	100.0	

System - Effective Communication b/t Team Members

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	11	32.4	32.4	32.4
	Moderately Agree	14	41.2	41.2	73.5
	Mildly Agree	7	20.6	20.6	94.1
	Mildly Disagree	2	5.9	5.9	100.0
	Total	34	100.0	100.0	

System - Acceptable Exchange Information w/ Other Systems

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	8	23.5	23.5	23.5
	Moderately Agree	13	38.2	38.2	61.8
	Mildly Agree	6	17.6	17.6	79.4
	Mildly Disagree	2	5.9	5.9	85.3
	Moderately Disagree	2	5.9	5.9	91.2
	Strongly Disagree	1	2.9	2.9	94.1
	Not Sure	2	5.9	5.9	100.0
	Total	34	100.0	100.0	

System - Integrated Appropriately w/ Previous Workflows

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	10	29.4	29.4	29.4
	Moderately Agree	10	29.4	29.4	58.8
	Mildly Agree	9	26.5	26.5	85.3
	Mildly Disagree	1	2.9	2.9	88.2
	Moderately Disagree	2	5.9	5.9	94.1
	Not Sure	2	5.9	5.9	100.0
	Total	34	100.0	100.0	

System - Enables Staff to Perform Work Well

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	12	35.3	35.3	35.3
	Moderately Agree	13	38.2	38.2	73.5
	Mildly Agree	8	23.5	23.5	97.1
	Not Sure	1	2.9	2.9	100.0
	Total	34	100.0	100.0	

System - Acceptable System Security

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	17	50.0	50.0	50.0
	Moderately Agree	10	29.4	29.4	79.4
	Mildly Agree	4	11.8	11.8	91.2
	Not Sure	3	8.8	8.8	100.0
	Total	34	100.0	100.0	

The criteria measured related to the system's information was mostly seen as moderately agreeable. A majority of the staff moderately agree that the information is accurate (52.9%), relevant (47.1%), complete (47.1%) and has an acceptable layout (41.2%). An even number moderately agrees (41.2%) as strongly agree (41.2%) that the information is available when needed. (Figure 9;Table4)

Figure 9

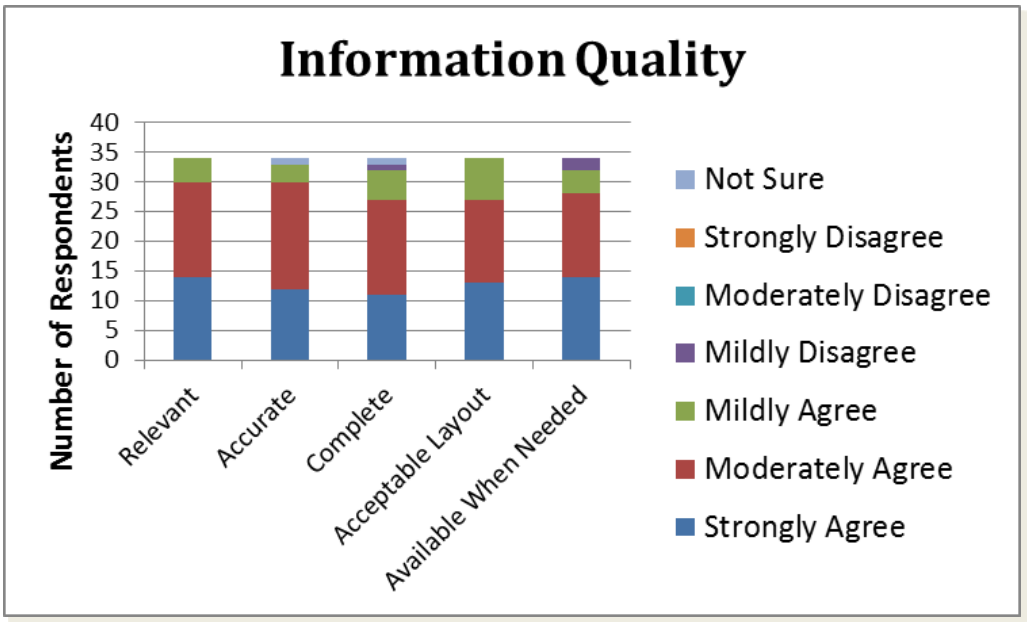


Table 4 : Epic Information Quality

Information - Relevant

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	14	41.2	41.2	41.2
	Moderately Agree	16	47.1	47.1	88.2
	Mildly Agree	4	11.8	11.8	100.0
	Total	34	100.0	100.0	

Information - Accurate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	12	35.3	35.3	35.3
	Moderately Agree	18	52.9	52.9	88.2
	Mildly Agree	3	8.8	8.8	97.1
	Not Sure	1	2.9	2.9	100.0
	Total	34	100.0	100.0	

Information - Complete

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	11	32.4	32.4	32.4
	Moderately Agree	16	47.1	47.1	79.4
	Mildly Agree	5	14.7	14.7	94.1
	Mildly Disagree	1	2.9	2.9	97.1
	Not Sure	1	2.9	2.9	100.0
	Total	34	100.0	100.0	

Information - Acceptable Layout

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	13	38.2	38.2	38.2
	Moderately Agree	14	41.2	41.2	79.4
	Mildly Agree	7	20.6	20.6	100.0
	Total	34	100.0	100.0	

Information - Available When Needed

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	14	41.2	41.2	41.2
	Moderately Agree	14	41.2	41.2	82.4
	Mildly Agree	4	11.8	11.8	94.1
	Mildly Disagree	2	5.9	5.9	100.0
	Total	34	100.0	100.0	

In the three characteristics of service measured, a majority of staff moderately agreed that the implementation process (55.9%), level of training (47.1%) and on-going support (47.1%) is acceptable. (Figure 10; Table 5)

Figure 10

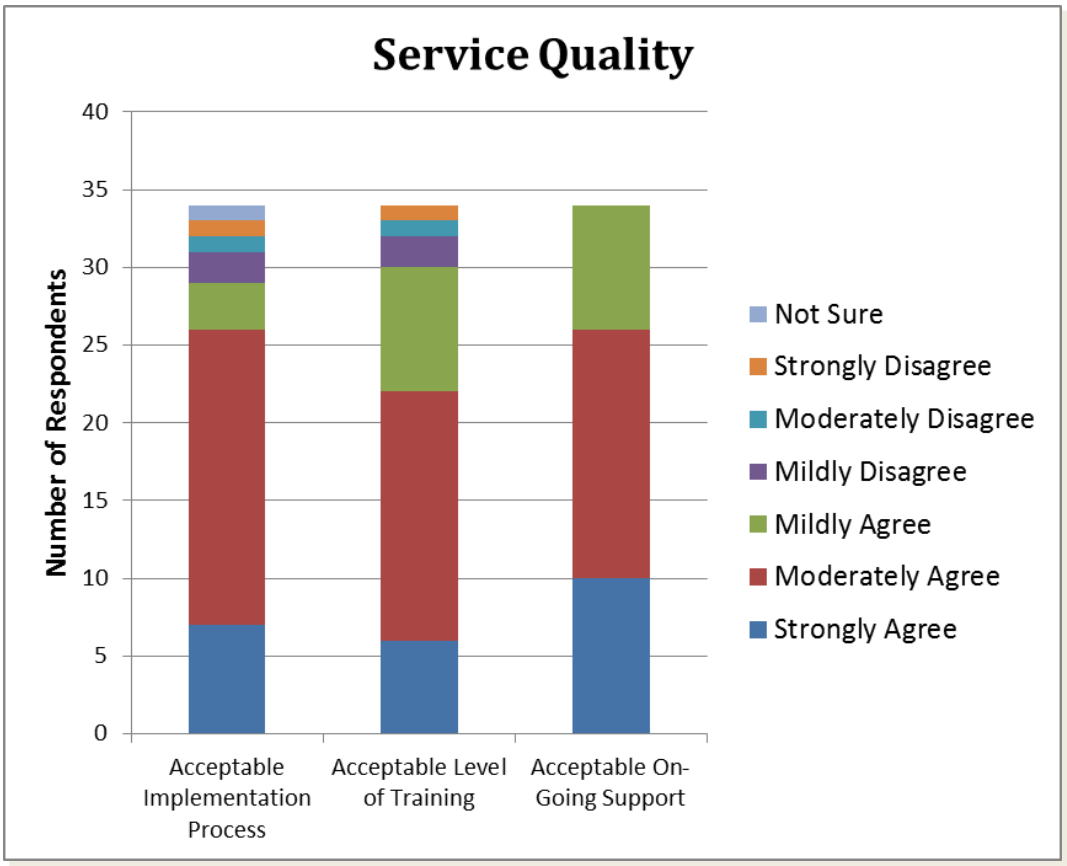


Table 5 : Epic Service Quality

Service - Acceptable Implementation Process

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	7	20.6	20.6	20.6
	Moderately Agree	19	55.9	55.9	76.5
	Mildly Agree	3	8.8	8.8	85.3
	Mildly Disagree	2	5.9	5.9	91.2
	Moderately Disagree	1	2.9	2.9	94.1
	Strongly Disagree	1	2.9	2.9	97.1
	Not Sure	1	2.9	2.9	100.0
	Total	34	100.0	100.0	

Service - Acceptable Level of Training

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	6	17.6	17.6	17.6
	Moderately Agree	16	47.1	47.1	64.7
	Mildly Agree	8	23.5	23.5	88.2
	Mildly Disagree	2	5.9	5.9	94.1
	Moderately Disagree	1	2.9	2.9	97.1
	Strongly Disagree	1	2.9	2.9	100.0
	Total	34	100.0	100.0	

Service - Acceptable On-Going Support

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	10	29.4	29.4	29.4
	Moderately Agree	16	47.1	47.1	76.5
	Mildly Agree	8	23.5	23.5	100.0
	Total	34	100.0	100.0	

Because most of the respondents do not work directly with the patients, the majority answered that they were not sure of the patient's satisfaction with clinicians' use of system (35.3%) or patient's concerns with system security and confidentiality (41.2%). A majority strongly believe that the clinical data has improved patient outcomes (41.2%), improved patient safety (41.2%), improved patient's knowledge of their health (38.2%) and improved clinical documentation (38.2%). A majority moderately believe the clinical data of the patient is accurate and valid (44.1%), the timely manner of the patient care services has increased (35.3%) and that there is an appropriate selection of patient care orders (35.3%). (Figure 11; Table 6)

Figure 11

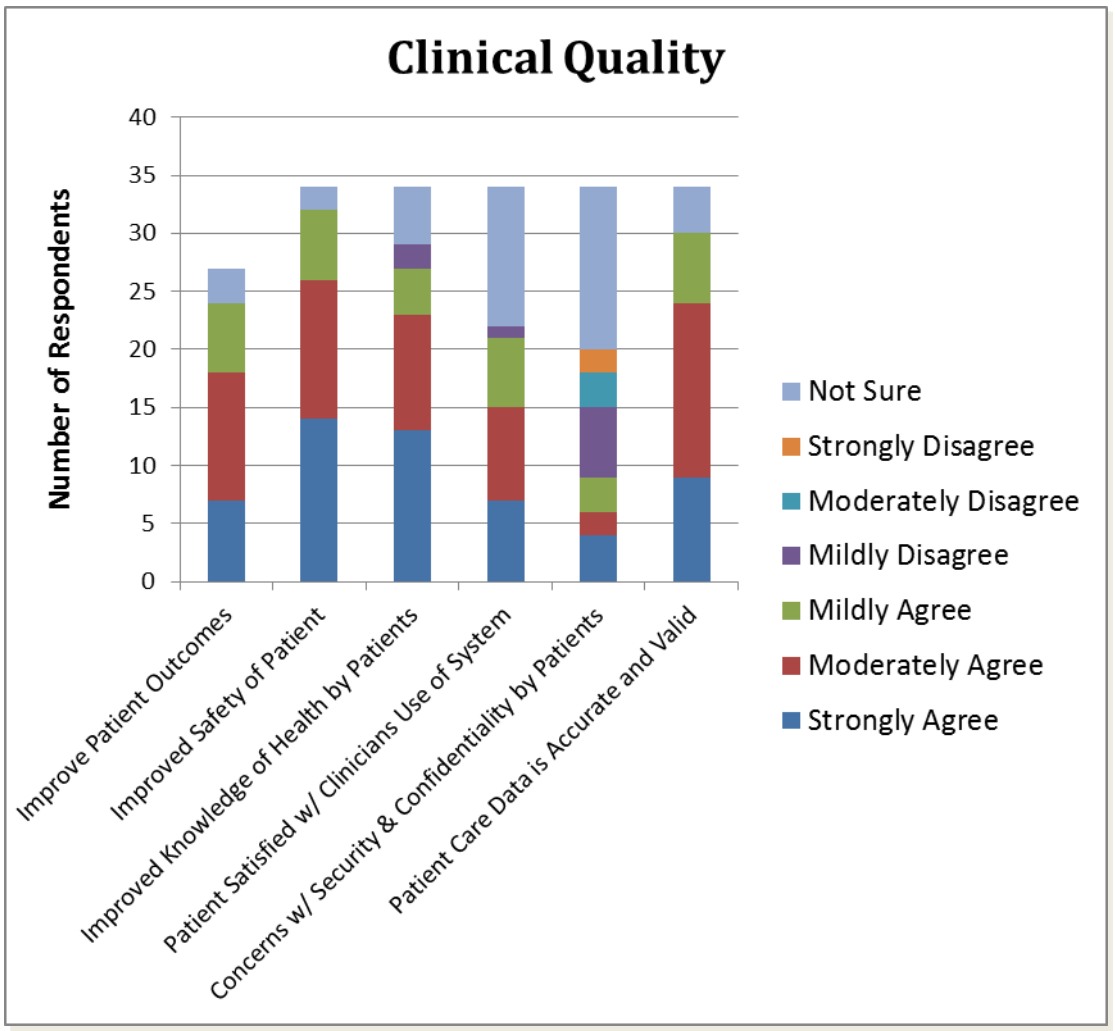


Table 6 : Epic Clinical Quality

Improved Patient Outcomes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	14	41.2	41.2	41.2
	Moderately Agree	11	32.4	32.4	73.5
	Mildly Agree	6	17.6	17.6	91.2
	Not Sure	3	8.8	8.8	100.0
	Total	34	100.0	100.0	

Improved Safety of Patient

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	14	41.2	41.2	41.2
	Moderately Agree	12	35.3	35.3	76.5
	Mildly Agree	6	17.6	17.6	94.1
	Not Sure	2	5.9	5.9	100.0
	Total	34	100.0	100.0	

Improved Knowledge of Health by Patients

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	13	38.2	38.2	38.2
	Moderately Agree	10	29.4	29.4	67.6
	Mildly Agree	4	11.8	11.8	79.4
	Mildly Disagree	2	5.9	5.9	85.3
	Not Sure	5	14.7	14.7	100.0
	Total	34	100.0	100.0	

Patient Satisfied w/ Clinicians Use of System

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	7	20.6	20.6	20.6
	Moderately Agree	8	23.5	23.5	44.1
	Mildly Agree	6	17.6	17.6	61.8
	Mildly Disagree	1	2.9	2.9	64.7
	Not Sure	12	35.3	35.3	100.0
	Total	34	100.0	100.0	

Concerns w/ Security & Confidentiality by Patients

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	4	11.8	11.8	11.8
	Moderately Agree	2	5.9	5.9	17.6
	Mildly Agree	3	8.8	8.8	26.5
	Mildly Disagree	6	17.6	17.6	44.1
	Moderately Disagree	3	8.8	8.8	52.9
	Strongly Disagree	2	5.9	5.9	58.8
	Not Sure	14	41.2	41.2	100.0
	Total	34	100.0	100.0	

Patient Care Data is Accurate and Valid

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	9	26.5	26.5	26.5
	Moderately Agree	15	44.1	44.1	70.6
	Mildly Agree	6	17.6	17.6	88.2
	Not Sure	4	11.8	11.8	100.0
	Total	34	100.0	100.0	

Timely Manner of Patient Care Services Increased

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	9	26.5	26.5	26.5
	Moderately Agree	12	35.3	35.3	61.8
	Mildly Agree	5	14.7	14.7	76.5
	Mildly Disagree	1	2.9	2.9	79.4
	Not Sure	7	20.6	20.6	100.0
	Total	34	100.0	100.0	

Appropriate Selection of Patient Care Orders

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	9	26.5	26.5	26.5
	Moderately Agree	12	35.3	35.3	61.8
	Mildly Agree	7	20.6	20.6	82.4
	Not Sure	6	17.6	17.6	100.0
	Total	34	100.0	100.0	

Improved Clinical Documentation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	13	38.2	38.2	38.2
	Moderately Agree	12	35.3	35.3	73.5
	Mildly Agree	4	11.8	11.8	85.3
	Mildly Disagree	1	2.9	2.9	88.2
	Not Sure	4	11.8	11.8	100.0
	Total	34	100.0	100.0	

The standard deviation of the criteria within the four quality themes were calculated and presented within Table 7. Within Table 8, cross tabulations are provided based on prior EMR experience vs. each of the acceptability of quality of the system, information, service and clinical data. The number of staff with prior EMR experience (N=19) slightly outnumbered the staff with no prior experience (N=15). Having experience with an EMR system or having no experience did not appear to affect the acceptability. In the four measures, the respondents in both groups found the quality of the system, its information, its service and specifically the clinical area all moderately acceptable.

Table 7 : Mean & Standard Deviations of System, Information, Service and Clinical Quality Measurements

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
System - Easy to Use	34	1	4	2.00	.696
System - Reliable Performance	34	1	4	1.82	.797
System - Consistently Available	34	1	4	1.68	.768
System - Acceptable Response Time	34	1	5	1.76	.855
System - Effective Communication b/t Team Members	34	1	4	2.00	.888
System - Acceptable Exchange Information w/ Other Systems	34	1	7	2.65	1.668
System - Integrated Appropriately w/ Previous Workflows	34	1	7	2.50	1.581
System - Enables Staff to Perform Work Well	34	1	7	2.03	1.167
System - Acceptable System Security	34	1	7	2.06	1.705
Information - Relevant	34	1	3	1.71	.676
Information - Accurate	34	1	7	1.88	1.094
Information - Complete	34	1	7	2.03	1.167
Information - Acceptable Layout	34	1	3	1.82	.758
Information - Available When Needed	34	1	4	1.82	.869
Service - Acceptable Implementation Process	34	1	7	2.35	1.390
Service - Acceptable Level of Training	34	1	6	2.38	1.129
Service - Acceptable On-Going Support	34	1	3	1.94	.736

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Clinical - Improved Knowledge of Health by Patients	34	1	7	2.59	2.047
Clinical - Patient Satisfied w/ Clinicians Use of System	34	1	7	3.79	2.508
Clinical - Concerns w/ Security & Confidentiality by Patients	34	1	7	4.88	2.185
Clinical - Patient Care Date is Accurate and Valids	34	1	7	2.50	1.796
Clinical - Timely Manner of Patient Care Services Increased	34	1	7	2.97	2.209
Clinical - Appropriate Selection of Patient Care Orders	34	1	7	2.82	2.081
Clinical - Improved Clinical Documentation	34	1	7	2.38	1.875
Valid N (listwise)	34				

Table 8 : Cross Tabulations

*Acceptability of the Quality of the Epic System * Prior EMR Experience*

Count

		Prior EMR Experience		Total
		Yes	No	
Acceptability of the Quality of the Epic System	Highly Acceptable	7	7	14
	Moderately Acceptable	9	7	16
	Neither Acceptable nor Unacceptable	2	1	3
	Moderately Unacceptable	1	0	1
Total		19	15	34

*Acceptability of the Quality of the Information Provided in Epic * Prior EMR Experience*

Count

		Prior EMR Experience		Total
		Yes	No	
Acceptability of the Quality of the Information Provided in Epic	Highly Acceptable	8	8	16
	Moderately Acceptable	10	6	16
	Neither Acceptable nor Unacceptable	1	1	2
Total		19	15	34

*Acceptability of the Quality of the Services Provided for Epic * Prior EMR Experience*

Count

		Prior EMR Experience		Total
		Yes	No	
Acceptability of the Quality of the Services Provided for Epic	Highly Acceptable	7	4	11
	Moderately Acceptable	7	7	14
	Neither Acceptable nor Unacceptable	3	2	5
	Moderately Unacceptable	2	2	4
Total		19	15	34

*Acceptability of the Clinical Data within Epic * Prior EMR Experience*

Count

		Prior EMR Experience		Total
		Yes	No	
Acceptability of the Clinical Data within Epic	Highly Acceptable	7	5	12
	Moderately Acceptable	8	8	16
	Neither Acceptable nor Unacceptable	4	2	6
Total		19	15	34

From the four core categories, each quality set's comment section was reviewed for common themes applicable to productive transition of HIT systems. Within the system qualityfocus, interoperability between modules within the system and to other systems is a noted concern of staff. As one respondent stated, "communication in the system is available but isn't utilized as well as possible." Another staffer mentions that the system "doesn't consistently interface properly with Midas." (Figure 12)For the information quality, an issue raised was the inability to access information. The view of a Case Manager is different than that of a nurse which brings concern that information is not being interpreted in the same manner (Figure 13).

Figure 12

Comments related to Epic System Quality

- Signed and held orders for patient status are being released by physician and nursing personnel changing the patient status to an incorrect status.
- Doesn't consistently interface properly with Midas. 2. Communication in the system is available but isn't utilized as well as possible. 3. The finance billing system is flawed. It can't register the payroll deduction payment plan that is in effect. The billing also can't automatically roll different cases charges into the main guarantor account so the accounts can register as payment in progress.
- Would like a better way to print out MAR without explanation of how to administer meds. Would like a more compact MAR. Would like a better way to print several days' worth of vital signs. Under CM snapshot- adult vitals last day is perfect except that it only shows the last day instead of several days.
- I sit at a desk in front of the computer all day long in a key code locked office so there's no traffic. No patients that come through or anything. It would be nice if a warning box popped up that was big and clear that Epic was going to shut down in 60 seconds so that I could click on it and keep it open. It is frustrating to be working on a case in Midas and have Epic go down all the time and have to keep logging in when I've been sitting in front of the computer the whole time. The other thing is that it's not very clear what dates you're looking at for labs under the overview tab. You really have to concentrate where you're at for the dates. It puts it in a 24 hour period but having the lab values put in rows under a particular date would be more helpful.
- The EPIC system has streamlined our work time and has been very easy to use.

Figure 13

Comments related to Epic Information Quality

- The medical record is compartmentalized and groups of people have access to limited information. This can be a communication issue between units such as Case Management or UR and the RCO for billing purposes or the communication between Nursing and Case Management in the discharge process.
- This is largely dependent upon the quality of documentation by health care providers-not an EPIC issue per se.
- Some information not reflected at times- delayed.

The largest numbers of concern are in relation to the service quality. One of the concerns is the training was not specific enough for particular job titles. An example given was a class attended by a Case Manager but included staff from the Admissions department. The class was taught using a task list for the Admissions department which was a "different view and way to enter" thesystem's authorization module. The Case Management felt the "class was not tailored enough" for their department. The same concern was noted by a staff member who not employed during the implementation but came after. She felt the training was inappropriate for her job description. Along the lines of training, it was mentioned for "more training services on over all process of Epic flow of documentation of a patient." (Figure 14) The staff seems to be unsure of how the system's modules are interconnected. Lastly, concerns were stated in regard to the timeliness of resolving issues. "IT is slow to respond and resolve issues when they arise" was the comment of one employee. For the final quality measure, the statements

indicated that the staff was unsure because they did not deal with patients directly (Figure 15).

Figure 14

Comments related to Epic Service Quality

- Now that Central TX Region is all on EPIC I anticipate the quality of service will increase and be timelier.
- Need classes addressing case management and utilization process. Need more training services on over all process of Epic flow of documentation of a patient. I did have a tech come over and he was very helpful. Many classes were set up for certain departments. While other departments did not have but very little training or understanding of how to work in Epic. The Tip sheets were very helpful and the one on one tech support was very supportive.
- When first taking EPIC training, it did not relate to what we do here. Many questions and frustrations expressed in classes and for a few months after. Today it seems to run ok
- IT is slow to respond and resolve issues when they arise.
- The training received was too general. Multiple job titles in the same class and we all have a different view of EPIC. For example, the class I attended on authorization/pre-certification included admissions department. They have a different view and way to enter the auth/cert screen than I do but the class was taught using their worklist. UR does not use that worklist; therefore, the class was not tailored enough for us.
- I wasn't here for the implementation of Epic. The training for me was for what a case manager or social worker does. It didn't apply to my job whatsoever. Not even a little bit. Everything I learned for Epic is what my co-workers taught me. And all the computer help I get is mainly from one nurse in my office who helps us -- she's very bright and can navigate very well around the Epic system.

Figure 15

Comments related to Epic Clinical Quality

- I work in an office. I don't work with patients anymore so I am not able to contribute to these questions.
- I don't know how the patient's feel about the EPIC system
- Not all patients have access or knowledge to access EPIC in the home environment. Appointments without f/u telephone calls or written notice are frequently missed.

The survey concluded with more general questions related to the implementation process. The topics mentioned by the staff tended to reflect the appropriate training of staff with statements such as “training should have been more specific to my job” and “educate staff thoroughly to obtain the best results. Benefits stated my respondents were more in relation to the system such as “work flow is improved” and “f aster easier access to information.” (Figure 16)

Figure 16

Survey General Comments

What specific features of Epic are especially appreciated?

- Able to complete documentation more efficiently. Documentation is readily available to be viewed by all disciplines. Finding physician orders, labs, demographic information, medical notes, etc. is much easier to access.
- The fact that you can review clinic notes and in-hospital notes to follow a patient.
- Everything is in one system. No longer do I have to go into various systems to find notes from various professionals.
- Electronic is great
- Clinical documentation is all inclusive within the Epic system.
- Timeliness of reports being available
- if notes are in the computer- they are available and do not have to hunt chart Labs and imaging results are faster to view
- icons that populate the patient list to indicate orders, consults , etc.
- all data and patient stays in one location - ability to use filters to only see what I need
- easy to chart and read documents
- Documentation of all areas in one place. Easy access to previous admissions.
- Scheduling
- Note Documents MAR manage orders

What specific aspects of Epic could be improved by the vendor?

- The access to all clinical notes in the same place.
- The work queues require more adequate routing rules or setting the rules correctly
- when need to print MARS or vitals- would be helpful to have a more concise form to print
- make faxing to skilled nursing facilities available through the system
- better way to print MAR and Vitals
- Bringing in notes from previous EMR
- It would be helpful to have the capability of keeping EPIC up for longer periods of time for those of us working 12 hour shifts in front of a computer. When it times out every ten minutes or so-it creates a significant waste of time from a manpower perspective.
- Have a warning box pop up in the middle of the screen that gives you 60 seconds before shutting down. Have the labs in one date order at a time under the overview tab-not a 24 hour block of time from yesterday at 0700 to today.
- Sticky Notes
- How can user identify salient points related to the work concentration to use effectively in her work on her day of review? I.e. not accomplished and needs to be done.

Do you have any lessons learned since the Epic system implementation?

- Educate staff thoroughly to obtain the best results.
- More hands-on training and less classroom lectures would be helpful. I really did not learn much until I actually began charting in the system.
- training should have been more specific to my job
- Before EPIC teaches classes-- they need to be prepared for Q&A; who do go to and f/u person for us to contact or that email will be sent out
- Yes! Auto search is not always the most helpful when scheduling appointments
- Learned to Navigate thru the system effectively

Do you have additional goals related to Epic that you or your department have not yet completed?

- I am still working on report writing to establish departmental metrics for CM, UR and ACS/ER.
- to better navigate the pre hospital encounters
- Still working with EPIC staff to optimize usage.
- Identify patients on Facesheet that patient needs items completed

Have there been any unexpected benefits gained for your department of the organization since implementing Epic?

- Increased documentation and more thorough information documented.
- My supervisor is able to track the number of consults put into epic.
- From a financial standpoint able to follow the billing process more adequately.
- finding info quicker and can view from anywhere-- not just where the chart had been located < or Not>
- Being able to have an discharge assistants consults queue
- Work flow is improved.
- Faster easier access to information

V. Discussion

The significance of the results continues to help develop critical elements necessary for a successful transition to a new comprehensive system. The study focused on the end users' beliefs regarding the quality of the system and particularly, its information and service. Areas of enhancement were revealed included improving training specific to job roles and supplying more fitting integration of processes and workflows. Likewise, confirmatory aspects of current procedures were observed throughout the study. After the implementation, a greater part of the respondents appreciated many of the aspects of having the new technology such as the ease of use, the ability to access to documents within one system and timeliness of information.

Key limitations of the study should to beunderscored. The study was conducted at two associated healthcare facilities located in one city in central Texas. Moreover, the questionnaire was limited to responses from same type of department within the two hospitals. The responses were limited to staff that do not have access to patient care as a routine part of their job responsibilities. Lastly, the fear of participating in survey may have limited the response. Disbelief in true anonymity may have limited or swayed respondents in their scoring or comments.

The resulting recommendations are focused on fostering staff engagement Taking guidance from a lecture presented by Rod Brace (2014), "The Science of Engagement", engagement is correlated to making progress. As part of progress, there needs to be clarity of goals, a feasible challenge and feedback on actions. But

to make progress, staff will need motivation. Motivation is provided by allowing choices, knowledge and connection to the progress.

As an illustration, the barrier of providing job-specific training could be tackled. Addressing the goal of job-specific training would acknowledge the staff concerns. Providing acknowledgement and recognizing the concerns will engage the personnel. Respond quickly with a plan of action will continue the commitment. Finally, provided feedback will continue the support of a positive transition.

In close, understand the critical elements to support positive HIT transitions are essential but the continued engagement of end users is also vital. Before, during and after implementation, healthcare personnel need to feel competent and related to the transition. Two future studies are recommended. First, a study could be developed to correlate staff engagement to positive HIT changeovers. The second would still be covering the gap in present research which continues to be the need for greater variety of positions giving feedback.

VI. Conclusions

The subsequent conclusions and recommendations will provide a summary of findings. Along with the findings, conclusions related to the implications to a positive implementation process related to the study and previous studiesare provided.

The participants were employed within the Continuum of Care departments of two acute care inpatient facilities. The majority of respondents declared themselves to be Case Management staff. This group includes RN Case Managers and Social Workers. The remaining staff was administrative support staff or management staff of the Continuum of Care departments.

The quality of the four areas of focus all was seen in a largely positive light. Over eighty percent of the respondents moderately or strongly agreed that the system was easy to use, had reliable performance, was consistently available and had an acceptable response time. While acceptable response time did have a ninety-seven percent positive response, one staffer did moderately disagree. Two other areas did contain responses that ranged from strongly agree to moderately or strongly disagree which were the acceptability of information exchange with other systems and the appropriate integration of previous workflows.

As the system information as a whole and the clinical information surveyed individually, the workers replied a mostly affirmative response or stated that they were unsure. Most felt the information was relevant, accurate and had an acceptable layout. A small minority mildly disagreed the information was complete (2.9%) or available when needed (6.9%). Within the clinical quality survey questions, the response of "Not Sure" was selected than any of the four quality specific areas. From the comments given by the respondents, this was due to the staff not working directly with the patients. Still, a majority strongly believed that the system had provided improved patient outcomes, patient safety, patient knowledge of their health and improved clinical documentation.

While the quality of service still received mostly agreeable responses, it provided the large number of comments of concern by the respondents. Although the majority of survey takers moderately agree the implementation process, level of training and on-going supports were acceptable, the three questions also had responses that included mild, moderate and strong disagreement. The primary issue noted appeared to be centered on job-specific training. Whereas the remarks did convey a desire to better understand the overall process of Epic, the many staff members mentioned the need for training related to "addressing case management." One employee mentioned that there were "many questions and frustrations expressed in classes and for a few months after" because "when (the staff) first took Epic training, it did not relate to what they did." (Figures 5 and 6).

Similar to previous studies, some of the same topics were observed in this study. As with other studies, the implementation process appeared to provide a mostly encouraging transition witha small number of components noted of concern to the staff. Similar to the study in "Transitioning from a computerized provider order entry and paper documentation system to an electronic health record: Expectations and experiences of hospital staff", positive characteristics observed included the quality and safety of patient care. Readily available all-inclusive clinical documentation and the ability to locate patient demographic information quickly were additional benefits of transitioning.

Moreover, conceivable enhancements for future implementations were illustrated with the recent study. One feature of greater apprehension was highlighted by staff with two other concerns of smaller notation. As mentioned in the article "Learning from Within to Ensure a Successful Implementation of an Electronic Health Record", the few of the staff within the current studyexpressed the similar need for further attention to processes and workflows within the new HIT system. Another minor concern was improving the exchange of information with other systems. More than an ability that can be imparted to the staff during the transition process, the implementation of this the element may be a requirement on the quality of the system itself. The

greatest concern appears to be appropriate staff training. While an understanding of the overall structure of Epic is wanted, a focus on more job-specific training was repeatedly articulated. In summary, the critical elements essential for a successful transitionemerging from the study appear to include appropriate training, attention to incorporating processes and workflows, swift feedback to questions and concerns and attention to the staff impression and opinion regarding the HIT system and its implementation.

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