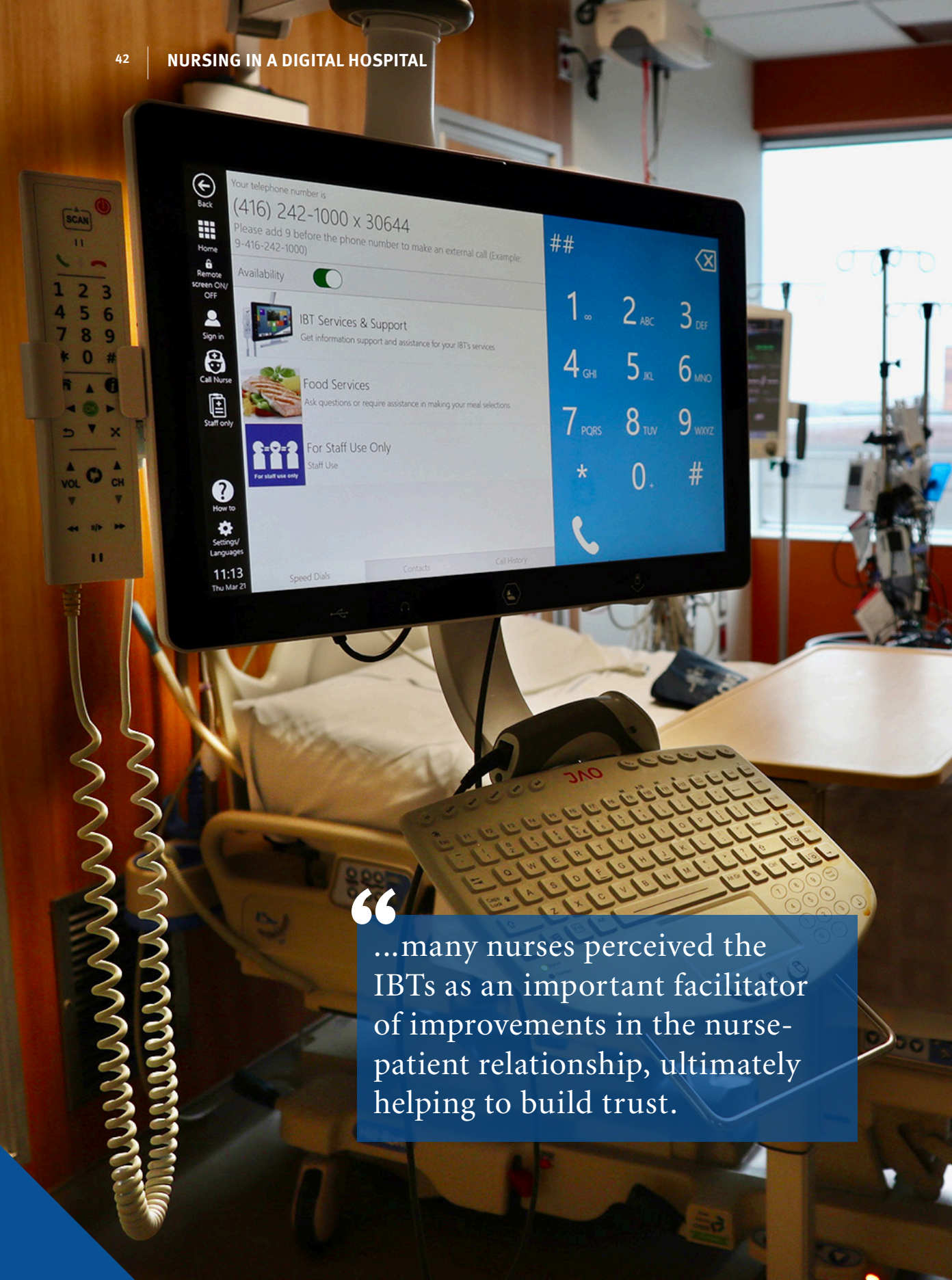

> “...many nurses perceived the IBTs as an important facilitator of improvements in the nurse-patient relationship, ultimately helping to build trust.

HUMBER RIVER HOSPITAL is one of Canada's largest community acute care hospitals, serving a population of more than 850,000 people in the northwest Greater Toronto Area.

The multi-site hospital currently operates out of its Wilson Avenue acute care site and Finch and Church Street reactivation care centres with a total of 722 beds, just over 3,800 employees, approximately 700 physicians and over 1,000 volunteers.

Affiliated with the University of Toronto and Queen's University, Humber River Hospital is North America's first fully digital hospital. Part of Humber River Hospital's digital infrastructure includes completely automated laboratory services, robots sorting and mixing medications, electronic health records, tracking systems for patients undergoing surgery that update families through their cellphones and patient computer bedside terminals – all varieties of technologies that automate information, eliminate paper and provide a connected experience for patients, staff and families.

Humber River Hospital was awarded Accreditation with Exemplary Standing in 2018 and since its opening in 2015 has received numerous awards and accolades for technological advancements and innovation (www.hrh.ca).

Patient Empowerment and Nursing Clinical Workflows Enhanced by Integrated Bedside Terminals

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WHAT WE LEARNED:

1. Patients highly valued the sense of empowerment they derived from the IBT service elements, including meal ordering and environmental conditions such as room lighting, temperature and window shades. Future studies need to explore what other service elements patients are seeking to control during their hospital stay.
2. The IBT does not replace the need for nurses to create the conditions by which the delivery of information to patients can support confidence and trust in the care and treatment being received. Ongoing attention must be paid to the potential impact of technology on the nurse-patient relationship.
3. The ability to influence personal health information through, for example, the integration of a patients' notes element into the IBT may provide the necessary level of involvement to garner a greater sense of patient empowerment in relation to health management.

Abstract

Background: Integrated bedside terminals (IBTs) were implemented at Humber River Hospital with the goal of supporting patient independence and autonomy and improving nursing workflows. The IBTs provide access to a range of convenience and entertainment services as well as access to personal health information. Due to the novelty of the technology, there is a paucity of empirical data on patients' use of, satisfaction with and perceptions of bedside terminals.

Aim: The purpose of this study was to evaluate the impact of IBTs on patient empowerment and nursing workflows.

Methods: A mixed methods design was employed using a cross-sectional patient survey and semi-structured interviews with nurses. The patient survey assessed patient empowerment and satisfaction with the range of services offered through the IBT. Patient scores were summarized using descriptive statistics. Additionally, face-to-face interviews with nurses were used to illicit feedback regarding the IBTs' impacts on nursing workflows.

Results: In total, 113 patients and 11 nurses participated in the study. Analysis of patient satisfaction surveys indicated that the IBTs enhanced the patient experience and increased self-care management. Nurses reported that the IBTs helped patients feel comfortable and entertained and helped enhance the nurse-patient relationship. However, nurses also expressed concern that elderly patients were less inclined to use the IBT.

Conclusion: The results from the present study suggest that the IBT system has the potential to empower patients and decrease demands on nurses. Patients' notes incorporated into the IBT may provide the necessary level of involvement to garner a greater sense of patient empowerment. The IBT does not replace the need for nurses to deliver information to patients in a manner that supports their trust.

Background

Health information technology (HIT) has been commonly developed for improving administrative functions and achieving greater operational efficiency, such as nursing clinical workflows. However, a new generation of HIT is emerging, which is aimed at connecting and integrating the hospital information network, clinical services, patient entertainment and communication systems at the point of care (Yoo et al. 2015). Integrated bedside terminals (IBTs) were introduced at Humber River Hospital (HRH) in 2015 with the primary purpose of enhancing the quality and safety of care delivery and elevating the patient experience (Figure 1). IBTs are bedside terminals that enable efficient access to clinical information that nurses and other healthcare providers can use to support care delivery and patients can use for entertainment services, such as television and radio, as well as Internet communication services, such as Skype and instant messaging. Patients also have access to convenience services, such as meal ordering, room environmental controls and personal health information, including the results of lab and diagnostic imaging tests and vital signs data through the bedside IBT. Recognizing that patient experience is a vital measure in the quality of healthcare service, this study set out to understand patient satisfaction and engagement with IBTs.

FIGURE 1. Integrated bedside terminals at Humber River Hospital.

Only a few studies have focused on nurse-centred bedside terminals (Blank and Bauer 1991; Brown et al. 1995). However, in these studies, the digital devices being examined were used solely by nurses for the purpose of documentation and were not intended for patient use. Since few hospitals around the globe have adopted patient-centred IBTs (sometimes referred to as "bedside terminals" or "smart bedside stations"), very few studies have been conducted on patient satisfaction with these devices. One study conducted by Ryu et al. (2016) in a South Korean hospital found that patients were highly satisfied with the bedside system, particularly with personalized services such as viewing lab results and checking hospital fees. Another study compared patient satisfaction associated with meal ordering using a bedside electronic system to traditional paper menus in an oncology ward. The findings revealed that patients who had the bedside electronic meal ordering system not only expressed greater satisfaction with their meals but also tended to order meals that were more nutritious than patients who were given paper menus (Barrington et al. 2018).

These studies provide a glimpse of some of the potential advantages of IBTs. Due to the novelty of the technology and the limited number of healthcare organizations that have implemented IBTs, there is a paucity of literature that examines the benefits of IBTs to patients and nurses. Further research is needed to leverage the capacity of the IBT to enhance the quality and safety of care delivery and elevate the patient experience. The present study was aimed at identifying impacts on patient empowerment and nursing workflows associated with IBT use in an acute care hospital setting.

Methods

Description of the IBT

A total of 724 IBTs were installed in rooms on all wards in 2015. The key services featured on the IBTs are categorized into four services: entertainment, communication, convenience and personal health information. All features are provided free of charge, with the exception of the entertainment services, which carry a fee of $10 per day.

Study design and sample

A cross-sectional and descriptive study design, using a representative subset of patients and nurses at a single point in time, was applied to assess the impact of the IBT on patient empowerment and nurses' clinical workflow. Permission to carry out the study was obtained from the Institutional Review Board at HRH. Informed consent was obtained from all participants. Participation in the study was voluntary, and all responses were anonymous. For the patient empowerment survey, all inpatients were eligible for inclusion in the study. Inclusion criteria for nurses included the requirement that nurses predominantly provide direct care to inpatients and have at least six months of experience working at HRH since the Wilson site opened in October 2015.

Data collection and instruments

Patients' responses were collected between October and November 2018. Trained volunteer personnel administered the questionnaire among inpatients. Demographic data, including age and gender, were collected through the questionnaire. Participants were asked to rank their confidence in using technology on a four-point Likert-type scale (very confident, somewhat confident, only a little confident and not at all confident) and to indicate whether they had received any training on the use of the IBT (yes/no).

The survey also included measures of satisfaction with patients' use of the IBT. Patient satisfaction with the IBT was quantified using a 14-item scale composed of the four domains of IBT services offered. Patients were asked to rate all of the services available through the IBT menu using a five-point Likert-type scale in which scores of 1 to 5 corresponded to ratings from "very poor" to "excellent." There was an additional option of reporting "N/A" for any service provided through the IBT that the patient did not use.

A 15-item scale, which consisted of items relating to three service domains, measured patient empowerment: access to the health record, access to meal ordering and access to environmental controls such as lighting, window shading, room temperature, etc. (survey adapted from Earnest et al. 2004; Barrington et al. 2018). Participants were asked to rate their level of agreement with each statement using a five-point Likert scale (strongly agree, agree, neither agree nor disagree, disagree or strongly disagree). The scale included items such as "having access to my health information through the IBT has been important to my healing process" and "having access to the room environmental controls has helped me feel more in control of my environment."

Impacts on nursing workflow

In addition to administering the questionnaire, semi-structured interviews were conducted in November 2018 with 11 nurses to assess the impacts of the IBTs on nursing workflow. All interviews were digitally recorded and transcribed. Demographic data were collected, including age, gender, length of employment at HRH and number of years of experience as a registered nurse, registered practical nurse or nurse practitioner.

Data analysis

Patient demographic data were summarized using descriptive statistics. Chi-square test and Fisher's exact test were used to compare categorical variables (gender, age category, confidence using technology and training received) between IBT users and non-users. As there were few participants in the 16 to 24 years category, this age group was combined with the 25 to 34 years category for the chi-square analysis. The 14 items related to patient satisfaction with the IBT services, as well as the 15 items related to the three patient empowerment domains, were summarized using frequencies and percentages. Additionally, a content analysis was conducted on nurses' textual interview data. Quantitative statistical analyses were performed using IBM SPSS Statistics (version 25). A p value of < 0.05 was considered statistically significant.

Results

Inpatient characteristics

A total of 113 inpatients participated in the study. Participant characteristics are summarized in Table 1. The majority of participants were female (58.4%) and over the age of 65 (30.6%), and many were "very confident" using technology (42.9%). Nearly 70% of participants indicated that they used the IBT during their stay, and 60% of participants indicated that they did not receive training on how to use the IBT.

Comparison of characteristics between IBT users and non-users indicated that IBT users were more likely to be "very confident" using technology compared to non-users (49.3% versus 28.1%, $\chi 2\ [1, N = 105] = 4.08$, $p = 0.043$). Non-users were more likely "not at all confident" with technology compared to IBT users (37.5% versus 12.4%, $\chi 2\ [1, N = 105] = 8.81$, $p = 0.003$). Receiving training on

the IBT was also associated with IBT use versus non-use (49.4% versus 13.9%, $\chi 2$ [1, $N = 113$] = 13.09, $p < 0.001$). There was no statistically significant difference between IBT users and non-users with regard to gender and age group.

Table 1. Comparison of baseline characteristics in inpatients by IBT user and non-user, *n* (%)

	Total (%) (*n* = 113)	IBT user (%) (*n* = 77)	Non-user (%) (*n* = 36)	*p* value
Gender (*n* = 113)				
Female	66 (58.4)	42 (54.5)	24 (66.7)	0.22
Male	47 (41.6)	35 (45.5)	12 (33.3)	
Age group (*n* = 108)				
16–34	20 (18.5)	15 (20.3)	5 (14.7)	0.33
35–44	12 (11.1)	6 (8.1)	6 (17.6)	
45–54	18 (16.7)	14 (18.9)	4 (11.8)	
55–64	25 (23.1)	19 (25.7)	6 (17.6)	
65+	33 (30.6)	20 (27.0)	13 (38.2)	
Confidence using technology (*n* = 105)				
Very confident	45 (42.9)	36 (49.3)	9 (28.1)	**0.043**
Somewhat confident	19 (18.1)	13 (17.8)	6 (18.8)	0.908
Only a little confident	20 (19.0)	15 (20.5)	5 (15.6)	0.554
Not at all confident	21 (20.0)	9 (12.3)	12 (37.5)	**0.003**
Training provided on using the IBT (*n* = 111)				
Yes	43 (38.1)	38 (49.4)	5 (13.9)	**< 0.001**
No	70 (61.9)	39 (50.6)	31 (86.1)	

IBT = integrated bedside terminal.

Patient empowerment and satisfaction with the IBT

The percentage of patients rating the patient empowerment items on a five-point scale from strongly agree to strongly disagree can be seen in Table 2. Overall patient empowerment ratings for access to health record services were neutral. Although most patients rated the subscale items as agree/strongly agree (40.0–49.1% of patients), almost one third rated the items as disagree/strongly disagree (23.6–32.7% of patients). "Having access to my personal health information has been important to my healing process" received the highest portion of agree/strongly agree ratings (49.1%).

Meal ordering services received higher patient empowerment ratings, with most patients rating the items as agree/strongly agree (51.5–71.9% of patients). The most highly rated patient empowerment item was "I was happy with what I ordered" (71.9%). Environmental control features also received high patient empowerment ratings, with most patients rating the items as agree/strongly agree (65.6–70.2% of patients). The most highly rated patient empowerment item was "having access to the room environmental controls allowed me not to have to rely on others as much" (70.2%).

Table 2. Patient empowerment ratings

Patient empowerment items	*n*	Strongly disagree (%)	Disagree (%)	Neither agree nor disagree (%)	Agree (%)	Strongly agree (%)
Having access to my personal health information has ...						
helped me gain more knowledge about my medical condition	55	5 (9.1)	8 (14.5)	19 (34.5)	17 (30.9)	6 (10.9)
helped me better understand my doctor's instructions	55	5 (9.1)	12 (21.8)	15 (27.3)	17 (30.9)	6 (10.9)
helped me be more involved in the treatment	55	5 (9.1)	13 (23.6)	15 (27.3)	14 (25.5)	8 (14.5)
helped me feel more in control of my medical care	55	7 (12.7)	11 (20)	14 (25.5)	14 (25.5)	9 (16.4)
been important to my healing process	55	6 (10.9)	9 (16.4)	13 (23.6)	17 (30.9)	10 (18.2)
Meal ordering service						
I was happy with what I ordered	64	1 (1.6)	7 (10.9)	10 (15.6)	24 (37.5)	22 (34.4)
I felt in control over what I ordered	64	3 (4.7)	8 (12.5)	9 (14.1)	21 (32.8)	23 (35.9)
Using the meal ordering service was enjoyable	64	5 (7.8)	6 (9.4)	14 (21.9)	18 (28.1)	21 (32.8)
The menu was visually appealing and influenced my menu order decisions	64	5 (7.8)	7 (10.9)	19 (29.7)	15 (23.4)	18 (28.1)
The meal ordering service has been important in allowing me to heal	64	5 (7.8)	5 (7.8)	18 (28.1)	18 (28.1)	18 (28.1)
Having access to the room environmental controls (e.g., lighting, window tint) has ...						
allowed me to sleep better	67	4 (6)	6 (9)	13 (19.4)	22 (32.8)	22 (32.8)
helped me feel more in control of my environment	67	3 (4.5)	5 (7.5)	13 (19.4)	24 (35.8)	22 (32.8)
allowed me not to have to rely on others as much	67	4 (6)	5 (7.5)	11 (16.4)	29 (43.3)	18 (26.9)
allowed me to make my room more comfortable	67	3 (4.5)	7 (10.4)	11 (16.4)	25 (37.3)	21 (31.3)
been important to my healing process	67	5 (7.5)	3 (4.5)	15 (22.4)	24 (35.8)	20 (29.9)

The percentage of patients rating their satisfaction with the IBT services on a five-point scale from "very poor" to "excellent" can be seen in Table 3. Overall, patients rated the IBT services positively. More than 90% of patients reported satisfaction with the instant messaging services (94.1% rated good/excellent). Similarly, most patients were satisfied with the lighting controls (80.4% rated good/excellent) and hospital information (79.1% rated good/excellent) features within the IBT. The

services with the lowest satisfaction ratings were meal order (14.6% rated very poor/poor), Internet services (19.2% rated very poor/poor) and Skype (21.4% rated very poor/poor); however, the Skype feature was also rated positively by 71.4% of patients.

Table 3. Patient satisfaction ratings with IBT services

	*n**	Very poor (%)	Poor (%)	Acceptable (%)	Good (%)	Excellent (%)
Entertainment						
TV	71	3 (4.2)	2 (2.8)	15 (21.1)	27 (38.0)	24 (33.8)
Radio	34	0 (0)	1 (2.9)	7 (20.6)	13 (38.2)	13 (38.2)
Music	27	1 (3.7)	1 (3.7)	6 (22.2)	9 (33.3)	10 (37.0)
Internet	26	2 (7.7)	3 (11.5)	6 (23.1)	7 (26.9)	8 (30.8)
Communication						
Skype	14	2 (14.3)	1 (7.1)	1 (7.1)	3 (21.4)	7 (50.0)
Instant messaging	17	0 (0)	1 (5.9)	0 (0)	5 (29.4)	11 (64.7)
Convenience						
Meal orders	62	4 (6.5)	5 (8.1)	14 (22.6)	16 (25.8)	23 (37.1)
Lighting controls	56	2 (3.6)	1 (1.8)	8 (14.3)	23 (41.1)	22 (39.3)
Temperature controls	54	4 (7.4)	3 (5.6)	8 (14.8)	20 (37.0)	19 (35.2)
Call bell system	49	1 (2.0)	3 (6.1)	11 (22.4)	11 (22.4)	23 (46.9)
Personal health information						
Resources	27	1 (3.7)	0 (0)	6 (22.2)	7 (25.9)	13 (48.1)
Hospital information	24	0 (0)	0 (0)	5 (20.8)	5 (20.8)	14 (58.3)
Lab test results	19	0 (0)	2 (10.5)	4 (21.1)	3 (15.8)	10 (52.6)
Medical record	16	0 (0)	1 (6.3)	4 (25.0)	2 (12.5)	9 (56.3)

*Total $n = 77$.
IBT = integrated bedside terminal.

Impacts on nursing workflow and the nurse-patient relationship

Of the 11 nurses interviewed, 63.6% were female, and the age range for participants was in the 20s to 40s. The average number of years of experience for all participants was 3.87 years ($SD = 2.79$), with 3.11 years ($SD = 2.99$) of employment at HRH. The majority of participants were graduates of a baccalaureate nursing program (81.8%) and practised as registered nurses (72.7%).

Nurses shared their perceptions and observations of the IBT system. Four themes, including positive patient outcomes, improved nurse-patient relationship, technological difficulties and older patients' need for companionship, as well as suggestions for improvement, were identified through face-to-face interviews.

Positive patient outcomes

Generally, the IBT technology was seen as having the potential to positively influence nursing workflow. Nurses reported that from their perspective, the IBT was a good source of entertainment and enjoyment for the patient to pass time and relieve boredom and agitation during a hospital admission. One nurse commented that she thought the IBT was a particularly good distraction for patients experiencing acute pain. Others noted that patients would often watch television from the IBT at night to fall asleep. Several nurses also noted that turning on the news channel on the IBT served as a reorientation strategy for reducing delirium among older patients. Additionally, having the environmental controls embedded within the IBT provided patients with greater independence. These were cited as having a positive impact on nursing workflow through decreasing demands on the nurse.

Improved nurse-patient relationship

Nurses also reported improvements to the nurse-patient relationship. Several nurses stated that they were able to use the IBT to lessen the patient's anxiety. The system contains a number of resources for patients to browse on a plethora of medical conditions, and several nurses reported opening up the resource page and educating patients on new diagnoses using the information resources on the IBT. As one nurse commented, "My patient was going for angioplasty, and she was very worried about the procedure. So I could pull out the material on the IBT, and she got an idea about what to expect. That made her feel a little better." As well, nurses frequently mentioned that patients or their family members would inquire regarding the results of a recent medical laboratory test, and the nurse would be able to pull up the results of the test on the IBT, without leaving the patient's room to obtain the results from the chart. Participants stated that this helped build trust between patients and the nurse as patients could become dissatisfied if the nurse did not immediately recall the patient's clinical findings.

Technological difficulties

Although the IBT system was generally regarded as a valuable and convenient tool, nurses did report some negative impacts on nursing workflow because of the IBT. The most common complaint was workload demands associated with providing training to patients and family members on the use of the IBT. Several nurses commented that older patients had a high degree of difficulty using the IBT because they had limited knowledge and experience using technology. Many nurses were very willing to help patients learn to use the IBT but stated that this imposed a time burden on their daily workload.

Older patients' need for companionship

Furthermore, some nurses noted that the IBT was not a source of diversion for older patients experiencing loneliness as they would still often seek the attention of nurses. Nurses reported that, generally, patients were enamoured with the novelty of the technology, and all nurses were optimistic that the IBT would be most used and valued by the next generation of patients, who place a high value on information technology.

Suggestions for improvement

A common complaint conveyed by nurses in this study was recurrent breakdowns of the IBT system. Nurses provided several suggestions for improving the IBT system, including increasing the text size for improved readability, increasing touchscreen and keyboard sensitivity and offering the option to display text in multiple languages to accommodate the diversity of the patient population. Nurses suggested adding a video tutorial to assist patients with learning to use the system themselves.

Discussion

To our knowledge, based on an exhaustive search of the CINAHL, ProQuest, and PubMed databases, this is the first study of its kind assessing the impact of smart bedside terminals on patient empowerment and nursing workflows. The findings from this study revealed that the majority of patient participants used the IBT during their stay to access their health record, order meals and regulate the environmental conditions in their room. Similar findings from Caligtan et al. (2012) revealed that patient room orientation and access to their own clinical information were two of the most important elements patients sought in bedside information systems. The results of this study suggest that there is alignment between the essential information patients are seeking and the data elements that are integrated into the bedside terminals at HRH. Validation of these data elements, in the context of their importance to patients, further enhances the opportunity to build bedside terminals that promote satisfaction and the potential for increased self-care management.

The highest empowerment ratings from patients who participated in this study were associated with feeling "more in control over meal ordering" and "more in control of [their] environment." This study found that the lowest rated feeling of empowerment was in relation to patients' control of medical care, understanding of the doctor's instructions and involvement in treatment. Although several studies found an association between access to information and increased participation in health management and improved outcomes, the findings from this study suggest that mere access to personal health information does not necessarily lead to patients' feeling of empowerment related to health management (Adamson and Bachman 2010; Poon et al. 2010; Schnipper et al. 2008).

The findings from our study led us to reflect on what more can be done to strengthen patients' experience of power and control over their own care. Presently, at HRH, the elements in the IBT that are associated with service domains such as meal ordering and room lighting are designed to actively involve patients. Conversely, the elements in the IBT that are associated with personal health information are built to prevent manipulation by the patient. To clarify, for the service domains, patients are free to make adjustments based on their preferences. However, for personal health information, patients are limited to simply viewing their medical information. The findings from previous studies revealed that when patients were proactive participants in their care, with access to health information and active involvement in developing their treatment plans, safety was enhanced and patient satisfaction improved (Campbell and Park 2008; Caruso 2007; Chaboyer, et al. 2010; Meuthing et al. 2007).

Our study suggests that the ability to influence personal health information through, for example, the integration of a patients' notes element into the IBT may provide the necessary level of involvement to garner a greater sense of patient empowerment in relation to health management. We thought about the relationship of the electronic medical record (EMR) to the hospital and the patient. The hospital is the custodian of the EMR, and the patient is the owner of the information contained within the EMR. Nurses and other clinical providers of the hospital are legally required to document and record their clinical impressions in the EMR. Once the information is entered, any changes to the EMR are conducted in the form of an addition versus a deletion. To clarify, if the nurse documented that the right leg was swollen but, in fact, the left leg was, the nurse would add the correction to the documentation and not delete the previous incorrect entry. Thus, if a patients' notes section of the EMR were introduced, we would suggest that a similar process could be established. That is, patients would be able to enter additional information but would not be permitted to delete or manipulate other information in the EMR. Potentially, this would provide patients and their families with the opportunity to add information that clarifies, enhances or corrects information contained in the EMR. Patients may benefit from a deeper level of engagement in the management of their health information and possibly gain a greater sense of empowerment over their care. Nurses and other healthcare providers may use the patients' notes to enhance patient-centred care by aligning expectations about treatment plans and avoiding potential errors and misunderstandings that may compromise care.

One of the challenges we anticipate with the introduction of the patients' notes element into the EMR is the resistance of some nurses, physicians and other healthcare providers to support the approach of patients having greater authority over their health information. The potential to incorporate a patients' notes section into the EMR may generate similar anxiety, as expressed by nurses and other healthcare providers when patient and family advisors were introduced into the healthcare system. Across healthcare organizations, concerns about exposure to greater liability and the inability to manage patients' expectations related to care delivery were commonly expressed. Those concerns have not been realized, and by all accounts, the engagement of patient and family advisors has been enlightening and a value-add for healthcare organizations. There will need to be more dialogue with patients and families, nurses, physicians and other clinicians to better understand the benefits and challenges of introducing the patients' notes section into the EMR. HRH is poised to take the lead on this conversation and leverage its technology to improve the patient experience and consistently deliver the safest and highest quality care.

Overall, IBT services rated highest by patients included instant messaging, hospital information and medical records. Our study supports previous research findings suggesting that communication tools and access to personal health information are valued elements in bedside information technology systems (Caligtan et al. 2012). Patients' perspectives indicate that models of care delivery incorporating IBTs to enable transparency and foster communication are essential ingredients for generating satisfaction and empowerment.

Most of the nurses participating in this study viewed the entertainment services of the IBT as an important method of providing entertainment and distraction for patients; relieving boredom, anxiety and pain; and serving as a reorientation tool for patients with delirium. The findings from this study are similar to previous research in which distraction techniques involving technology resulted in patients experiencing decreased pain and anxiety (Li et al. 2011; Hudson et al. 2015; Tashjian et al. 2017). Our study suggests that the IBT at HRH is an effective, safe and simple means of helping patients remain oriented, stimulated and comfortable. Additionally, the findings from this study suggest that the distraction potential of the IBT entertainment services improved nursing workflow by decreasing the demands on nurses. In particular, the ability for patients to control the environmental conditions in their room alleviated the necessity for nurses to perform ancillary care responsibilities such as dimming lights and adjusting temperature settings, leaving more time for nurses to focus on direct care responsibilities. Our study did not have the opportunity to validate the usefulness of the IBT for distraction purposes from the patient perspective. A future study could explore this matter further to gain a better understanding of this potential benefit of the IBT for patients.

An interesting outcome of this study is that many nurses perceived the IBTs as an important facilitator of improvements in the nurse-patient relationship, ultimately helping to build trust. Patient education and information about numerous medical conditions is available through the IBTs, and according to the nurses in our study, is a valuable resource for patients and families. Additionally, several nurses commented that bedside access through the IBT to patient health information such as test results enabled them to save time, immediately respond to requests for information and provide education and reassurance to patients. This is an important finding of our study because some of the previous literature has suggested that technology may compromise the therapeutic relationship (Baysari et al. 2018; Rathert et al. 2017).

In our study, the IBTs served to build trust between patients and nurses, thereby strengthening the therapeutic relationship and facilitating safer care and positive patient experiences. Our findings suggest that the process by which technology is integrated into care delivery versus the technology itself might lead to improved relationships. For example, regardless of whether or not the information is accessible at the bedside, nurses must be open and responsive to the informational needs of patients and make the time to ensure that those needs are met. Having patient information contained in one location and accessible at the bedside makes conversations with patients timely but does not ensure that patients' informational needs are satisfied. The nurse remains central in creating the conditions by which the delivery of information to patients supports or erodes their confidence and trust in the care being delivered. Ongoing attention must be paid to the potential impact of technology on the nurse-patient relationship.

Essentially, our study found that nurses considered the IBT system a valuable and convenient tool for themselves and patients. However, several nurses complained of the additional workload that IBTs imposed because patients and families needed to

be taught how to use the system. Our findings suggest that the time burden spent teaching patients to use IBTs needs to be examined further and alternative methods need to be developed to ensure that every patient receives adequate teaching regarding the use of IBTs. Failure to do so may begin to erode the many benefits attributed to IBTs from both the patient and the nurse perspective. Shortly following this study, hospital volunteers were trained to teach patients and family members about the use of the IBT. Future research will evaluate the initiative from the patient, volunteer and nurse perspectives to gain a better understanding of the strengths and challenges of educating patients and families on the use of the IBT.

Also, several nurses in this study expressed concern for elderly patients and their inability to grasp the use of the IBT. The use of bedside technology may not be suitable for all patients. However, IBT technology is highly valued by patients who are able to use it. Anecdotally, patients who were interviewed in this study reminded nurses and surveyors who moved the IBTs away from the bedside to complete the surveys that they needed to return it back to the bedside. As with any tools or resources provided to patients, such as call bells, if they are inaccessible to the patient, then they cannot be used, whether embedded in the technology or attached to the bed linen. As the digital footprint grows across healthcare organizations, basic nursing considerations must be maintained.

Our study caused us to reflect on the circumstances where patients are unable to use the IBT. We are currently exploring other effective approaches to maintain equitable access to personal health information and support patient empowerment in circumstances where patients cannot use the IBT. With this feedback from patients and staff regarding IBT use, HRH has developed a patient and family advisory committee dedicated to the improvement and uptake of IBTs across the hospital. This committee is composed of representatives from patients and families with first-hand experience using the IBTs, nursing staff and leaders, the information technology and services team and human factors engineers. As a high-reliability hospital, this study has highlighted the importance of broad stakeholder engagement required to implement continuous improvement and explore the opportunities for enhancing both patient and staff experience with the IBTs. Items that have been discussed to date include modifying information displays (e.g., larger text sizes), alternative language options and video lessons (i.e., IBT tutorials to both provide patients an orientation to the IBTs and serve as a resource to review how to access information if a patient had forgotten how to do so).

Limitations

The small sample size of this study provided the opportunity to gain in-depth insights into the impact of IBTs on patient empowerment and nursing workflows. Although the findings may not be widely generalizable, the results of this study revealed important information that other hospitals seeking to integrate IBTs may consider to support their implementation. The results are based on self-reported

data, which may be subject to social desirability bias, especially when audio recorded. However, nurses were equally open regarding both the advantages and limitations of IBT technology. As well, interviews with nurses were administered and analyzed by the research coordinator to minimize any influence on the participants' responses.

The limitations of the patient surveys include its cross-sectional design, which may be prone to non-response bias. Also, the study measured satisfaction with the IBT at a single hospital site; therefore, generalizations to other patient populations must be made with caution and may not be extended to broader healthcare settings.

Conclusion

A major advantage of this study is that responses regarding the IBT's impacts were sought from both patients and nurses. To our knowledge, this is the only study of its kind. IBTs were introduced at HRH with the principal goal of enhancing the quality and safety of care delivery and elevating the patient experience. Our study reveals where this goal was met and adds new knowledge to the existing body of literature about patient and nurse satisfaction and engagement with IBTs. Importantly, this study contrasts to others suggesting that mere access to personal health information leads to patient empowerment in relation to health management. Our study revealed that the IBT at HRH is an effective, safe and simple means of helping patients remain oriented, stimulated and comfortable, with the distraction potential of the IBT entertainment services improving nursing workflow and leaving more time for nurses to focus on direct care responsibilities. Another new finding of our study is that the IBTs served to build trust between patients and nurses because the system enables immediate responses to patient requests for information and education. Finally, strategies must be considered to maintain equitable access to personal health information and empowerment strategies in circumstances where bedside technology may not be suitable for patients.

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