Patient engagement in the inpatient setting: a systematic review

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ABSTRACT
Objective To systematically review existing literature regarding patient engagement technologies used in the inpatient setting.

Methods PubMed, Association for Computing Machinery (ACM) Digital Library, Institute of Electrical and Electronics Engineers (IEEE) Xplore, and Cochrane databases were searched for studies that discussed patient engagement (‘self-efficacy’, ‘patient empowerment’, ‘patient activation’, or ‘patient engagement’), (2) involved health information technology (‘technology’, ‘games’, ‘electronic health record’, ‘electronic medical record’, or ‘personal health record’), and (3) took place in the inpatient setting (‘inpatient’ or ‘hospital’). Only English language studies were reviewed.

Results 17 articles were identified describing the topic of inpatient patient engagement. A few articles identified design requirements for inpatient engagement technology. The remainder described interventions, which we grouped into five categories: entertainment, generic health information delivery, patient-specific information delivery, advanced communication tools, and personalized decision support.

Conclusions Examination of the current literature shows there are considerable gaps in knowledge regarding patient engagement in the hospital setting and inconsistent use of terminology regarding patient engagement overall. Research on inpatient engagement technologies has been limited, especially concerning the impact on health outcomes and cost-effectiveness.

INTRODUCTION
Engaging patients in their healthcare is a growing trend. The Institute of Medicine (IOM) has recommended that individuals receive opportunities to access appropriate medical information and clinical knowledge, enabling them to be the ‘source of control’ in making healthcare decisions. By increasing patient participation, it is believed that patients can experience higher satisfaction and better health outcomes. A recent issue of Health Affairs dedicated to patient engagement, referred to the phenomenon as equivalent to the next ‘blockbuster drug’. One area in which patient engagement has been historically limited is within the hospital. For many patients, hospitals are unfamiliar, isolating places filled with anxiety and unanswered questions.

Being a hospital patient has been called one of the most dis-empowering situations one can experience in modern society. In a survey of hospital patients conducted by Cumbler et al, 90% of respondents said they wanted to review their hospital medication list for accuracy, but only 28% were given the opportunity to do so. O’Leary et al reported that only 32% of hospital patients surveyed could correctly name even one of their hospital physicians. A popular account of the difficulties faced by hospital patients is found in the 1980 autobiographical Martha Weinnman Lear book, adapted as the Mary Tyler Moore televersion movie, Heartsounds. The protagonist is a doctor-turned-patient whose care team ignores him as he nears death from heart failure. His wife makes the illustrative statement, ‘I marveled … He is a doctor; he is white and middle-class; he has a wife who can make demands in his name; he is a private-room patient in a great medical institution; he is gravely sick; what the bloody hell goes on in the wards?’

The purpose of this review article is to summarize the existing scientific literature regarding patient engagement during inpatient care. Specifically, the review focuses on use of health information technology (IT) to increase patient engagement and self-efficacy in this setting.

BACKGROUND
There is considerable evidence indicating the benefits of providing patients with access to their health information, including increased patient participation in health-related decision-making, decreased decisional conflict, and increased adherence to care. Engaged patients have higher levels of satisfaction, increased understanding of their care, more engagement in health improving behaviors, and improved health and outcomes. These patients receive more patient-centered care, and have increased levels of trust of, better relationships with, and more confidence in their physicians. Additionally, increased patient engagement has shown a positive correlation with reduction in overall expenditure and reduction in litigation against health professionals.

Multiple initiatives have focused on patient engagement. The maxim ‘Nothing about me without me’ has been used to summarize the principles of patient-centered care and shared decision-making. The Agency for Healthcare Research and Quality sponsored a national public service advertising campaign ‘Questions Are the Answer’ (http://www.ahrq.gov/questionsareanswer), which encourages patients to ask questions of their care providers, and clinicians to ‘treat patient inquiries not as an impediment to care but as an opportunity to enhance it’. The Joint Commission and National Quality Forum have also started their own initiatives surrounding patient engagement.

Research Council emphasized use of health IT for the ‘empowerment of patients and their families in effective management of health care decisions’, to educate individuals about health, and to support communication with care providers.32

Along with the benefits of engagement come some ethical considerations. Patient preferences do not always coincide with clinicians’ judgments about the relative effectiveness of treatments, therefore it is necessary to discuss whether to ‘promote efficient and effective health care, sometimes at the expense of patient choice’ or to always respect patient desires.26 Additionally, research has shown that patients do not always make rational decisions, which can result in pressure on practitioners who then prescribe illogically in response.33 There is also the question of what information patients can readily understand, and whether adverse consequences, such as an increased disease burden, may result. These considerations must be taken into account in designing engagement interventions.

Much of the research involving patient engagement to date has been conducted in the outpatient setting. Personal health records (PHRs) and online portals are now offered by many healthcare delivery organizations and provide a variety of services, including: secure messaging with providers; displaying laboratory test results, medications, problem lists, and health summaries; refilling prescriptions; and scheduling appointments.34–44 The multi-site OpenNotes initiative enables patients to read their doctor’s notes from office visits.45–47 At Columbia University Medical Center, the Patient Clinical Information System (PatCIS) allows patients to review and actually contribute information to their electronic records via the web.48 Additionally, the federal government has developed the Blue Button initiative which allows patients in the Veterans Administration to download a simple, readable version of their electronic records with the click of a button.49

While research in the outpatient setting has made significant progress in providing patients with access to their health information, less progress has been made within the inpatient setting. Even though evidence has shown better health outcomes with the provision of better information, these information needs are often not met, especially within the hospital setting.10–52 With 36 million hospital admissions each year in the USA,53 provision of information and engaging patients within the hospital is an important priority.

Previous reviews discussing patient engagement have focused on shared decision making,54–56 use of mobile phone messaging,57–58 telephone communication,59 email communication,60 interactive applications for self-management of health,61–65 virtual reality (VR) for rehabilitation,66 and patient education.67–73 These reviews have focused on the outpatient setting, and to our knowledge, no such review has been conducted on patient engagement with a focus on the inpatient setting. This represents a critical gap in knowledge, particularly as new care delivery models are attempting to place patients at the center of their own healthcare.74

METHODS
This review followed the methods outlined in Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA).75 We conducted our search across four electronic databases: PubMed, Association for Computing Machinery (ACM) Digital Library, Institute of Electrical and Electronics Engineers (IEEE) Xplore, and the Cochrane database in February 2013. A three-part terminology search was used to identify studies that (1) discussed patient engagement (‘self-efficacy’, ‘patient empowerment’, ‘patient activation’, or ‘patient engagement’), (2) involved health IT (‘technology’, ‘games’, ‘electronic health record (EHR)’, ‘electronic medical record’, or ‘personal health record’), and (3) took place in the inpatient setting (‘inpatient’ or ‘hospital’). Exclusion criteria were non-English language publications. MeSH terms were not used in the search criteria as we did not find consistently used MeSH terms to describe patient engagement.

The search strategy involved determining appropriate search keywords and then aggregating results from the four databases. Two investigators (JP and DV) screened the results and determined, based on title and abstract, whether to include each article for full review. Full review consisted of in-depth analysis of the identified articles to summarize the findings of each. Additional candidate articles were identified by reviewing references of the included articles. Articles were then categorized by content and grouped for discussion.

RESULTS
In total, 546 results were found: 92 from PubMed, 94 from the ACM digital library, 226 from IEEE Xplore, 126 from Cochrane, and 8 from citations within the found articles. Of the 546 results found, 22 qualified for full review; excluded articles dealt with outpatient care settings or did not involve IT interventions (figure 1). Of those that qualified for full review, 17 were included in the final results; 5 articles were excluded, again due to their lack of inpatient focus or non-technological interventions. Of the 17 included, 3 were randomized controlled trials (RCTs), 11 employed a quasi-experimental design, and 3 were qualitative analyses (table 1). Of these results, 3 articles identified design requirements for inpatient engagement technology. The remaining 14 articles described interventions, which we placed into five categories: entertainment, generic health information delivery, patient-specific information delivery, advanced communication tools, and personalized decision support.

Design requirements
The hospital environment presents special challenges for implementing IT to support patient engagement. Wilcox et al76 used inpatient interviews to explore requirements for medication IT. They found patients were often confused by frequent changes in medication therapies, and desired verbal briefings to be supplemented with electronic information. In particular, patients thought that having a record available would help them gauge therapeutic progress. Patients also desired the ability to read educational information about their medications and to be able to validate a list of their home medications.

Skeels and Tan70 conducted interviews in four different hospital units to examine opportunities to use technology to improve the inpatient experience. The authors asserted that patients desired the ability to send more information with the nurse call button so nurses could prioritize their calls. Patients hoped a personalized board could show a progress bar with important steps as well as past and future events (eg, a doctor’s upcoming visit). Participants also wanted to track ‘medications, pain scale data, and billing information’, and be able to look up medical information about their condition and living a healthy lifestyle. Patients expressed a desire for general activities such as music, movies, television, games, and video conferencing. Also noted were the difficulties of limited mobility and reclining postures of inpatients, and suggestions made for the use of voice commands.

Morris and Karlson77 asserted that a ‘hospital patient should be treated as a situationally-impaired user’, and noted that...
impairments are highly dynamic in nature. Patients may feel disoriented by sights, sounds, smells, and frequent staff changes. Because verbal information is easily forgotten, it is important to have computer-based memory support in the hospital. Morris and Karlson recommended leveraging information stored in a patient’s EHR to help evaluate the patient’s cognitive status. This evaluation could then help ‘inform dynamic adaptation’ and potentially affect privacy permissions on the patient’s data to allow family members access when the patient is not cognitively sound.

**Entertainment**

As early as 2003, researchers anticipated the benefits of VR or gaming on improving patient engagement through entertainment. An 11-participant pilot study conducted by Bers et al. provided children undergoing dialysis treatment with a computer-based application that allowed them to create ‘characters, stories and spaces while communicating in real-time’. The application engaged ‘both patients and staff in the creation of a virtual community-support network’. Patients could communicate privately and the application helped some patients ‘voice personal concerns without the burdens of face-to-face or real-time conversation’.

A similar usage of VR with children was completed within a burn unit by Das et al. This nine-patient RCT studied a VR game used by children aged 5–18 years who were receiving treatment for burn injuries. Use of the game was shown to significantly lower average pain scores and decrease anxiety. This study supported findings that VR-based games can reduce physical pain ‘with minimal side effects and little impact on the physical hospital environment’.

VR technology was used by Dvorkin et al. during inpatient rehabilitation. The group used a three-dimensional haptic/graphic system in the rehabilitation of traumatic brain injury (TBI) patients. In this study, nine participants (six with TBI, three without) used this ‘VR and robotic optical operations machine’ to reach for a visual target. They found the VR-haptics intervention to be ‘effective, well-tolerated and highly motivating’.

**Generic health information delivery**

Several studies used video presentations to increase patient engagement during hospitalization. Mahler and Kulik conducted an RCT of video usage. Video recordings were shown to patients in preparation for their surgeries. Results of the trial found that patients who viewed the videos felt ‘significantly better prepared for the recovery period’ and had higher reported self-efficacy beliefs. They also had significantly shorter intensive care unit (ICU) stays and were released from the hospital more quickly than patients in the control group.

Stevens et al. used videotapes as part of an intervention to encourage patients who had given up smoking while in the hospital to continue to do so after they left. This RCT of over 1000 participants was conducted across two hospitals. Results showed that the intervention group had a 50% increase in smokers who did not relapse into previous smoking behavior.

Yin et al. developed an intervention to improve the confidence patients had in managing their hospital stays. Thirty-six participants walked through an interactive visual novel concerning helping a family member avoid a fatal heart attack. This study found a significant effect when using flow score as a composite covariate; the more engaged in the novel the participant became, the more confidence they gained.

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**Figure 1** Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) flow diagram of search strategy to identify articles.
### Table 1: Studies of inpatient patient engagement by category

<table>
<thead>
<tr>
<th>Category</th>
<th>Author</th>
<th>Brief description</th>
<th>Experimental type</th>
<th>Number of participants</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design reqs</td>
<td>Wilcox et al⁷⁶</td>
<td>Used interviews with patients and nurses in a cardiology step-down unit to determine common trends in medication information needs</td>
<td>Interviews</td>
<td>17</td>
<td>Semi-structured interviews found a desire to keep track of current medications and trends. Patients desired additional educational information about their medications in the hospital. Found common themes on information content valued</td>
</tr>
<tr>
<td>Design reqs</td>
<td>Skeels and Tan⁵⁰</td>
<td>Conducted interviews with patients and visitors to discover opportunities to improve the inpatient experience</td>
<td>Interviews</td>
<td>16 patients, 5 visitors (21 total)</td>
<td>Semi-structured interviews found opportunities for improved communication and awareness as well as provision of social connectedness and entertainment</td>
</tr>
<tr>
<td>Design reqs</td>
<td>Morris and Karlson⁷⁷</td>
<td>Discussion of hospital-specific requirements for delivery of information</td>
<td>Position paper</td>
<td>--</td>
<td>Discuss how hospital patients be treated as situationally-impaired computer users, currently receive much information verbally, have many changing care team members and could benefit from accessibility research</td>
</tr>
<tr>
<td>Entertainment</td>
<td>Bers et al⁷⁸</td>
<td>Explored usage of a computer-based application, Zora, in a pediatric hemodialysis unit in order to facilitate coping with chronic physical illnesses</td>
<td>Quasi-experimental</td>
<td>7 patients, 4 staff (11 total)</td>
<td>Results found that use of computational environments can provide an opportunity for pediatric patients and their caregivers to communicate and help with coping of chronic illnesses. Overall patient satisfaction was high (mean=5.3 out of 7, SD=1.3), enjoyment (5.7, 1.6), low harm (1.4, 1.1); staff had even more pleasing results: satisfaction (6.5, 0.5), safety (5.6, 1.4), harm (1.0, 0.0)</td>
</tr>
<tr>
<td>Entertainment</td>
<td>Das et al⁷⁹</td>
<td>Studied the use of VR games in reducing pain felt by children with burn injuries during burn management procedures</td>
<td>Randomized controlled trial</td>
<td>9</td>
<td>Using the Face Scale Pain Scores, found lower average pain scores (4.1 (SD: 2.9) to 1.3 (SD: 1.8)) when add VR to use of pharmacological analgesia. Nurse interviews had high satisfaction/appreciation</td>
</tr>
<tr>
<td>Entertainment</td>
<td>Dvorkin et al⁸⁰</td>
<td>Used a haptic/graphic paradigm to improve attention and concentration of traumatic brain injury patients</td>
<td>Quasi-experimental</td>
<td>9</td>
<td>Subjects tolerated technology and showed increased # targets (higher attention) on day 2 of using the intervention. Found it engaging and enjoyable</td>
</tr>
<tr>
<td>Generic info</td>
<td>Mahler and Kulik⁸¹</td>
<td>Evaluated use of three types of videotapes to assist in preparing patients for coronary artery bypass grafts</td>
<td>Randomized controlled trial</td>
<td>268</td>
<td>Using a survey, found that viewing any videotape resulted in feeling better prepared for recovery, higher self-efficacy for using spirometer and speeding recovery, higher use of spirometer, released more quickly (shorter LOS). Three video types seemed relatively equal in effectiveness</td>
</tr>
<tr>
<td>Generic info</td>
<td>Stevens et al⁸²</td>
<td>Multi-part inpatient intervention including counseling, videotapes, self-help materials and a phone call to encourage ex-smokers to continue to avoid use of tobacco</td>
<td>Randomized controlled trial</td>
<td>1119</td>
<td>Using surveys and taking saliva samples, found use of intervention increased ex-smokers by 50% (9.2% to 13.5%), testing done at 3- and 12-month intervals</td>
</tr>
<tr>
<td>Generic info</td>
<td>Yin et al⁸³</td>
<td>Prototyped the effects of using a visual novel game to improve hospital patients confidence in managing their own care</td>
<td>Quasi-experimental</td>
<td>36</td>
<td>Found significant impact on increase of self-efficacy (measure by modified Generalized Self-Efficacy Scale (10-item) when combined with Flow State as co-variante, p=0.004</td>
</tr>
<tr>
<td>Patient-specific</td>
<td>Bickmore et al⁸⁴</td>
<td>Testing of an animated, empathic virtual nurse who assists in educating and counseling patients at discharge</td>
<td>Quasi-experimental</td>
<td>30 (group 1)+19 (group 2)=49</td>
<td>Preliminary User Study: 92% of patients comfortable with receiving health information this way. Hospital User Study: Felt like virtual nurse cared about them, 74% preferred virtual nurse to their doctors/nurses. System was easy to use, high satisfaction, prefer to use; like authority of information</td>
</tr>
<tr>
<td>Patient-specific</td>
<td>Vardoulakis et al⁸⁴</td>
<td>Provided mobile phones with access to dynamic, interactive reporting to patients within the emergency department</td>
<td>Quasi-experimental</td>
<td>25</td>
<td>Using interviews, found improved patient awareness (more calm/less anxiety). Found few barriers to deployment. Useful for updating visitors about their current health status and care plans</td>
</tr>
<tr>
<td>Patient-specific</td>
<td>Vawdrey et al⁸⁵</td>
<td>Used tablet computers to allow patients within a cardiothoracic surgery step-down unit to access personal health record information</td>
<td>Quasi-experimental</td>
<td>5</td>
<td>Using interviews and a survey containing the Telemedicine Satisfaction and Usefulness Questionnaire (25-item), found improved satisfaction and engagement. Patients believed in the usefulness of application</td>
</tr>
<tr>
<td>Patient-specific</td>
<td>Dykes et al⁸⁶</td>
<td>Pilot testing of an electronic bedside communication center to facilitate access to health information</td>
<td>Quasi-experimental</td>
<td>11</td>
<td>In focus groups and interviews, patients expressed interest in using tool, liked tailored education content and access to information</td>
</tr>
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**Table 1 Continued**

<table>
<thead>
<tr>
<th>Category</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Patient-specific</td>
<td>Wilcox et al. [87]</td>
<td>Ward of Crit, study in an emergency department using large information displays</td>
<td>Quasi-experimental</td>
<td>18</td>
<td>Overall positive response to displays, high subjective satisfaction found through user interviews.</td>
</tr>
<tr>
<td>Communication</td>
<td>Vawdrey et al. [85]</td>
<td>Use of BabyCareLink, a secure collaborative environment to allow parents to access information concerning their infants in the NICU</td>
<td>Quasi-experimental</td>
<td>8</td>
<td>Usability testing showed the tool to be useful and easy to use.</td>
</tr>
<tr>
<td>Communication</td>
<td>Anthony et al. [84]</td>
<td>Offered collaborative rounds for families, members, and multimedia sources to allow parents greater access to information concerning their care.</td>
<td>Quasi-experimental</td>
<td>57</td>
<td>Patients valued the educational component, reported greater awareness of their care teams, and appreciated the system’s ability to maintain privacy. The study found the system helped in ‘improving awareness, promoting patient empowerment, and enhancing ownership of medical information in hospitals’.</td>
</tr>
<tr>
<td>Personalized decision support</td>
<td>Wayand et al. [86]</td>
<td>Testing of a personalized patient decision support tool for a NICU, VR, virtual reality.</td>
<td>Quasi-experimental</td>
<td>8</td>
<td>Patients also reported ‘the benefits of an in-room information display outweighed any privacy concerns’.</td>
</tr>
</tbody>
</table>

**Patient-specific information delivery**

In addition to simply providing the same information to all patients, several studies have focused on the provision of patient-specific information to increase patient engagement.

Bickmore et al. [83] developed an ‘animated, empathetic virtual nurse interface for educating and counseling hospital patients with inadequate health literacy’ at Boston Medical Center. This study of 49 patients found the system was easy to use, resulted in high levels of patient satisfaction, and most participants preferred receiving information from the virtual nurse over their actual doctor or nurse. They believed the system provided authoritative information and appreciated the time the virtual nurse spent with them. Some patients felt the system helped them become more involved in their care.

With the proliferation of mobile phones and tablet computers, new approaches of presenting health information and engaging patients in their healthcare are being introduced. Vardoulakis et al. [85] developed a mobile phone application that provided patients with ‘a dynamic, interactive report on their progress, care plan, and care team throughout their emergency department stay’. Patients found the information helped reduce anxiety and ‘regain some semblance of participation in their own care’. Patients valued the educational component, reported greater awareness of their care teams, and appreciated the system’s ability to maintain privacy. The study found the system helped in ‘improving awareness, promoting patient empowerment, and enhancing ownership of medical information in hospitals’.

Similar to the work of Vardoulakis et al., Vawdrey et al. [85] developed a patient-facing tablet computer application that linked their institution’s EHR and PHR systems. This application enabled five test patients to access information such as their care team profiles and hospital medication records. Through semi-structured interviews, patients reported that the application was useful as a memory aid, improved medication tracking ability, and fostered personal connections through care team member photographs. The tablet application was perceived to be a ‘useful tool for providing information and increasing patients’ engagement in their care’.

Dykes et al. [86] conducted another study that used a tablet device to provide patient-specific information. The authors led focus groups and used a participatory process to design an electronic bedside communication center. The tool allowed patients to access tailored patient information and educational content. Usability testing results showed high satisfaction and high perceived value.

A study by Wilcox et al. [87] assessed the usefulness of large in-room information displays in an emergency department. The displays included personalized information such as medications, vital signs, allergies, and care team details. Results of the 18-patient study showed a positive response, and patients found having the information calming. The displays facilitated information sharing and promoted discussion with care providers. Patients also reported ‘the benefits of an in-room information display outweighed any privacy concerns’.

**Enhancing communication**

In addition to more traditional technology, there is some research into current abilities to provide information and data access in new ways. Baby CareLink, described by Safran in 2003, was a web-based application used by 300 parents to remotely follow the hospital care of their premature infants. The system allowed parents to see ‘daily reports, doctor’s notes,
and a baby growth chart’ as well as research materials, messages from the night shift care team, and photographs. Safran reported a 75% reduction in quality-of-care problems, illustrating the potential this type of collaborative tool offers in keeping families informed and involved.

In addition to its application in neonatal care, video conferencing was utilized to allow patients to communicate with family members and clinicians who are geographically distant. A project at Lehigh Valley Hospital used IT to allow patients’ family members to join on rounds in the ICU and facilitate ‘virtual meetings between family members and an off-site intensivist during nonprime hours’. Such family meetings involved multimedia sources to review patient conditions, results, and plans of care including digital radiology films and trends from vital sign readings. A survey conducted with 57 staff members found the majority of the people who utilized the system believed it improved patient safety and staff response times.

**Personalized decision support**

In addition to improving the provision of information within healthcare, there are efforts to help patients and parents of patients make tough, personalized decisions. Weyand et al. designed a computerized decision support tool for parents with children in a neonatal ICU (NICU). The tool assisted parents in making informed decisions, allowed for greater communication with the physicians, and provided information on ethically challenging situations. Initial studies, of eight parents, showed this tool offered potential benefits to both future parents and physicians working in the NICU.

**DISCUSSION**

The results of this review suggest that research on patient engagement within the inpatient setting is still in its infancy. From the studies found, we have developed a preliminary model to describe potential types of engagement methods. These studies overall represent positive findings and outline viable metrics to be utilized in measuring patient engagement. They also help to describe important design considerations and challenges unique to the inpatient setting. The results also show the lack of a standard terminology in regard to engagement which suggests the potential benefit of the development of such a standard. As patient engagement is of growing importance in the current healthcare system, future work, including a focus on conducting large statistically powered RCTs, is recommended.

Advances in technology have enabled new methods for patient engagement. The spread of electronic medical record systems within care organizations, and the proliferation of mobile technology, provides the capability to employ technology to increase engagement. Figure 2 presents a model for classifying the various methods. We have chosen a pyramid structure to represent the perceived quantity of interventions at each level of engagement. The entertainment category encompasses basic technologies such as television and internet access (which we did not find in the literature), as well as entertainment options for medical purposes (eg, pain management through distraction). Generic health information refers to the provision of health-related content to patients, including tailored information for a particular diagnosis or treatment. Patient-specific information implies unique content delivered to each individual, such as laboratory test results or medication administration records. Advanced communication technology facilitates communication between patients and care team members. Personalized decision support aids patients and families in making decisions about treatment options. We theorize that as the complexity of interventions increases, expected usage by patients decreases.

The majority of studies found in this review followed quasi-experimental designs using interviews and surveys to measure the success of each intervention; only 3 of the 17 results employed a randomized design. This suggests that the quality of the evidence base for this domain is underdeveloped and could benefit from further, more rigorous analysis. Results of all three RCTs had positive results, indicating the potential of future work. Success was most often defined as increased user satisfaction. Various metrics were employed to measure satisfaction, including the Critical Care Family Satisfaction Survey and the Telemedicine Satisfaction and Usefulness Questionnaire.

Overall, studies found positive impact through use of engagement technologies, with some demonstrating lower average pain scores, increased self-efficacy and engagement. Various measures of self-efficacy were used, including a modified Generalized Self-Efficacy Scale, and a self-efficacy scale based on the work of Conditte and Lichtenstein and Sallis et al. Only two studies measured clinical outcomes: one evaluated smoking cessation, and the other measured length of hospital stay. Future work should focus on use of RCTs to further evaluate effects of engagement technologies on patient outcomes.

The studies identified in this systematic review provide valuable lessons for designers and implementers of technology. Notably, engagement within the inpatient setting presents challenges that are less salient in the outpatient world. For example, if electronic devices are provided to patients, there are issues regarding infection control, data security and privacy, physical management of the devices (eg, who distributes and collects them), and ergonomic issues. It can also be challenging to provide the same information within the inpatient setting to the patient once he/she has left the hospital. Such issues have yet to be fully addressed, and future research is warranted to ensure patient engagement in the inpatient setting is optimized and tailored to each patient’s specific needs.

To gain more insight into inpatient engagement needs, research and lessons learned from outpatient projects like Project HealthDesign can be utilized. Project HealthDesign is a multi-site project that employs user-centered design processes to create computer-based applications to support health across patient types. The project focused on using PHRs as ‘platforms for action’ and encouraged patient self-management of their health. A trend to consider in designing new engagement interventions is the spread of patient-owned mobile devices. Future interventions could potentially leverage the increased...
availability of devices and design applications which run on multiple platforms (ie, tablet computers and mobile phones of varying operating systems). Utilization of a web-interface over a custom-built platform-specific application could provide for more seamless access to information in transitioning from the inpatient to the outpatient realm. One obstacle in researching patient engagement is the relative lack of standard terminology and measurement techniques. There is no specific MeSH term for patient engagement. Terms such as ‘patient participation’, ‘patient satisfaction’, and ‘self-efficacy’ are often used without consistency.94 In addition to the various engagement measures mentioned above, a well-known instrument for measuring patient engagement is the Patient Activation Measure (PAM) developed by Hibbard et al.95 96 The PAM is a 22-item questionnaire that measures activation of the patient in managing his/her health.97 Future research would benefit from the development of an ontological framework for describing and measuring patient engagement to provide a common vocabulary for research in this area.

Limitations of this review include the potential exclusion of relevant articles due to incomplete search terms. As noted above, there is a lack of standard terminology surrounding the subject of patient engagement and no consistently utilized MeSH terms. Additionally, only English language studies were reviewed. As with all literature reviews, the result set may be influenced by publication bias.98 No formal ‘grey literature’ searches were conducted, but conference proceedings and papers found within the search databases were included.

Inpatient patient engagement and satisfaction are of growing importance to hospitals as patient satisfaction scores will soon affect reimbursement rates. Starting in fiscal year 2013, the Patient Protection and Affordable Care Act put into place a value-based purchasing plan that determines hospital performance and pay, based in part on Consumer Assessment of Healthcare Providers and Systems (HCAHPS) scores.99 HCAHPS includes satisfaction measures across eight domains including items such as communication with nurses, pain management, and new medicines being explained. HCAHPS publicly reports patients’ perspectives of hospital care. Thus, further research analyzing the efficacy and usefulness of inpatient engagement is important. With the spread of EHRs and emergence of PHRs, healthcare institutions are positioned well to provide patients with access to their personal health information.

CONCLUSION

The results of this review demonstrate that knowledge gaps exist regarding patient engagement in the inpatient setting. Much work remains to be done in this area. As Henwood et al13 noted, ‘the informed patient will not emerge naturally or easily within existing structures and relationships’. Future studies should focus on identifying optimal methods for engaging patients and rigorously examining the impact of these methods on the healthcare delivery process. Specifically, there is a clear need for both methodological and practical research on inpatient engagement that addresses health outcomes and cost-effectiveness.

Competing interests None.
Provenance and peer review Not commissioned; externally peer reviewed.

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11. Hibbard JH, Greene J, Overtont V. Patients with lower activation associated with higher costs; delivery systems should know their patients’ ‘scores’. Health Aff 2013;32:216–22.


