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Promoting Pediatric Healthcare through Persuasive Information Systems: A Qualitative Study

Completed Research Paper

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Abstract

This paper presents qualitative findings from a Randomized Controlled Trial that focused on applying a Persuasive Information System to promote Pediatric Healthcare following the guidelines of Integrated Management of Childhood Illnesses. The study was primarily designed to introduce Persuasive Information Systems for promoting pediatric healthcare in a relatively under-developed country. The study investigates potential impact of simple text-based reminders on improving parents' knowledge and skills when dealing with a sick child at home before deciding to seek healthcare professionals. Reminders were selected for this study, as they are most commonly employed persuasive software features in the area of Persuasive Information Systems. For data collection, we conducted Focus Group Discussions with participants of both intervention groups. The qualitative findings indicate that the participants largely favored reminders although there were some skeptical remarks. The findings from presented study are expected to help system designers work in collaboration with parents and healthcare professionals to improve the content and delivery of reminders. The qualitative findings helped us identify five emerging themes that are expected to open research opportunities for improving child healthcare researchers.

Keywords: Pediatric Healthcare; Integrated Management of Childhood Illness, Persuasive Information Systems, Reminders; Focus Group Discussions.

Introduction

Persuasive Information Systems

There is a growing interest in the area of Persuasive Information Systems. These systems are designed with an aim to help improve people improve their actions and lifestyles, for example, health-related behaviors, better eating habits, exercising, mental health (Langrial et al. 2014), and general wellbeing (Ramachandran et al. 2010). Persuasive Information Systems are somewhat understudied research area in low- and middle- income countries. Majority of the work on these systems has been done in developed countries such as the USA, the UK, Australia and the EU. Introducing the research domain of Persuasive Information Systems could benefit general population in low- and middle- income countries to a great extent however; it would take a series of research efforts to make the target population aware of the notion of persuasion through technology (see Fogg, 2002) and their potential benefits. While many of the Persuasive Information Systems focus on task adherence and, system designers anticipate positive outcomes generally using logical arguments, we propose that simple persuasive strategies are the starting point to influence target population and motivate them to incrementally modify and change their behaviors. This study aims to explore potential impact of reminders on motivating parents to look after their children (under the age of 5 years specifically) in the Sultanate of Oman. Before designing the research protocol, we performed a situation analysis in the country and found out the despite being a relatively rich and developing country, childhood illness remains an area of major concern.

Childhood Illness in Low- and Middle- Income Countries

Childhood illness continues to pose an ongoing challenge for healthcare professionals especially in low- and middle- income countries and consequently add significantly to the global disease burden (Mushi et al. 2010). A majority of the sick children are not properly assessed; and counseling for parents is almost neglected (WHO, 2001). Although poor healthcare facilities and high treatment costs are among the major reasons for substandard child healthcare, however the implication of parents' knowledge and skills related with child healthcare cannot be overlooked (Cooley & Sagerman, 2011). Recent advances and worldwide acceptance of Persuasive Information Systems as an effective tool has created opportunities to automate various areas of pediatric and general healthcare (DeRenzi et al. 2008). Yet, it is surprising to observe that there is a seemingly lack of literature that focuses on investigating potential impact of such technologies on improving child healthcare in a holistic way. The urgency of the matter can be noticed from various published research articles where high mortality rates are repeatedly underscored (Blencowe et al. 2012; Boschi-Pinto et al. 2008; Boschi-Pinto et al. 2009; Waddington et al. 2009; Cleland et al. 2012). Designing and delivering effective interventions that can potentially improve parents' knowledge and skills to give immediate preliminary healthcare to children evidently calls for innovative solutions.

Integrated Management of Childhood Illness (IMCI)

To overcome the persistent challenge of substandard child healthcare, the World Health Organization (WHO) introduced the Integrated Management of Childhood Illness (IMCI) initiative (Gove, 1997). IMCI aims to reduce childhood mortality and morbidity rates through timely and appropriate case management of common childhood illnesses. It focuses on the importance of an integrated pediatric education and training. IMCI- training is commonly delivered through multidisciplinary groups under the umbrella of Primary Health Care (PHC) (Shouly, 2011). Such as nursing, immunization, pharmacy, quality control, dietitians, health educators, community support groups and General Practitioners (GPs). Several activities of the groups are combined and interrelated to the extent that it is virtually impossible to assign a separate role for each group. Among the other components of the IMCI initiative, the community component has been identified as the key for immediate response to childhood illness in home setting (Thompson et al. 2009). We argue that investing in improving child healthcare knowledge among families and immediate caregivers would allow them to play an active role improving child healthcare. For further improving child healthcare, the WHO promotes implementing IMCI- training that can enhance the knowledge and skills of parents and immediate caregivers (Al-Araimi & Langrial, 2016). It is expected that such a strategy would help set up learning priorities and building up of a holistic approach for assessing community pediatric health problems. To investigate the impact of relatively simple text-based intervention, we developed and examined presented work. The text messages were delivered automatically to the participants' mobile phones. The content was derived and designed based on the guidelines provided by the WHO. We anticipated that the text-based reminders would improve parents' knowledge and skills when dealing with sick children in home setting. Further, we expected that a simple intervention using the fundamental principles of Persuasive Information Systems would enhance adherence because simple and incremental strategies are known for being effective (Fogg, 2009).

Previous Work

There has been substantial work in this area that has helped in bringing up child healthcare standards (Kiplagat et al. 2014). In a study it was observed that health care students who received community- based education, made noticeable improvements in IMCI- community practice (Patwari & Raina, 2002). IMCI has been implemented and evaluated in a number of countries including Brazil, Peru, Bangladesh, Uganda and Tanzania under the assessment approach known as Multi-Country Evaluation (MCE). It has been observed that the initiative has helped reduce child mortality rate. In addition, it improved general quality of healthcare. As a consequence, IMCI has been implemented to some degree in more than a 100 countries (Mushi et al. 2010). Notwithstanding the wide adoption of IMCI- strategy, it is surprising to observe that childhood mortality and morbidity rates have not dropped considerably. While conducting the literature review, we came across a high number of published articles that highlight the persistent problem of childhood illness and high mortality rates (Geldsetzer et al. 2014). These recent findings underline the prevalence of childhood illnesses despite the introduction and adoption of IMCI- initiative for more than a decade. Several reasons could be associated with this finding, for example, lack of interest from policy makers, resistance from experienced medical professionals or perhaps lower impact of IMCI-

teaching approach on case assessment and management skills of healthcare professionals. While all the said hypothetical influences could stand true, this study examines the potential impact of text-based reminders on knowledge and skills of parents in dealing with sick children at home prior to reaching healthcare units. More specifically, we aimed to explore the impact of the reminders in helping parents and immediate caregivers develop behaviors of continuously paying attention to the well being of their children.

Persuasive Technologies

Fogg (2002) introduced the research field of Persuasive Technology. Generally speaking, persuasive technologies are designed to bring a positive change in people's behaviors. Building upon Fogg's seminal work (Fogg, 2002), Oinas-Kukkonen and Harjumaa (2009) redefined the research area by adding that persuasive information systems help people change their behaviors without the use of coercion or deception. Further, use of a persuasive information system has to be on a voluntary basis (Karppinen & Oinas-Kukkonen, 2013). Persuasive Information Systems are well-studied research area that can lead to the development of much-needed eHealth interventions (Langrial et al. 2014). Oh et al. (2005) define eHealth as delivering of healthcare solutions using technological platforms such as information systems. The potential advantages of eHealth interventions have been highlighted in terms of reach, ease of access, accessibility, cost effectiveness, and novel sustainable solutions (Murray, 2012). Ritterband and Tate (2009) further endorse eHealth interventions for healthcare by highlighting Web-based healthcare interventions as scalable and efficient. HCI researchers have stressed on designing eHealth interventions that can bring desired change in users' behaviors. Identifying the scope of persuasive information systems and eHealth interventions, Choe et al. (2011) propose that technological innovations could be used to improve general wellbeing. While Choe et al. (2011) offer an appealing framework for developing eHealth interventions; we suggest that their framework does not provide explicit guidelines. Consolvo et al. (2009) emphasize on utilizing behavior change theories when designing eHealth interventions. Their design strategies are valuable however to the best of our knowledge evaluating the effect of definite persuasive software features has been fairly disregarded.

Persuasive Systems Design Model

Building on Fogg's (2002) seminal work, Oinas-Kukkonen and Harjumaa (2009) proposed a theoretical framework otherwise known as the Persuasive Systems Design model (PSD model). The model is about methodically designing and evaluating persuasive information systems, in this case eHealth interventions. Usually, a persuasive information system would remind users to perform target behaviors when they are engaged in the interaction. The PSD model provides a range of persuasive software features and functionalities for developing persuasive information systems. The four distinct categories outlined by the PSD model are Primary Task, User-system Dialogue, Credibility and Social Support software features. Researchers have examined the PSD model in different contexts, for example, Lehto and Oinas-Kukkonen (2011), Räsänen et al. (2010), Stibe et al. (2013), Drozd et al. (2012) and Kuonanoja et al. (2015). The PSD model has also been applied in the area of ubiquitous applications that are developed for general

wellbeing (Langrial et al. 2012), personal wearable devices for physical training (Harjumaa et al. 2009), and information systems that promote healthy behavior (Purpura et al. 2011). The model does not promote assimilation of all the proposed software features to develop an effective intervention meaning thereby the persuasiveness of a given eHealth intervention for behavior change is by no means guaranteed in terms of the quantity of incorporated persuasive software features. The concept of using computer-mediated reminders is not new (Langrial, 2012; Pop-Eleches et al. 2011; Hasvold & Wooton, 2011; Walji & Shang, 2008). There is evidently a lack of literature about health information systems reporting the impact of interventions using persuasive techniques aimed at improving child healthcare (Webb et al. 2010; DeRenzi et al. 2011). On the contrary, there is a rich body of literature that reports studies and investigations pertaining to the impact of persuasive information systems for promoting healthy behaviors in general (Chatterjee & Price, 2009; Blanson et al. 2009; Kumar et al. 2013). However, it is an unexpected observation to note that persuasive information systems have been under-utilized in the area of pediatric healthcare. Reminders can improve eHealth interventions to facilitate task completion (Langrial et al. 2014; Oinas-Kukkonen & Harjumaa, 2009). Reminders else known as prompts can be of varying designs for instance, they could be combined as subtle messages (Neff & Fry, 2009) and can be delivered through different media with varying frequencies. Reminders have regularly been used in persuasive information systems for improving general and mental health. Different techniques have been examined to advance the efficiency of reminders, for example, with personalized content.

Identifying this gap, we conducted this study using a fairly simple software feature that was drawn from the Persuasive Systems Design model (Oinas-Kukkonen & Harjumaa, 2009) i.e. text-based reminder with an aim to improve parents' knowledge and skills in giving immediate healthcare support to a sick child before reaching a medical professional. For developing the content of the reminders, we utilized the IMCI protocol (WHO, 2005) and focused solely on the use of text-based approach as a convenient and cost effective method to reach target audience. Reminders were chosen as it is acknowledged that they can prompt users to initiate a desired action (Mathews et al. 2016; Coomes et al. 2012; Langrial et al. 2014). Reminders have been extensively studied previously in terms of content, design, and frequency of delivery (Neff & Fry, 2009). We also opted to conduct post-study focus groups with the participants keeping in mind the following focal hypothesis:

Text-based reminders can improve parents' knowledge and behaviors towards child healthcare in a desired way as recommended by the IMCI guidelines.

Procedures

Recruitment

The study was conducted from July 2016 to November 2016. Recruitment pamphlets were distributed among households, hospitals and local educational institutions in Sur, Sultanate of Oman. The recruitment pamphlets explained that we were seeking voluntary participants (parents with children under 5 years of age). In response, we received 165 telephone calls however, after the initial screening, 35 respondents were excluded from the study, as they were medical professionals.

Ethical Approval

Respecting the professional and upright code of conduct, we obtained ethical approval from the Ministry of Health, Sultanate of Oman. The ethical approval application included aim of the study, detailed information for the potential participants, the research plan, informed consent and a report about the ethical aspects of the research. The study had no physical or psychological implications on the participants. Informed consent was received prior to the commencement of the study. Participants were also advised that they were under no obligation to complete the study and that they could withdraw at anytime. The actual sample size comprised of 130 participants.

Randomization

Using the tool (<https://www.random.org/lists>), randomization was performed on the 10th of July. Participants were randomized into two groups: (1) an intervention group 1 (n=65) that received bi-weekly automated text-based reminders that drew their content from the IMCI- guidelines, and (2) an intervention group 2 (n=65) that served as a waiting list group that received bi-weekly reminders with general content explaining the significance of child healthcare. The intervention for group 1 commenced on the 18th of July 2016 and concluded on 18th of September 2016. The intervention for group 2 commenced on the 25th of September and concluded on the 25th of November 2016.

The Intervention

Data Collection

Upon completion of the study, participants from both the Intervention and the Wait-list (control) Group were invited to attend and participate in focus group discussions. The first author acted as the mediator of the focus groups. The focus groups were arranged to gather participants' opinions and insights about the intervention with a special focus on the impact of reminders on their behaviors towards child healthcare. The main purpose of arranging the focus group discussions was to collect qualitative data that could be used to highlight whether the intervention was perceived useful and to what extent (if applicable), reminders helped participants adhering with the IMCI- recommended practices, whether they felt that there was an actual change in their behaviors towards child healthcare and if indeed the intervention improved their knowledge and attitudes towards child healthcare. In response to the invitation to attend the focus group discussions, a total of thirty-seven (n=37) participants

agreed to participate. As a result, three focus group discussions were organized and conducted on the 5th, 6th and 7th of December 2016. Each focus group lasted for approximately 90 minutes. The moderator welcomed the participants and initiated the conversation about the importance of child healthcare. This was followed by a subtle question about the participants' opinion about the intervention and their comments about the reminders. The contents of the text-based reminders for Intervention Group I, and Intervention Group II (control) were developed using the IMCI protocol. The second author who is an IMCI expert developed short yet easily understandable content. Table 1 and 2 present a brief overview of the key practices as recommended by the World Health Organization and samples of the reminders (Intervention Group I) and Intervention Group II (control) respectively. The content of the reminders for Intervention Group II (control) was over-simplified and more general in nature to identify whether the content of the messages had an influence on the participants.

IMCI Recommended Practices	Brief Description	Example of the reminder
Breastfeed	<i>Breastfeed the infant for at least four months. HIV-infected mothers should consult healthcare professionals.</i>	“Breast milk is the perfect food for your new born baby. This is a polite reminder that your baby deserves the best food, i.e. breast milk ☺”.
Complementary foods	<i>Feed the child with freshly prepared energy and nutrient – rich complementary food.</i>	“Remember to feed your child with fresh and energy rich complementary food at regular intervals.”
Mental development	<i>Respond to the child’s needs, for example, by talking and playing.</i>	“Your child’s mental development is important. Spare adequate time to play and interact with him/her.”
Immunization	<i>Ensure to complete the full course of immunization before their first birthday.</i>	“When was the last time that you had your child vaccinated? Why don’t you go through the medical card and mark the upcoming vaccination date?”
Hygiene practices	<i>Dispose of children’s faeces, wash hands regularly especially before and after preparing the meals.</i>	“Please remember to wash your hands before and after feeding your child. This will keep both you and your child from illnesses ☺.”
Endemic areas	<i>Protect the child from malaria-endemic areas.</i>	“Dear parents, just a quick reminder! Keep the house clean, ensure that there is no stagnant water and use mosquito net for your child.”
Use of fluids	<i>Give the child more fluids including breast milk even when they are sick.</i>	“Dear mother, even when your child is sick, please do not stop breast feeding. Continue breastfeeding and seek professional advice from the nearest healthcare facility.”
Home treatment practice	<i>Provide appropriate home treatment.</i>	“Dear parents, your baby’s health care begins from home. Look after your child at home. Give him/her attention, play / talk with him/her, keep the baby clean ☺.”

Prevention from injuries	<i>Take appropriate actions to prevent the child from injuries.</i>	<i>“Dear parents, did you check out the surroundings of your baby today? It is always a good idea to keep an eye on your baby as well as the surroundings. Please remember, prevention is better than cure ☺.”</i>
Child abuse	<i>Prevent the child from abuse and neglect.</i>	<i>“Dear parents, your baby is growing everyday and needs more and more attention. Please ensure that s/he receives appropriate attention. Why not play with the baby for some time ☺.”</i>
Parental participation	<i>Ensure that men actively participate in childcare.</i>	<i>“Dear dad, you are equally responsible for your baby’s care. At times, mothers get exhausted. Perhaps, it is your turn to participate and share the burden of parental care ☺.”</i>
Illness recognition	<i>Recognize the signs of illness and seek immediate professional help.</i>	<i>“Dear parents if you notice anything unusual, for example, loose stools, give your child Oral Dehydration Solution (ORS) but seek medical advice without any delays. God bless your child.”</i>
Health professional’s advice	<i>Follow the healthcare professional’s advice do not forget follow-ups.</i>	<i>“Dear parents, always remember to listen to the doctor’s advice. Did you follow-up the last visit to the doctor? It is highly recommended that you make a follow-up visit to the doctor.”</i>

Table 1. IMCI- recommended Practices that were incorporated in the text-based reminders for Intervention Group I.

IMCI Recommended Practices	Brief Description	Example of the reminder
Breastfeed	<i>Breastfeed the infant for at least four months. HIV-infected mothers should consult healthcare professionals.</i>	<i>“Dear mother, just to remind you that there is no substitute for breast milk.”</i>
Complementary foods	<i>Feed the child with freshly prepared energy and nutrient – rich complementary food.</i>	<i>“Dear parents, always think of feeding your child with supplementary diet.”</i>
Mental development	<i>Respond to the child’s needs, for example, by talking and playing.</i>	<i>“Dear parents, it is a good idea to interact and play with your child.”</i>
Immunization	<i>Ensure to complete the full course of immunization before their first birthday.</i>	<i>“Dear parents, did you miss out on any vaccination/s for your child? Please look through the medical card.”</i>
Hygiene practices	<i>Dispose of children’s faeces, wash hands regularly especially before and after preparing the meals.</i>	<i>“Please remember to keep your hands clean when feeding your child.”</i>

Endemic areas	<i>Protect the child from malaria-endemic areas.</i>	<i>“Dear parents, try to protect your child from mosquito bites.”</i>
Use of fluids	<i>Give the child more fluids including breast milk even when they are sick.</i>	<i>“Dear mother, fluids are necessary for your child’s health. Make sure you give your child enough fluids.”</i>
Home treatment practice	<i>Provide appropriate home treatment.</i>	<i>“Dear parents, look after your child at home. They need your attention☺.”</i>
Prevention from injuries	<i>Take appropriate actions to prevent the child from injuries.</i>	<i>“Dear parents, did you check out the surroundings of your baby today? Try to protect your child from any injuries.”</i>
Child abuse	<i>Prevent the child from abuse and neglect.</i>	<i>“Dear parents, please remember that your child needs to be protected from abuse!”</i>
Parental participation	<i>Ensure that men actively participate in childcare.</i>	<i>“Dear dad, just a polite reminder that you are equally responsible for the welfare of your child.”</i>
Illness recognition	<i>Recognize the signs of illness and seek immediate professional help.</i>	<i>“Dear parents please consult a doctor when you feel that your child is sick!”</i>
Health professional’s advice	<i>Follow the healthcare professional’s advice do not forget follow-ups.</i>	<i>“Dear parents, doctors are experts in healthcare. Always listen to their advice.”</i>

Table 2. IMCI- recommended Practices and text-based reminders for Intervention Group II.

Results

We hypothesized that the impact of text-based reminders on parents would be such that they will become more knowledgeable in dealing with sick children at home before reaching a medical healthcare professional. In addition, reminders will help parents develop and sustain proactive behaviors towards wellbeing of their children. In this paper, qualitative results from both Intervention Groups are reported. It is interesting to note that comments indicate similar responses. This could be for the fact that parents have a natural tendency to look after their child and even a generic message was as effective as a slightly modified one. Generally, a high majority of the participants appreciated the simplicity yet informative nature of the text-based reminders and stated that they felt more confident when dealing with their children at home by focusing more on preventive measures, which indeed is a highly desirable finding. Generally, participants from Intervention Group I seemed to approve the text-based reminders and the implicit element of persuasion. Below are some of the exemplary positive comments:

“ The text messages highlighted the importance of breastfeeding. I cannot imagine feeding my baby with formula milk.” (Mother, Age 23, Intervention Group I)

“ It is easy to forget how important is cleaning (hygiene). The messages (reminders) helped me adopt the function (practice) of washing my hands regularly.” (Mother, Age 25, Intervention Group I)

“ I am very busy (occupied) with my studies and household jobs (chores). Thanks you for reminding me that my child’s vaccination was due.” (Mother, Age 21, Intervention Group II)

“ I liked (approved) the text messages (reminders). Even my husband started looking after our child.” (Mother, Age 27, Intervention Group II)

“ I have started taking care (making sure) that my baby’s surroundings are clean all the time.” (Mother, Age 24, Intervention Group I)

“ I have four kids and it is easy to forget (overlook things). The messages (reminders) helped me recall the important dates for my baby’s (child’s) immunization.” (Mother, Age 22, Intervention Group I)

“ I never thought that I would ever ignore (overlook) my baby. But then, I am a human. The messages (reminders) were very useful. ” (Mother, Age 24, Intervention Group II)

“ I have formed an habit (behavior) of keeping my self clean and I make sure that all the adults in the house make an effort to keep things neat (clean).” (Mother, Age 28, Intervention Group II)

Some of the participants were more skeptical and yet constructive remarks. Below are some of the exemplary comments:

“I appreciate the messages (reminders). Perhaps, it was a good idea to send out emails too. I am a working woman and I keep an eye on my emails (regularly).” (Mother, Age 27, Intervention Group II)

“Did you consider the time for sending the messages (reminders)? I would have preferred to receive those (reminders) in the morning because I check my phone mostly at the start of the day.” (Mother, Age 25, Intervention Group II)

“I like the messages. They are informative for sure. But why can I not interact with the sender? I believe there should be a platform for interaction. For example, what if I have missed my child’s vaccination?” (Mother, Age 23, Intervention Group I)

Based on the remarks and comments, we propose that researchers in the area of pediatric healthcare should use persuasive information systems especially the basic software features such as reminders. While designing the reminders, it must be kept in mind that parents are generally very busy with their daily lives especially mothers are occupied with their children and household chores. It is therefore easy for them to overlook important matters. Use of reminders can make a difference. Reminders do not have to be complex. Simple and easy to read text messages can serve the purpose. Based on the qualitative findings, the following five themes were identified that are proposed for researchers in the area of child healthcare.

- 1) ***Provision of timely and positive feedback:*** Users of a given intervention expect immediate feedback. Provision of real time or immediate feedback leads to improved interaction between users and information systems. Generally, positive feedback helps improve the learning process too (Mitrivic et al. 2013). Schubart and colleagues (2011) also support the use of immediate and positive feedback. Hence, we suggest that reminders and feedback should be carefully designed and delivered for optimal results.
- 2) ***Using Text-based and Email-based Reminders:*** It is well known that email-based reminders have the capability to supplement text-based (SMS) reminder. Carefully planned and delivered SMS-based reminders have been identified as a key to successful interventions (Pop-Eleches et al. 2011). It is argued that GSM/Cell phones are more like everyday “partners” and make it much easy for the reminders to be successfully sent out to the users. The use of text-based reminders becomes even more important for users who do not check their emails in a regular basis (Langrial & Lappalainen, 2016)
- 3) ***Reminding people of their priorities:*** An intervention is more likely to be successful when the users are reminded about what they value the most, for instance, in the presented work, it is the children. People have a natural tendency to pay attention to what they value the most and reflect upon their core values (Ploderer et al. 2014). In addition, we argue that the content of a given intervention should be designed and crafted in a manner that there is no cognitive burden on the users to identify what is really important for them. In other words, when users know what is important for them, they are more likely to take appropriate and desired actions (Kuonanoja et al. 2015).
- 4) ***Designing simple yet engaging reminders:*** Literature reveals that researchers are making extra efforts to come up with novel yet perhaps complicated interventions. Reminders are a fundamental software features. We are arguing that at times, simplistic approach is the best way forward. A wide number of studies as well as literature reviews (Zurovac et al. 2011; Shojania et al. 2010) support our argument. During the focus groups, it was observed that the participants appreciated simple and to-the-point reminders. Based on the comments and the published material, we strongly argue that simple reminders are as good as complex ones.

5) ***Sending reminders in a logical order:*** Interventions that deal with healthcare especially child health should be developed and designed in a way that the users (parents/caregivers) have an engaging and informative experience. In other words, the content of the intervention (reminders in this case) should be simple, informative and meaningful. The reminders that are sent out should be planned in a logical and incremental manner. This would help system designers involve the users leading to desired user engagement because user engagement largely depends on cognition and logical arguments (Langrial & Lappalainen, 2016).

Discussion

The purpose of the study was to investigate the potential impact of simple text-based reminders on parents' knowledge in dealing with sick children. Participants' comments and feedback gathered through focus groups reflect the usefulness and effectiveness of reminders. Almost all the participants gave positive and encouraging comments regarding the usefulness of the reminders and claimed that they have higher confidence when dealing with their children, preventing them from illnesses, injuries and accidents. These findings, although fairly expected, indicate the significance of reminders as an essential feature of any persuasive information system. The findings also indicate that a relatively simple intervention is enough for helping people form a habit or behavior. However, it must be noted that the participants were receiving reminders that were related with their children's health. Perhaps this was the reason that the reminders received such a high level of approval and acceptance. Presented work has several contributions for researchers in the area of persuasive technologies and health informatics. First, to the best of our knowledge, there is no other study that has examined the impact of reminders (persuasive information systems) on improving pediatric health in low- and middle-income countries. Second, the findings indicate that reminders are more convincing when they are in alignment with what users value most, for example, in this case, children. Presented work has its limitations too. There was a marginal difference in the content of the messages for both the intervention groups. However, we are now in the planning phase to develop another intervention protocol. We plan to consider the identified themes. Our first step towards this direction would be to investigate whether there are different outcomes when text-based and email-based reminders are sent separately to different intervention groups.

Conclusions

We have presented qualitative findings of a relatively simple text-based intervention (reminders) incorporated with the key recommended practices from IMCI, World Health Organization. Upon completion of the intervention, we investigated participants' experiences especially in terms of learning (if any) new knowledge or forming new behaviors. We also made an effort to evaluate the overall usefulness and practical impact of text-based reminders on improved knowledge of parents in terms of treating sick children in home settings. Surprisingly, a high majority of the participants approved the intervention and gave positive feedback. Based on the qualitative findings, we argue that reminders remain a fundamental software feature for persuasive information systems. Further, we propose that it is not necessary that over-complicated interventions are a key to the formation of behaviors. Quite on the

contrary, this study shows that simple techniques with meaning content can have equal if not more impact on improving healthy habits, habit formation and /or enhancing knowledge.

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