Benefits and Barriers of Pediatric Healthcare Providers toward Using Social Media in Asthma Care

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ABSTRACT

Background: *Adolescents with asthma are the least compliant age group for asthma management.* ***Purpose:*** *The purpose of this study was to explore attitudes, beliefs and perceptions of two pediatric physician groups towards using social media technology (SMT) to improve asthma management in adolescents.* ***Methods:*** *We employed in-depth interviews and a focus group to understand pediatric attending physicians' and residents' perspectives of SMT use in asthma management. We analyzed data using the constant comparative method.* ***Results:*** *Physicians acknowledge the importance of health education for asthma management and the potential for SMT. Identified benefits include enhanced understanding of how adolescents perceive asthma, improved patient-provider relationships, the availability of an interactive venue and an additional way to provide accurate information to asthmatic teens. The barriers consisted of time constraints during office hours, personal commitments, work schedules, lack of comfort with the technology and perceived liability issues.* ***Discussion:*** *SMT is considered a valuable tool to reach this target population. The barriers of using SMT need to be overcome for voluntary adoption to occur.* ***Translation to Health Education Practice:*** *SMTs may provide a dynamic platform for both health education and allow physicians to better understand the needs and wants of adolescents with chronic diseases.*

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BACKGROUND

As the 21st century unfolds, information technology is predicted to influence the methods by which patients receive health education –"Information technology will be used to change the way care is delivered from an approach centered on the physician visit to one in which tools such as email and Internet-based health information provide continuous communication and information flow between clinicians and patients."[1(p570)] Information from the Pew Internet and American Life Project reports that nearly 75% of U.S. adults are regular Internet users, and of these, 80% participate in groups.[2]

Use of these technologies is prolific in the U.S., with adolescents representing the most

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avid users of the Internet. Two-thirds of teen Internet users go online daily and often participate in social network websites. The percentage of adolescents who are online consumers and who use social network websites has been climbing since 2008, reaching 73% in the last year.[2]

One-third of online teens search the Internet for health, physical fitness and dieting information. Older teens (14-17 years of age) are more likely to search for online health information, including sensitive topics such as drugs, depression, and sexual health that are sometimes difficult to discuss.[2] The clear growth in the use of social media technology (SMT) emboldens the resolve to develop disease management tools that incorporate these technologies. SMT encompasses an array of innovations that move non-interactive and individual Internet use toward what is currently defined as "Web 2.0," or technology features with the capacity for dynamic interaction among users, including social networking sites.[3]

The Internet provides a medium for patients and healthcare providers to communicate, and has been suggested as a tool to monitor and manage chronic diseases. Some research indicates that patients desire a highly interactive web-based plan that is directly linked with their physician's office for real-time treatment.[4] In fact, the use of social media in the health care field has been indisputably growing during the last decade. SMT currently occupies special functionalities in chronic disease management.[5-6] International researchers have noted the benefits of using SMT to manage chronic illnesses and the barriers that prevent the wide use of such technology. [4-10]

SMT also has been called participatory web[3] as patients are no longer passive viewers of information but rather active participants in online communities. In some cases, they even contribute to the websites' content.[7] Jensen et al.[7] examined 15 active social network groups that focus on diabetes management, revealing that social network members are active participants, sharing personal experience, requesting disease related information and exchanging emotional support. Other chronic diseases, such as asthma, are beginning to appear as topics on Facebook™ forums, where adult asthmatics share their stories with other asthmatics across the globe.

Asthma Prevalence and Associated Costs

Asthma is a chronic lung disease that makes breathing difficult for nearly 23 million Americans, including 7 million children and causes 14 million lost school days each year.[11] Asthma related expenditures in the U.S. exceed $30 million annually.[12] Asthma is a chronic or lifelong incurable disease that can be life-threatening if not properly managed and controlled. Around 13.3% of adults and children are diagnosed as asthmatics. African Americans experience higher asthma prevalence than American Indians/Alaska Natives, Native Hawaiians and Pacific Islanders, and Caucasians (21.9%, 10.1%, 11.3%, and 12.3% respectively).[13] According to the 2009 National Health Interview Survey, 17.3% of adolescents aged 12-17 years are diagnosed with asthma.[13] The prevalence of asthma among adolescent boys exceeds that of their female counterparts (16.6% vs.11.1%).[13] Rates differ in asthma prevalence by region of the country, with percentages lowest in the West (11.4%), and highest in the Northeast (15.3%).[14] Urban and rural asthma rates are similar.[15] For diseases like asthma, self-management education is a significant component in chronic disease care. It provides patients with the essential skills to help control disease related health decline, decrease crisis events and emergency room visits, and improve overall quality of life.[15-16] Asthma prevalence has risen in the past decade, even though effective disease strategies exist. To address the recommended asthma management guidelines, over a decade ago *Healthy People 2010* set several objectives to increase patient education and disease management strategies provided by health care professionals. Some of the objectives include teaching how to use inhalers and how to respond to an asthma episode, what to change in the house, school or work environment to improve asthma, and delivering a written asthma management plan. Despite improvement in delivering asthma management tools, several *Healthy People 2010* targets were left unmet. Achievement of these targets varies across age groups with most improvements occurring among children ages 18 years and younger.[14] Regardless, adherence to asthma treatment and self-management remains inadequate during adolescence. This lack of adherence can be ascribed to teens' negative attitude toward asthma, the belief of invincibility, and the desire to maintain normal routines.[17] Age-appropriate self-management education for adolescents needs to take into account their developmental changes.[18]

Newly established *Healthy People 2020* goals focus on reducing asthma-related deaths and reducing hospitalizations and school absenteeism.[19] Whereas the use of SMT for asthma management is not explicitly described in the *Healthy People 2020*, the use of SMT for chronic disease management is included in the Health Communication and Health Information Technology objectives (HC/HIT-5 – 8) and will become increasingly important in the administration and attainment of chronic disease management goals.[19]

Social Networks and Asthma Management

Several studies have examined the contribution of social network sites to asthma management and asthma outcomes. Results from a six-month randomized clinical trial using the Asthma Quality of Life Questionnaire (AQLQ) demonstrated improved asthma control among persons in an Internet-based asthma management group compared to those who received traditional physician follow-up.[20] These results suggest potentially enhanced asthma management when using Internet-based monitoring and education tools. The outcomes are attributed to the patients' opportunity to record symptoms regularly and obtain a more accurate contextualization of their current disease status.[20] In a one-year study completed by the US Army Medical Research Acquisition Activity, researchers monitored the effectiveness of Internet-based home monitoring and education of children with asthma compared to office-based care. Internet-based in-home monitoring and patient education

was more effective than office-based care.[1] Krishna et al.[21] found that supplementing traditional verbal and printed asthma education with an interactive multimedia asthma education program could result in increased asthma knowledge, reduced asthma morbidity, and lower emergency room costs. Children and parents who were more informed about their asthma through multimedia educational programs had better control of their asthma symptoms.[21]

Other implemented tools include Care for Asthma via Mobile Phone (CAMP), Support Community and AsthmaPulse.com™. The Taiwan-based CAMP is one demonstration of an evolving disease management system that utilizes the Internet and mobile phones. Asthma patients and their physicians may access peak flow metrics and other relevant information for management, such as weather information.[22] AsthmaPulse.com™ is an online, non-physician-monitored community that links asthmatics and their families with information, articles, and opinions relevant to asthma.[23] An online forum by the Asthma and Allergy Foundation of America Support Community offers "support and inspiration" by encouraging members to post journal entries of their experiences with asthma and provides capabilities for members to discuss concerns amongst each other.

PURPOSE

Because of its potential utility in chronic disease management and control, SMT requires further exploration in real world settings. Thus, the purpose of this study was to explore healthcare providers' perspectives of social media's potential use in improving asthma management and communication among their adolescent patients.

Conceptual Framework

Social marketing is the use of marketing principles and techniques for developing and promoting socially beneficial programs, behaviors and other products.[24] In public health, social marketing has been used as a strategic planning process to develop behavior change interventions, bring health products to market and improve service delivery. During the past 20 years, the CDC, the U.S. Department of Agriculture (USDA), the United States Agency for International Development (USAID), among other governmental organizations, have used social marketing to promote family planning, breastfeeding, nutritious dietary practices and increase utilization of programs and services.[25-26] Social marketing is based on a commitment to understand consumers (or patients in the present context) who are using a product or service. This "customer orientation" helps gain understanding of a priority audience's needs, aspirations, values and everyday lives.[26-27]

Three entities, the University of South Florida (USF) Center for Social Marketing, the Florida Prevention Research Center and the Department of Pediatrics at the College of Medicine, collaborated in employing a social marketing framework to conduct formative research among multiple audience groups that influence asthma management among adolescents. This particular paper focuses on the research conducted with pediatric providers to illuminate: (1) frequency and reasons why pediatric providers need to interact with patients outside of regularly scheduled clinic appointments; (2) how pediatric providers currently use digital media and other forms of communication in personal and professional life (examining mandated versus self-selected media); (3) pediatric providers' thoughts about digital media utility (e.g., social networking sites) for sharing information and aiding in the management of asthma; and (4) pediatric providers' willingness to be an active member/moderator on a social networking site for asthma control. Table 1 shows the specific research objectives and questions.

Consistent with the social marketing framework, formative research was conducted to identify benefits and barriers to the adoption of social media and their use in managing personal health information and communication among healthcare providers. Interview guides were developed based on the theoretical marketing mix (product, price, place and promotion), and results were used to create an integrated marketing plan based on these "4Ps." Table 1 also illustrates the template used to develop the interview guide questions for healthcare providers. The interview guides and the template were developed and reviewed by social marketing experts.

METHODS

Participants

Formative research with healthcare providers consisted of a convenience sample of second-year and third-year pediatric residents as well as with attending physicians who oversee pediatric residents in training. A total of nine attending physicians and 17 residents were included in the research. One focus group (four attending physicians), one dyad interview, and three individual interviews were conducted with pediatric attending physicians who rotate through the pediatric and pulmonary clinics at a major teaching hospital in Florida and provide direct patient care to asthmatic teens. Fourteen individual and two dyad in-depth interviews were conducted with pediatric residents during their clinic rotation in pediatrics. Interviewers consisted of graduate students from the University of South Florida College of Public Health. The students received didactic instruction and experiential training in the use of the interview guide, recording the interview for feedback, and providing feedback on the flow of the guide. No demographic information was collected from interviewees to maintain their privacy. The research protocol was reviewed and approved by the University of South Florida Institutional Review Board.

Data Analysis

Audio recordings were obtained for all interviews and focus groups. These recordings were transcribed by a professional service. Data management was performed using NVivo version 8.0.[28] A codebook was developed based on the initial marketing mix constructs. The constant comparative method was used to analyze the data. Open coding was used to identify emerging themes and revise the codebook. Once the codebook was finalized, the three interviewers reviewed and re-coded each

Table 1. Using Social Marketing Principles to Guide Development of Research

Marketing Mix for Providers	Objectives and Research Questions for this Project	Potential Variables Assessed
Product What behaviors should we promote?	▪ Assess impact and "winnability" ▪ How are providers currently communicating with adolescent patients outside of regularly scheduled appointments, e.g., only when crises emerge? ▪ How often providers communicate with patients or their caregivers? What are they currently doing to monitor/trend patient peak flow data?	▪ How responsive to participation? ▪ Impact on control ▪ Winnable for project
Which segment should we give greatest priority?	▪ Assess impact and "winnability" ▪ How are they currently using mobile communication technologies, networking sites and other forms of social media? ▪ What is their level of understanding/familiarity with using social and mobile media in medical care and management of chronic diseases such as asthma?	▪ Age or level of residency ▪ Current skill level in using technology
Core product: what do we offer/promise?	▪ What motivates them to monitor patient symptoms? ▪ Identify SCA or position for participating in new system	▪ Dissatisfaction with current system we would replace ▪ Time invested in current system ▪ Perceived Benefits of new system
Augmented product	▪ Assess interest in text alerts ▪ Would health providers be willing to monitor discussions of adolescent patients and their families concerning a social networking site to identify and correct medical misinformation?	▪ Text alerts ▪ Virtual community ▪ Other
Price/Barriers Price: what barriers and other factors must be addressed?	▪ Identify determinants ▪ What barriers do providers have in monitoring patients? ▪ Barriers in using technology	▪ Time ▪ Concerns about medical liability
Place Place: where and when to monitor data	▪ Identify best times and places to review data	▪ Phone, computer, other ▪ How often ▪ Time of day
Place: where and when to send alerts	▪ Identify mechanism to receive alerts	▪ Phone? ▪ What is cut off or trigger? ▪ What time(s) of day
Place: which networking site to use (if any)	▪ Assess interest in monitoring discussions	▪ Myspace or Facebook or other
Promotion	▪ Identify trusted spokespersons	▪ More experienced, respected resident ▪ Attending ▪ Fellows ▪ Chair
Promotion	▪ Identify information channels	▪ Email ▪ Texting ▪ Staff meetings
Promotion	▪ Identify promotional activities/items	▪ App ▪ Reminders for charts or clinic

transcript. Passages sorted by category/code were read by two researchers who identified recurring themes and the range of diversity in responses and prepared summary statements. Within each topic, sorted passages for residents and attending physicians were read separately to facilitate comparison of responses. Researchers compared notes on each topic for consistency and agreed on statements to be included in the research findings.

RESULTS

Attending Physicians

When asked about their personal and professional use of technology and interaction on social networking sites, the majority of attending physicians reported that they did not use social media; however, many had cell phones, texting pagers for work, and used the Internet for email communication. Some participants mentioned that older physicians do not use "modern technology" such as electronic medical records.

Most physicians rely on the telephone to communicate with their patients' caregivers outside of normal office hours, e.g., to follow up on laboratory/test results, symptoms, emergency room visits, and medication prescriptions, or to answer questions. Because many of the teens are less than 18 years of age, provider-patient conversations occur primarily with the caregiver.[29]

Physicians were mixed in their views about the general use of technology for disease management. Whereas some of the attending physicians were excited about the prospect of using technology, others exhibited little interest. Those who were interested in technology perceived its use as a way to improve quality of patient care with the potential to yield better disease management skills. Those who lacked interest reported that technological advances for patient management would be demanding, time-consuming, increase potential for liability and risk violating patient health information regulations. Additionally, they noted that insurance company reimbursement for these types of patient contacts is lacking unless a telephone call has been documented. Other forms of communication, such as e-mail, are not reimbursed. They also were concerned that communication via email might be used by their patients for emergencies. The primary reason was the delay in the physician response if the patient has an emergency that needed to be addressed immediately. During clinic time, the physicians do not always have immediate access to email, especially if they are seeing other patients.

Attending physicians had limited knowledge of any particular existing social media site for asthma. Only one physician knew about a specific social networking site for teens with asthma. When asked specifically about the potential benefit of social network websites for youth with asthma and their caregivers, attending physicians perceived them as an efficient platform for teens to build bonds with other asthmatic teens and as a separate entity for parents to connect with other parents. The benefits included sharing experiences and providing a support mechanism. When asked about the benefits of monitoring a social network site, physicians mentioned the importance of educating and providing reliable and up-to-date information with the ability to reach a large number of asthmatic teens and their families and the possibility to engage in motivational interviewing.

Attending physicians suggested that the content of the online social network for teens should emphasize educational topics. Specifically, they felt that an educational website could teach adolescents the skills required for asthma self-management. Education is a top priority for the physicians, with medication administration paramount. There was concern that the clinic visits may not provide sufficient penetration in asthma education to the teens. SMT may be the vehicle to meet the needs of both the provider and the patient. It would allow physicians to educate patients after clinic hours and allow patients to be in a more comfortable forum for discussions and questions.

An emphasis was placed on empowering adolescents, as opposed to being a parent figure and instructing them in their asthma management. Attending physicians thought this platform might be ideal to inform asthmatics about recalls on medications, school outbreaks, or any other type of timely information.

Despite the benefits of social networking sites, the additional time required to monitor sites was identified as a significant barrier by attending physicians. They reported that their daily schedules were already overwhelming and that it would be difficult for them to find the time for these added responsibilities. Additionally, attending physicians were concerned about the requirements of a social network site in terms of what moderating a site would entail. Twenty-four hour access emerged as another concern with monitoring a social media site. For example, physicians were concerned that at work or other locations they may not have Internet access to these sites.

Attending physicians reported concerns associated with parents' interaction with online social networks because a segment of parents in their population do not speak or read English and may experience difficulty understanding the content and also may face technological barriers. They also noted that some parents might find it difficult to operate in the virtual world. Attending physicians were also concerned that parents, as well as adolescents, may share incorrect information with other site members and spread faulty recommendations that can cause unwanted behavioral changes, because parents are perceived to rely on the experiences of other parents.

Resident Physicians

Second-year and third-year residents also were interviewed to understand their perceptions of social media and technology for the care and communication with adolescents who experience asthma. When asked about their personal and professional use of devices for communication, most of the residents were multi-device users. Many had text capable pagers, smart phones, iPhones and personal computers or iPads.

When asked about their current communication with patients outside of normal office hours, the majority of residents indicated that they did not communicate

with patients after clinic hours. A limited number of residents reported having to call a patient for a follow-up appointment to an asthma crisis.

Residents were asked about their awareness of SMT to manage asthma. Most were unaware of any sites and had not really searched for such a site. Most felt that it would be a good mechanism for adolescents to bond and provide a support mechanism. They also believed it would provide a venue to understand adolescents with asthma better, especially in regard to their attitudes, how they interpret asthma management, and the misconceptions that may exist. Some felt that this information would improve how they communicate with their adolescent clinic patients.

Additionally, they felt this platform would be a way to share accurate information, clear up misconceptions, educate adolescents about the disease process and also improve provider-patient relationships. Residents felt that social media would make adolescents more inclined to listen and offer a less invasive format for them to ask questions. Correcting misinformation was viewed as a benefit for the residents. Residents suggested that posting on walls, blogs and message boards would be a good way to share educational information with patients who have asthma. Ideally, they would prefer an organized chat room or system that would not require them to respond to every person's post.

When asked about their willingness to moderate a social media site for adolescents with asthma, responses were mixed. The major barriers to participation included lack of time, conflicts with work schedules and reluctance to assume personal responsibility for providing monitoring. However, some residents felt that social media site monitoring could be incorporated in their current workload. They recommended that several residents be assigned to serve as website moderators each day or that they be rewarded monetarily for monitoring the site outside of regular hours. Residents reported that they would be more likely to participate if asked to monitor their own patient base and not others, and if the time required to manage their patient base did not exceed two hours per week.

DISCUSSION

This study examined how attending physicians and residents working in a teaching hospital-based clinic view the use of SMT for communicating and managing adolescent patients who have asthma. Residents and attending physicians agreed that there is potential growth of Internet-based asthma care and management and benefits for using this system along with barriers that may hold them from participating were mentioned.

Overall, both residents and attending physicians perceive the value of social network sites as an efficient channel to communicate with their asthmatic teens, learn about their concerns and utilize this mode to deliver asthma education, an important component in disease health care that may not addressed sufficiently during clinic visits. Resident physicians recognize that the online environment is an appropriate place to deliver information to teen patients given that high volume of adolescents who search for information and regularly connect with others through this venue.

Since the patients' engagement in social network communities is characterized by informal communication among other members of the community, healthcare providers, as some researchers noted, should be receptive to self-management and play an active role in the management of their patients' chronic condition, combining informal approaches with the traditional chronic care management model.[7] Similarly, participants in our study perceived the use of SMT as a beneficial tool to understand adolescents' perception of asthma and management. The residents, in particular, felt that by using SMT they could reach and understand adolescent patients better and equip them with strategies to tailor their own health education in the clinic.

Another benefit valued by both the resident and attending physicians was the opportunity to disseminate accurate, up-to-date asthma information that can help in reducing misconceptions about asthma. Currently, "nearly one-third of the 100 million Americans who have looked for healthcare information online say that they or people they know have been significantly helped by what they found in cyberspace,"[30 (p. 69)] whether this information was correct or not. Therefore, ensuring accuracy and reliability of health information available online is a meritorious effort. Although health information is largely trusted on the Internet, nearly three-fourths of health care information seekers do not verify what they have learned, which is a missed opportunity for physicians to play an active role in patients' self-management experiences.[30] A study on the quality of health information on the Internet found that many sites lacked information on 27% of the clinical elements and information relevant to asthma for English language sites, and this statistic is even worse for Spanish language sites (33%).[31] Lack of continuity among these sites and the occurrence of conflicting advice further complicate understanding.[31] As a method for overcoming these barriers, health care providers can use SMT to deliver accurate and appropriate asthma information that is reliable and specifically tailored to their asthmatic teens.

Both attending physicians and residents in the current study suggested that asthma recommendations sent to patients should pertain to the patient's personal asthma status, medical regimen, and triggers. Personalized information, they thought, will contribute to building self-management skills. The use of SMT would allow medicine to take a step toward improved managed care and patient education. Additionally, attending physicians felt this venue would allow for up-to-date recall and other pertinent or emergency information that would reach the patient in a timely fashion, although concerns were raised about the development of patients' potential dependence on this system as a primary care method.

Both groups felt that communication with patients between office visits is vastly infrequent, and both groups thought it is important to verify electronic messages and

a patient's condition through a personal form of follow-up such as phone calls or emails. They report not seeing the patient frequently enough in the clinic for follow up visits. That makes asthma control more challenging.

Despite noted benefits ascribed to SMT in the asthma management in this study, significant barriers were identified that need to be overcome to ensure usability. Lack of time, concerns about information accuracy, liability, reimbursement and patient confidentiality are among the most prominent. The barriers associated with attending physicians were similar to those documented in the literature. When examining attitudes toward the use of mobile technology to monitor asthma, physicians, like our study participants, expressed concerns about time, cost and workload implications.[9] Physicians' perception of the cost of new technologies differ from the actual cost, and occasionally prevents them from incorporating these innovations in clinical settings, especially in independent small practices.[32] In contrast, some clinics have gone entirely paperless, relying instead on Web-based social media such as weblogs, instant messaging, video chat and social networks that reengineer interaction between physicians and patients.[33]

LinkMedica™, an interactive service that allows daily diary values entered by patients to be sent via the Internet to a centralized database that is accessed by healthcare providers, evaluated the utilization and perception of patients and healthcare providers using an asthma monitoring Web service.[4,34] The majority of health care providers (73%) agreed that there is a need for services that monitor asthma self-management, yet less than 40% actively used such a tool with their patients. Further, health care providers experienced difficulties while operating the system, and found that managing different user names and passwords for different services as well as login procedures was a barrier.[34] Older generations of physicians sometimes have less experience with Internet and lack the skills or interest in new technology; therefore, they are less inclined to adopt these tools.[34] Physicians also expressed preferences for face-to-face interactions over other methods.[34] These lessons support the concerns raised by residents in our research. They emphasized that simplicity of the operation system is the key to physicians' buy-in as well as patients' compliance to participate. A simple operation system will simplify the use of SMT by the older generation of physicians that are less engaged with modern technology, an attribute that characterized majority of the attending physicians in our study.

Future efforts should address specific physician barriers to the use of SMT to gain their engagement with these methods. Other imperative considerations in design have been noted for using SMT tools to manage chronic diseases. When designing SMT tools, necessary considerations include sourcing and quality of information, processing, storage, updating and management of data, degree of customization, identification and access, technical support, legal issues such as confidentiality, licensures and reliability of record, and training of health professionals that monitor the website.[34] When building SMT chronic disease management tools it is important that issues of design are addressed before healthcare professionals put them into operation.

Generally, resident physicians showed more awareness toward social media when compared with the attending physicians. Most residents acknowledged participation in social network websites, and overall they were more inclined to incorporate social media in the disease management care. Although appreciating the importance of a social network website as a tool to deliver asthma education content and to connect with young patients, attending physicians and residents feel that participation is time-consuming and adds more responsibilities to their overwhelming schedules. Attending physicians were hesitant about the moderator's role and needed further clarifications with regard to the additional responsibilities. To make the moderating task more feasible, they suggested that hours be limited and defined in advance. Residents further suggested that the allotted time for moderating a social network website take place during regular working hours as they valued their time "off call" with family and friends.

The goals of asthma management are to eliminate death, prevent or promptly treat acute episodes and increase the quality of life for patients and their families. Traditional asthma management strategies have included education, trigger control, timely access to pharmacologic agents and follow-up care. SMT approaches have emerged as tools for communication and monitoring with respect to the care strategies cited immediately above. Improved understanding of disease management that integrates SMT methods is likely to enhance monitoring, education, treatment, and overall protocols for individually-tailored care.[35]

Limitations

Whereas we were able to interview the majority of physicians through a convenience sample at a single clinic, expansion of lessons learned in our investigation to other clinics and practices must be carefully considered. For instance, different SMT solutions may be appropriate for academic clinical settings, small private practices, etc. SMT is useful if and only if the target patient population has access to such technologies on a normal basis in the specific case of self-management of long-term chronic illnesses. We further assume that with our sampling and data gathering methods we have reached theoretical saturation of ideas within the physician population in a clinic. Based on scheduling constraints, we used a number of interview methods for gathering physician perspectives, and this may have modified the data that we see.

TRANSLATION TO HEALTH EDUCATION PRACTICE

Public health education can take advantage of SMT to embolden asthma health education and empower adolescents who experience asthma or other chronic diseases. Through our work, we understand that education in the clinic setting is noted as an important feature to the care physicians provide, and that it is time-intensive. Attending physicians asserted the limitations on patient

education enforced by time constraints. From this, SMT can alleviate some of the inefficiency that physicians feel they experience while broadening the patient's learning experience beyond the clinic visit.

Residents are willing to offer their time, through a structured rotating schedule, to monitor proposed Web 2.0 social networking sites that bolster the quality of health information and content. This format affords them the opportunity to understand this audience segment. In terms of controlling the quality of the information, studies point to tailoring educational messages based on audience segmentation, thereby increasing the opportunity to change individual behavior. Based on our findings, both attending physicians and residents perceive the online space as a potential channel to implement asthma education.

More specifically, social network websites can fit adolescents' lifestyle, provide interactive learning, and connect patients with asthmatic peers and healthcare providers. As opposed to clinic visits, communication through online networking can create a neutral platform for asthmatic teens to share their thoughts and concerns freely, and develop better communication with their healthcare providers, allowing asthma education when and where they are receptive to obtaining it.

Professional variations by age and interest in technology among physicians may modify the efficiency by which a clinic or other professional setting will incorporate SMT as a method for health education practice. Before making the decision to implement SMT into asthma care of adolescent teens, clinics should assess physician interest, opinions and willingness to use these methods. Further, the health education dynamic is not solely isolated between asthmatic adolescent patients and their healthcare providers but also includes patients' caregivers. The role of caregivers in the administration of educational material should be leveraged to moderate patient education in cases where the caregiver is more active on SMTs than patients. The use of applications on mobile devices or social networking sites does not replace urgent or necessary care. To gain physician buy-in when SMT is sought, data from attending physicians suggest using social networking sites. The information shared on such sites must be monitored, and website monitoring scheduling schemes should be tailored for clinic staffs' work schedules. Overall, attending physicians emphasized that teen empowerment should be included in SMTs implemented for better asthma self-management.

A lesson learned from residents' interviews is that resident and attending physicians may vary in their ability to easily operate SMT-related devices and programs. Residents in our study suggest creating a more structured system to make the experience less onerous on their schedules. Clinics should consult with both health educators (who are adept at assessing health and health education needs) and social marketers (who are adept at adopting a consumer orientation) to develop plans for implementing such technology.

Bensley et al.[36 (p. 7)] noted, "many people living with asthma perceive asthma management to be limited to symptom control… [which] is antithetical to the goal of asthma management established by health educators and medical professionals." With tailored health education, researchers were able to identify quality use of this educational instrument with the end goal of changing behavior.[36] Yet, within asthma care experiences, Anhoj and Neilson[4] identified that even with virtual experts who provide "intelligent" feedback based on patients' virtual diaries, virtual experts cannot replace the experience of face-to-face interaction with healthcare providers. Using similar methods, but tailoring such functionality to include Web 2.0 capabilities that build a sense of community among users, may overcome time and adherence barriers. The end product would be strengthening health education in the adolescent asthma arena by optimizing resident physicians' time and the end-user/patient experience.

Numerous platforms have evolved to facilitate physicians' contact with social media.[37] These platforms enable physician-to-physician networking, both for social and professional use. Sites such as Sermo, Medpedia, iMedExchange and Ozmosis attract thousands of participants. Despite the potential professional benefits of social media described throughout this paper, some physicians approach social media use cautiously, fearing that their presence will increase their vulnerability to professional liability (e.g., discussing individual patients or having confidential information disseminated intentionally or unintentionally by office staff or physicians themselves).

These concerns notwithstanding, regarding the problem of asthma management and youth, controlling anxiety about physical concerns (e.g., increased respiration, increased heart rate) is paramount.[38] The application of SMT to existing management and control strategies may address much of this anxiety through proactive provider-patient and patient-provider communication, presumably leading to augmented benefits for providers, patients, and at-home caregivers alike. The implications for patients are noteworthy as social media tools offer physicians instantaneous access to a wide array of advice and problem-solving tools.

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