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## Telemedicine in Primary Care

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### 1. Introduction

I receive a call from a parent telling me that his 4 year old has developed a rash. Despite all the questions about its shape and consistency, I was not confident to reassure the parent. Suddenly, he sends me a photo of the rash on my blackberry. Another parent audio recorded his child's cough that was bothering them all night. On daily basis, I see patients who present to the office for checkup from close adjacent countries. They are in a hurry and leave before the results of the tests are out, or they might do the tests when they go back to their own country. So I use email correspondence to comment on the results or receive the results. I have a depressed patient who still corresponds with me about her medical condition as she had to leave the country to continue her education. Every now and then, I am challenged with patients who want to discuss sensitive issues by emails like impotence or unusual obsessions. Definitely, you have encountered that meticulous patients who has jotted his blood pressure readings on an excel sheet, printed it and brought it to the clinic. The above scenarios are some aspects of telemedicine and they pose some questions to answer concerning the appropriateness of this way of communication; safety and assurance of confidentiality and privacy in communications, effectiveness, preference of patients.

Telemedicine is defined as the use of telecommunications technology to provide medical information and services to geographically distant population. As a result, telemedicine has tremendous applications in different domains of diagnosis, treatment, education and research and has been applied in dermatology, radiology, cardiology, surgery, etc. There exist two modes of operations: real-time and store-and-forward modes. In store-an-forward approach, the transmission is asynchronous and the recipient can access the data at a later time. It is used in transmission of photos of skin lesions, imaging studies, chronic disease measurements between health care providers or between the patient and health care provider for second opinion, specialist consultation or physician feedback. In real-time approach, both parties need to synchronize their time. It is used in videoconferencing, and telesurgery.

Most of the literature describe short termed pilot projects as there are number of barriers that hinder the fast adoption of such applications: 1) privacy and security; (2) reliability of information; (3) technological challenges such as bandwidth and interfacing; (4) the lack of technology and money in areas of utmost need of this technology; (5) cost; (6) lack of standards and interoperability. Moreover, there are certain challenges to teleconsultation

mainly licensure, liability and legal issues; physicians who practice across different states or countries might be subject to different practices and thus exposed to lawsuits.

Despite the potential benefits of telemedicine in improving access, there is a need to establish the quality of the services and its impact on quality of care. A Cochrane review has shown that telemedicine applications are feasible yet enough evidence is still lacking concerning their effects on health outcomes or costs. (Currell et al., 2000) For example, in one study, transmitting x-ray radiographs to a remote orthopedic surgeon using the mobile phone MMS (multimedia messaging service) resulted in under or over diagnosing that would have led to mismanagement in 48% of the cases. (Chandhanayingyong et al., 2007) Definitely, there are some limitations to the accuracy of the physical exam using teleconsultation such as the lack of palpation and smell. (Boodley, 2006)

## **2. Telemedicine applications in primary care**

### **2.1 Home monitoring for chronic disease management**

Remote monitoring for disease management is one important application of telemedicine. Home telemonitoring systems have been implemented in many chronic diseases as asthma, chronic obstructive pulmonary disease (COPD), diabetes, hypertension and heart failure. A systematic review has shown that these systems are reliable and accurate with very few technical errors. (Pare et al., 2007) Telemonitoring projects had led to positive improvements in outcomes though the findings were not consistent across all projects and diseases. However, there are reported benefits of decrease in hemoglobin A1c, reduction in systolic and diastolic blood pressure, detection of early deterioration in COPD patients and decrease in hospital admissions. (Pare et al., 2007; Pare et al., 2010) In addition, use of home telemonitoring empowers the patients to actively get engaged in their care, and improving their general sense of well-being. (Pare et al., 2007)

Home telemonitoring requires monitoring hardware and software that will automatically record data from the patient such as weight, heart rate, blood glucose level, insulin use, etc. Some systems alert the provider and the patient to warning values; others are complemented with web-based information for self-support. Major barriers to remote monitoring include the cost of the equipment; need for personnel for installation and maintenance and system reliability; moreover the equipment should be simple and easily used by the patient and customized to an elderly population.

### **2.2 Web portals**

More institutions and vendors are investing in providing Web based portal usage to their systems. This is driven by the total interconnectivity of the Internet on a global scale as well as the lower costs needed as data storage and maintenance is handled by the application service provider (ASP). Moreover, it will empower the patients as they get involved in health decisions. It has a promising future in improving communication between various parties such as physicians, hospitals and insurers thus providing a holistic care. A patient can log in to the portal and request prescription refills and referrals, have access to schedule an appointment, browse through the health library as well as send messages to their physician.

In a pilot study of implementation of Patient Gateway, physicians described their experience with using the web portal as positive in the administrative issues such as refill, referral and appointment requests. (Kittler et al., 2004) One important obstacle to the use of providers of such systems is their fear of increase in workload in the absence of reimbursement. (Kittler et al., 2004) In addition, lack of standards and interoperability among different sources of data pose a great challenge to the design of these portals.

### **2.3 Teleconsultation**

Teleconsultation has been used more frequently between health care providers for specialist opinion or referral purposes. It requires more sophisticated equipment such as digital cameras, digital scopes, and videoconferencing facilities. Transmission of digital retinal images by primary care practitioner to ophthalmology specialist was as effective as personal evaluation for screening for diabetic retinopathy. This has tremendous benefits to diabetic patients or older patients who live in remote areas or can not visit multiple doctors for mobility limitations. There are few reported projects where teleconsultation occurred between patients and their providers. In a geriatric retiring community, most patients were able to use the computer system to communicate with their physician without assistance; the majority could accurately see and hear the health care provider. (Bratton & Cody, 2000)

## **3. Email communication**

In this chapter, we will be discussing email communication between physician and patients based on contractual relationship that is the patient is known to the physician in contrast to emails communication in forum discussions.

### **3.1 Scope of use of email communication between patients and physicians**

The practice of email communication between patients and providers lags tremendously behind the increase in the general email usage and willingness of patients to send email messages to their health care providers. (Sittig et al., 2001) Eighty five percent of 9000 email users surveyed in 2000 reported daily use of email; yet only 6% have even sent an email to their provider. (Sittig et al., 2001) Despite two thirds of university based clinic patients who access their emails almost daily at home or work, 90% have never used email communication with their physician. (Moyer et al., 2002a) Even in the past decade, the utilization of emails between patients and physician has modestly increased. A membership survey of the American College of physician - American Society of Internal medicine showed that less than 7% of internists (15,375 respondents) exchanged email communication with their patients on weekly or daily basis though two thirds had access to computers and used Internet from home for email uses. (Lacher et al., 2000) A study in 2006, 16.6% of 4203 Florida physicians used email from their office for communication with patients; 17.4% of those physicians (or 2.9% of the total number of physicians) used emails with patients on daily basis. (Brooks & Menachemi, 2006) A following survey representing the same population in 2008 revealed a slight increase in the percentage of physicians who use email (20%). (Menachemi et al., 2011)

### 3.2 Characteristics of physicians and patients who utilize email communication

In general, physicians who are early adopters of this email communication with patients are more than their counterpart to be enthusiastic about its usage and less bothered by time pressures. (Moyer et al., 2002a) Physicians who are more likely to use emails with their patients were younger, university based (Gaster et al., 2003), had training in family medicine or surgery and practiced in large groups of 50 or more. (Brooks & Menachemi, 2006) Older physicians (>60 years old) and physicians of Asian descent are unlikely to involve in email usage with their patients. (Brooks & Menachemi, 2006) Characteristics of physicians who used the Internet were younger than 50, full time or part time academic physicians and males. (Lacher et al., 2000)

Patients are more likely younger and college graduates. Similar to physicians, patients with ethnic minorities are less likely to use emails with their providers. (Ye et al., 2010) In a survey of university based clinics, patients who described themselves as email users were healthier with higher levels of income and education than non email users. (Moyer et al., 2002a)

### 3.3 Attitudes and barriers to email utilization by physicians and patients

Patients considered email communication with providers as a convenient way of communication that enhances their access to their health care provider and thus improve quality of care. (Ye et al., 2010) Reasons given by email users about their reluctance to send email to their physicians were mainly their lack of knowledge of their physician's email or whether their provider uses email. (Sittig et al., 2001) Other barriers included patient concerns about the effectiveness and efficiency of the email communication. (Moyer et al., 2002a)

Physician's attitudes towards email communication varied among agreement with its potential for enhancing access to patients, restricted use of email communication and adequacy for administrative issues (Moyer et al., 2002b). Important barriers or concerns cited among physicians are lack of time and increase in workload, security and confidentiality, and reimbursement. (Gaster et al., 2003; Moyer et al., 2002b; Pizziferri et al., 2003) However, studies have not proven this fear of increase in workload. Over 6 months period, there was no increase in the volume of messages or time spent answering the messages between physicians who used telephone messages with their patients compared to those who used email communication. (Leong et al., 2005) In university based clinics, the majority of the physicians used email communication with their patients and self-reported an average of 8 emails per month. (Gaster et al., 2003) Controlled trials have shown that physicians respond to an average of 12-13 emails per week spending 5-10 minutes a day. (Virji et al., 2006)

When email users in the general population were asked about their willingness to pay for email communication with their providers, 47% reported that they will not be willing to pay for email communications and 38% were ready to pay 5-10 dollars. (Sittig et al., 2001) On the other hand, 42% of patients surveyed in the waiting room of a primary care clinic were willing to pay a small annual fee for this service. (Virji et al., 2006)

Physicians had their concerns about the content of email communications. Physicians do not consider emails suitable for investigation of new symptoms or discussion of mental issues. (Gaster et al., 2003) More than two thirds agree that it is appropriate to communicate with a patient by email about appointment scheduling, medication refills and informing patient about normal results; while half of the physicians only consider disease management and dose adjustment and discussion of abnormal results are appropriate. (Gaster et al., 2003)

Both HIPAA regulations and AMA guidelines emphasize greatly confidentiality and privacy; yet most physicians and patients did not express this concern. Only 20-30% of email users report concern about security or possibility of others reading the email other than their physician as a barrier to email communication between patients and providers. (Sittig et al., 2001; Moyer et al., 2002a) In a qualitative analysis, most of the physicians who used emails with their patients did not get concerned with confidentiality as "long as the patients are comfortable using email". (Patt et al., 2003)

### **3.4 Content and structure of emails**

Emails used by patients, in general, included one single issue or concern at a time (Anand et al., 2005; White et al., 2004) and were concise and medically relevant. (White et al., 2004) Very few patients include sensitive material in their email communication with their provider. (White et al., 2004) Email content included prescription refills, administrative issues, non urgent consultations and checking laboratory results (Couchman et al., 2001; Leong et al., 2005) Content analysis of emails between pediatricians and parents showed that email messages contained one concern at a time with inquiry about a medical question or medical update in the majority of the emails. (Anand et al., 2005) Content analysis of adult email communication with their provider included mainly information updates (42%), followed by prescription renewal and health questions (38%), and inquiry about test results (11%) (White et al., 2004) Though physicians are worried over an increase in workload and the content of emails, around half of the emails sent to the providers were mainly updates and did not require a physician response in 2 studies addressing adult and pediatric population. (Anand et al., 2005; White et al., 2004)

In general population surveys, the expected response time from the physician is between 1-2 days. (Sittig et al., 2001) However, in a study of patients in family practice clinics in central Taxis were more demanding in a very short response time; 21%, 53% and 26% of patients expected a response time to laboratory results in less than 9 hours, 9 to 24 hours and more than 24 hours respectively. (Couchman et al., 2001)

### **3.5 Ethical and legal concerns**

Many argue that the utilization of Emails communication incur an element of injustice among patients who do not have access to the Internet especially the poor and elderly patients. In a study about email use among patients of a primary clinic, patients who reported lack of email access were more likely to be Black or Medicaid insured. (Virji et al., 2006) Moreover, email communication has the potential to improve the care and decrease the workload at the clinic if it was used by elderly patients with multiple comorbidities who frequently utilize the health service. Although 52 (1.3%) out of 4059 patients over 65 years of

age reported use of email with their community based physicians, 50% expressed enthusiasm about possibility of using it. (Singh et al., 2009) Jurisdictional issues play an important role if the physician and patients are located in different states or countries. Physicians should be aware of their state/country laws concerning email communications and licensed health actions.

### **3.6 Benefits of email communication**

Email communication between patients and physicians has the potential to improve quality and efficiency of health care. Emails are simple and can be executed at the patient's and physician's convenient time thus eliminating the telephone associated interruptions. It can decrease the unneeded office visits to check normal results or ask for a refill or an administrative issue. Email communications can aid in patient education by attaching relevant documents or referring the patient to reliable internet website. Email use enhances the communication between physicians and patients thus improve satisfaction of patients. In a controlled study, use of emails increased patients' satisfaction in convenience and amount of time spent in their contact with their physician. (Leong et al., 2005) Emails can serve as visit extenders for patients who live in remote places or elderly with limited ability to use transportation means.

### **3.7 Guidelines of proper use of email communications**

Both the American Medical Association (AMA) and American Medical Information Association (AMIA) have established guidelines for proper use of email communications between patients and physicians. (Kane & Sands, 1998; Robertson, 2001) They focus on assurance of proper clear safe communication.

#### **3.7.1 Establishment of expected turnaround time**

Establish a document describing the expected turnaround time. Inform the patients not to use emails for urgent issues. Inform the patients about your policies in case of vacation and unavailability.

#### **3.7.2 Establishment of email types and handling**

Establish the types of topics that you will discuss through email. Remind the patients not to use emails for sensitive and private issues. Instruct the patient to mention the reason for the consultation in the subject of the email and include his patient identification number in the body of the message. Use autoreply and acknowledge options by patient and yourself to insure the receipt of the emails. Send an email informing the patient of his completed request. Make your statement clear and concise.

#### **3.7.3 Completion of informed consent from patients**

Prepare an informed consent that cover all the above items and make sure the patient signs the informed consent and is documented in his medical chart. Include in your informed consent a statement that releases you from liability in case of technical failures.

### **3.7.4 Documentation in the chart**

Print the email communication and insert into the medical chart of the patient. In the presence of electronic medical record, the email should be part of the medical file of the patient.

### **3.7.5 Assurance of privacy and protection**

Use encrypted messages for safe transmission of emails. Inform the patients that emails are not completely safe especially if they use their work emails. Inform the patient if any of your office staff might have access to the emails for triage purposes.

## **4. Phone communication**

The first phone call ever recorded was for a medical need. When Alexander Graham Bell's accidentally spilled battery acid on himself, his famous quote, "Watson, come here I need you" gave birth to the first telephone message and simultaneously to the role of the telephone in medical care. (Car & Sheikh, 2003)

### **4.1 Scope of mobile phone communications between patients and physicians**

Telephone consultations have been widely used in daily activities of clinics in the past few decades and accounts for at least 25% of patient encounters. (Delichatsios et al., 1998) Although use of telephone consultations has increased tremendously, it has been in the context of the clinic setting, triage during after-hours and administrative issues. The access of patients to their own providers through contacting the personal mobile phone of the physician is still in its infancy. Less than half of primary care practitioners reported giving their cell phone number to patients; one third gave their number to only a small percentage of patients. (Peleg et al., 2011)

### **4.2 Characteristics of mobile phone communications between physicians and patients**

There is limited research addressing the magnitude of use of patients of cellular phones to communicate with their physicians. In 2001, a physician recorded his cellular phone calls received from patients over 3 months and found out that he had 94 patient calls; 10% of them occurred during the weekend when the majority occurred during clinic hours at the time he was seeing other patients. Mean duration of calls was 5.8 minutes. They asked about advice on treatment (29%), second opinion (26%), results of medical tests (15%), drug prescription or medical form (12%). (Peleg, 2001)

Characteristics of frequent land telephone callers might be extrapolated to mobile phone use. Characteristic of after hour frequent callers included female gender, frequent office, hospital and emergency room visits. (Hildebrandt et al., 2004) In general, telephone consultations are shorter, include fewer problems, and require less data gathering than face to face consultations. (McKinstry et al., 2010)

### 4.3 Benefits of mobile phone communication

Potential benefits of telephone consultations are improved access and convenience to patients. (Car & Sheikh, 2003) Mobile phone consultations have the benefit of after hour easy access to the physician overcoming answering machines. Giving mobile phone number to patients gives the impression that the physician is caring and increases the trust relationship between the physician and patient. (Dillaway, 2009) Potential benefits recognized by physicians who provide their cell phone number to patients include reduction of clinic visits, reassuring the patient and giving them a sense of security. (Peleg et al., 2011) Patients reported that they would go to emergency rooms if they were unable to contact a physician. (Delichatsios et al., 1998)

Moreover, after hour call might help reassure patients and improve the triage process. Consider a mother calling for advice concerning a fall of her child with lip lacerations. As a physician, you have no clue about the depth of the laceration and whether it needs emergency transfer for suturing or just reassuring. A cell phone with supported camera can be of utmost benefit in this situation. Majority of patients attending a rural practice in New Zealand showed enthusiasm about using their mobile cameras for medical triage; physicians, as well, were satisfied with the quality of images for diagnosis. (Jayaraman et al., 2008)

### 4.4 Safety concerns

One of the great challenges of phone consultations is risk of medical errors. A descriptive, retrospective case review of all the telephone-related close malpractice claims showed 3 most common errors categories: poor documentation, faulty triage decisions and incomplete history taking over the phone. (Katz et al., 2008) Using simulated patients, less than one half of resident and attending pediatricians took an adequate history and more than one third made inappropriate management decisions. (Yanovski et al., 1992)

Telephone consultations were judged less likely to include sufficient information to exclude important serious illnesses. (McKinstry et al., 2010) Failing to recognize the potential seriousness of a frustrated patient's multiple calls for the same problem is potential source of medical error because the multiple providers taking the calls were unaware of prior calls. (Katz et al., 2008) In terms of safety, more than 70% of clinicians and 60% of patients were concerned that clinicians would be more likely to make a wrong/inaccurate diagnosis in telephone consultation compared to face-to-face consultations. (McKinstry et al., 2009)

Challenges with telephone consultations include the lack of nonverbal clues, no direct observations and examinations, lack of active listening as the physician might be engaged in his own activities at time of call and talking to family members. Mobile phone cameras and audio recording can have the potential to compensate for the lack of observations.

### 4.5 Applications of mobile phone telecommunications

mHealth or mobile health is defined as the practice of medicine that is supported by mobile devices such as cellular phones and PDAs. There has been a tremendous improvement in mobile phones technologies, mobile cameras, data processing, network accessibility, and storage capabilities. Mobile phone health related applications target different aspects of

health care. Some commercial applications are used by the patient himself for caloric counting, record keeping. Other applications are connected to home based monitoring devices and aid the users to track their vital signs or disease measurements to be shared with their health care provider. Use of mobile phones, in primary care, can be extended to health promotion and awareness campaigns. A short message service (SMS) sending advice and support to smoking cessation among adolescents improved their quit rates at 6 weeks. (Patrick et al., 2008) Participants in an Internet and mobile phone based intervention were provided with wrist worn accelerometer and Bluetooth compatible mobile phone. Weekly exercise plans were offered and email /mobile phone reminders were issued with feedback on their barriers. The intervention motivated healthy adults and significantly increased their level of physical activity. (Hurling et al., 2007) SMS can be used for reminding patients of their health maintenance tests. Mobile phones can be used in self-monitoring chronic diseases and filling diaries. SMS collection of asthma diary data was favored by selectively motivated asthmatic patients due to its integration in their daily life activities as one patient asserted: "...I am not good at routines. Therefore, it is great to get a reminder saying, 'take your medication.' It gives me freedom and creates control." (Anhoj & Moldrup, 2004)

Mobile phone facilitates the interaction between primary care practitioners and specialists especially in remote areas. This improved communication will impact the quality of care delivered to patients. Mobile phones are accessible with the providers at all times which decrease the burden on providers who are in call. They can still enjoy their personal life, though interrupted, while on call and serving patients. The transmission of radiologic pictures using mobile phone multimedia messaging (MMS) was feasible and cost effective for rapid management of musculoskeletal injuries in a remote hospital. (Archbold et al., 2005)

## 5. Conclusion

Globalization, increased awareness of patients and enthusiasm to control their health and lack of specialists in rural areas will continue to impact the growth and expansion of telemedicine applications in the future. There exist many successful practices of telemedicine in home monitoring and management of chronic diseases, teleconsultation with specialists. Both physicians and patients are willing to increase their communication with each other through email and mobile phones. However, telemedicine has its legal, financial and ethical limitations and challenges that need to be addressed and standardized. Primary care physicians need to be prepared to be technology savvy and change their office settings in order to be able to meet the future demand of telemedicine applications.

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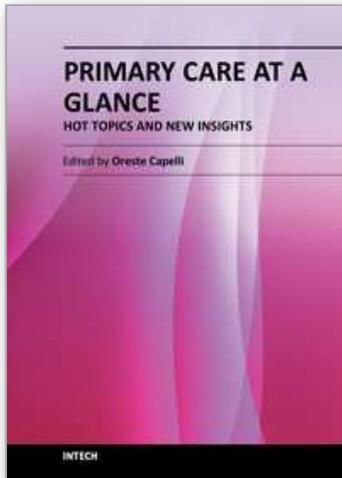
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## **Primary Care at a Glance - Hot Topics and New Insights**

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"Both among scientists and clinical practitioners, some find it easier to rely upon trivial explanations, while others never stop looking for answers". With these surprising words, Augusto Murri, an Italian master in clinical medicine, reminds us that medical practice should be a continuous journey towards knowledge and the quality of care. The book brings together contributions by over 50 authors from many countries, all around the world, from Europe to Africa, from Asia to Australia, from North to South America. Different cultures are presented together, from those with advanced technologies to those of intangible spirituality, but they are all connected by five professional attributes, that in the 1978 the Institute of Medicine (IOM)<sup>1</sup> stated as essentials of practicing good Primary Care: accessibility, comprehensiveness, coordination, continuity and accountability. The content of the book is organized according to these 5 attributes, to give the reader an international overview of hot topics and new insights in Primary Care, all around the world.

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