

## MINI-REVIEW

# Cancer Care Management through a Mobile Phone Health Approach: Key Considerations

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### Abstract

Greater use of mobile phone devices seems inevitable because the health industry and cancer care are facing challenges such as resource constraints, rising care costs, the need for immediate access to healthcare data of types such as audio video texts for early detection and treatment of patients and increasing remote aids in telemedicine. Physicians, in order to study the causes of cancer, detect cancer earlier, act in prevention measures, determine the effectiveness of treatment and specify the reasons for the treatment ineffectiveness, need to access accurate, comprehensive and timely cancer data. Mobile devices provide opportunities and can play an important role in consulting, diagnosis, treatment, and quick access to health information. Their easy carriage makes them perfect tools for healthcare providers in cancer care management. Key factors in cancer care management systems through a mobile phone health approach must be considered such as human resources, confidentiality and privacy, legal and ethical issues, appropriate ICT and provider infrastructure and costs in general aspects and interoperability, human relationships, types of mobile devices and telecommunication related points in specific aspects. The successful implementation of mobile-based systems in cancer care management will constantly face many challenges. Hence, in applying mobile cancer care, involvement of users and considering their needs in all phases of project, providing adequate bandwidth, preparation of standard tools that provide maximum mobility and flexibility for users, decreasing obstacles to interrupt network communications, and using suitable communication protocols are essential. It is obvious that identifying and reducing barriers and strengthening the positive points will have a significant role in appropriate planning and promoting the achievements of mobile cancer care systems. The aim of this article is to explain key points which should be considered in designing appropriate mobile health systems in cancer care as an approach for improving cancer care management.

**Keywords:** Cancer care - management - mobile health - key considerations

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### Introduction

In most countries chronic diseases lead to high health care costs and reduced productivity of people in the society (Engelgau et al., 2011). Cancer is one of the most preventable chronic diseases and a major public health problem in many countries (Jemal et al., 2010; Hassanzad, 2011). The best way to reduce costs of health sector and increase the empowerment of people is prevention of chronic diseases and appropriate health activities management through the use of modern information communication technology (ICT) devices. Using mobile devices because of the challenges of health industry such as resource constraints, rising health care costs, the need for immediate access to healthcare data types such as audio video text for early detection and treatment of patients and increasing remote aid in telemedicine and home care seems inevitable (Tan, 2009).

Studies indicate that lack of timely access to patient information (Martins et al., 2009), discontinuity of the communication and lack of coordination between service

provider, and health care team members (Khairat et al., 2010) are the main causes of medical errors. Physicians, in order to study the causes of cancer, detect cancer earlier, prevent or determine the effectiveness of treatment, and specify the reasons for the treatment ineffectiveness, need to access accurate, comprehensive, and timely cancer data (SEER Training Modules, 2013: <http://training.seer.cancer.gov/>).

Mobile devices provide opportunities and play an important role in consulting, diagnosis, treatment (World Health Organization, 2011: [http://www.who.int/goe/publications/goe\\_mhealth\\_web](http://www.who.int/goe/publications/goe_mhealth_web)), chronic disease management such as cancer (Strandbygaard et al., 2010), patient empowerment (Suter et al., 2011), quick access to health information (Prgomet et al., 2009), medical education and research (Pawar et al., 2012), and rapid establishment of communication regardless of distance restraints (Warren et al., 2011). Also easy to carry and quick access to cancer information on mobile devices make them perfect tools for healthcare providers in cancer care management.

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While there is a potential advantage for mobile health programs in cancer care, many challenges exist for developing and implementing these tools. Accordingly, effective use of mobile devices in cancer care requires extensive research and investigation of different aspects. It is obvious that identifying and reducing barriers and strengthening the positive points will have a significant role in the appropriate planning and promoting the achievements of mobile cancer care systems. The aim of this article is to explain the key points which should be considered in designing appropriate mobile health [M-Health] system in cancer care management as an approach for improving cancer care management.

## **General Key Factors in Cancer Care Management through M-Health Approach**

### *Human resource*

Trained and skilled personnel at health care centers in the field of information technology (IT) (Khoubati et al., 2010), user attitudes, technology acceptance (Venkatesh et al., 2012; Cresswell et al., 2013), user characteristics like age, economic, social and educational status (Hardiker et al., 2011) are some of the important considerations in the design and implementation of mobile based system in cancer care management. User acceptance through the provision of advisable training and cultural awareness are also possible. Staff participation and involvement in all stages of the process from planning to implementation, clear and effective communication between managers and all staff members involved in the project and describing the advantages of technology and change management are important to increase user acceptance (Safdari et al., 2012).

### *Confidentiality and privacy, legal and ethical issues*

Because of increasing dependence on information and communication technology at health care centers in gathering, transferring, storage and evaluation of health data, applying the security and privacy guidelines are essential (Safdari et al., 2011). Mobile devices are easy to lose or be stolen and possibility of forgetting and leaving in a place or being stolen from the pockets or tables are very high. Even if they are not stolen or lost, intruders can sometimes gain all the access they need if the device is left alone and unprotected, or in some cases the data is "sniffed out of the air" during wireless communications, or if malware is installed (Stanford University, 2013: [http://www.stanford.edu/group/security/securecomputing/mobile\\_devices.html](http://www.stanford.edu/group/security/securecomputing/mobile_devices.html)). Cancer care systems based on the mobile like other information technology systems are exposed to various types of security threats such as environmental threats like fire, unintentional events for example user error and intentional threats. In order to achieve an acceptable level of security for health information in mobile devices, identifying the security needs in various aspects of electrical, physical, personal and administrative security in addition to the traditional view are essential. Obviously, applying mobile based system is combined with success when it is in accordance with the principles of legal, ethical and social rules.

### *Health care organization*

There are many factors in health care organization that can have an impact on information systems such as organizational culture that is one of the most important factors in the success of technology implementation (Randell et al., 2010). Flexible organizational structure and leadership behaviors and providing an environment in which innovation in organizations is appreciated facilitate moving towards technologies (Vaccaro et al., 2012). Implementation of cancer care management system based on mobile approach requires organizational culture to accept the need to use this system and high level management support in health care organizations.

### *Appropriate ICT and mobile infrastructure and costs*

Providing appropriate ICT and mobile infrastructure especially information, technical and communicational infrastructure is important in the successful application of mobile based systems. Also proper investment in the purchase, design, implementation, maintenance and updating of information systems is necessary (Lucas, 2008; Cripps et al., 2011). In developing and implementation of cancer care management based on mobile devices, planning for items such as costs of system implementation and maintenance should be considered (Khoubati et al., 2009).

## **Special Key Factors in Cancer Care Management through M-Health Approach**

### *Interoperability*

Dynamic health environment needs high interoperability among professionals with different skills, various specialty and complicated process. Hence, applying mobile devices in this field is facing a lot of challenges. Lack of system interoperability with electronic health records and other IT tools (Lawler et al., 2011) is very important factor in developing mobile cancer care system.

For providing effective cancer care and shared information, all actions need to be coordinated. Facilitating decision making needs interoperability and effective communications between professionals. In this way medical error is reduced and quality of remote cancer care will be increased. To meets these needs, cancer care system must use health information standards especially sharing and exchanging information standards like Health Level Seven (HL7) as a messaging standard (HL7 organization, 2013: <http://www.hl7.org/implement/standards/index.cfm>), (LOINC: Logical Observation Identifier Names and Codes) to facilitate the electronic transmission of laboratory results (<http://loinc.org/background>), SNOMED CT (Systematized Nomenclature of Medicine Clinical Terms) as a comprehensive computerized clinical terminology covering clinical data for diseases, clinical findings, and procedures (Safdari et al., 2009). Also applying cancer coding standard like ICD, ICD-O and CPT is necessary (Safdari, 2003).

### *Human relationship*

Mobile devices allow cancer information to share and flow from the central hospital in big cities to remote

villages and vice versa, remove the distance boundaries and improve professional relationships between health care providers and develop new relationships between levels regardless of time and space such as with patients residing in remote villages and with doctors based in hospitals (Chib et al., 2012). Despite this benefit, mobile health as one of the information technology tools decreases face to face communication between doctor and patient and causes omission of human relationship (Mohammadzadeh et al., 2013). Since cancer patients need to enjoy peace along with assurance, considering challenges such as eliminating human relationships and reducing face to face communication between physician and patient and planning for them will affect the improvement of patient satisfaction and quality of care significantly.

#### *Mobile devices and tele communication factors*

Applying mobile devices in cancer care management needs identifying important effective factors and planning for them. Some of the current key points in this field include: designing of mobile health services content (Hardiker et al., 2011), device and sensor type that can be used, type of data and language presentation (Taniar, 2009), scalability in terms of data rate and power and energy consumption, antenna design, quality of service (Qos), energy efficiency (Patel et al., 2010; Klingeberg et al., 2012), weight of wearable devices in patient status monitoring, difficulty in some data processing due to the devices used in cancer patient monitoring, the location of data collected which affects the accuracy of cancer information, user training to use wearable system and mobile health system, mobile system market penetration (Chan et al., 2012), mobile system compatibility with personal tasks (Viitanen et al., 2011), ill-functioning of system that leads to medical errors and negative effects on care outcomes, patients and personnel (Nykänen et al., 2011). Also tele communication industry which includes reliability, sustainability of connections and sudden interruptions of telecommunication networks (Aggarwal, 2012) must be considered.

#### **Conclusion**

The successful implementation of mobile-based systems in cancer care management is constantly faced with challenges such as: user acceptance, skilled and professional human resources, suitable funding, standards related to technology, equipment and systems for mobile communication, privacy and data security, good information and technological infrastructure, increasing accuracy of critical signals, interoperability between different systems, bandwidth limitations, quality of health services, battery life limited tools and so on.

User acceptance is improved through the provision of advisable training, cultural awareness, user participation and involvement in all stages of the project and describing the advantages of mobile health and change management.

Providing adequate bandwidth, preparation of standard tools that provide maximum mobility and flexibility for users, decreasing obstacles which interrupt network communications, using suitable communication

protocol, cost of purchasing and using, insurance coverage and supporting patients that use remote monitoring devices, adoption of adaptable wireless technologies, data encryption while transferring, paying attention to legal and ethical aspects, user friendly, allowing the interaction between the system components, nomination and establishment of rules, guidelines, and standards and proper policies regarding the use of mobile devices particularly with respect to privacy and data security while sending cancer information are all important in the successful application of mobile cancer care systems that should be considered.

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