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Information management flow for tele-homecare for the elderly; An emerging need for continuity of care

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Abstract

Background and objectives: Tele-homecare methods can be used to provide home care for the elderly, if information management is provided. The aim of this study was to compare the places and methods of the data collection and media that use Tele-homecare for the elderly in selected countries in 2015.

Methods: A comparative-applied library study was conducted in 2015. The study population were five countries, including Canada, Australia, England, Denmark, and Taiwan. The data collection tool was a checklist based on the objectives of study. Persian and English papers from 1998 to 2014, related to the Electronic Health Record, home care and the elderly were extracted from authentic journals and reference books as well as academic and research websites. Data were collected by reviewing the papers. After collecting data, comparative tables were prepared and the weak and strong points of each case were investigated and analyzed in selected countries.

Results: Clinical, laboratory, imaging and pharmaceutical data were obtained from hospitals, physicians' offices, clinics, pharmacies and long-term healthcare centers. Mobile and tablet-based technologies and personal digital assistants were used to collect data. Data were published via Internet, online and offline databanks, data exchange and dissemination via registries and national databases. Managed care methods were telehealth management systems and point of service.

Conclusion: For continuity of care, it is necessary to consider managed care and equipment with regard to obtaining data in various forms from various sources, sharing data with registries and national databanks as well as the Electronic Health Record. With regard to the emergence of wearable technology and its use in home care, it is suggested to study the integration of its data with Electronic Health Records.

Keywords: Electronic Health Record; Home Care; Elderly; Telecare; Data

1. Introduction

Receiving home care services is increasing due to the increased trend of chronic diseases, the desire for shorter stay in hospitals, and its high expenses (1), especially for the population of disabled and elderly patients, whose use of home care services is increasing (2). Studies suggest that 58% of all home care services are received by the elderly (3-5). On the other hand, most services required by the elderly are not care services provided by hospitals, such that evidence suggests annually 20-30% of elderly people are unnecessarily hospitalized and their stay is longer than required (6). Considering that according to the World Health Organization predictions, in 2020 the elderly will account for 1 billion people, and as the number of elderly people increases relative to the total population, the issue of their health, comfort and welfare finds new and extensive dimensions and they impose numerous outcomes and needs to the health system (7, 8). Therefore, home care can be employed in the form of medical, nursing or rehabilitation services and efficient use of information technology is of special importance. Using information technology for the elderly in various aspects can be regarded as the facilitator of healthcare services. Currently,

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information and communication services have provided a background for offering healthcare services and have excluded providing these services in special and fixed locations. Extension and development of communication tools is such that it has provided the possibility to offer homecare services in their houses (9-11). Remote monitoring to care for elderly people with congestive heart failure and chronic obstructive pulmonary disease (COPD) has been reported along with the use of the Internet for caring for elderly patients with diabetes. While these methods reduce medical and transportation costs, they result in significant savings in physicians and patients' time (12). However, using this kind of information technology is useful and advantageous when it maintains the continuity of care for patients. This issue demands the need to consider data sources and a way of sending data in various locations of care to provide the possibility to save and retrieve exact information of patients by healthcare providers at all healthcare centers, and information systems of hospitals and medical centers are enabled to access all data related to these patients. On the other hand, home care centers can also access data related to these patients in all medical centers (13). The aim of this study was to compare information management flow, the places and methods of the data collection and media that use tele-homecare for the elderly in selected countries to maintain the continuity of home care for the elderly while facilitating the relation between healthcare providers at home and in hospitals, and reducing clinical errors due to quick access to major health data.

2. Material and Methods

A comparative-applied library study was conducted in 2015. The study population were five countries, including Canada, Australia, the UK, Denmark, and Taiwan. Inclusion criteria for the countries were their being developed in terms of the Electronic Health Record, home care for the elderly and at least three available studies related to the Electronic Health Record for providing home care for the elderly. It was attempted to select at least one country in each continent. However, Africa was excluded from this study, since no developed country and study was found in this continent. The data collection tool was a researcher-made checklist based on research objectives, the formal and content validity of which was approved by four experts and members of faculty in health information management and geriatric nursing. Data were collected by reviewing Persian and English papers from 1998 to 2014, related to the Electronic Health Record, home care and the elderly, and they were extracted from authentic journals and reference books as well as academic and research websites. After collecting data, comparative tables were prepared and the weak and strong points of each case were investigated and analyzed in selected countries. Data flow process was drawn based on the results of this study.

3. Results

Investigating data flow of Electronic Health Records for home care of the elderly in selected countries respectively showed the following (Table 1):

3.1. Canada

In Canada, services provided in hospitals, physicians' offices, clinics or long-term care facilities, can also be received at home (12). Supervising patients receiving home care is conducted via remote methods or points of service plans. In methods of receiving remote service, patients and clients use tools such as vital signs monitoring or digital tools such as videos to survey their health status or disease (14). These tools manage patients' health at home. Data collection, displaying and storage of vital signs data and clinical information as well as assessment of documents is conducted via transferring these data to a remote and communication network. To supervise patients' health at home, clinical specialists access these data via central systems and they can share these data with other providers and care teams (14). Another home care plan in this country is the applied programs of points of service. These programs entail information software or systems that are used at the point of service, i.e. the patients' home. Data that are essential for clinical decisions are extracted from data saved at the repository of the Electronic Health Record. Point of service systems that act via this method can also function as the sources of the Electronic Health Record. Information produced at local databases is received and stored by repositories of the Electronic Health Record (15). Of the various points of service systems connected to the Electronic Health Record are the Clinical Information System (CIS), Hospital Information System (HIS), Pharmacy Information System (PIS), Laboratory Information System (LIS), Digital Imaging and PACS System (16).

3.2. Australia

To use health data in Australia, a digital record is developed that could be accessed by the patient and healthcare providers at any place and time. Information of digital records could be accessed and used at home via various tools and media, including USB (portable memory), web-based personal computers, smart phones or tablets (17). The

Electronic Health Record has made it possible to use information of electronic records at home via remote video conference, email and texts between physicians and patients (18).

3.3. England

In the UK, the National Health Service (NHS) has an electronic health portal (19) that stores the NHS Care Records Service and patients' data locally and centrally in a database called Spine. Spine is a large central database to store a summary of patients' records in the British National Health Service that entails patients' demographic data, data related to services provided and data of secondary services. When storing data, a series of data that are related to the patient's healthcare are stored as identifiable data and the other class is stored as anonymous data with the aim of providing secondary services such as the report of diseases, stored on Spine. Although patients' electronic records are completely kept at health centers where care is provided, the summary of information is automatically transferred to the record summary on Spine from the patients' electronic records. Storing and sharing data related to home care is also possible via this portal (20, 21).

3.4. Denmark

Patients in Denmark have had access to data of their Electronic Health Record since 2003 via the National Health Portal called SUNDHED (www.sundhed.dk) and via MEDCOM national program. The task of this portal is to collect and dissipate healthcare data among citizens and specialists and to conduct various remote medical plans, from radiology and counseling to home care (19, 22). Tele-homecare and medicine is provided via video conference and home monitoring using various technologies including image transfer technology for those patients with chronic and long-term diseases who need to continually refer to health centers or those who live in rural areas. In addition, remote projects are provided to care and supervise patients with dermatological and rehabilitation problems as well as drug abuse and wound healing, or to conduct and interpret radiology. To receive advice, the connection between healthcare specialists is provided via video conference. In addition, results of diagnostic screening tests of mammography and x-ray tests are transportable among hospitals (23).

3.5. Taiwan

In Taiwan, transferring data from its Electronic Health Record to other health centers is conducted using portable memories including CD-ROM, USB, and telephone via patients themselves. Transferring and sharing records between healthcare providers is also possible via the Internet, with the condition of patients' permission. In these cases, an electronic record is saved as a databank in the online Electronic Health Record located at the National Health Insurance Network. Information of this record is transferred to the hospitals via a port (24). In Taiwan and many countries around the world, elderly people prefer to live at home and in society rather than being kept at care centers. Therefore, demand for tele-homecare and remote medical healthcare is significantly increasing (25), and remote medicine, telecare and telehealth in this country is repeatedly replaced with other healthcare methods (26). Collecting all data, including vital signs data obtained from devices used by patients, data from weighting tools, blood pressure monitors, blood sugar measuring tools, pulse oximeters, cardiogram and lung and heart sounds, as well as other devices developed for the elderly patients, is conducted, and data are transferred to a clinical information system. Other data transferred to the clinical information system include data related to remote monitoring equipment and automated equipment for monitoring emergency conditions of patients, data related to changing lifestyle to manage age-related hazards for those elderly patients who live alone or are independent, and data from secondary devices including panic buttons, drug prescribers, bed/chair occupancy sensors, telephones for the elderly, wireless perimeter security sensors, fall detectors and other accidents, and devices required for automatic operation or emergency events as audio-visual signals to be sent to care centers (25).

Table 1. Data source of Electronic Health Record for home care of elderly people in selected countries

Data sources		Countries under study				
		Canada	Australia	England	Denmark	Taiwan
Places of obtaining data	Hospitals	√	√	√	√	√
	Physicians' offices	√	√	√	√	√
	Clinics	√		√		
	Pharmacy	√		√		
	Long-term care services	√		√		
	Sensors for telehomecare	√				√
Use of data	Available telehomecare	√	√	√	√	√
	Vital signs monitoring devices for telehomecare	√	√	√	√	√
	Digital (video) tools for telehomecare	√	√	√	√	√
	Remote health management system	√			√	√
	Communicative network for telehomecare	√			√	√
	Sensors for telehomecare	√				√
	Remote tools and equipment for telehomecare of patients	√				
	Providing tools and equipment	√				
	Electronic drug prescription services			√		
Points of service systems	Clinical information system	√				√
	Hospital information system	√				√
	Pharmacy information system	√		√		√
	Laboratory information system	√				√
	Digital imaging and PACS system	√		√		√
Registries and national database	National Patient Registry				√	
	National Patient Index				√	
	Personal electronic medical profile				√	
	Quality registration and service information				√	
	Registries	√				
	Public Health Surveillance data	√				
	Laboratory data	√				
	Diagnostic imaging data	√				
	Pharmaceutical data	√				
Media (Portable devices)	USB		√			√
	CD-ROM					√
	Tablet		√			
	Cell phone		√			√
	Web-based personal computers		√			
Source of data	Spine database			√		
	SUNDHED Health Portal				√	
	Repositories		√			
	Central infrastructure		√			
	Online databank					√
	Health space portal			√		
Exchange method	Portable storage devices					√
	Internet					√

4. Discussion

Today, home care is being converted into a growing trend of providing health care services (8). Current services provided at home entail a wide range of therapies, from follow up visits to assess improvement after surgery, and elderly patients' normal visits, to complicated therapies including dialysis and intravenous treatments. Home care advantages, especially for the elderly and disabled patients are the independent care of patients in their homes and the reduction of expenditures, since home care expenditures are typically lower than keeping patients at hospitals (12). The important issue is to maintain the continuity of patients' care. Considering that providing data plays a more effective role in this field, this study was conducted with the aim of comparing information management flow for

tele-homecare of the elderly in selected countries in 2015. Results of this study showed that data required for home care of the elderly are obtained from various sources and in different forms. Public places for receiving data were hospitals, physicians' offices, clinics, pharmacies, and long-term care facilities (12, 20, 24). A large amount of these data included clinical, laboratory, diagnostic imaging and pharmaceutical data (19, 23, 27). The major source of patients' data to provide better care services was patients' data from hospitals, where they had been hospitalized or received care services for any reason, and their physicians' offices. In these countries, an Electronic Health Record is regarded as the major source of supplying data (18, 24). In addition, using video conference tools is necessary to direct and supervise patients (18, 23). To save data related to home care for the elderly, various methods were used. In some centers, various mobile-based technologies including tablets and personal digital assistants were used to collect data at the care locations, i.e. patients' homes. This is of special importance for home care of the elderly (28, 29). However, results of evaluating home care conducted by the center for controlling diseases and the National Center for Disease Prevention and Control in America showed that 54% of home care institutions rejected the use of any of these technologies and only 16% of them accepted the Electronic Health Record and 28% accepted using the Electronic Health Record and mobile technology. Factors affecting acceptance or rejection of these technologies are the type of possession of service providing center, type of care and the number of patients covered (29). Accelerating the transfer of healthcare to the patient's home requires using communication and information technology to enable home care centers to transfer data after collecting it via a communication system to a health management system at patients' homes, and supervise patients by sharing information with other health care providers (14). In reporting the results of study under the title of "Electronic Health Record System for Elderly Care to Predict Health Assessment" where sensors were used for home care assessment of the elderly, the authors installed sensors in the elderly patients' homes and connected their data to the Electronic Health Record and telecare. The authors reported advantages obtained from their intervention in better management of chronic diseases and reduction of nurses' workload and suggested the Electronic Health Record system be mixed with sensor systems and telecare for elderly care (30). Results of these studies comply with the results of the present study. Since, to supervise the elderly and their home care, sensing networks used in home care are required to be integrated with information systems, especially the Electronic Health Record (30) and regarding biosensors including those that measure vital signs and prescribe exercises or medicine according to that, or alarms in case of critical conditions (10) which are being used increasingly in telecare and home care, it is therefore required to equip these sensors and clinical applied systems (including admission, discharge and transfer systems, clinical information systems, laboratory information systems etc.) as well as the Electronic Health Record to interact with these care methods. Results of this study showed that data exchange and data sharing methods are issues that could be mentioned in transferring data. Media like USBs, mobiles or data repositories store and keep data and exchange them among the care spectrum using the Internet and online or offline databanks between various service providers (17, 18, 24), while another study recommended presenting data to patients using USBs (31). In a study under the title of "Telehomecare and Reducing Healthcare Expenditures", Noel et al. installed a monitor in patients' homes for the supervision of nurses in the central station and provided the connection between patient and care provider via video conference. In their report, they stated that using video conference has many advantages including more patient satisfaction, shorter stay of patients in hospitals, and the possibility of remote counseling with specialists, monitoring medical conditions, preventing instable signs, and increasing patients' training on rehabilitation therapies (32) that complied with the present study. Furthermore, results of this study showed that data are published via registries and national databases, including the National Patient Registry, National Patient Index, and Personal Electronic Medical Record (33), since, providing home care can assist patients' care when the continuity of care and patients' supervision is maintained. These results emphasize the importance of considering data dissipation and use in home care of the elderly. Today, various methods are used to provide home care services (34, 35). In addition, new communication and information technologies can support and develop social and home care (34), since, as the population of the elderly and their need for conservative treatment outside hospitals increases (36), to support home care for elderly patients who stay at home, it is required to pay special attention to the continuous flow of data to maintain the continuity of care. Results of study showed that in using data, it is important to pay heed to the way of management and home care equipment. In most countries, two methods of telecare management are emphasized that affect the way of using data. These two methods were telehealth management systems and points of service (15, 16). In addition, it is important to point out that any equipment used for home care creates data (24, 25) that again should flow in care systems. Of these devices, there are vital sign monitoring devices, sensors, and home devices and equipment in both of which, remote health management and points of service systems as well as devices and equipment are used (13, 14) at the point of providing services.

5. Conclusions

Data and data flow adjustment via the Electronic Health Record are required to maintain the continuity of care in patients who receive home care. In addition, considering the emergence of new technology including wearable systems and using them in home care, it is suggested to investigate the integration methods of the Electronic Health Record in home care of the elderly using human computer equipment.

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Conflict of Interest:
There is no conflict of interest to be declared.

Authors' contributions:
All authors contributed to this project and article equally. All authors read and approved the final manuscript.

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