Original Article

Presenting a Population-Based Multiple Sclerosis Registry for Iran

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Abstract

Introduction: Worldwide prevalence of Multiple Sclerosis (MS) is growing, and given the huge burden on the patient, the community and the healthcare system, prevention interventions and symptom management in order to improving the quality of life of these patients are of utmost importance. One of the most important strategies in this regard is providing the existence of an MS population-based registry. Accordingly, this research was aimed at providing a population-based MS registry model.

Materials and Methods: This is a qualitative study, carried out within the years 2016 and 2017. The population of the present study consisted of models of multiple sclerosis population registries. In this study, a model was provided using library resources, informational networks and information retrieval from databases of PubMed, Google Scholar, Springer, Science direct, and Wiley and also through studying the registry of developed countries. Then, this model using Delphi technique and questionnaire tool was validated and after data analysis, the final model was presented.

Results: In the present study, a demographic MS registry model including the following eight main criteria was proposed: registry goals, data sources, minimum data set, data set, data processing, various types of reports, quality control measures and patient follow-up procedures.

Conclusion: Considering the prevalence of MS in Iran and the need for optimal data management, it is recommended that measures be taken to establish and use a national MS population-based registry and be one of the priorities of the Ministry of Health and Medical Education.

Keywords: Multiple sclerosis, Registry, Data management, Population based registry

1. Introduction

Multiple Sclerosis (MS) is a highly chronic debilitating illness, with social and economic consequences, in which the immune system destructs the protective sheath around nerve fibers (myelin) and the destroyed myelin disrupts the connection between the brain and the spinal cord and other parts of the body [1,2]. Some of the symptoms are common like muscle soreness, balance problems and dizziness, visual problems, loss of strength, dryness and spasms, anxiety, depression, speech disorders, and urinary incontinence [3]. The onset of MS is common during precocious puberty and between the ages of 20 and 40 [4]; therefore, it is considered as one of the main causes of disability in young people [5]. Its prevalence among women is almost two times more than among men [6]. The main cause of this disease is unknown. The focus of the

current treatments is more on reducing and managing attacks [7]. According to the Iranian MS Society (IMSS), which is a member of the MS International Federation, there are about 40,000 MS patients in Iran, of which only 17,000 are recorded in IMSS [8]. It is critical to manage and prevent MS due to the fact that there is no cure for it and also its adverse effects on patients' personal and social life: MS affects the quality of life in terms of physical disabilities, movement disorders, and mental and psychological effects[9]. Information Technology has a key role in health systems, especially in disease prevention, health level monitoring in a population, treatment and etc. [10]. One of the first steps for developing an effective disease management and prevention program is providing a disease registry, designed in two types of hospital-based registries and population-based registries [11, 12]. Population registry is an organized process for collecting, storing, retrieving, and using information from patients who have a particular disease and live in a specific geographical area [13, 14]. One of the benefits of an MS Population-based registry is monitoring the outbreak and prevalence of the disease, improving the quality of care, and evaluating the effectiveness of the patients [15, 10, 16, 17, 18]. The National Cancer Institute and Abdelhac study mentioned that a registry system, regardless of its type, includes: finding cases, collecting and storing information, abstracting, quality control, follow-up with patient, and reporting [19, 20].

In a study by Myhr, entitled "the Norwegian MS Registry and Biobank", it is stated that an MS registry contains three different forms: a general form for demographic data and two other forms for initiating treatment and follow-up. Recording and following-up with patients in this registry should be done at least once a year. It also points out that data analysis is done using descriptive statistics such as proportion and rate, and the purpose of creating such a registry, as a user-friendly tool, is to record all relevant variables [21]. Henriksen in his study "The use of epidemiological multiple sclerosis registers in research: the Danish MS Registry", referred to an MS population-based registry as an effective tool for epidemiological studies, neurological centers, general practitioners, rehabilitation department in hospitals, and MS associations as data sources, demographic data (age, sex, race, etc.) and clinical data (diagnosis, status of injury and patients disability, etc.) as minimum data set. In this study, the diagnostic criteria of the MacDoland mentioned as one of the methods for controlling the data quality entered in the registry, and also how to follow-up patients via address or telephone number every 6 months[16]. In a study by Nickerson, entitled "The multiple sclerosis relapse experience: patient-reported outcomes from the North American Research Committee on Multiple Sclerosis (NARCOMS) Registry", it pointed out that the purpose of an MS Registry is to research about MS, treat and educate patients. Using the registry data including demographic data (age, sex, race, etc.) and clinical data (age of onset of symptoms, age of diagnosis, relapse date, disability level, etc.) can be used for the effectiveness of medications. It is also stated that patients every six months, would fill out the questionnaires of the registry through the website of this registry, online or by mail [22].

Therefore, due to the negative consequences of MS prevalence and the importance of registries in managing and controlling the disease, and the fact that there is no MS population-based registry in Iran, this study was aimed to provide a population-based MS registry model for Iran.

2. Materials and Methods

This is a qualitative study that was carried out during the years 2016 and 2017. The population of the study consisted of MS population-based registries. In this study, sampling was not performed. Developing and validation of the MS population registry

model, using Delphi technique was performed in three steps. In the first step, the MS population registry coordinates from the sources and related articles in the databases of PubMed, Google Scholar, Springer, Science Direct, and Wiley and also the US registry study, France, Denmark, and Norway extracted.

The basic model was designed based on eight main criteria including registry goals, data sources, minimum data set (MDS), data set, various types of data processing, various types of reports, data quality control measures, and patient follow-up procedures. In the next step, to validate the model, a questionnaire containing 21 questions was developed. The questionnaire was validated through content validation based on the study of valid texts and receiving experts' opinions regarding the subject of the research.

The reliability of the questionnaire was obtained through Test-Retest and correlation coefficient of 92%. Then, the questionnaire was distributed among 5 neurologists, 5 epidemiologists, and 5 health and medical information management specialists, who were faculty members of medical universities with at least five years' work experience, and the final model was presented based on the agreement coefficient of 85%, so that each criterion, with an agreement of over 85%, remained in the model, and other criteria, which were less than 85%, were eliminated from the model. Finally, after data analysis, the final model of multiple sclerosis population registry was presented for Iran.

3. Results

According to the findings of the present research, the proposed model of MS population-based registry consists of 8 main criteria, agreed upon by experts. These criteria include: registry goals, data sources, minimum data set defined by the Center for Disease Control and Prevention in Ministry of Health and Medical Education (Iran), the data set used by health centers at the regional, municipal, provincial and national levels, data processing at regional, municipal, and provincial levels, various types of reports provided at regional, municipal, provincial and national levels, data quality control measures, and patient follow-up procedures.

Each criterion has several sub-criteria among which the income level sub-criterion was eliminated from the final model, as only 60% of the experts and specialists agreed with it. Correspondingly, due to the experts' opinion poll and the importance of the clinical data in this registry, more than 90% of the experts suggested that the "paraclinical evaluations" sub-criteria should be added to the "clinical data" from the minimum data set criteria; this suggestion was applied in the final model. Eventually, the final model including the 8 main criteria with several sub-criteria was confirmed, as shown in Table 1.

Table 1. The proposed MS population-based registry model for Iran

Criterion	Sub-criterion
MS registry goals	Treating and educating MS patients
	Medical research
Data sources of MS registry	Hospital-based registry
	Research centers
	Neurological centers
	Specialists in MS neurology
	General practitioners
	Rehabilitation department in hospitals
	MS association
	Neurology clinics

Criterion	Sub-criterion	
Minimum data set defined by the Center for Disease Control and Prevention in Ministry of Health and Medical Education (Iran)	**Demographic Data**	Full Name Birthdate Identification number Gender Race Nationality Income Employment status Level of Education Marital status Health insurance status
	Clinical Data	Age of onset of symptoms Age of diagnosis Relapse date Current status of the immune system Symptoms and immunological treatment Use of healthcare services Disability level
the data set used by health centers at the regional, municipal, provincial and national levels	**Administrative data**	Identification number Full Name Gender Date and place of birth Personal physician / family doctor / neurologist's address and contact information Date of death Name and number of the insurance Date of the last informed consent Ethnicity and race
	Socio-economic data	Place of living (current and previous) Marital status Spouse's information Adopted child Twin Gravida Level of Education Patient's children (count, gender and date of birth) Job Status Job Type Insurance status Membership in the MS Association Quality of life (physical functioning status, mental status, general health status) Major events of life (divorce, death of loved ones, job loss
	Clinical data	Family history and medical records of the patient MS steps Assessments and tests (vital signs, clinical evaluations, daily activities, nerve disorders, performance measurements Diagnostic tests and procedures (laboratory tests and bioassays / biological markers, medical imaging, non-imaging diagnostics, treatment and intervention data, disease-modifying treatments, relapse treatment, MS symptom therapy, other treatments
Data processing at regional, municipal, provincial levels,	The period between the age of first symptoms and the time of diagnosis The frequency percentage of different ages showing the first symptoms The frequency percentage of treatment types according to patients' profiles The frequency percentage of different diagnostic methods The frequency percentage of suicide in MS patients The average age of the patients The average age of diagnosis The proportion of female patients in comparison to male patients	

Criterion	Sub-criterion	
	Evaluation of correlation and the correlation between registry variables using correlation coefficient	
Various types of reports provided at regional, municipal, provincial and national levels	Report of patient follow-up information Comprehensive report of all registry data based on specific diagnostic or therapeutic features Report of medical analysis for physicians Report of any registry to its higher level registry Monthly reports to the physicians (such as the case report of each registry patient, where a case report is a detailed report of the symptoms, signs, diagnosis, treatment, and follow-up of an individual patient.) Periodic reports for doctors to inform them from the registry status	
Data quality control measures in MS population registry	**Quality control indicators**	Correctness Completeness of information in terms of quality: relevance, consistency, format of information display, timeliness, coverage, data validity, definition
	Quality control methods	Assign a national identification number to each patient to prevent duplicate registration Control the data accuracy using McDonald's criteria and confirmation by registry physicians Re-control the final report before each data analysis and before printing
Patient follow-up procedures in MS population registry	**Patient follow-up procedures**	Making a phone call or send a text message Emailing Sending letter
	Follow-up interval	Monthly Every 6 months Yearly

4. Discussion

One of the most important measures for managing chronic diseases, including MS, is the registry design [23]. The MS population-based registry is an organized process for collecting, storing, analyzing, and disseminating information about MS patients [24]. The main purpose of this registry is to manage and control the symptoms of a large population of MS patients, its effective role in the quality of healthcare, engage patients in self-care and be used as the basis for research [16, 17, 18]. Accordingly, the main goals of the registry in the proposed model include the treatment and education of MS patients and medical research.

Regarding the data sources of a registry, Rockville holds the idea of existence of two types of primary data and secondary data. Primary data is collected for direct purposes of the registry, and secondary data includes information collected in order to achieve other registry goals [25]. Studies have shown that the most important demographic registry data sources include hospital registries, MS communities, research centers, neurological centers, physicians specializing in MS neurology, general practitioners, the rehabilitation department in hospitals, MS associations, and brain and neuroscience departments [16, 26]. On the other hand, the collected data by the registry must be trustable, compatible with data standards, and must be proportional to the burden of centers' responsibility for the registry [19].

Considering these cases, the minimum data set for the proposed model includes: 2 groups of demographic and clinical data and sub criteria for each group where data sets are at the regional, municipal, provincial, and national levels; 3 groups of administrative, socioeconomic data, and clinical data that provide collecting and storing all patient data, including demographic, treatment, follow-up, and patient history and records. This category

has the most compliance with the registry goals.

Given that MS registry system is a dedicated system, it is important to cover the specific purposes of this system. In the proposed model, the data integrity is considered in such way that it is not so little that too many numbers of data elements in each category cause confusion and it is not so much that the data elements of one category overlap with the data elements of other categories. In the registry data management, using data processing techniques, it is possible to evaluate care patterns, assess clinical implications and ensure the cost effectiveness of healthcare [27].

Data processing in the registry includes statistical, descriptive, and analytical studies [28]. The most important ones of these processes are: the period between the age of the first symptoms and time of diagnosis, the frequency percentage of different ages showing the first symptoms, the frequency percentage of treatment types, the frequency percentage of suicide in MS patients, the average age of the patients, the average age of diagnosis, the proportion of female patients in comparison to male patients, validation of correlation and the correlation between registry variables using correlation coefficient [28].

The aforementioned processes were considered in the proposed model. Providing information of the processed patient data, therapeutic analysis, providing monthly and periodic reports, and follow-up information to physicians, care providers and health authorities is essential which is considered in the proposed registry. These reports are initiated from the regional level and then referred to national levels.

In order to have quality control and quality assurance in terms of completion of data items, visual inspection to control some inconsistencies such as age and birth date, systematic methodologies, and coding investigation for coding errors and inconsistencies were performed [29]. Assessment methods for information quality criteria in most European advanced registries was the basis for the McDonald's diagnostic criteria [30, 24].

The registry goals without the assurance of the quality of the registry data could not be achieved. Therefore, in the current study, data quality control including indicators and other methods were considered as a major criterion in the design of the demographic multiple sclerosis registry. Communication methods with patients in a registry should be identified: a direct link (current address, telephone number) or through the spouse, guardian (young children), relative or a friend [31].

Since the demographic registry system should cover as much MS patients as possible, the proposed model is designed to follow-up patients regarding their address and culture type. For example, following-up for patients who have not access to the Internet must be done by sending a letter. In a study which was done in the United States in 2016, it is mentioned that follow-up with patients was done through the website or by sending a letter every six months.

Due to the role and importance of the multiple sclerosis population registry in managing and controlling MS and reducing its cost, the proposed model is designed to cover all of the goals of a MS population registry. Also, a clear and precise division into criteria and sub-criteria of this model has been made.

Time limitation of experts was one of the most important limitation of the study. The authors allocated more time to performing this part of study, and had two weeks for every round of the Delphi phase to solve this problem.

5. Conclusion

Regarding the aims of the MS population-based registry model, namely improving the quality of healthcare and knowledge in the field of MS, monitoring the incidence and prevalence of the disease, mortality rate, geographical distribution and monitoring the quality of treatment, it is recommended that measures be taken to

establish and use a national MS population-based registry in Iran, which should become one of the priorities of the Ministry of Health and Medical Education. The research findings could be used for these cases: Raising the health policymakers and planners' awareness of the importance of the MS population-based registry, obtaining useful MS information for research centers, and using an efficient registry to manage patients' data. It is suggested that in future studies, software design models be considered based on the current study.

Conflict of Interest

The authors declare no conflict of interest.

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