Electronic Medical Records for Mental Disorders: What Data Elements Should These Systems Contain?

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Abstract. Identifying data elements of electronic medical record systems (EMRs) is one of the essential steps for the comprehensive and proper health data collection. The aim of this study was to determine the data elements required for EMRs in the field of mental disorders. We conducted a literature review and also we randomly selected 50 medical records of patients with mental disorders to identify a preliminary list of essential data elements for EMRs for mental disorders. Then, 33 mental health specialists were surveyed to validate the list of data elements through a questionnaire. We identified that health data elements of EMRs for patients with mental disorders can be categorized into seven classes (demographic data of patients, administrative data of physicians, administrative data of patients, history, clinical data, treatment, and financial data) and 10 subclasses. After the validation process, 140 essential data elements for EMRs for patients with mental disorders were introduced.

Keywords: data elements, minimum data set, electronic medical record systems, mental disorders

1. Introduction

Today, healthcare systems have moved towards the utilization and use of electronic technologies such as mobile health and electronic medical records (EMRs) [1]. The use of these technologies can lead to reduce medical errors, improve quality of health services, increase productivity, improve information quality, support for clinical decision-making, reduce healthcare costs, and better patient-physician communication and education [2-6].

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Despite the benefits of EMR, its utilization in the mental health field is more modest compared to other areas [7]. Today, the very high growth of medical knowledge has led to an increase in the number of clinical specialties and hence more than one expert involved in the treatment of patients, due to nature of mental illness [7]. In such an environment, many medical records could be created based on the treatment process by many specialists. Therefore, patients' data are scattered [6].

There are many barriers and challenges for developing and implementing electronic systems such as EMRs [6, 8, 9]. In this regard, determining the appropriate and consensus-based data elements for developing EMRs is important. Data elements play an important role in collecting and documenting information about patients in their EMRs [10]. The purpose of Minimum Data Set, as core health data elements, is to standardize data items and their definitions [11]. On the other hand, for the purpose of developing electronic medical record systems for patients with mental disorders and customizing them according to the needs of psychiatric patients, one of the main steps is to identify the data elements required by the electronic medical records in this area.

Many promising studies have been done on the design of data elements in different medical fields [12-14]. Furthermore, there are many studies related to data elements of EMRs in different fields [10, 15, 16]. In addition, some studies have been conducted on the design of psychiatric assessment forms or mental illness registry [17, 18]. Organizations such as UK National Health Service [19] set Mental Health Minimum Data Set (MHMDS) and Australian Institute of Health and Welfare (AIHW) [20] has the same elements in medical records of patients with mental disorders as the 27 elements. However, these data elements have not been developed and customized for electronic systems. Some promising studies have been conducted for implementation of EMRs in mental institutions [21-23], but they have not reported data elements for EMRs. Therefore, there are few studies regarding the data elements required for EMRs in mental disorders. The aim of our study was to determine *minimum* data elements required toward developing EMRs for patients with mental disorders.

2. Methods

This descriptive cross-sectional study was carried out in 2018. To determine the data elements for the EMRs for patients with mental disorders, a literature review [17-20] were conducted. In the next step, 50 medical records of psychiatric patients were randomly selected from one of the specialized psychiatric hospitals, in Tehran, Iran. All patients' data were completely anonymized and the study has been proved by the ethics committee as well. The medical records were selected based on the psychological disorders diagnosis codes of International Classification of Diseases, fifth chapter (F00-F99). From each of the 10 blocks of this chapter, five records were randomly selected. Using a checklist, the contents of these records were extracted and qualitatively were analyzed to identify the common data elements used by physicians.

Then, we aggregated and classified the data elements identified from the literature review and medical records in some data classes and subclasses. In the next phase, data elements were validated through a survey on psychologists and psychiatrists (Figure 1). To this end, a questionnaire was designed in two parts. The first part contains the demographic data of participants, and the second part was related to the data elements for EMRs, which were classified into seven data classes. The scale of this questionnaire was two choices: necessary and unnecessary. The content validity of this

tool was confirmed by three relevant experts (in the fields of mental health, health information management and medical informatics). We used the Kuder-Richardson coefficient for its reliability. The paper-based questionnaires were handed to 45 mental health specialists (psychologists and psychiatrists) with a minimum of 10 years of work experience in the relevant field. These specialists were selected from three psychiatric hospitals (15 participants from each hospital). Finally, 33 specialists participated.
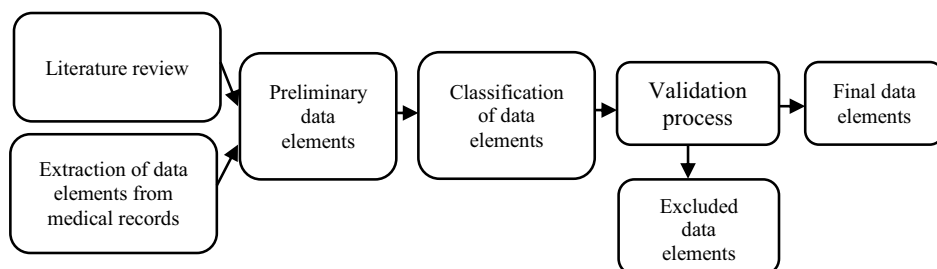

Figure 1. The steps of the study

Data analysis was done using descriptive statistics and SPSS software, version 20. After a survey by specialists, the agreement on each of the given data elements was calculated as percentages. All data elements with less than 75 percent agreement were considered as unnecessary data elements and excluded [24, 25]. Other data elements were suggested as the necessary data elements for the electronic medical records of mental disorders. The ethics committee of Iran University of Medical Sciences, Tehran, Iran approved this study and confidentiality of patients' data was observed.

3. Results

The demographic characteristics of the participants are presented in Table 1.

Table 1. Demographic status of participants in the research

Demographic characteristics		Total	
		Number	**Percent**
Gender	Man	30	90.9
	Woman	3	9.1
Age group (years)	40>	3	9.1
	40-50	6	18.2
	50<	24	72.7
Type of job	Clinical	29	87.9
	Clinical and academic	4	12.1
work experience (years)	20>	9	27.2
	20-30	12	36.4
	30>	12	36.4

Table 2. Frequency distribution of data elements

Classes of data	Subclasses	Number of data elements (Pre-poll)	Number of deleted data elements	Number of final data elements
Demographic data of patients		24	6	18
Administrative data of physicians		6	1	5
Administrative data of patients		8	-	8
History	Medical	16	-	16
	Social	8	-	8
	Allergy	2	-	2
	Family	1	-	1
Clinical data	Sign and symptoms	42	-	42
	Chief compliant	3	-	3
	Laboratory	8	3	5
	Diagnosis	5	-	5
Treatment	Medication	12	1	11
	Electroconvulsive	14	-	14
Financial data		6	4	2
Total		155	15	140

In total, 155 data elements were identified and classified in seven data classes and 10 sub-classes for the EMRs. Of these, a total of 140 data elements were validated by participants as necessary data elements for EMRs, as presented in Table 2. Finally, the data elements obtained for the EMRs are shown in Table 3. The excluded data elements are shown in Figure 2.
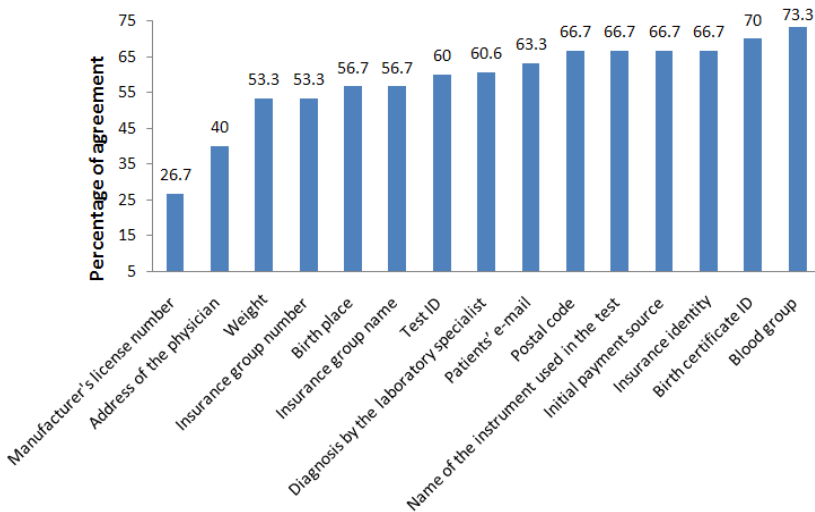

Figure 2. The excluded data elements

Table 3. Data elements of the EMRs for mental disorders

Classes	Subclasses	Name of the data element
Demographic data of patients	-	First name, Last name, Medical record number, Father's name, Date of birth, Marital status, Gender (male, female, unknown), Current Status of employment, National ID, Nationality, Language, Ethnicity, Religion, Patient address, How to live (with parents, alone and etc.), Patient phone number, Companion patient phone number, Education level
Administrative data of physicians	-	First name and surname of physician, Physician unique ID, Family name of anesthesiologist, Anesthesiologist unique ID
Administrative data of patients	-	Post-discharge status (recovery, relative improvement, discharge against medical advice, died, follow up), Duration of stay, Type of admission (outpatient, hospitalization, emergency), Patient entrance (with ambulance, under anesthesia, etc.), Frequency of admissions, Informed consent, Hospitalization place (ward, room), Final diagnosis code based on last edited of ICD and DSM
History	Medical	History of chronic diseases (diabetes, hypertension, etc.), History of surgery, History of head trauma, History of urinary incontinence in childhood, History of hospitalization in psychiatric centers, History of seizure, The most important event in childhood, Early childhood problems, Early adolescence problems, Early adulthood problems, History of suicide, ADHD in childhood, Type and dose of previous medications, Possible side effects of medications (type of complication, treatment of the complication), The source of history (the patient, the patient's father, etc.)
	Social	Smoking history and its type, History of alcohol use, History of use of psychoactive tablets and its type, Legal history of the patient, Common habits, Other social histories
	Allergy	Patient's medication allergy, Patient's food allergy
	Family	History of mental illness in parents, sister, brother, uncle, etc.
Clinical data	Sign and symptoms	Delusions and its type, Illusion and its type, Sleep disorders (insomnia, etc.), Serious and important changes in food habits (increase or decrease in appetite), Changes in daily activity (extremes in activity-etc.), Irrational fears or phobias and its types, Obsessive thoughts, Obsessive acts, Suicidal thoughts, Change in libido (increase or decrease in libido), Self-injury, Self-sexual injury, Physical harm to others, Sexual harm to others, Alcoholism, Drug addiction, Cognitive problems, Depressed mood, Occupational dysfunction, Anxiety, High-risk behaviors, Status of social participation, Inability to enjoy, Illegal actions of patients, Guilty feeling, Physical distress, Speech impairment, Feel of safety in life, Feelings of panic and fear, Feelings of pity too much to some people, Anger in dealing with others, Inability to concentrate, Pessimism and suspicion, Hysterical faints, Aggression (verbal or physical), Fast weight change (increase or decrease weight), Irritability, Symptoms of mental retardation (low IQ, etc.), Patient's vital signs.
	Chief compliant	Main complaints, Starting date of the current disease, The onset of current disease (suddenly, after a specific problem, unknown, etc.)
	Laboratory	Type of test (blood test, urine test, stool test, spinal cord test, etc.), Physician's order date, Patient status during the test, Interpretation of the physician, Test results
	Diagnosis	Admission diagnosis (the cause of hospitalization), The main diagnosis (diagnosis at discharge), Final diagnosis, Post-discharge recommendations (follow up, etc.), Any consultation (psychology, internal, heart, etc.)

Table 3. Continued

Classes	Subclasses	Name of the data element
Treatment	Medication	Name of the medicine (brand or generic), Drug code, Prescribed dose, Number or volume of the drug dispensed, Route of administration (oral, nasal breathing, syringe, etc), Frequency of drug use (four times a day, three times per day, etc.), Date of use, Date of stopping the drug, Date of prescription, Time of administration of the drug, Possible side effects of the drug
	Electroconvulsive therapy	Name of specialist physician, Name of anesthesiologist, Symptoms of disease, Type of anesthetic, Muscle relaxant type, Type of missed drug, Amount of anesthetic agent, Amount of muscle relaxant, Atropine, Mile ampere, Shock therapy result, Patient status at the end of anesthesia, Complications before the shock, Complications after shock
Financial data		Cost, Insurance contract

4. Discussion

The accurate documentation of patients' information is directly related to the quality of treatment and the improvement of treatment outcomes. This requires the creation of a comprehensive and appropriate medical record that covers all the required information and responds as much as possible to the current situation of patients. This cannot be done except by precisely identifying the appropriate data elements for documentation of patients' data in medical records. In fact, it is clear that the comprehensiveness and appropriateness of EMRs for mental disorders depend on the correct selection of these elements that their collection seems necessary [20-22].

This study aims to answer the question of which data elements are required for electronic medical record systems for patients with mental disorders. After detailed literature review [16-19] and surveys carried out by psychiatric experts about the data elements designated for the electronic medical record, in total, 140 data elements for the EMRs of patients with psychiatric disorders were identified. These elements were classified into seven data classes: demographic data of patients, administrative data of physicians, administrative data of patients, history, clinical data, treatment, and financial data and 10 subclasses. Rezai et al. [17] considered the data elements required to document the mental history and evaluation of patients in a total of 58 elements, in 11 categories of demographic data, past history (disease history, psychiatry history, medical history, non-psychiatry history, history of development and history of health, history of family psychology, history of relationships with family, legal history), current symptoms, suicidal risk assessment, behavioral or emotional conditions, thinking process, physical examination, drug abuse assessment, safety and domestic violence, the ability to function and daily activities, multi-axial diagnosis, and treatment outcomes. In the UK [18], 76 data elements in four categories including patient details, mental health care details, details of the assessment of the care plan approach, and the details of the mental health care package have been developed. In Australia [19], 27 data elements have been defined in this regard. Furthermore, in Europe, a standard titled Patient Summary has been developed o define data elements for European electronic medical records. In the Patient Summary, different categories of data such as patients' attributes, patients' address books, advance directives, allergy and intolerance, functional status, history of past illness, history of pregnancy, history of procedures, immunizations, medical devices, medication summary, plan of care,

problems, results, social history and cross border have been defined [26]. However, none of these data elements developed in these countries is related to EMRs for mental disorders. Although they are valuable, they have not defined specialized data elements for EMRs for mental disorders. In our study, some categories of data and data elements are similar to these projects; however, more specialized data elements in the field of mental disorders were identified for EMRs.

As this study was conducted in three hospitals in one country, our results may not be generalizable to the other countries. Additionally, in this study, we considered mental disorders in general. Therefore, this research provides fundamental findings for further studies. Future studies may consider specific mental disorders to identify more specialized data elements. Lastly, developing data elements is a preliminary step to develop EMR systems. Further studies should focus on developing use cases and the EMR system.

In conclusion, we are confident that the results of this study will be of great assistance to mental health centers, which want to implement electronic medical records. Identifying these elements at least leads to an overview that can help information system developers and EMR vendors to facilitate and accelerate the development of such a system and reduce the likelihood of a system failure. In addition, the results of this study can be useful for mental health managers who tend to implement electronic medical record systems, in order to plan more accurately and increase system effectiveness.

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