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Correction of patient medical record errors through a file control method

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ABSTRACT

Aim: The purpose of this study was to reduce the errors that might occur in the medical practice records to the lowest possible level, thereby contributing to a better quality of health care services. The aim of this study is to reduce the errors and deficiencies in the patient files by providing training related to medical records and patient files to the personnel who are responsible for filling the patient files. This study was based on medical record errors in patient files.

Method: The study was carried out in a training and research hospital in the Turkish health sector, and 360 physicians, nurses, and medical secretaries took part. In this context, the mistakes in the patient files were monitored and recorded, the recordings were analyzed to determine error areas, and the participants were trained to enter patient files correctly and completely.

Results: The error-free patient file rate was 9% in the first month of the study. In the second month of the study, the participants were trained to properly complete the patient's files. The error-free patient files rate increased to 35%, 41%, 69% in the second, third, and fourth month of the study, respectively.

Conclusion: Our data demonstrate the importance of educating health workers to prevent mistakes in medical records. Our data also demonstrate the necessity of using electronic medical recording systems. All health institutions should move into regular, accurate, and complete recording systems to prevent medical errors that might arise in terms of patient and employee safety, thereby helping to fulfill their legal responsibilities.

Introduction

In recent years, there have been major developments in data-information management and clinical decision-making processes. Electronic medical records are used extensively in healthcare institutions, especially in hospitals. In recent years, developments in software and the internet have increased the use of electronic medical records in health systems in multiple countries, including Turkey. Electronic medical records are extremely important in terms of patient safety, cost reduction, rapid delivery of services, quality improvement, and evidence-based practice, evidence-based nursing, and clinical performance. However, healthcare professionals, particularly medical secretaries who will use electronic medical records, need to be trained in this. Errors in medical records put health professionals and hospitals at a disadvantage in legal and other situations [1–4].

One of the most important problems of quality management in the health system is disruptions in the recording of medical data. Patient's anamnesis reports, epicrisis, informed consent forms, surgical side-marking forms, and that physician orders are not written in accordance with service quality standards are the main problems. Failures to correctly complete health records have adverse effects on patients' safety [5]. Patient files are important documents indicating to whom, why, where, when, and how care and treatment are given [6]. Patient files in healthcare organizations

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can be recorded manually or electronically [7]. Manual patient record systems are a conventional type of recording method. Typically, compared to conventional approaches, electronic medical record (EMR) systems are more modern and advantageous [8]. At the beginning of the 2000s, especially in developed countries, conventional manual medical record systems began to be substituted for EMR systems [9]. However, although progress has been made in moving into the EMR system in many countries, medical records are still kept on paper in those countries [10–12]. However, due to technological, financial, and organizational factors, EMRs have been adopted slowly, especially in developing countries [13].

Medical records do not always contain reliable data. Medical records are often incomplete or incorrect, and their clinical reliability is insufficient [14,15]. This leads to difficulties in managing health care, as well as measuring and developing the quality of care. EMR systems are thought to have many benefits for health care. Significant progress has been made in EMRs, especially in the United States [10]. EMRs provide important benefits in many areas, such as controlling health expenditures, reducing costs, improving quality and patient safety, increasing efficiency, accuracy and precision in patient information, paperless health care, fast and continuous entry of patient data, and providing more health data to medical researchers [5,7,9,16,17].

The patient record systems in hospitals in Turkey are typically automation systems in which information are scattered and cannot be converted into data, are used only in medical processes, and this system does not have a standard [18]. The results of diagnosis and treatment methods applied to patients in health institutions are kept in the files prepared for patients. The complete and accurate creation of patient files can provide significant benefits to patients, hospitals and paying, social security and health insurance institutions. In particular, the complete and accurate filling of the medical records and patient files will have a positive impact on the treatment process, facilitate the examination of the patient's medical history and provide important legal benefits in the case of the request of the judicial authorities [19].

Method

Aim

The purpose of this study was to investigate opportunities for reducing the error rate in medical practice records using a File Control Team (FCT). Our study aimed to correct the deficiencies in the file contents, especially the deficiencies in the physician requests reviewing all inpatient files within 4 months in a public hospital in Turkey. In this context, the healthcare organization employees (physicians, nurses, medical secretaries) were trained on maintaining complete and correct medical records; after being audited, the results obtained were compared with the pre-training situation. In this study, the errors and deficiencies in the patient files were investigated according to the branch, profession and error sources. Also, in the study, medical records staff and health professionals were trained on medical record errors, and this was analyzed by the influence percentage method of reducing the error in recording inpatient files. The File Control Team (FCT) was created within the hospital to examine and correct medical errors in patient files. There is little research on in-depth analysis of medical record errors in the Turkish health system. To our knowledge, this study was the first quality management study that examines the type and incidence of medical record errors based on patient care files. This research is one of the initial studies in Turkey related to reducing the errors and deficiencies in the patient files by providing training related to medical records and patient files to the personnel who are responsible for filling the patient files. This study was based on medical record errors in patient files.

Study design

This study was based on medical record errors in patient files. This research was carried out in Van, Turkey. Van providence is one of the biggest provinces of the Eastern Anatolia region in Turkey. This study was planned at the "Van Region Training and Research Hospital". This hospital is the largest hospital of a middle-sized province situated in the eastern part of Turkey. Ethical approval was obtained from Van Regional Training and Research Hospital Ethical Committee. The administrative permission required for the research was taken from the top management of the related hospital.

In this study, the FCT was created within the hospital to examine and correct medical errors. This research included training and corrective actions for the patient files. The team is responsible for the management, training, coordination, error detection, and data recording. The team consists of five people (three doctors and two medical secretaries). All orders given by health care providers and other medical records were instantaneously and manually reviewed by the FCT, established by the researchers within the hospital. The obtained data were analyzed on excel, and the errors were detected. The problem-based solutions were produced for the detected errors. All inpatient files receiving inpatient treatment in a health facility between May 1, 2015, and August 31, 2015, were controlled by FCT members during the study. Within this scope, a total of 11,212 patient files taken from 34 different branches within the hospital in the related period were reviewed instantaneously. Accordingly, a form consisting of the standards that are considered to be important in terms of patient and employee safety was prepared in the scope of Quality Standards in Health, published by Turkish Republic Ministry of Health. FCT reviewed and recorded the errors in the patient files by profession, according to this form (Table 1).

The truth/falsity of patient files was determined by the Quality Standards in Health (version 5), published by the Republic of Turkey Ministry of Health. A control chart was created containing the features and documents required in the patient files. Patient file error criteria were determined in this control chart. Patient file control criteria include missing signatures, not completing required gaps and gaps, not filling the file in time, not updating the information when necessary, not repeating the forms in case of changes, not having spelling errors, not making the definitions clearly and not delivering the file on time. Also, the contents of the documents to be included in the patient file specified in the directive of medical records and archive services of inpatient treatment institutions and whether they were filled in correctly were examined. These documents included; (a) patient acceptance paper, (b) medical observation and examination paper, (c) body temperature paper, (d) patient sign, (e) x-ray request paper and reports, (f) laboratory request paper and examination reports, (g) surgery paper, patient inspection request form, and (h) output summary (epicrisis).

Data analysis

The research data were analyzed with SPSS Version 20. Data were analyzed with descriptive statistics.

An article was also sent by the hospital management to the health service providers at the beginning of the study. It is stated in this informative article that the treatment plan does not satisfy Health Quality Standards and risks the patient's safety. It is also stated in the article that the treatment plan should include the treatment date, full name of the drug, its dose, time of application, frequency of application, a period of administration, and mode of administration; in which abbreviation, shapes, and symbols should not be used, and that this information should be updated daily.

Table 1
Errors of patient files by profession.

Source	Error
Secretary	• Failure to fill out the social security and identification information of patient in the file • Failure to make markings on the patient file form correctly • Incomplete/incorrect filling out the hospitalization consent form • Failure to delivery of files on time • Missing examinations and reports
Doctor	• Failure to fill out the doctor's daily observation form • Failure to write patient's medical chart daily, using inappropriate abbreviations, not specifying dose, route of administration, period of administration, issue date of medication, not including physician information • Failure to fill out epicritis report timely and correctly • Failure to record the informed consent form prior to risky interventional procedures • Missing or incorrectly filling out necessary information in the consultation form • Filling out II, III and IV sections of the safe surgical control list incompletely • Failure to fill out APACHE II (Acute Physiology and Chronic Health Evaluation), PRISM (Pediatric Risk of Mortality) score (in 3rd stage intensive care patients) • Failure to make side labeling in the surgical area detection and operation preparation form • Lack of seal and signature in the documents and forms
Nurse	• Failure to fill out nursing services pre-evaluation form correctly • Filling out the informed consent form for the patients with blood transfusion • Missing/incorrectly filling out blood component transfer and transfusion follow-up form • Failure to record patient and patient relative's training • Failure to fill out falling risk scale when patient is hospitalized/or his/her state changed. • Making typos in the level and observation form, missing description, the presence of missing descriptions. • Failure to fill out the related part of the safe surgical control list before patient's departure from clinic • Failure to fill out the discharge summary form, to record for discharge training

Table 2
Training participation rate by profession.

Title	Number of education participants	Number of education nonparticipants	Participation rate (%)
Physicians	110	56	66
Nurses	227	53	81
Secretaries	32	0	100

Table 3
Internal-surgical clinic distribution of patient files and distribution of reasons of error by month and profession.

Item no	Total file number reviewed	Number of patient file filled out correctly		Number of patient file filled out incorrectly		The sources of error by profession group		
						Doctor-related	Nurse-related	Secretary-related
May total	2.636	245	9%	2.391	91%	2.111	268	955
Internal	952	151	16%	801	84%			
Surgical	1.684	94	6%	1.590	94%			
June total	2.666	945	35%	1.721	65%	1.609	143	545
Internal	1.062	822	77%	240	23%			
Surgical	1.604	123	8%	1.481	92%			
July total	2.590	1.072	41%	1.518	59%	1.254	116	359
Internal	874	682	78%	192	22%			
Surgical	1.716	390	23%	1.326	77%			
August total	3.320	2.283	69%	1.037	31%	988	59	240
Internal	948	447	47%	501	53%			
Surgical	2.372	1.836	77%	536	23%			
Total (4 months)	11.232	4.545	40%	6.687	60%	7.795	827	2.605
Internal	3.836	2.102	55%	1.734	45%			
Surgical	7.376	2.443	33%	4.933	67%			

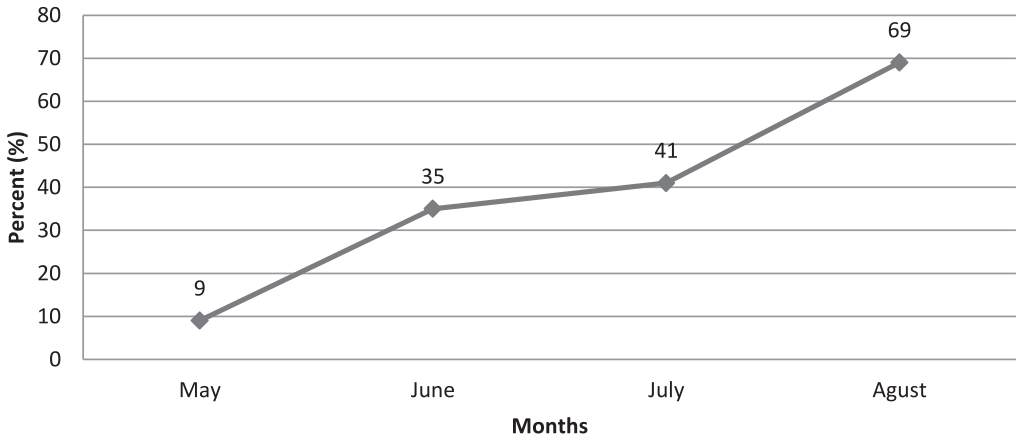
Following these activities, physicians were given training on treatment plan writing and medical errors. The training was realized in five phases. The training was given by FCT to the clinically responsible physicians in the first phase, clinically responsible nurses in the second phase, clinician physicians in the third phase, clinical nurses in the fourth phase, and clinical secretaries in the fifth phase.

When the rate of the trained personnel was reviewed, we detected a 100% participation rate in secretaries, 81% in nurses, and 66% in doctors (Table 2).

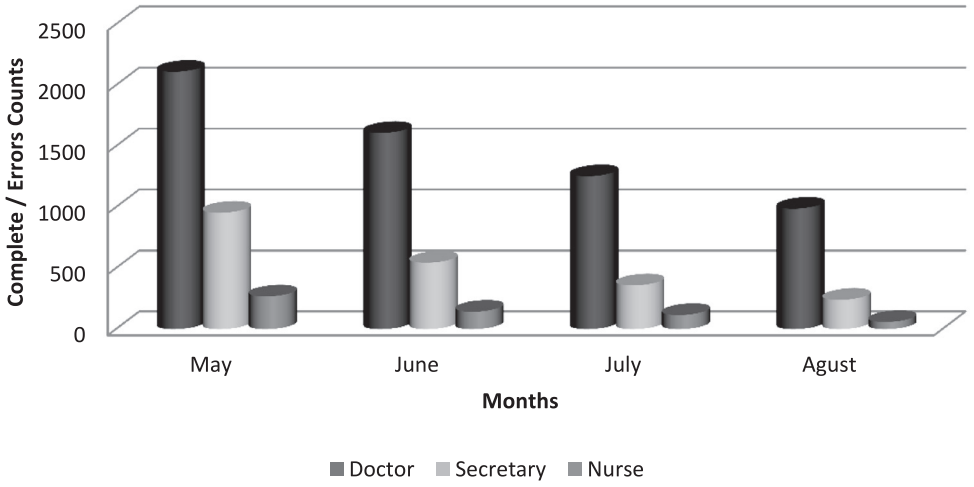
Results

All inpatient files receiving inpatient treatment in a health facility between May 1, 2015, and August 31, 2015, were controlled by FCT members during the study. Within this scope, a total of 11,212 patient files taken from 34 different branches within the hospital in the related period were reviewed instantaneously. Accordingly, it was determined that the total number of files correctly filled out for the related period was 4.545 (40%) in general, and the number of files filled out incorrectly was 6.687 (60.0%). Among the total files reviewed, 3836 (34%) belonged to internal clinics and 7376 (66%) belonged to surgical clinics (Table 3).

When reviewed clinically, we found that the rate of the patient files completed correctly in the internal clinics was 55%; the rate of the patient file incorrectly filled out in the surgical clinics was 33% throughout the 4 months of the study. On the other hand, while the rate of patient file correctly filled out was only 9% at the beginning of the study (May 2015) throughout internal and the surgical clinics, it increased to 35% at the end of the first month



Graph 1. Complete/without errors record ratio in patient files.



Graph 2. Numbers of incorrect patient files by profession (between May 1, 2015 and August 31, 2015).

of training (June 2015), to 41% at the end of the second month (July 2015), and to 69% at the end of the study (August 2015) (Graph 1).

In the same period, the rate of files correctly filled out, which was 16% in the internal clinic, increased to 47%, the rate of files incorrectly filled out, which was 6% in the surgical clinics, increased to 33%.

The sources of error have been revealed according to occupational groups in the study. When sources of error are reviewed according to the professional groups, the number of files incorrectly filled out in the health institution during the study period was improved by about 53% in physicians, by about 77% in nurses, and by about 74% in secretaries (Graph 2).

The FCT investigated the reasons for secretary-based error sources at the beginning of the study and determined that most problems arose from uncertainty or deficits in the distribution of roles between the policlinic secretary and the clinical secretary. Thereupon the job definitions of the policlinic secretary and clinical secretary were redefined and clarified.

When the distribution of the patient files was reviewed according to branches, we found that the furthest errors were experienced in general surgery (18,37%) and plastic surgery (11,14%). We found that daytime chemotherapy, ophthalmic, hyperbaric medicine, and hematology services were the units that are relatively better at completing patient files. When accurate and complete file distribution is examined according to branches; cardiology, cardiovascular, plastic surgery and pediatric surgery branches have higher accurate and complete file rates than other branches (please see Table 4).

The distribution of the error made in the medical record was also discussed within the scope of the study. Accordingly, the main errors made in filling out the content of the files were as follows: lack of physician information; failure to write daily orders, specify doses; failure to specify the time and route of administration of medication; using abbreviation, shapes, and failure to specify the date. The main serious error rates determined are using abbreviation, shapes and symbols, and failure to specify the route of administration of medication (mouth or vein) in patient files (Graph 3). The distributions of the errors by professional title (occupation) are given in Graph 4.

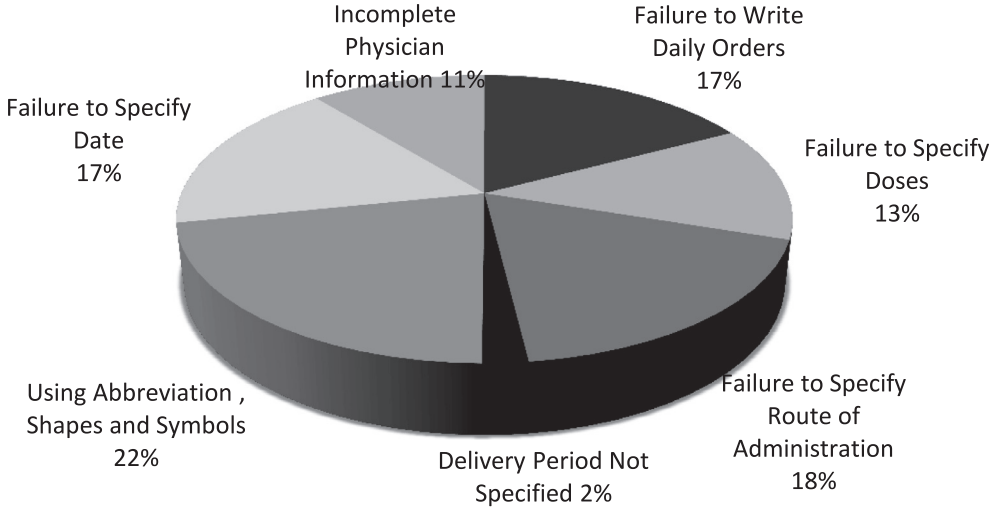
A total of 6687 files were incorrectly completed by nurses, physicians, and secretaries, and the total number of errors in the professional title- based distribution was 11,229. We found that 1.67 errors per file were made on average. This indicates that more than one physician, nurse, or medical secretary-related errors were made on the same file.

Discussion

In this study, we aimed to correct the deficiencies in the file contents, especially the deficiencies in the physician requests reviewing all inpatient files within 4 months in a public hospital

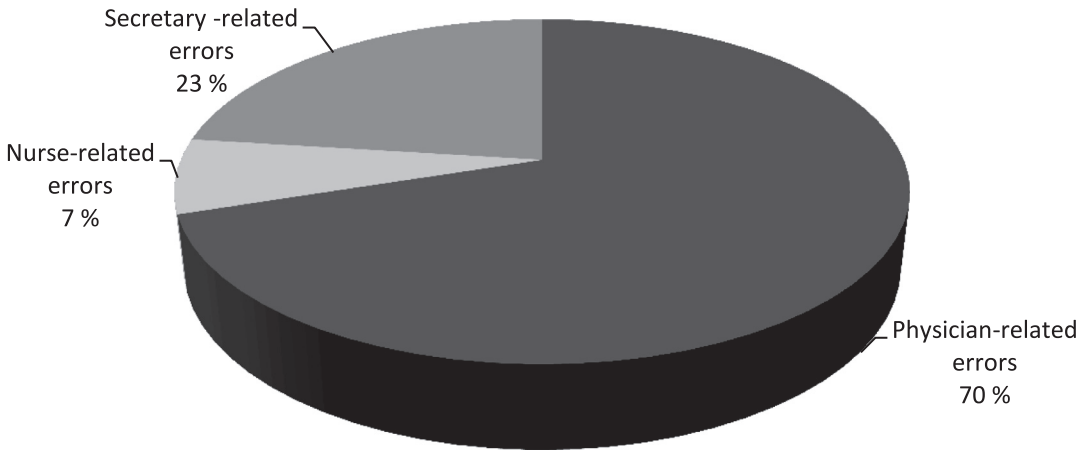
Table 4
Distribution of patient files reviewed on clinical basis.

Clinics	Number of files incorrectly filled out/total number of incorrect files (%)	Number of files correctly filled out/total number of correct files (%)	Number of clinical files/total number of files (%)
Dermatology	0,27	0,25	0,26
Internal medicine	2,7	5,22	4,18
Infectious disease	0,76	1,28	1,06
Physiotherapy	0,31	1,27	0,87
Gastrology	1,96	1,9	1,93
Chest diseases	2,25	5,56	4,19
Ear nose throat	7,24	3,77	5,2
Neurology	0,78	2,69	1,9
Psychiatry	0,03	2,54	1,5
Rheumatology	0,25	0,66	0,49
Medical oncology	0,36	1,78	1,2
Neuro Surgeon	4,13	2,41	3,12
Pediatric surgeon	9,64	4,68	6,73
General surgery	18,37	7,98	12,27
Thoracic surgeon	0,81	0,29	0,5
Ophthalmic	0,01	7,3	4,29
Orthopedics	8,71	5,77	6,98
Plastics surgery	11,14	6,21	8,25
Urology	5,4	4	4,58
Burn Unit	0,28	1	0,71
Reanimation intensive care	2,39	1,77	2,03
Nephrology	1,88	0,87	1,29
Endocrinology	0,69	0,51	0,58
Day time chemotherapy	0	2,9	1,7
Hematology	0,09	0,95	0,59
Undersea and hyperbaric medicine	0,08	0,16	0,12
Asiatic	0,31	0,66	0,51
Algological	0,04	0,05	0,04
Cardiology	7,44	13,06	10,74
Cardiovascular	8,61	6,98	7,66
Internal intensive care	0,8	1,05	0,94
Cardiovascular intensive care	0,44	0,85	0,68
Cardiology intensive care	1,72	3,53	2,78
Palliative care	0,12	0,1	0,11
Total	100	100	100



Graph 3. Percentage slices of errors made in medical records.

in Turkey. In this context, the healthcare organization employees (physicians, nurses, medical secretaries) were trained on the complete and correct medical recording; audited, the results obtained were compared with the pre-training situation. We found that the complete file rate compliance rate increased and the errors decreased from 91% to 31% through the training given and audits performed during the study. The manual file recording system-based errors were quite high at the beginning of the study in the healthcare organization, and with training and auditing, a relative improvement was provided in the complete file rate. The department where the errors were made at most at the beginning (May 2015) and at the end (August 2015) of the study was surgical clinics. The medical record error rates were worst at the general surgery and plastic surgery departments. The number of the documents filled out in the surgical clinics, patient circulation, and highness of the number of operations applied to the patient



Graph 4. Distribution of errors in patient files according to profession.

affected the error rate, especially in these two departments. The reasons of higher error rates in these clinics were determined as the highness of daily hospitalization of patients, intervened with limited (local anesthesia) narcotization method; failure to specify a separate workflow diagram and/or procedure for these patients. In this study, we found that the number of files incorrectly filled out was higher in the clinics with more hospitalization.

The 91% rate of patient file error was more than expected when the study gets started. Patient files ($n = 1333$) were investigated in a study by Aljeraisy et al. based on the observations or detection of patient files, and 79% of these files were determined to be incorrect [20]. The sources of error in the files incorrectly filled out in a public hospital in Saudi Arabia were investigated in another study by Dibbi et al. [21]. Accordingly, a total of 3963 errors were detected in 2627 patient files, filled out incorrectly for 2 years (June 2000–June 2002). Accordingly, it was determined that three or more errors were made in 10% of the subject patient files, two errors in 2%, and one error in 1%. It was found that an average of 1.5 errors were made per file. Here, we detected an average of 1.67 errors was made per patient file.

Aljeraisy et al. find out that the order writing error made by physicians in the medical records and patient files was in the first place with a ratio of 56%, and the dose writing error was in the second place with a ratio of 22%. They revealed that in medical records and patient files, the use of symbols, figures and abbreviations takes the first place with a ratio of 22%. The second source of error was found to be 17% with no date in patient files and medical records [20].

As a result of the study, the rate of complete files could be increased only to 69%, and the expected rate of 100% was not reached by the researchers. One of the main reasons why this expected level could' not be achieved is that physicians with high autonomy in health institutions prefer their usual registration system. The least level of participation in the medical registration training meeting was realized by a physician group within the scope of this study, on the other hand, the highest rate of files incorrectly filled out was physician-related. The necessity to move into an EMR system has been argued for in many countries. Sood et al. revealed that there are significant differences between developing and developed countries regarding the development, progress, and sustainability of EMR systems, and asserted that EMR system-related applications should be reviewed, especially in developing countries [22]. In this context, it was stated in the study by Funmilola et al. that manual methods have been used in medical recording in most of the existing hospitals in Nigeria, and that this causes many problems, especially inconsistencies in the handwriting of individuals, excessiveness in patient files, and the archiving problems of patient files [23]. In a study by Wong and Bradley, the periods in which EMR was used and that EMR was not used (2006–2007) were investigated in terms of accessibility to medical records, integrity in medical records, and physician satisfaction. The authors found that the time spent finding medical records decreased from 31.2 to 15.7 s. However, the rate of correctly filling out medical records increased from 6.5% to 45.7%, and the average score of physician satisfaction increased from 11.3% to 15.2% [24]. In a study by Pourasghar et al. on physicians and nurses in Iran, 60% of physicians and 80% of nurses stated that they had difficulty in attaining patient information from the patient files filled out manually [25]. Most (90%) of the interviewed doctors and a great majority of the nurses reported that bad handwriting was the main problem with the patient files filled out manually [16].

Conclusion

Our study may be important for health information management and technology management. Because, this research is one of the initial studies in Turkey related to reducing the errors and deficiencies in the patient files by providing training related to medical records and patient files to the personnel who are responsible for filling the patient files. This study produced large improvements regarding important issues in terms of patient safety, such as writing order, the safety of the medication, surgical safety, for which great difficulties have been encountered, and most common errors have been made in satisfying Health Quality Standards. At the end of the study, the integration of the hospitalization consent form into the hospital information management system (HIMS) was recommended, and the recommendation was approved by the hospital administration.

The orientation of staff has been increased with safe surgery-themed training and accelerated the compliance of newly admitted health professionals to the rules. The correct-side and correct-patient surgeries are provided through the procedures and instructions prepared in the direction of safe surgical practices. Effective communication within the team has been improved with the pre-op unit operation instruction, and it has been attempted to prevent false/inappropriate side marking. Safe surgical practices have increased the functionality and reliability of surgery processes.

Doctors, nurses, and medical secretaries can take important actions in reducing medical record errors in the error file. Here, we found health professionals can significantly reduce the recording errors in patient files, especially with the in-service training of

physicians and nurses. Although training and auditing are important factors for correctly filling out manual medical record system files. Thus, multiple studies revealed that EMR systems reduce the rate of faulty and deficient patient and medical informatics. Moreover, EMR could decrease the workload of healthcare professionals, provide savings from stationery equipment, and improves patient safety [16,17,26–28]. It is also believed that EMRs will facilitate incompatibility of the order, and nurse observation grade form, reduce drug application errors and facilitate to achieve patient's previous treatment plans. On the other hand, the development of the EMR system will allow patients to play a more active role in his/her treatment, allow the physician to see the treatments performed, and help the patient to receive efficient treatment in a shorter time. To eliminate mistakes originating from nursing applications, it is necessary to create an area where the nurses can put their initials in medication applications and to write other information (e.g., fever, blood pressure, pulse, respiratory follow-up, notes). All health institutions should move into regular, accurate, and complete recording systems to prevent medical errors that may arise in terms of patient and employee safety and fulfill their legal responsibilities. Therefore, the Turkish health system, including the hospital where this study is conducted, should move into the detailed recording systems, such as e-pulse application, which is currently in the pilot phase and not available in every institution.

To minimize the errors and deficiencies in patient files and medical records, it is important to considered personnel training, user-friendliness of the software, creation of necessary warning systems due to errors in the records, strengthening the integration between hospital automation requests, and keeping the patient files completely electronically.

Limitations and directions for future research

This study has some limitations regarding the generalizability of the findings to all hospitals. A large-scale hospital operating in one province of Turkey constitutes the sample of the study. Future research should be carried out large scale sampling and geographically different regions in Turkey and international context. This study based on the inpatient files. It is important to examine and investigate the records of inpatients and outpatients. Future research related to our study should be conducted and planned in university hospitals and private hospital in Turkish health system. This study was planned and conducted in one hospital. Subsequent work must now be done in multiple countries and regions, and international comparative studies should also to be carried out. This study was based on reviewing inpatient files. Future research can be planned based on quantitative, qualitative, meta-analysis, and surveys.

Health care organizations should move into regular, accurate, and complete recording systems to prevent medical errors that might arise in terms of patient and employee safety and thereby help to fulfill their legal responsibilities. There is a close relationship between EMRs and evidence-based medicine and nursing. Medical records have an important influence on the development of evidence-based medicine and nursing practices. The results of this study shed light on the benefits that training provides on the development of the patient file recording systems; not only in the health institutions using manual patient file recording systems but also in those using EMR systems.

Author Statements

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References

[1] Top M, Gider Ö. Nurses' views on electronic medical records (EMR) in Turkey: an analysis according to use, quality and user satisfaction. J Med Syst 2012;36:1979–88.
[2] Farsi AL, West DJ. Use of electronic medical records in Oman and physician satisfaction. J Med Syst 2006;30(1):17–22.
[3] Fung CH, Woods JN, Asch SM, Glassman P, Doebeling BN. Variation in implementation and use of computerized clinical reminders in an integrated healthcare system. Am J Manag Care 2004;10(2):878–85.
[4] Fowler SA, Yaeger LH, Yu F, Doerhoff D, Schoening P, Kelly B. Electronic health record: integrating evidence-based information at the point of clinical decision making. J Med Libr Assoc 2014;102(1):52–5.
[5] WHO (2006). Electronic health records: Manual for developing countries. http://apps.who.int/iris/bitstream/10665/207504/1/9290612177_eng.pdf. Accessed 01.04.2017.
[6] Özmen Ö. Evaluation of the 2007 yearbooks of the policlinic of the department of family medicine, faculty of medicine, Cukurova University (Undeliver Specialization Thesis). Adana: Cukurova University/Institute of Health Sciences; 2010.
[7] College of Physicians and Surgeons of Ontario (2012). Cpso policy statement–medical records. https://www.cpso.on.ca/uploadedFiles/policies/policies/policyitems/medicalrecords.pdf. Accessed 01.04.2017.
[8] Canadian Medical Association (2012). Module 6: Medical records management. https://www.cma.ca/Assets/assets-library/document/en/practice-management-and-wellness/MEDED-12-00307-PMC-Module-6-e.pdf. Accessed 02.04.2017.
[9] Rocca WA, Yawn BP, Sauver JLS, Grossardt BR, Melton LJ. History of the Rochester epidemiology project: half a century of medical records linkage in an US population. In Mayo Clin Proc 2012;87(12):1202–13.
[10] Kalogriopoulos NA, Baran J, Nimunkar AJ, Webster JG. Electronic medical record systems for developing countries: review. In: Proceedings of the annual international conference of the IEEE engineering in medicine and biology society; 2009. p. 1730–3.
[11] Williams F, Boren S. The role of the electronic medical record (EMR) in care delivery development in developing countries: a systematic review. J Innov Health Inf 2008;16(2):139–45.
[12] Asabe SA, Oye ND, Monday G. Hospital patient database management system: a case study of general hospital north-bank Makurdi-Nigeria. Int J Adv Comput Technol 2013;2(3):65–72.
[13] Biruk S, Yilma T, Andualem M, Tilahun B. Health professionals' readiness to implement electronic medical record system at three hospitals in Ethiopia: a cross sectional study. BMC Med Inform Decis Mak 2014;14(1):115.
[14] Hannan TJ, Rotich JK, Odero WW, Menya D, Esamai F, Einterz RM, et al. The mosoriot medicalrecord system: design and initial implementation of an outpatient electronic record system in rural Kenya. Int J Med Inf 2000;60(1):21–8.
[15] Noraziani K, Nurul' Ain A, Azhim MZ, Eslami SR, Drak B, Sharifa Ezat WP, Akma ASN. An overview of electronic medical record implementation in healthcare system: lesson to learn. World Appl Sci J 2013;25(2):323–32.
[16] Adane K, Muluye D, Abebe M. Processing medical data: a systematic review. Arch Public Health 2013;71(1):27–33.
[17] Castelnuovo1 B, Kiragga A, Afayo V, Ncube M, Orama R, Magero S, Okwi P, Manabe YC, Kambugu A. Implementation of provider-based electronic medical records and improvement of the quality of data in a large HIV program in sub-Saharan Africa. PLoS ONE 2012;7(2):e51631.
[18] Esatoğlu AE, Köksal A. Use of computer technology in hospitals. Ankara Univ Med Fac Mag 2002;55(1):29–40.
[19] Özbabalık D. Medical document and documentation definition and history. In: Özbabalik Demet, editor. Medical documentation. Eskişehir: Anadolu Unıversıty Publications; 2012. p. 2–9.
[20] Aljeraisy M, Alanazi M, Abolfotouh M. Medication prescribing errors in a pediatric inpatient tertiary care setting in Saudi Arabia. BMC Res Notes 2011;4:294.
[21] Dibbi H, Alabrashy H, Hussain W, Fatani M, Karima T. Causes and outcome of medication errors in hospitalized patients. Saudi Med J 2006;27:1489–92.
[22] Sood SP, Nwabueze SN, Mbarika, et al. Electronic medical records: a review comparing the challenges in developed and developing countries. In: Proceedings of the forty-first annual Hawaii international conference on system sciences; 2008. p. 248.
[23] Funmilola A, Jinmisayo A, Ozichi E. Development of an electronic medical record (EMR) system for a typical Nigerian hospital. J Multidiscip Eng Sci Technol (JMEST) 2015;2(6):1253–9.
[24] Wong R, Bradley EH. Developing patient registration and medical records management system in Ethiopia. Int J Qual Health Care 2009;21(4):253–8.

[25] Pourasghar F, Malekafzali H, Kazemi A, Ellenius J. Fors U: what they fill in today, may not be useful tomorrow: lessons learned from studying medical record at the women hospital in Tabriz, Iran. BMC Public Health 2008;8:139.
[26] Al-Nassar B, Abdullah MS, Osman WRS. Overcoming challenges to use electronic medical records system (EMRS) in Jordan hospitals. Int J Comput Sci Netw Secur 2011;11(8):51–8.
[27] Gadd CS, Penrod LE. Assessing physician attitudes regarding use of an outpatient EMR: a longitudinal, multi-practice study. In: Proceedings of the AMIA symposium; 2001. p. 194.
[28] Boonstra A, Broekhuis M. Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions. BMC Health Serv Res 2010;10(1):231.