The Effectiveness of Continuous Quality Improvement System Establishment on Improvement of the Data Recording Quality in the Emergency Department: A Clinical Audit

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Abstract- Defects in medical records is a common problem in many hospitals of Iran, especially emergency departments. This study was conducted to evaluate and establish a continuous quality improvement (CQI) system for improving the quality of patient data recording in the emergency department. This clinical audit was performed on the medical records of the patients discharged from the emergency department of Jiroft, Imam Hospital in 2017. Evaluations were conducted before and one month after an intervention entitled "data recording quality improvement." Data registration rate by the medical staff was 73% before and 84% after the intervention. There was no marked difference in the quality of data recording in in-patients before and after the intervention. Regarding the establishment of a CQI system, the data registration rate by the medical staff of the emergency department improved significantly after the intervention.

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Keywords: Documentation; Emergency department; Medical records; Continuous quality improvement

Introduction

The emergency department is one of the most important departments in terms of life-saving medical and surgical interventions. Therefore, there is a need for continuous and repeated evaluation, planning, and management to maintain and enhance the quality and safety of the services to increase the patients' and medical staff's satisfaction (1,2). The data recording quality is one of the indices used for the evaluation of the emergency department performance, which is used to assess the quality of care and services delivered to patients. Therefore, establishment and development of accurate data recording system are a vital need (2). As also emphasized by the WHO, medical documents should be completed to assess the quality of patient care.

On the other hand, these documents are also used in legal proceedings and can protect the medical staff if they are complete and accurate (3). Any error from the medical staff in completing medical documents may have devastating effects on the quality of patient care, legal issues, and economic matters (4). Numerous studies have evaluated the quality of data recording and shown serious defects in and the undesirable quality of the documents (5-11).

Therefore, there is a need for an efficient management system for supervision and continuous quality improvement, which requires accurate medical documentation and data recording. Different methods have been proposed in this regard, one of which is the Continuous Quality Improvement (CQI) system. In this method, the performance of the medical team at the present time is evaluated, and strategies are offered to enhance it. Then, re-evaluation is done after the intervention at a certain interval. Therefore, this process requires structured and accurately recorded clinical data and follow-up (12) (13). Effective intervention in the CQI is continuous education of the medical team, which has proved effectiveness in previous studies (14-16). This study was conducted to evaluate and establish a CQI system for improving the quality of patient data recording in the emergency department as a clinical audit.

Materials and Methods

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Study design

This clinical audit was conducted in the emergency department of Jiroft, Imam Hospital, Kerman, Iran in 2017. The protocol of the study was approved by the Ethics Committee of Jiroft University of Medical Sciences, and the study researchers were committed to anonymity and confidentiality of the data throughout the study.

The monthly input of the emergency department is 20,000 individuals per year on average, of whom 70% are temporary patients who are discharged after primary diagnostic interventions like simple imaging studies and lab tests and prescribing drugs, if necessary. Moreover, 20% of the patients are outpatients who receive services like IV therapy, casting, and splint, and are discharged within 6 hours. Finally, 10% need to stay beyond 6 hours and are hospitalized.

Data collection method

A checklist was provided after consulting with and collecting the views of experts (for validity). The checklist was used to evaluate recording or not recording of 9 items, including the triage note, emergency physician's note, emergency physician's order, procedure report, operative note, paraclinical report (CT scan, X-ray, lab tests, ECG), discharge note, primary diagnosis, and final diagnosis. The sample size in this stage was calculated 450 considering a confidence level of 95% and error of 5%. However, to increase the validity of the study, 500 samples were recruited.

In the first phase of the study (before intervention), 500 medical records were randomly selected from patients visiting the emergency department in April and evaluated using the checklist. These records were completed by nine emergency physicians. To maintain the normal distribution of the patients, 70%, 20%, and 10% of the records were selected from temporary patients (350 records), outpatients (100 records), and inpatients (50 records), respectively. Cluster sampling was used to maintain the proportion of the number of records with the number of physicians' shifts.

In the second phase of the study (intervention), the results of the first phase were presented to 9 emergency physicians in an educational session. The intervention in this study was educating physicians, which was undertaken as a workshop including detailed explanation of the significance of medical documents and their accurate recording.

In the third phase (post-intervention), re-evaluation was done one month after the intervention using the same pattern of 500 records and checklist.

Statistical analysis

SPSS-21 was used for data analysis. Frequency and net percentage frequency were used to report descriptive results. T-test and one-way ANOVA were used to compare the results before and after the intervention. *P* less than 0.05 were considered significant.

Results

In this study, 1000 medical records were evaluated at a one-month interval. Nine items, including the triage note, emergency physician's note, emergency physician's order, procedure note, operative note, paraclinical report (CT scan, different imaging modalities, lab tests, ECG), discharge note, primary diagnosis, and final diagnosis were assessed in each record. The results are presented separately for short stay, outpatient, and inpatient units. It should be noted that in some health centers, the procedure note and the operative note are the same, and all interventions and procedures are recorded in one note known as the operative note, while some centers have two separate notes (a procedure note for non-surgical procedures and operative note for surgical interventions).

Results of 350 temporary records (in each phase before and after the intervention)

Table 1 compares the completion of the above items before and one month after the intervention in temporary records of the emergency department of Jiroft, Imam Hospital in 2017. The recording quality improved significantly in 6 out of 7 items after the intervention ($P \leq 0.005$). Two items, i.e., procedure note and operative note, were not applicable in these patients and were not thus evaluated.

Results of 100 outpatient records (in each phase before and after the intervention)

Table 2 compares the completion of the 9 items before and one month after the intervention in outpatient records of the emergency department of Jiroft, Imam Hospital in 2017.

Table 1. Comparison of the completion of evaluated items before and one month after the intervention in temporary records of the emergency department of X, X Hospital in 2017

Item		Before intervention	After intervention	*P* *
Triage note		(%100) 350	(%100) 350	-
Emergency physician's note		(%60/6)212	(% 99/1) 347	≤0/005
Emergency physician's order		(%68/3) 239	(%93/4) 327	≤0/005
Procedure note		-	-	-
Operative note		-	-	-
Paraclinical report	• **CT Scan**	(%50/0) 19	(%65/0) 26	0/252
	• **X-ray**	(%33/33) 20	(%73/0) 54	≤0/005
	• **Lab test**	(%90/0) 18	(%42/5)17	≤0/005
	• **ECG**	(%5/0)1	(%47/8) 11	≤0/005
Discharge note		(%31/7) 111	(%88/3) 309	≤0/005
Primary diagnosis		(%67/1) 235	(%83/1) 291	≤0/005
Final diagnosis		(%50/3) 176	(%74/0) 259	≤0/005

**P* less than 0.05 were considered significant

Table 2. Comparison of the completion of evaluated items before and one month after the intervention in outpatient records of the emergency department of X, X Hospital in 2017

Item		Before intervention	After intervention	*P* *
Triage note		(%19/0)19	(%75/0) 75	≤0/005
Emergency physician's note		-	-	-
Emergency physician's order		-	-	-
Procedure note		(%64/0)64	(%100)100	> 0/05
Operative note		(%60/0) 60	(%100)100	> 0/05
Paraclinical report	• **CT Scan**	(%100) 100	(%64/5) 20	0/028
	• **X-ray**	(%32/3) 10	(%83/3) 40	≤0/005
	• **Lab test**	(%21/3) 10	(%100) 100	≤0/005
	• **ECG**	(%100) 100	(%70/6) 24	0/051
Discharge note		(% 34/0) 34	(%81/0) 81	≤0/005
Primary diagnosis		(%10/0)10	(%60/0)60	≤0/005
Final diagnosis		(%10/0)10	(%37/0)37	≤0/005

**P* less than 0.05 were considered significant

The highest recording rate was related to CT scan and ECG reports before the intervention. After the intervention, the procedure note, operative note, and lab test report had the highest recording rate. A significant improvement was seen in the triage note, X-ray and lab report, discharge note, primary diagnosis, and final diagnosis after the intervention ($P \leq 0.005$). Before the intervention, of 100 outpatient records, 64 (64%) had a procedure note of which 10 (15.6%) had the physician's stamp. After the intervention, all medical records (n=100) had a procedure note of which 83 (83%) had a physician's stamp ($P \leq 0.005$).

Results of 50 inpatient records (in each phase before and after the intervention)

Table 3 compares the completion of the 9 items before and one month after the intervention in the inpatient records of the emergency department of X, X Hospital in 2017.

A significant change was observed in recording the CT scan and X-ray report, and final diagnosis ($P \leq 0.005$). The physician's note date was recorded in 34 medical records which increased to 45 records (97.8%) after the intervention ($P \leq 0.005$). The time of the physician's note was available in 18 records (49.9%) which increased to 97.8% after the intervention ($P \leq 0.005$). The physician's signature was recorded in 25 medical records (56.8%) which increased to 35 records (76.1%) after the intervention ($P=0.074$). The physician's stamp was present in 34 medical records (77.3%) before and 45 medical records (97.8%) after the intervention ($P \leq 0.005$). There was a significant increase in recording the date and time and the presence of the physician's signature and stamp at the end of the physician's note after the intervention ($P \leq 0.005$). There was no significant difference in writing the procedure note before and after the intervention. Before the intervention, 10 procedure notes (15.6%) had the physician's stamp which increased to 83 notes (83%) ($P \leq 0.005$). We observed no significant change in writing

the operative note before and after the intervention. Before the intervention, 10 operative notes (16.7%) had the physician's stamp which increased to 71 notes (71%) after the intervention ($P \leq 0.005$). All (100%) of the requested CT scans had reported before the intervention which decreased to 64.5% after the intervention ($P=0.028$). Before the intervention, 6 (60%) recorded CT scan reports had a report date which increased to 100% after the intervention ($P \leq 0.005$). The CT scan report time was recorded in 4 medical records (40%) before the intervention which increased to 15 (75%) after the intervention ($P=0.061$).

There was no significant difference in recording the time ($P=0.725$) and date ($P=0.420$) of X-ray reports before and after the intervention. We also found no significant difference in recording the date (from 60% to 66.7%, $P=0.727$) and time (from 40.0% to 53.3%, $P=0.508$) of lab reports before and after the intervention. After the intervention, recording the date of ECG reports increased significantly from 4 (40.0%) to 24 (83.3%) medical records ($P=0.012$). A significant difference was seen in recording the time of ECG reports ($P \leq 0.005$). The difference in recording the date of discharge note was not significant ($P=0.064$), while a significant difference was seen in recording the discharge time ($P \leq 0.005$).

Table 3. Comparison of the completion of evaluated items before and one month after the intervention in inpatient records of the emergency department of X, X Hospital in 2017

Item		Before intervention	After intervention	*P* *
Triage note		(% 22/0) 11	(% 40/0) 20	0/083
Emergency physician's note		(%88/0)44	(%92/0)46	0/741
Emergency physician's order		(%100) 100	(%96/0) 48	0/153
Procedure note		(%50/0)25	(%72/0)36	0/040
Operative note		(%50/0)25	(%58/8) 29	0/547
Paraclinical report	• **CT Scan**	-	(%83/3) 15	≤0/005
	• **X-ray**	-	(%93/8) 15	≤0/005
	• **Lab test**	(%52/0) 13	(%85/7) 18	0/026
	• **EEG**	(%56/1) 16	(%75/0) 24	0/070
Discharge note		(%50/0) 25	(%68/0) 34	0/103
Primary diagnosis		(%36/0) 18	(%42/0) 21	0/682
Final diagnosis		(%4/0) 2	(%30/0) 15	≤0/005

**P* less than 0.05 were considered significant

Main finding

The patient data registration rate by medical staff was 73% before and 84% after the intervention.

Discussion

According to the results of this study, the rate of medical data recording by the emergency department staff of Jiroft, Imam Hospital improved significantly after the intervention versus before the intervention.

Different studies have been conducted in this regard which has shown different results. The documentation rate of medical records was 85%, 35.2%, and 62% in studies by Rangraz Jeddi F, Mahmoudian S, and Asghari Z respectively (2,8,17). Medical data recording was acceptable (68.7%) and appropriate (62%) in studies by Somi M and Mohseni Saravi B respectively (4,10). Gommnami N *et al*., conducted a review study and reported that the completion rate of medical records by physicians ranged from 41.5% to 93% in Iran (5). A study by Esmailian M *et al*., showed that 67.3% of documentation standards were observed in medical records on average (1). The overall rate of medical data recording in our study was consistent with the above studies. Torki S reported that the primary and final diagnosis were recorded in 79.9% of the records while Mashoufi M showed that the primary diagnosis, final diagnosis, and operative procedures were recorded in 71.9%, 60.8%, and 52% of the medical records (9). In our study, the primary diagnosis was recorded in 67.1% of temporary records, 10% of outpatient records, and 36% of inpatient records, which was lower than the above studies. Moreover, the final diagnosis was recorded in 50.3% of temporary records, 10% of outpatient records, and 4% of inpatient records, which was also lower than the above studies. According to these findings, the rate of recording the primary and final diagnosis in temporary patients' records was higher than other records, which may be due to the clearer status and diagnosis of these patients for physicians, and the rate of medical data recording decreased as the diagnosis became more complicated. In a study by Talebi L *et al.*, date and time were not recorded in 8% and 19% of emergency medical records, and the

physician's stamp and signature were not present in 61% and 27% of the records, respectively. In our study, the date and time of the physician's visit were absent in more than 50% of the records, which was higher than the above studies, but the physician's signature was present in an acceptable percentage of temporary and outpatient records. The physician's signature was recorded in 25 (56.8%) of inpatient records. It seems that the physicians' attention to the date, time, stamp, and signature decreased in hospitalized patients. In the study by Talebi L *et al*., 70% of the evaluated records had at least one recording error, indicating a high rate of recording error as compared to other studies (11). A study conducted in Urmia emergency department showed lack of important and valuable elements in emergency records (18). Arzamani M reported a completion rate of 75% before and 79% after the educational intervention. The number of complete physician's order note was 2890 (90.5%) before and 2989 (93.6%) after the intervention. There was no significant difference in recording the lab report before and after the intervention, which is consistent with our results (14). In a systematic review by Gommnami N *et al*., the accuracy of patient data recording ranged from 73% to 95%, and the completion rate ranged from 41.5% to 93% (5). Kasu *et al*., reported an increase in medical data recording from 73% to 84% after educational intervention. In this study, the effect of the intervention was assessed after 8 months. The completion rate of physician's order note increased from 96% to 96.4% (16). In our study, the mean completion rate was 73% before and 84% after the intervention, which is similar to the study by Kasu. In our study, completion of the physician's order note increased from 239 (68.3%) to 327 (93.4%) temporary patients' records after the intervention but decreased from 100% to 96% in inpatients, probably because some residents of the emergency department had clinical rotations in other wards and were replaced by other residents. Since the physician's order note is completed by residents, it is possible that the residents who received the intervention were transferred to a new ward or hospital within one month after the intervention and the new residents who replaced them were not completely familiar with the process and had differences in this regard. In a study by Tinsley *et al*., the off-service note was available in 3% of the medical records which increased to 60% and 90% one and six months after the intervention, respectively. Moreover, the frequency of the daily progress note increased from 3% before education to 60% and 60-83% one and six months following education (15). This study showed the frequency of recording the operative note and procedure note was acceptable before the intervention which could be due to the legal importance of these notes. In hospitalized patients, the frequency of recording only three items improved significantly after the intervention, and almost no significant improvement was seen in recording the majority of the items. In hospitalized patients, in addition to the emergency physician, other specialists also take part in the treatment process, which may reduce the sensitivity of the emergency physician to careful patient data recording. On the other hand, an in-patient stay beyond 6 hours in the emergency department, which is usually a very busy department, may affect the physician's sensitivity to data recording, indicating the decreased quality of emergency services. Therefore, most changes were seen in temporary patients and outpatients after the educational intervention.

The data registration rate was 73% before and 84% after the intervention. The CQI system with educational intervention significantly improved patient data recording in outpatients and temporary patients.

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