

*Original Article***Medical Errors Management Before and After Implementation of Accreditation in Hospital**Ghasem Abedi¹ Ehsan Abedini¹ Roya Malakzadeh² *Fereshteh Araghian Mojarad³

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Abstract

Background and purpose: This study aimed to manage medical errors before and after the implementation of accreditation in public, private, and social security hospitals of Mazandaran, Iran.

Materials and Methods: This descriptive study has been done in 38 hospitals. Data were collected through documents reviewed relating to 2013 and 2014. The paired t-test and Friedman test were used by statistical software SPSS.

Results: Results showed that the most and the least percent of reported errors, before accreditation, in sequence, were related to public clinical unit (55.9%) and operating rooms (0.6%), and after accreditation in public clinical unit (46.6%) and operating rooms (2.3%) in teaching centers. The most errors (before accreditation) occurred in the morning (62%) and the least, in the evening (8.3%) in teaching centers. Furthermore, after accreditation, the most errors occurred in the morning (64.8%) and the least, in the night (17.3%) in therapeutic hospitals. Paired t-test showed that there is no significant difference between medical errors before and after accreditation. Friedman test showed that structural/systemic errors reported were the most important medical errors in teaching centers after accreditation and therapeutic hospitals before accreditation ($P < 0.05$).

Conclusion: There is no significant difference between the rate of reported errors before and after the implementation of accreditation. This illustrates that the role of management in controlling of medical errors has been poor, and stronger management should be applied in providing health care services.

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Key words: Management, Medical errors, Accreditation, Hospital

1. Introduction

From the simplest to the most complex medical activities may be accompanied with errors (1). Medical errors, as a part of inevitable consequences of human action, have significant economic and clinical outcomes (2). According to some studies, medical errors have been proposed as preventable adverse errors that are considered as one of the main causes of death in many countries such as United States (3). Although, some progress has been made for decreasing special types of adverse events (4), but the rate of medical errors remains high (5). Considering the high incidence statistics of adverse events, medical errors have become an unavoidable feature of the healthcare system in the world (6).

According to estimations, nearly, one per 10 hospitalized patients experiences an adverse event that about half of them are preventable. In addition, about one-third of the adverse events can injure the patient that its influence can be commerce from increasing the length of stay to death (7). The results of Baker's research in Canada showed that among 255 patients who had experienced adverse events, 106 (41/6%) of them had injured or dead that 20/8% of dead cases were potentially preventable (8). Therefore, diagnosis, prevention, and effective management of medical errors and condemn of recurrence are the priorities of the health system. A critical step for managing and preventing these errors is detecting, identifying, and reporting them. According to many studies, if an error is not detected, it cannot be managed (9). For example, if in giving drugs to patients, the nurse makes a mistake and inform subject to matron, then matron also will consult with the supervisor in solving the problem. If the doctor and head of the department interfere in creating solutions

and advice system, not only achieving the solution becomes easier, but the best cure process will be selected. It seems that if the managers have an appropriate attitude of patient safety, perhaps they voluntarily express errors in public panel of hospital for learning and teaching others, and report them to authorities for further investigation (1).

Because of limitations, too late efficiency (10) and necessity for maximum use of available resources (11) in hospitals, in one hand, and providing desired services and quality improvement (12), in other hand, make it so important to use a suitable approach for evaluation and improvement of performance because hospitals' goals and objectives cannot be fulfillment effectively without a comprehensive pattern of programs evaluation and reviewing and they cannot enforce effective management to reduce medical errors regardless of the facts and results of activities. Obviously, providing and applying such an approach can organize hospitals performance and brought them a clear perspective (13).

Accreditation is one of the consequences of evaluation of hospital, which is based on predetermined standards (14), and it is a criterion for health care services provider to achieve predetermined standards, through comparative evaluation of the external and independent (15). Accreditation program has been an important mean to improve quality and safety in health care organization and is considered as an inseparable part of the health care system is in more than 70 countries (16).

Development of hospital accreditation could increase the public awareness of medical errors and existing gaps in the development of patient safety in the health care system (17). Based on studies have been conducted to evaluate the benefits of accreditation, hospital accreditation can improve the quality and performance of

organizations (18). Devkaran and O'Farrell's study showed a marked reduction in the number of complaints has been made after the conducting of hospital accreditation (17). Series of studies on evaluating the effect of the implementation of accreditation programs on hospitals performance in the world showed that implemented accreditation programs in hospitals of South Africa, Zambia, Australia, Copenhagen, Egypt, and the Philippines had significant effect on hospitals performance and decreasing of complaint from health care providers (19).

According to the context above, this study aimed to mention the importance of accreditation in hospitals and presentation the medical errors statistics in Mazandaran (Iran) hospitals and identification the role of accreditation programs conducting in the position of medical errors.

2. Materials and Methods

The present descriptive study was done in 38 hospitals (including 25 public hospitals, 8 private hospitals and 5 social security Hospital) of Mazandaran.

Data were collected through reviewing of documents relating to the annual reported medical errors in different parts of the hospital including; public clinical, special clinical, and operating rooms from 2013 to 2014. Then, collected data were evaluated, classified, and analyzed by descriptive and inferential statistics. The paired t-test and Friedman test were used by the statistical software SPSS for Windows (version 21, SPSS Inc., Chicago, IL, USA).

3. Results

The results of the descriptive analyze of the data, relating to the reported medical errors are shown in table 1.

Table 1. Percent of reported medical errors in teaching center and hospitals

	Teaching center		Hospitals	
	Before accreditation	After accreditation	Before accreditation	After accreditation
Percentage of reported errors by the hospital sections				
Public clinical	55.9	46.6	41.2	36.6
Specific clinical	23.6	42.2	23.9	23.9
Operating room	0.6	2.3	5.4	3.5
Para-clinical	19.8	8.7	28.0	29.6
Administrative	-	-	-	-
Other	-	-	0.8	6.1
Position of errors reporters				
Doctor	10.5	2.8	0.49	0.49
Clinical staff	60.6	44.8	60.2	37.6
Officials	18.4	39.5	12.4	25.4
Para clinical staff	4.1	9.1	24.0	21.2
Administrative staff	6.1	2.4	1.7	15.0
Nurse	-	-	0.16	0.16
Student	-	-	0.8	0.8
Other	0.35	0.35	1.1	-
Educational level of reporters				
PhD	4.8	2.8	0.16	0.6
MA	3.0	1.7	1.2	1.0
Bachelor	78.4	89.4	93.4	91.8
Technicians	12.4	4.5	4.2	6.8
Other	1.2	0.6	0.7	0.5
Time of error				
In the morning	62.0	53.6	58.0	64.8
In the evening	8.3	21.1	21.0	17.8
At night	29.3	25.2	20.0	17.3
Percentage of reported diagnostic errors				
Lack of recognition	6.0	18.3	7.0	4.7
Misdiagnosis	17.1	14.2	10.2	7.0

Table 1. Percent of reported medical errors in teaching center and hospitals (Continue)

	Teaching center		Hospitals	
	Before accreditation	After accreditation	Before accreditation	After accreditation
Laboratory error	60.6	28.5	30.4	49.3
Delay in diagnosis	10.0	20.4	8.6	2.8
Radiology error	5.0	5.0	18.9	19.0
Other	1.0	6.1	24.6	17.0
Percentage of reported medication errors				
Improper dose	46.5	40.7	43.4	33.5
Drug interactions	17.8	27.6	22.1	13.8
Monitoring errors	1.9	5.2	1.3	2.2
Lack of attention to	1.0	1.3	2.6	4.1
Allergies	2.9	2.9	2.6	1.4
Wrong diseases	4.9	11.8	4.7	6.7
Expiration date of drug use	3.9	1.3	2.6	1.8
Incomplete drug order	15.8	5.2	2.6	5.2
Other	1.9	2.6	14.3	29.1
Percentage of reported errors in the registration stage				
Poor handwriting of doctor	7.6	3.5	6.3	.0
Incomplete command	8.7	7.1	5.9	2.8
The lack of accurate registration	70.6	69.6	43.3	48.3
Mismatch drug card	9.7	8.9	10.5	12.9
Other	3.2	3.2	34.3	30.9
Poor handwriting of doctor	7.6	3.5	6.3	.0
Percentage of reported therapeutic errors				
Infection	91.1	69.3	18.9	45.9
Bedsore	0.7	6.1	4.47	5.5
Fall ill	6.6	24.4	1.0	4.2
Other	0.7	0.7	66.4	44.2
Percentage of blood injection reaction and blood products errors				
Incompatibility	5.13	-	34.6	5.1
Sending wrong sample	69.23	50.0	7.6	3.0
Delivery of the wrong blood bags	17.95	16.6	19.2	1.0
Wrong blood transfusion	5.13	16.6	3.8	17.5
Other	16.6	16.6	72.1	72.1
Percentage of reported surgery and anesthesia incidents errors				
Surgery on the wrong part	15.7	27.2	18.7	7.3
Unnecessary surgery	15.7	15.7	37.5	37.5
Surgery on wrong patients	5.2	9.0	-	-
Complications after Surgery	26.3	18.1	12.5	2.9
Burning during surgery	5.2	18.1	1.4	1.4
Leaving surgical instruments	5.2	5.2	4.4	4.4
Events during sedation	10.5	10.5	6.2	7.3
Side effect of anesthesia	5.2	5.2	1.4	1.4
Other	5.2	9.0	2.5	7.5
Percentage of reported structural/systemic errors				
Equipment failure	25.9	22.6	9.2	15.0
Inadequate equipment	9.2	5.6	2.8	5.6
Not calibrated	20.3	5.6	3.4	5.6
Improper conditions	20.3	15.0	9.2	8.2
Inadequate training	18.5	16.9	29.4	22.1
Other	3.7	33.9	45.6	42.2
Percentage of reported technical errors				
Shortage of the number of staffs	12.4	42.6	8.5	25.5
Un experienced staff	8.7	13.2	27.3	9.7
Lack of staff awareness	57.6	14.7	25.5	19.1
Improper fitting of the catheter	2.1	7.3	10.2	4.2
Lack of adequate skills	17.5	19.1	17.9	27.4
Other	0.7	2.9	10.4	13.8

Table 2. Staff view on preventable errors (percent)

	Teaching center		Hospital	
	Before accreditation	After accreditation	Before accreditation	After accreditation
Yes	93.7	87.5	98.1	96.1
No	6.0	6.0	0.7	2.7

Table 3. Results of descriptive survey on main factors of events (percent)

Main factors of events	Teaching center		Hospitals	
	Before accreditation	After accreditation	Before accreditation	After accreditation
Clinical wrong	78.8	66.0	67.7	54.4
Organizational flaws	5.9	7.5	11.2	23.0
Improper relationship	13.2	17.9	15.6	18.2
Other	1.7	7.5	5.2	4.2

According to table 1, the most and the least percentage of reported errors was related to public clinical and operating room in teaching center and hospitals. The most and least rate of errors was reported in order, by clinical and para-clinical staffs in teaching center and clinical and administrative staffs in hospitals. The most rate of errors were reported by staff who have a bachelor. In term of time, most of the errors happened in the morning, and least of them happened in the afternoon. Most of the diagnostic errors were related to laboratory errors. Most percentage of reported medication errors was related to wrong drug. Most rate of reported errors in the registration stage were related to the lack of accurate registration. Most of the reported therapeutic errors were related to infection. Sending wrong sample was the most reported error in the term of blood injection reaction and blood product errors. Side effects after surgery and equipment failure were the most reported errors in term of surgery events and structural/systemic errors and most of the reported technical errors were related to lack of awareness staff. Conducted surveys on hospital staff about whether occurred error are preventable or not, before and after accreditation, are shown in table 2.

According table 2, teaching center and hospitals staff believed that more than 90%

errors were preventable. Results of surveys on main factors of events are shown in table 3.

Based on table 3, clinical error was one of the main causes for the occurrence of the incident that most of reported amount was allocated to it.

Paired t-test was used to investigate the difference between medical errors before and after the accreditation. The results showed a mean of -0.0002 ± 0.1207 before accreditation and mean of 0.01487 after accreditation with CI ranging from -0.02989 to 0.02950 ($t = 0.013$, $df = 65$, $P = 0.989$).

According to paired t-test results, there is no significant difference between medical errors before and after accreditation, and this indicates that accreditation has failed to reduce effectively medical errors. To evaluate the priority of medical errors before and after the accreditation, the Friedman test was used, and results are presented in table 5.

According to table 5, reported systematic errors in teaching center, after accreditation and in hospitals, before accreditation were most important medical errors. Another important point is that there is not significant change in medication errors before and after accreditation, whether in teaching center or hospitals and third place of importance is allocated to it. It is noteworthy that some errors are simultaneously in the same place that indicate their same priority in terms of importance.

Table 5. Comparison between priority of different king of medical errors before and after of accreditation in teaching centers and hospitals

Priorities	Teaching center		Hospitals	
	Before accreditation	After accreditation	Before accreditation	After accreditation
First priority	Reported therapeutic error	Reported structural/systemic errors	Reported structural/systemic errors	Reported blood injection reaction and blood products errors
Second priority	Reported technical error	Reported error in the registration stage	Reported therapeutic error	Reported diagnostic error Reported error in the registration stage Reported surgery and anesthesia incidents error.
Third priority	Reported medication error	Reported medication error Reported surgery and anesthesia incidents error.	Reported diagnostic error Reported medication error.	Reported medication error
Fourth priority	Reported blood injection reaction and blood product error	Reported diagnostic error Reported technical error	Reported error in the registration stage Reported blood injection reaction and blood products errors Reported surgery and anesthesia incidents error Reported technical error	Reported structural/systemic errors
Fifth priority	Reported error in the registration stage	Reported errors by hospital sections Reported blood injection reaction and blood products errors	Reported technical error	Reported technical error
Sixth priority	Reported diagnostic error Reported surgery and anesthesia incidents error	Reported therapeutic error	Reported error by hospital units	Reported therapeutic error
Seventh priority	Reported error by hospital units Reported structural/systemic errors			Reported error by hospital units

4. Discussion

According to the results, most of the reported errors in the hospitals happen in the public clinical units that majority of them are reported by clinical staff in the morning. In term of diagnostic errors, The most errors are related to laboratory errors, and in term of medication error, most errors are related to wrong medicine... most of the registering errors were due to the lack of accurate registering of actions. In case of therapeutic errors in teaching center and hospitals, most of the reported errors are related to infection.

Most of the blood injection reaction errors were related to sending wrong samples from units in teaching center and other cases in hospitals. Shortage of staff in teaching center and lack of adequate skills in hospitals were the most of reported errors in term of technical errors, and most of these errors in hospitals are preventable. Totally, the main cause of the hospital incidence is clinical errors.

Kabirzadeh et al. (1) in their study found that 39/6% of managers have experienced a medical error and 68/4% stated that errors are

reported in the hospital they work. Evaluation of Managers' attitudes showed that most of them (95/7%) believe that reporting medical errors, will improve patient safety. Devkaran and O'Farrell (17) conclude that the accreditation programs led to reducing complaints from medical errors, which is inconsistent with the results of the study. According Alkhenizan and Shaw (19), accreditation program is effective on the performance of the organizations and in a reduction the rate of medical errors, which is inconsistent with the results of the study.

Wong et al. (20) showed that the category of equipment-related errors had the highest rate of incidents (29%), perhaps not surprising given our technology-intensive procedures. Communication errors had the second highest rate (24.7%). These two categories constituted 53.7% of the total number of errors. This contrasts with a broader distribution from the ear, nose, and throat surgery survey, in which four categories made up 53.3% of the errors (technical errors at surgery comprised 19.3% of the errors; medication, 13.7%; testing, 10.4%; and surgical planning, 9.9%). The impact equipment-related errors on patients were common, with effects reaching the patient level in 49.1% of the incidents. Fortunately, most consequences were minor, and only 8.4% of the events required a reoperation. Communication errors were the second most frequent error (24.7%). Medication errors are also an ongoing source of concern.

According to the results of this study, accreditation has no impact on reducing medical errors, so, it is recommended that Management, control, and handling of medical errors in hospitals should be Scrutinized and accreditation programs should be done with more seriousness and stronger management and with the cooperation of all personnel (including doctors, nurses, and hospital officials in different sectors) are working in providing health care services.

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References

1. Kabirzadeh A, Bozorgi F, Motamed N, Mohseni Saravi B, Baradari A, Dehbandi M. Survey on attitude of chief managers of hospitals towards voluntary incident reporting system, Mazandaran University of Medical Sciences, 2010-2011. *J Mazandaran Univ Med Sci* 2011; 21(84): 131-7. [In Persian]
2. Rajabzadeh A. Does information technology lead to the reduction of medical errors? *Health Inf Manage* 2012;10(1): 1-2. [In Persian]
3. Starmer AJ, Spector ND, Srivastava R, West DC, Rosenbluth G, Allen AD, et al. Changes in medical errors after implementation of a handoff program. *N Engl J Med* 2014; 371(19): 1803-12.
4. Wang Y, Eldridge N, Metersky ML, Verzier NR, Meehan TP, Pandolfi MM, et al. National trends in patient safety for four common conditions, 2005-2011. *N Engl J Med* 2014; 370(4): 341-51.
5. Landrigan CP, Parry GJ, Bones CB, Hackbarth AD, Goldmann DA, Sharek PJ. Temporal trends in rates of patient harm resulting from medical care. *N Engl J Med* 2010; 363(22): 2124-34.
6. Nasiripour AA, Raeissi P, Ghaffari F, Maleki M, Jafari M. Designing a medical errors control model for Tehran University Of Medical Science hospitals. *Payavard Salamat* 2014; 8(1): 44-56. [In Persian]
7. Wachter R. *Understanding patient safety*. New York, NY: McGraw-Hill; 2008. p. 23-4.
8. Baker GR, Norton PG, Flintoft V, Blais R, Brown A, Cox J, et al. The Canadian Adverse Events Study: the incidence of adverse events among hospital patients in Canada. *CMAJ* 2004; 170(11): 1678-86.
9. Cao H, Stetson P, Hripcsak G. Assessing explicit error reporting in the narrative

- electronic medical record using keyword searching. *J Biomed Inform* 2003; 36(1-2): 99-105.
10. Niven PR. *Balanced scorecard step-by-step: maximizing performance and maintaining results*. 2nd ed. New York, NY: Wiley; 2002.
 11. Khalesi N. Comparative study of the role of management in the quality of health care services at the University of Tehran and providing appropriate solutions. Tehran, Iran: Islamic Azad University, Science and Research Branch, Faculty of Management; 2002. [In Persian]
 12. Tehran University of Medical Sciences. *Operational program for the hospitals of Tehran University of Medical Sciences*. Tehran, Iran: Tehran University of Medical Sciences Publications; 2009. [In Persian]
 13. Alvani SM, Mojibi T, Tabari M. Comprehensive model for assessing the public sector. *Journal of Social Sciences* 2005; 2(7): 28-50. [In Persian]
 14. Ameryoun A, Chaghary M, Tofighi Sh. The study of hospital accreditation procedure in selected countries and presentation of guidelines for Iran. *Teb Tazkiyeh* 2013; 22(1): 61-8. [In Persian].
 15. de Walcque C, Seuntjens B, Vermeyen K, Peeters G, Vinck I. Comparative study of hospital accreditation programs in Europe. Brussels; Belgian: Health Services Research (HSR), Health Care Knowledge Centre (KCE); 2008. KCE reports 70C, D/2008/10.273/03.
 16. Greenfield D, Braithwaite J. Developing the evidence base for accreditation of healthcare organisations: a call for transparency and innovation. *Qual Saf Health Care* 2009; 18(3): 162-3.
 17. Devkaran S, O'Farrell PN. The impact of hospital accreditation on clinical documentation compliance: a life cycle explanation using interrupted time series analysis. *BMJ Open* 2014; 4(8): e005240.
 18. Lanteigne, G. Case studies on the integration of Accreditation Canada's program in relation to organizational change and learning: The Health Authority of Anguilla and the Ca'Focella Ospedale di Treviso [Doctorate Thesis]. Montreal, Canada: School of Medicine, University of Montreal; 2009.
 19. Alkhenizan A, Shaw C. Impact of accreditation on the quality of healthcare services: a systematic review of the literature. *Ann Saudi Med* 2011; 31(4): 407-16.
 20. Wong DA, Herndon JH, Canale ST, Brooks RL, Hunt TR, et al. Medical errors in orthopaedics. results of an AAOS member surve. *J Bone Joint Surg Am* 2009; 91: 547-57.