

Evaluation of Standards in Intensive Care Units in Isfahan Hospitals, Iran

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Abstract

Aims: Intensive Care Units, which enjoy having the latest equipment and experienced medical staff, admit patients in critical conditions to be taken care of. Modern equipment with the latest medical care techniques have made this unit a specialized one for taking care of the admitted patients. The present study was an attempt to evaluate the observation of standards in ICUs and the extent to which such standards correspond with the standards defined for these units in the Iranian Hospital Evaluation National Plan.

Methods: It was a descriptive study carried out in 2010 in Isfahan Province, Iran. The apparatus used was the Iranian National Hospital Evaluation Checklist for intensive care units. Checklists have been completed after inspecting, scrutinizing the documents, and interviewing the medical staff in ICUs.

Results: The highest observation of the ICU standards has been in the military hospital by 84.2%. Educational hospitals, half-private hospitals, private hospitals, and network hospitals had observed the standards by 83.6%, 83.3%, 78.6% and 77.13% respectively.

Conclusion: The result of this study showed that the military hospital had a higher level of standards in ICU. This may be due to military discipline and environment or other reasons. Further studies are needed to find the influencing factors.

Keywords: Evaluation; Standards; Intensive Care Unit; Iranian National Hospital Evaluation Checklist

Introduction

Hospitals, due to their diagnostic abilities, play an important role in the modern medical cares. Though the majority of the resources in health and hygiene sector are devoted to the services offered in hospitals, the efficacy of such services needs more profound evaluation. The importance of such evaluations is more evident in the case of more critical medical services, such as those offered in Emergency rooms, ICUs, and Operating rooms [1].

Intensive care unit, due to its special and unique equipment, is a unit which receives and takes care of the patients in very critical conditions. Using the latest methods of treatment seems impossible without ICU. The majority of patients in this unit are those with pulmonary disorders including post-operation insufficiencies, rib fractures, etc [2,3,4].

The emphasis on this unit indicates that hospitals are in need of this unit more than any time before. That's why hospitals have increased their number of ICU beds over time [5]. In order to design or modify the intensive care units, one need to check the demand for ICU based on the evaluation of the resources, the patient reception and release statistics, and the number of patients in this unit in other hospitals in the same region.

Codifying and using standards in ICUs will result in higher patient survival rates and lower costs through preventing from making mistakes in the management of the ICU affairs and reducing preventable deaths because the most important index in evaluating the efficacy of an ICU is the evaluation of the death toll in that unit. It is possible to achieve this objective in Iran by supplying the needed financial resources, having adequate surveillance, reforming the nonstandard or old physical structures, mobilizing ICUs, employing experienced

staff, and managing the use of human resources [7,8].

Jadidi [10] believes that by improving the quality and quantity of the educational, physical, and human resources, it is possible to pave the way for offering better services though it may not have a direct effect on the reduction of death toll after 24 hours [9]. The extent to which the standards are observed in CCUs is at moderate to excellent levels [10]; however, improving the efficacy of ICUs by meeting the standards in educational hospitals in Isfahan, Iran, needs attention from hospital managing team.

Identifying the risk factors related to the death rate in ICU is the first step to take which can result in better identification of patients in danger, critical medical interventions, better and more efficient medical cares, and lower death rates in ICUs. On the other hand, the deaths after being in ICU for 24 hours can be attributed to other variables [11, 12].

There have been numerous studies regarding the codification of standards for ICU in most countries all over the world especially in developed countries. Since 1983, this subject has been the focus of attention for most private organizations such as National Environmental Policy Act (NEPA) and Joint Commission on Accreditation of Healthcare Organizations (JCAHO).

Designing an ICU and improving its present conditions need the experience and skills of both the standard codification organizations and the ICU medical staff who are quite familiar with patients' needs in that unit. In 1988, the Society of Critical Care Medicine (SCCM) presented a set of guidelines for designing an ICU, but it seems that in Iran not enough attention has been paid to those standards and the importance of their use in medical centers [13].

Examining hospitals and optimizing their structures need to be done continuously. If we do not study and examine the conditions of our medical centers for any possible needed modifications and if we do not optimize and standardize the ICU's present conditions today, we will have to invest and spend much more resources in the near future [14]. This study was an attempt to examine the evaluation results of hospital ICUs in Isfahan province, Iran, and the comparison of those with the available standards.

Methods

The present study is a descriptive – applied piece of research carried out in 2010. All hospital ICUs in Isfahan (including the educational, network, private, half-private, and military hospitals) constituted the population of the study. Fifteen ICUs in 10 hospitals were randomly selected as the sample for the present study. All these hospitals were under the supervision of the Isfahan University of Medical Sciences. Out of these 10 hospitals, there were 3 educational (university), 2 network, 2 Social Security, 2 private, and 1 state hospitals. A hospital could have been selected for study if it had an ICU, was in Isfahan Province, and was supervised by an organization. Also, a hospital could have been left out of the study if its ICU was shut down.

The apparatus used was the Iranian National Hospital Evaluation Checklist for intensive care units. This checklist consists of two sections: the first part checks some background information about the unit, and the second part involves 8 categories and 4210 points which include the criteria for categorizing the evaluation standards set by the Ministry of Health and Medical Education. These categories are human resources (12 items; 1,000 points), education (5 items; 400 points), physical space (20 items; 300 points), technological capabilities (16 items; 600 points), installations (13

items; 300 points), medical equipment (33 factors; 855 points), medical ethics (9 items; 450 points), and 'Others' (10 items; 350 points) including items, such as having educational workshops, which do not fall in the previous categories [15]. Since the checklist used was a standard one, the reliability and validity of that was taken as granted.

The evaluation team visited the ICUs and completed the checklists. The checklists were filled by the anesthetist because of his familiarity with the evaluation procedure. The checklists were completed using observation, examination of the documents, and interview with matrons, doctors, supervisors, and head nurses of the ICUs. In order to observe the ethical principles, the right permissions were obtained from the Deputy of Medication in Isfahan for all the studied hospitals, and while keeping the secrecy of the gathered data, each hospital was later informed of the results of the evaluation.

Results

For the Human Resources index, the state hospital 1-ICU1 had the highest score (925 points), and the state hospital 2-ICU2 had the lowest score (670 points). Regarding the Physical Space index, the network hospital 2 and the half-private hospital 1 obtained the highest score (300 points) while the half-private hospital 2-ICU3 obtained the lowest score (185 points). Regarding Technological Capabilities index, the military hospital (600 points) and the network hospital 1 (533 points) had the highest and lowest scores, respectively. In Education index, the state hospitals had similar scores. For Installations index, the half-private hospital 1 scored highest (295 points) and the state hospital 2-ICU3 scored lowest (217 points). In Medical Equipment index, the half-private hospital2, had the highest score (843 points), while the lowest score, was for the state hospital 2-

ICU2 (670 points). In Medical Ethics, most ICUs obtained the maximum score (350 points). Finally, while the network hospital 2 had the highest score (315 points), the state

hospital 2-ICU3 had the lowest score (205 points) in the others category (see Figures 1 & 2).

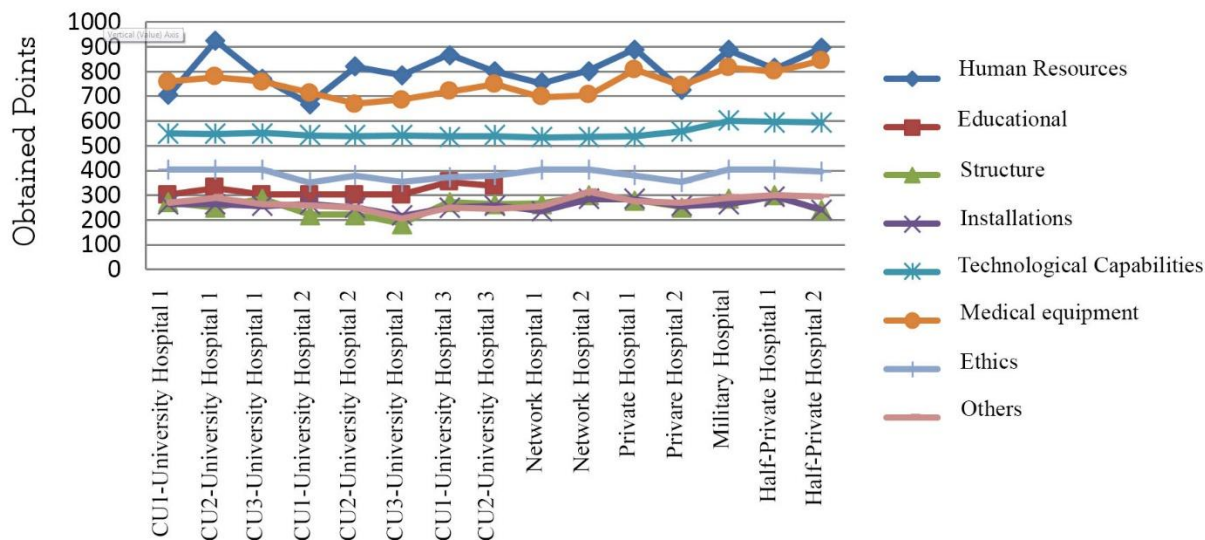


Figure 1. Total points obtained by each hospital in different standard indices

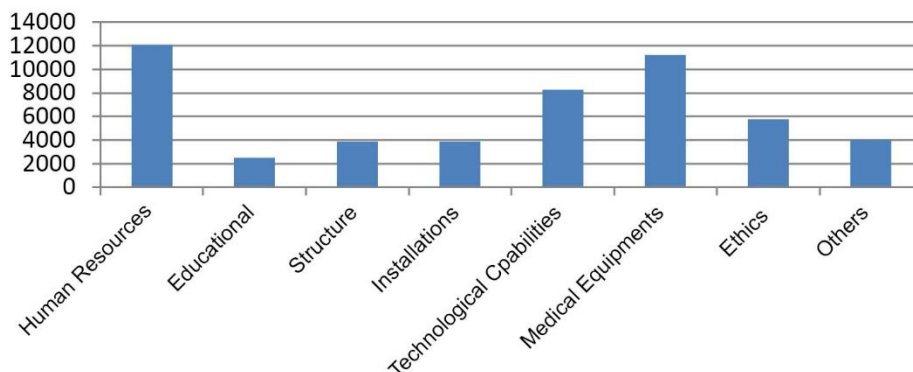


Figure 2. Total Points Obtained by hospitals in each category

After balancing the points gained by hospitals in each category, the data showed that the Human Resources index had the highest score (0.233) and the Education index received the lowest score (0.048).(Table 1)

The extent to which standards were observed from the highest to lowest was in the military hospital (84.2 %), educational hospitals (83.6 %), half-private hospitals (83.3 %), private hospitals (78.6%), and the network hospitals (77.13 %).(Table 2,3)

Table 1. Total Points Obtained by Hospital in each Category

Standard indices	Score	Mean	Std. Deviation
Human Resources	0/233	807/6	74/84
Education	0/048	168/9	20/13
Physical Space	0/075	259/9	32/02
Installation	0/074	259/1	20/03
Technological Capabilities	0/160	554/2	23/45
Medical Equipment	0/216	749/5	51/63
Medical Ethics	0/112	387	20/77
Other	0/077	269	27/20

Table 2. Total Points Gained by each Hospital

	Educational	network	Private	Half-private	Military
Total score	28156/5	6494/5	6618/5	7014	3545
Percentage	83/60	77/13	78/60	83/30	84/20
Mean	439/94	463/89	472/75	501	506/42
Std. Deviation	212/14	204/46	233/38	247/62	261/95

Discussion

The total mean score for the evaluation was 3,456 with the military hospital receiving the highest score and the network hospitals receiving the lowest score. In sum, the studied hospitals enjoyed acceptable standard indices. *Moini* [16], having evaluated the ICUs in Arak, Markazi Province, concluded that the ICU standards were quite far from the accepted indices for those units. Although the findings of the present study were different from *Moini*'s, they are in line with *Sahebzadeh*'s [10] findings in evaluating CCUs.

One thousand points of the total points obtained went to the Human Resources index, which indicates the significance of employing experienced and educated staff in that unit. There are four groups of people involved in hospital Medical care: a) physicians, b) nurses, c) paramedics, and d) inexpert staff. It is quite clear that there must be an adequate number of personnel in each category based on predefined standards. Moreover, benefiting these employees should be efficient enough so that the responsibilities are evenly and logically distributed among them. The highest index of observing such standards belonged to the military hospital (88.5%) while the lowest one belonged to the network hospitals (77.85%). *Mahory* et al. [17] names the 24 hour presence of an anesthetist as one of the factors effective in decreasing the death rates in ICUs. Also, *Brown* and *Dullivan* [18] emphasize the full-time use of physicians and specialists in those units.

The standards in education category were observed by 79.18 % in educational hospitals. The university professors' presence and participation in educational debates and group discussions group had the highest score among items in this category, which shows the importance of improving the medical staff's knowledge base. However, since this item only applies to educational hospitals, there is no such an item for other hospitals in the evaluation.

In the case of Physical Space index, locating and designing different wards in a hospital and specifying the relations between nurse's stations and patients' beds can facilitate offering better medical cares in hospitals. Adequate physical space, appropriate designs, clean environment, and the right arrangement of the medical equipment are all among factors playing an important role in improving the quality of the offered medical cares. The military hospitals had the highest levels of standards (95%) and the educational hospitals had the lowest standards (82.25%) in this regard.

The Technological Capabilities index examines hospital capabilities for offering practical services to ICU patients. In fact, the work load of a hospital or a ward in that affects the quality of its medical care and is the index used to decide whether to increase that hospital's resources or not. This work load can be determined based on the daily statistics of that hospital or ward. In comparison with other indices, the Technological Capabilities index can be improved more easily by having a more

detailed plan because making the best use of available resources has always been easier than supplying and gathering new resources; moreover, the hospital authorities have the full control of what they have and can make the best use of them. In sum, this index intends to check whether the ICU management can make the right use of its capabilities to offer medical cares after all the needed resources and equipment have been supplied to ICUs. The military hospital observed the standards by 100% while the network hospitals had the lowest level of standards (89.16%) regarding the Technological Capabilities category.

In the case of Installations index, enough attention has been paid to the needed equipment in ICU, but the importance of the medical staff's ability to use the equipment has been completely neglected. There have been times when, due to inadequate instructions, the staff were observed not to be able to make the best use of the available equipment. Despite such neglect in that index regarding the personnel's instruction or their ability to use ICU equipment, the half-private hospital had the highest levels of standards (89.5%) and the educational hospitals were observed to have the lowest levels of standards (84.37%).

Regarding the standards for the Medical Equipment index, the medical staff's ability to use the equipment has been neglected, too, and the 33 items present in this category simply refer to the availability of the equipment. This section of the checklist can be regarded as the easiest part of the evaluation which can gain points for all the hospitals being evaluated. The half-private hospitals obtained the highest score (92.82%)

while the network hospitals obtained the lowest score (79.09%) in observing the standards.

In observing medical ethics, ICUs often face legal and ethical issues especially in the case of patients in critical conditions with a low chance of reviving or healing. Observing patient's rights, respecting patients and their families, and following moral codes in treating patients' and their families are items which may cause legal problems for the hospital and staff. The military and network hospitals were observed to meet the standards by 100% while the private hospitals had the lowest level of standards (90.74%) regarding ethics in medication.

In the Others section of the checklist, there has been some attention paid to education and educational workshops. Half-private hospitals had the highest levels of standards in that section (85%) and the educational hospitals had the lowest standards (72.67%).

Baratpour and *Sajadi* [19], examining the extent to which standards are observed in ICUs in the city of Isfahan, found that based on the evaluation of the physical spaces and the related items, installations, and the safety in ICU, Al-Zahra and Kashani hospitals had the highest levels of standards while Isabn-e-Maryam and Markazi hospitals had the lowest levels of standards. Also, *Ahmadi* [5] states that paying attention to issues such as the color and lighting in the ICU and tele-monitoring the patients' conditions are very important in improving the medical cares offered in ICU. Though good steps have been taken in this regard, one needs to note that this must be an ongoing process.

Table 3. Evaluation Scores of ICU Units According to Standards in Different Hospitals

Standards Index		Human Resources	Educational	Structure	Installation	Technologic al Capabilities	Medical Equipment	Ethics	Other
Hospitals									
Educational	Total Score	6347	2534	1974	2025	4354	5834	3055	2035
	Percentage	79/33	79/18	82/25	84/37	90/70	82/40	94/29	72/67
	Mean	793/3	316/7	246/6	253	544/2	729/1	381/8	254/3
	S.D	81/83	20/13	34/23	15/90	5/41	38/07	22/02	24/55
Network	Total Score	1557	N.A ¹	567/5	520	1070	1400	810	570
	Percentage	77/85	-	94/58	86/66	89/16	79/09	100	81/42
	Mean	778/5	-	283/7	260	535	700	405	285
	S.D	36/06	-	22/98	35/35	2/82	7/07	0	42/42
Private	Total Score	1619	N.A	532/5	540	1096	1551	735	545
	Percentage	80/95	-	88/75	90	91/33	87/62	90/74	77/85
	Mean	809/5	-	266/25	270	548	775/5	367/5	272/5
	S.D	115/96	-	19/44	21/21	14/14	54/44	17/67	3/53
Half-private	Total Score	1706	N.A	540	537	1193	1643	800	595
	Percentage	85/3	-	90	89/5	99/41	92/82	98/76	85
	Mean	853	-	270	268/5	596/5	821/5	400	297/5
	S.D	57/98	-	42/42	37/47	2/12	30/40	7/07	3/53
Military	Total Score	885	N.A	285	265	600	815	405	290
	Percentage	88/5	-	95	88/33	100	92/09	100	82/85
	Mean	885	-	285	265	600	815	405	290
	S.D	-	-	-	-	-	-	-	-

Conclusion

The military, educational, and social security hospitals ranked first to third respectively in the evaluation of ICUs. To improve the quality of the services in these units, the more successful hospitals need to share their experience with other hospitals by having joint conferences and setting visiting tours. Moreover, educating the personnel and planning for making the best use of the available capabilities are other strategies used to improve the quality of medical cares. The steps taken by hospitals to improve their medical services need to be recorded. In fact, most hospitals that did not receive a high score in the evaluation had not recorded the steps they had taken to improve their medical services in their ICUs. As such, it seems necessary for hospitals to use the right

software to record their data and information in order to improve the quality of the medical services they can offer.

References

1. Mossadeg Rad AM. Textbook of Organization and Hospital Management 2. Tehran: Art Institute of Dibagaran Tehran; 2004.[Persian].
2. Vali L. Survey of equipment, facilities, drug and medical devices in PICU and relation with pediatric mortality rate in Tehran Pediatric Special. Proceeding of the First Congress of Resources Management in Hospital. Tehran: Iran EmamHosain University Publisher; 2002.p. 363-65.[Persian].
3. Mahory A, Heshmati F, Norozinia H, Abasi V, Norozinia Sh, Solaimani M. Role of resident anesthesia specialists in decreasing mortality rate in ICU. Iran Society of Anesthesiology &Care Journal. 2003; 41(23):17-22.[Persian].
4. Zakerimoghdam M, Aliasgharpour M. Intensive Care of Nursing in ICU, CCU and Dialysis. 4th ed. Tehran: AndishehRafie; 2006. p. 9-11.[Persian].

5. Ahmadi Danieli A. Changes in the organization and design of special care in modern hospitals. *Hospital Journal*. 2001;3(7):22-28.[Persian].
6. Guide the design and architecture of the Intensive Care Unit. Tehran: Management and Planning Organization, 2004.[Persian].
7. Duke GJ, Morley PT, Cooper DJ, Mcdemott FT, Corder SM, Tremayne AB. Management of severe trauma in intensive care units and surgical wards. *Med Journal*. 1999;19:416-19.
8. Abrishamcar S, Abedinzadeh MR, Arti HR, Hoshmand F. Survey of inpatient cases and mortality rate in ICU in AyatallahKashani Hospital of Sharehkord. *Journal of Sharehkord University of Medical Science*. 2003;3:73-8. [Persian].
9. Jadidi R, Norouzi A, Moshiri E. The relationship between physical and human resources in the Intensive Care Units and patients mortality rate in Hospitals of Markazi Province's:2007. *Journal of Arak University of Medical Sciences*. 2009;12(2):29-38. [Persian].
10. Sahebzadeh M. Evaluation of standards in CCU of University hospitals in Isfahan. Search project approved: Isfahan University of Medical Sciences. 2007. [Persian].
11. Apostolopoulou E, Nikoloudi P, Kalafati M, Tsaras K, Kastestaras T. Risk factors for ICU mortality in critically ill patients. *ICU Nurs WEB J*. 2002;12:12-20.
12. Sadaghiani E. Security in intensive care unit. Volume one. Tehran: Jahanrayaneh; 1998:317-23.
13. Sadaghiani E. Auditing standards and the accreditation organizations and health care facilities (hospitals). Tehran: Research Institute for Social Security Publication; 2004.[Persian].
14. AliRezai M. Optimization of physical spaces Hospital and its role in preventing waste. *Health Insurance Journal*. 2000;4(15):12-21. [Persian].
15. The process of evaluating hospital performance and intensive care unit. Health Insurance Organizations, The Office of Health Services. 2010. [Persian].
16. Moini L, Fani A, Peyroshabani B, Baghinia M. Evaluation of the standards of health care services and comparison of predicted mortality and real mortality in patients admitted to Valiasr and Amiral-momenin Hospitals of Arak by APACHE IV scoring system (2009-2010). *Arak Medical University Journal (AMUJ)* 2011; 14(57): 79-85. [Persian].
17. Mahory A, Heshmati F, Norozinia H, Abasi V, Norozinia Sh.Solaimani M. [Role of resident anesthesia specialists in decreasing mortality rate in ICU]. *Iran Society of Anesthesiology & Care J* 2003; 41(23):17-22. [Persian].
18. Brown JJ, Sullivan G. Effect on ICU mortality of a full-time critical care specialist. *Winnipeg:*

American College of Chest Physicians. 1998;96:27-29.

19. Barat Pour S, Sajadi HS. Observance standard in Intensive Care Unit in Isfahan city. Research project approved: Isfahan University of Medical Sciences. 2005. [Persian].