Pharmacophore

ISSN-2229-5402

Journal home page: http://www.pharmacophorejournal.com

Pharmacophore
an International Journal
ISSN 2229-5402

CAUSES AND LENGTH OF HOSPITALIZATION OF PATIENTS AND COST AND MORTALITY RATE IN AN INTENSIVE CARE UNIT

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ARTICLE INFO

Received:
03th Jun 2017
Accepted:
29th Nov 2017
Available online:
14th Dec 2017

Keywords: *Intensive Care Unit, Mortality, Length Of Stay, Reason For Hospitalization*

ABSTRACT

Introduction: To determine causes for hospitalization and mortality is the most important indicator in evaluating the abilities of the medical intensive care unit of the hospital. This information can be used to organize health status and reduce the mortality rate.
Method: In this study, data of 1973 patients who had been hospitalized in Imam Khomeini hospital in intensive care units were collected through hospital information system and patient's records held in the archives were analyzed using SPSS software.
Results: Of 1973 patients, 1193 patients (60.5%) were male and 780 (39.5%) were female. The mean (SD) age of the patients was 55.27 ± 23.67 years, (53. 99 ± 24.18) for males and (57. 23 ± 22.74) for females. The highest frequency for normal discharge outcome in the studied patients was obtained in 1391 patients (70.5%) and mortality outcome in 533 patients (27%) had the next highest frequency, and only 49 patients (2.5%) were discharged from the intensive care unit with personal satisfaction. Mean ± SD length of hospitalization in the intensive care unit of the patients was 11. 36 ± 21.24 days; the maximum length of stay was 228 days and the minimum length of stay was less than one day.
Conclusion: The respiratory insufficiency (failure) is the most common cause of death in hospitalized patients in more than 48 hours in the intensive care unit. In the present study, the mortality rate was reported 27%. Also, of those who died, 60.5% were male and 39.5% were female.

To Cite This Article: Bahlol Rahimi, Alireza Mahoori, Hamed Ghanipour, (2017), "causes and length of hospitalization of patients and cost and mortality rate in an intensive care unit", ***Pharmacophore, 8(6S),*** *e-117367.*

Introduction

Health and safety are one of the most fundamental human rights and according to the constitution, it must be easily accessible to all individuals (1). Each hospital should be equipped with a system that can manage the information necessary for planning and provide efficient monitoring of patient care and makes hospital management more efficient. This information, including trends and data, will improve decision making (2-3). Many factors affect the utilization of hospitals; careful use of them will help to identify aspects of the complex relationship between parts that are sensitive to changes, which will be obtained by creating associations within the hospital. Various criteria are used to evaluate the use of hospitals; however, none of these factors alone can provide the proper aspect of the hospital. These indicators can be categorized as follows: indicators related to the population covered or social indicators, indicators associated with hospital sources such as hospital beds, diagnostic and therapeutic facilities and benefiting from them. Statistics related to the morbidity and mortality rates in the hospital showing the relationship between diseases and patients, are collected via medical records. The statistics include the patient's personal characteristics (e.g., gender, occupation, marital status, etc.) and other data such as outcomes of hospital stays (such as improved or died patients). For optimum use of the existing facilities at health care centers and hospitals, the identification of factors affecting the increased length of hospitalization and reducing it with reasonable methods will ensure optimal and

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greater use of hospital beds. Length of hospitalization in patients admitted in hospital might be due to various factors, some of which can be removed by accurate understanding of treatment procedure of patients admitted in hospitals; thus, while increasing bed occupancy rate, this process raises bed efficiency and the costs per patient will be reduced and mental complications caused by a prolonged stay in hospital will also be prevented (2). The mean duration (length) of hospitalization is one of the most important indicators of hospital's performance. There is no reason that long-stay care leads to better quality care. In fact, over the last thirty years, a gradual reduction in the average length of hospitalization in member countries of the Organization for Economic Cooperation and Development has coincided with improved quality of care (4-5). In a study in Australia, Simpson et al., have introduced only 6 important factor affecting the patients' length of stay including severity of disease in patients, the effects of the treatment, the number of complications, daily surgery, the prevalence of disease, access to nursing home care and demonstrate that any factor affecting the factors will have an impact on the length of stay (6). Now, the world has solved problems related to unnecessary staying with a number of ways, one of which is the presence of full-time specialists in hospitals to reduce patient's length of stay (7). Length of stay refers to the time, expressed in days, between admission and discharge from hospital, which measures the use and efficiency of inpatient beds (8). At present, there is no general consensus on the factors affecting on patient's length of stay. But in general, 4 categories of these factors have been identified: patient's factors such as age, sex, social support, socio- economic status, nutritional status and postoperative nosocomial infections; hospital related factors such as hospitals size (number of beds), the ratio of nurses to patients and the area where the hospital is located; the source and type of payment, such as having or lack of insurance and payment to hospitals for fee or other payment methods and factors related to type of activity in physicians for family physicians, private or resident physician at the hospital (9-10). According to the descriptions provided and the importance of hospitalization in the intensive care unit, and due to lack of sufficient beds and changes in hospital costs as well as the fact that no study has recently been carried out in this respect;, we decided to conduct a study to investigate the above issues.

Materials and methods

This cross-sectional study was conducted in 2013 in Imam Khomeini hospital intensive care unit. All of the patients in the intensive care unit were evaluated. An information registration form was used to collect data in this study, which was prepared on the basis of studies in scientific papers and textbooks and includes characteristics, manner and the rationale for referring patients to intensive care unit, status of the patient's general admission and information about the complications and the patient's discharge, transfer or death and cost and its validity was confirmed by professors. Its reliability was also evaluated with test / re-test on the file number of patients. The data were collected through a hospital information system and patient records in the archives. This information includes all data of hospitalized patients including their length of hospitalization, insurance status and its type, hour and day and month of admission and discharge, diagnosis and cause of patient's referral, cost information, age, recipients and information about the disease. Data were analyzed by SPSS statistical software using descriptive statistics. Given that there is no intervention in the treatment of patients and the use and disclosure of patient's information is completely confidential, this study does not have any ethical problem.

Results

Of 1973 patients, 1193 patients (60.5%) were male and 780 (39.5%) were female. The mean (SD) age of the patients was 55.27 ± 23.67 years; most patients were aged 120 years and the minimum age was less than one year, (53. 99 ± 24.18) for males and (57. 23 ± 22.74) for females. 358 patients (18.1%) were aged under 30 years, 676 patients (34.2%) aged between 31 and 60 years and 939 patients (47.7%) were older than 60 years. The highest frequency for normal discharge outcome in the studied patients was obtained in 1391 patients (70.5%) and mortality outcome in 533 patients (27%) had the next highest frequency (Table 1).

Table 1. Frequency of outcomes in studied patients

		Frequency	Percent
	Normal discharge	1391	70.5
	Discharge with personal satisfaction	49	2.5
	Death	533	27

The highest incidence rate for hospitalization was related to GICU with 696 patients (35.3%) and the least incidence rate for hospitalization was related to DICU with 108 patients (5.5%) (Table 2).

Table 2: Frequency of hospitalization in intensive care units

	Frequency	Percent
GICU	696	35.3
SICU A	549	27.8
SICU B	280	14.2
MICU	172	8.7
DICU	108	5.5
NICU	168	8.5
Total	1973	100

Hospitalization for 48 hours a week had the highest frequency in 925 patients (9/46) and hospitalization more than a month had the lowest frequency in 721 patients (7/8%) (Table 3).

Table 3: Frequency of length of hospitalization in patients by categories

	Frequency	Percent
Less than 48 hours	400	20.3
48 hours a week	925	46.9
8 days to a month	476	24.1
More than one month	172	8.7
Total	1973	100

Table 4. Frequency of initial diagnosis for patients

Service	The number of patients Frequency)Percent(	The most common diagnoses made	Frequency	Percent
Gastrointestinal	81(4.1)	Gastrointestinal bleeding	52	064.2
		Cirrhosis	13	16
		Etc* .	16	19.8
Nephrology	89(4.5)	End-stage kidney disease	23	25.8
		Acute renal failure	12	13.5
		Chronic renal failure	12	13.5
		Etc.	42	47.2
Neurology	263(13.3)	stroke	183	69.6
		Convulsion	44	16.7
		Etc.	36	13.7
Orthopedic	129(6.5)	Femoral fractures (different parts(	98	76%
		Ulnar fracture	13	10%
		Etc.	18	14%
Surgery	576(29.2)	Multiple trauma	152	26.4
		Surgery of the esophagus	78	13.5
		Gallbladder surgery	57	9.9
		Etc.	289	50.1
Respirator system	176(8.9)	COPD	71	40.3
		Pneumonia	50	28.4
		Etc.	55	31.2
Oncology	41(20.7)	Non-Hodgkin's Lymphoma	9	21.9

		AML	4	9.7
		Etc	28	68.4
ophthalmology	7(0.03)	Cataract	6	85.7
		Etc	1	14.3
ENT	12(0.06)	Jaw bone fractures	5	41.6
		Surgical nasal polyps	2	16.6
		Etc.	5	41.8
Endocrinology	48(2.4)	Diabetic ketoacidosis	23	47.9
		Issues related to adrenal endocrinology	12	25%
		Etc	13	25%
Urology	131(6.6)	BPH	77	58.7
		kidney stone	39	29.7
		Etc	15	11.6
Neurosurgery	411(20.8)	Intracerebral hemorrhage	259	63
		Bone fractures skull	99	24%
		Etc	53	13%
Rheumatology	9(0.4)	Rheumatoid arthritis	4	44.4
		Antiphospholipid syndrome	2	22.2
		Etc	2	33.3

* Other less common diagnoses

277 patients (14%) of the patients were admitted without early diagnosis.

In this study, the mortality rate of patients admitted in intensive care unit in terms of service was as follows:

Table 5. Mortality rate in patients according service admitted

Service	Frequency	Percent
Surgery	113	21.2
Neurosurgery	109	20.5
Neurology	107	20.1
Respiratory system	81	15.2
Gastrointestinal	37	6.9
Nephrology	33	6.2
Oncology	23	4.3
Urology	11	2.1
Endocrinology	8	1.5
Orthopedic	5	0.9
Rheumatology	4	0.8
ophthalmology	1	0.2
ENT	1	0.2
Total	533	100

As it is shown in Table 5, the different frequencies of mortality rate in patients admitted to the intensive care unit was related to surgery with 113 cases (21.2%), neurosurgery with 109 cases (20.5%), neurology with 107 cases (20.1 %), respiratory system with 81 cases (15.2%), gastrointestinal with 37 cases (6.9%), nephrology with 33 cases (6.2%), oncology with 23

cases (4.3%), urology with 11 cases (2.1%), endocrinology with 8 cases (1.5%), orthopedics with 5 cases (0.9%), rheumatology with 4 cases (0.8%), ENT with 1 case (0.2%). Among patients who died, 63 patients (11.8%) were under 30 years, 182 patients (34.1%) were aged between 31 and 60 years and 288 patients (53.9%) were older than 60 years, the maximum age of death in patients was 107 years and the minimum age of death in patients was less than one year. The most frequent causes of death among hospitalized patients more than 48 hours was reported in respiratory failure in intensive care unit among 102 patients (24.17%). 215 (40.3%) of those who died were male and 318 (59.7%) were female. The average age of those who died was 59.49 ± 22 years. The mortality rate in patients hospitalized more than 48 hours in the intensive care unit was reported 467 cases (87.6%), the highest mortality rate in patients hospitalized more than 48 hours was reported on the third day of stay in the intensive care unit with 40 cases (7.5%). The results obtained for the type of insurance for studied patients were as follows:

Table 6. Frequency of type of insurance used in studied patients

	Frequency	Percent
Rural	543	27.5
Self-employed (Iranians)	268	13.6
Accident insurance	330	16.7
Social security	238	12.2
Government employees	180	9.1
Imam Khomeini Relief Committee	121	6.1
Private	76	3.9
Other classes (supportive)	73	3.7
Foreign nationals	12	0.6
Iran insurance	4	0.2
15 Khordad Foundation	2	0.1
Urmia Central Prison	2	0.1
Tejarat bank	1	0.1
Sepah bank	1	0.1

In Table 6, frequencies of insurance used by patients were rural insurance with 543 cases (27.4%), accident insurance with 330 patients (16.7%), self-employed insurance (Iranians) with 268 cases (13.6%), social security with 238 cases (12.2%), government employees with 180 cases (9.1%), Imam Khomeini Relief Committee with 121 (6.1%), the armed forces with 121 cases (6.1%), private insurance with 76 cases (3.9%), other classes with 73 cases (3.7%), Iran insurance with 4 cases (0.2%), prison of Urmia and 15 Khordad Foundation each with 1 cases (0.1%), Tejarat bank and Sepah bank each with one case (0.1%) and 12 cases (0.6%) for foreign nationals. Mean ± SD cost per patients was 56796089 ± 72880145.01 IRR. The average cost per day of hospitalization in the intensive care unit was calculated 4999655.78 IRR. In the survey, the average cost of hospitalization for any insurer is as follows:

Table 7. Mean and standard deviation of hospitalization in patients by the insurer

Insurance	**Mean ± SD**
Foreign nationals	122657389.8±138205247.9
Accident insurance	71765883.6 ± 83638619.2
Other classes (support(	70415217.7± 9538039.8
Urmia Central Prison	70306812.6 ± 70126061.6
Imam Khomeini Relief Committee	55980173.2 ±70126061.6
Sepah bank	55717000
Rural	52954203.80 ± 65206262.02
Self-employed (Iranians)(	51857892± 65346479.3
Armed Forces	511441012.3± 58515627.1
Social security	44544796.3 ±55946391.9
Tejarat bank	37443000
Iran insurance	35082862.5 ±2379393.9
Private	34355630.4 ± 41798022.8
Government employees	25484290±25685526.54
15 Khordad Foundation	2091880±17127257.6

Discussion and conclusion

There are various reports regarding mortality rate and problems caused by hospitalization in intensive care units. Several studies have been conducted to determine the causes of increased mortality rate of patients admitted to the intensive care unit; this study was conducted to evaluate the frequency of mortality rate and the cost of hospitalization in the intensive care unit of Imam Khomeini hospital in 2012. In our study, like the study by Abrishamkar and colleagues, the highest mortality rate of more than 48 hours of intensive care unit was associated with respiratory failure; the consistency between the results of these two studies suggests that the most common cause of death in hospitalized patients in more than 48 hours in the intensive care unit is respiratory failure (11-12). However, in a study by Zand and his colleagues in 2008 in Markazie province, the most common cause of death was reported cardiac arrhythmia (13-15), which was inconsistent with the results of this study; the inconsistency between two studies may be attributed to separated places of heart disease treatment center and our study center (Imam Khomeini hospital). In the present study, the length of stay was 11.36 days, which was different from the study conducted in Tehran by Afshar (7 days). This difference could be due to two different inpatient services in two centers and then from a different sample sizes; in this study, 1973 patients from 13 different inpatient services admitted were reviewed; whereas in the study by Afshar, only 427 out of 6 domestic services had been investigated (16-18). In a study by Abrishamkar study like the study by Zand, accident was identified one of the most common causes of hospitalization, which was consistent with two similar previous studies. According to the results of these studies and statistics provided by the bodies concerned about road accidents in Iran, the consistency between the results of these studies is confirmed. In this study, the mortality rate was reported 27%, which was consistent with the results of the study by Abrishamkar and his colleagues (37.4%). This difference is primarily due to the different years of two studies (improved diagnosis and treatment of disease) and is an indicator of the positive impact of education and health systems and subsequently due to different sample sizes in two studies and the duration of two studies; for example in the study by Abrishamkar and colleagues, 296 patients who had been hospitalized during three years in the intensive care unit in Ayatollah Taleghani Hospital were examined; whereas, in our study 1973 patients hospitalized in the intensive care unit during the study period of 1 year in Imam Khomeini hospital were studied. In a study by Rafeie, the mortality rate was reported 28.1% which was consistent with this study (27%). In the current study, of those who died, 60.5% were male and 39.5% were female, which was consistent with the study by Afshar and Zand. The average age of those who died was about 60 years, which was consistent with the results of the study by Afshar (64 years). In the study by Rafiei, mortality rate in the first 24 hours was reported 7.9%, which was different from the present study (3.9%); this difference can be caused by the medical staff performance in intensive care units, including doctors and nurses (19-20). In this study, 14% of patients had unexplained death; while in the study by Zand and his colleagues, it was 6.2%. This difference may be due to different sample sizes in both studies. Since third-level services are offered to patients referred to specialist clinic of Imam Khomeini Hospital and Imam Khomeini teaching Hospital and many patients referred had not a definitive diagnosis after the intervention and they were referred as well as many patients have face with miscellaneous problems, preparation of a diagnosis and treatment plan has been very difficult for them. For the purposes of the study, the average cost calculated for a stay in the intensive care unit for patients was estimated 4,999,655.78 IRR. The majority of differences in insurance used was reported for foreigner patients with the highest average cost and then for patients who had an accident. The study found that maximum stay of patients was reported between 48 up to a week and respiratory failure is also viewed the largest cause of death among patients.

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