

## Studying the causes of hospitalization and death of those hospitalized in the ICU unit of Imam Reza (PBUH) Hospital of Kermanshah (2008 to 2013)

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### ABSTRACT

**Introduction:** The ICU unit of a hospital is one of the most sensitive and important strategic units in a hospital for critically ill patients who, despite having several background diseases, have a hope of survival. Considering the importance of patients' death toll in evaluating the hospitals, this study was conducted to determine the frequency of hospitalization and death among the patients hospitalized in the ICU unit of Imam Reza Hospital of Kermanshah.

**Methodology:** This cross sectional, descriptive study was conducted using the files of those hospitalized in the ICU unit of Imam Reza Hospital of Kermanshah. To describe the data for quantitative variables, we used mean and standard deviation, while frequency percentage was used for qualitative variables. Chi square and t-tests in SPSS v.20 were used to investigate the relationship between the variables studied.

**Findings:** As the results indicated, the total number of the patients hospitalized from 2009 to 2013 was 7828 people. Of this number, some 912 (11.65%) died, while the remaining 6916 patients were discharged from ICU. The major causes of hospitalization in the ICU were respiratory problems (26.1% or 2109 people) and gastrointestinal disorders (21.8% or 1710 people), while the greatest causes of the death toll were respiratory disorders (31.3%) and neurological disorders (18.8%).

**Conclusion:** Fewer death tolls among those suffering from respiratory, neurological and gastrointestinal disorders in the city of Kermanshah requires greater care in the ICU in order to reduce the death toll and undertake the interventions based on population.

**KEY WORDS:** death toll, ICU, causes of hospitalization.

### 1. INTRODUCTION

The intensive care unit (ICU) is one of the most sensitive strategically units in a hospital used to take care of critically ill patients who, despite having several background diseases, have a hope for survival. In other words, the critical condition of those in the ICU makes it impossible to keep them in the other units with other patients. Intensive care refers to looking after patients suffering from life-threatening diseases under the care and supervision of the most skilled personnel using advanced equipments and tools (Halpern, 2004). One of the most important factors in assessing the therapeutic capabilities of the ICU of a hospital is to study the death toll among the patients. There are various death toll rates in different countries. For example, the following death rates were reported among the elderly in the ICU of different countries: 32% in Toronto, Canada (Friedrich, 2006), 13.5% in Sao Paulo, Brazil (Oliveira,2010), and 18.4% in Finland (Reinikainen, 2012). Of the total death toll in our country, some 1.5% of the general deaths take place in the ICU (Madineh, 2003). Keeping in mind that our society is growing old and considering the fact that the demographic change rate of the Iran is faster than the general population of the world and changes in the epidemiologic appearance of the diseases indicate the greater demand for intensive cares in the present and future. Different researches conducted in various parts of Iran have reported varying statistics about the death toll observed in the ICU. The following death rates were reported among the patients in the ICU of different cities of Iran over a period of 3 years: 37.4% in Sharekord (Soleimani,2014), 18.2-43.8% in Semnan (Zand and Rafiei, 2010), 25% in Arak (25%) and 17.9% in Qazvin (Bekirogullari, Rasolabadi, 2015).

There are differing reports about the death rate and the side effects of hospitalization in ICU. There are differing ideas and views about the causes of death and the correlation between the length of hospitalization and the side effects and the type of side effects that emerge with the longer hospitalization of the patients. Various researches have been conducted with the goal of finding the factors that enhance the chances of patients' death in the ICU. Patients in the ICU requiring ventilator for more than 14 days are those older than 65 with infectious shock, kidney and cardiovascular disorders, and hospital infections which enhance the death tolls in ICU's (9) (Ghannad,2016, Ghaffari,2015). In a research conducted in 28 hospitals with 37 ICU's, it was proved that old age alone was an

important factor in enhancing the death toll. For each 5 years increase in the patients' age, their possibility of death grows more. Patients undergoing surgeries experienced greater death tolls than those with medical problems.

Considering the importance of death tolls in evaluating hospitals and different prevalence's of this issue in various areas, the present study was conducted with the goal of finding the frequency of the causes of hospitalization and death among those hospitalized in the ICU of Imam Reza Hospital of Kermanshah.

## 2. MATERIALS AND METHODOLOGY

The present cross sectional, descriptive study was conducted using the files of the patients hospitalized in the ICU of Imam Reza Hospital of Kermanshah from early 2009 to late 2013. All the patients who had been hospitalized in the ICU for various medical and surgical reasons entered the study. Those patients in need of hospitalization in the ICU who had died before being sent to this unit or those who had not been sent to the above-said ward for any reason (lack of vacant beds, etc) and those patients with faulty files were discarded. Having gained the necessary permits to access the files, the list of the names and the file numbers of the patients were extracted from the hospital archive. The data from the files was collected using a pre-fabricated checklist. The data used in the files included: patients' age, gender, the date and hour of reception and discharge from ICU, the cause of being sent to ICU, the monitoring and supporting devices of the patient, Glasgow coma score, the patients' state in terms of being afflicted with Sepsis and MRSA (Methicillin-Resistant Staphylococcus Aureus), the final status of the patient (death or discharge). To describe the data for quantitative variables, we used mean and standard deviation, while frequency percentage was used for qualitative variables. Chi square and t-tests in SPSS v.20 were used to investigate the relationship between the variables studied.

**Findings:** The total number of the patients hospitalized in the ICU of Imam Reza Hospital of Kermanshah since early 2009 up to late 2013 was 7828 people. Of all these people, 912 (11.65%) died and 6916 (85.35%) were discharged from ICU. In other words, the death rate in the ICU of this hospital over the course of 5 years was reported to be 11.65% (table 1). The average age of the patients hospitalized in the ICU was  $57.23 \pm 18.51$ , while this number among the dead was  $59.35 \pm 17.78$ . Of all those hospitalized in the ICU, 3249 (41.5%) were female and 4579 (58.5%) were male, while there were 380 (58.3%) males and 532 (41.7%) females among the dead. The major causes of hospitalization in the ICU were respiratory problems (26.1% or 2109 people) and gastrointestinal disorders (21.8% or 1710 people), while the greatest causes of the death toll were respiratory disorders (31.3% or 285 people) and neurological disorders (18.8% or 171 people). The prevalence of resistance to Methicillin among all the patients in the ICU and those dead were 3.16% and 27.1% respectively, while the prevalence of Sepsis in the total number of those hospitalized in the ICU and the dead was 2.43% and 20.8% respectively (Table 1). The average Glasgow score among the dead and those hospitalized was  $9.81 \pm 3.42$  and  $13.21 \pm 2.33$  respectively.

**Table.1. Distribution frequency of those who died in the ICU in accordance to the cause of death and other background variables**

Gender	Number	Percentage
Male	532	58.3%
Female	380	41.7%
Cause of hospitalization in the ICU (n= 7828)		
Respiratory disorders	2109	26.9%
Trauma	632	6.8%
Cardiovascular disorders	589	7.5%
Neurological disorder	1330	17%
Gastrointestinal disorder	1710	21.8%
Kidney disorders	1197	15.3%
Other causes	361	4.6%
Causes of death in the ICU (n= 912)		
Respiratory disorders	285	31.3%
Trauma	38	4.2%
Cardiovascular disorders	95	10.4%
Neurological disorders	171	18.8%
Gastrointestinal disorders	133	14.6%
Kidney disorders	133	14.6%
Other causes	57	6.3%
resistance to Methicillin in ICU (n= 912)		
No	665	72.9%
Yes	247	27.1%
Sepsis in ICU (n= 912)		

No	722	79.2%
Yes	190	20.8%
death tolls per year		
2009	142	15.6%
2010	159	17.4%
2011	196	21.5%
2012	202	22.1%
2013	213	23.4%
Average age (n= 912)		59.35 ± 17.78
Average Glasgow score (n= 912)		9.81 ± 3.42
The average length (days) of hospitalization in ICU (n= 912)		5.19 ± 3.96

The average age and the number of the dead (912 people) was significantly more than the average age and the number of the people discharged from ICU ( $P < 0.001$ ). As of the dead, the difference between the average age of men ( $60.82 \pm 18.12$ ) and women was significant ( $P < 0.002$ ). No significant difference was observed concerning the hospitalization length in both groups (the dead and discharged) (table 2). The frequency distribution of the causes of hospitalization among the dead and discharged was also different and this difference was reported to be statistically significant (table 2). No significant difference was found in the frequency distribution of the dead and discharged in terms of gender (male and female). Affliction with Sepsis (20.8% vs. 3.6%) and resistance to Methicillin (27.1% vs. 3.6%) was significantly higher among the dead than what was observed among those discharged ( $P < 0.001$ ). Among the dead people, 247 people (27.1%) were resistant to Methicillin and this resistance among men (61.54%) was much greater than what was observed among women (38.46%). There were also 190 people (20.8%) afflicted with Sepsis of whom 70% were male and 30% were female ( $P < 0.001$ ).

**Table.2. Comparison between the causes of hospitalization and other background variables among those who died and those who were discharged from ICU**

	Total number of people (n= 7828)	Number of people discharged (n= 6916)	Number of dead (n= 912)	P-value
Average age	57.23 ± 18.51	56.95 ± 18.59	59.35 ± 17.77	0.001
Average Glasgow score	13.21 ± 2.33	13.66 ± 1.69	9.81 ± 3.42	0.001
Average length (days) of hospitalization in ICU	5.09 ± 3.86	5.08 ± 3.85	5.19 ± 3.96	0.428
Gender (%)				
Female	41.5%	41.5%	41.7%	NS
Male	58.3%	58.5%	58.3%	
Cause of hospitalization in ICU (%)				
Respiratory disorders	26.9%	26.4%	31.2%	0.001
Trauma	6.8%	7.1%	4.2%	
Cardiovascular disorders	7.5%	7.1%	10.4%	
Neurological disorders	17%	16.8%	18.8%	
Gastrointestinal disorder	21.8%	22.8%	14.6%	
kidney disorders	15.3%	15.4%	14.6%	
Other causes	4.6%	4.4%	6.2%	
Resistance to Methicillin (%)	6.3%	3.6%	27.1%	0.001
Sepsis (%)	5.6%	3.6%	30.8%	0.001

### 3. RESULTS AND DISCUSSION

The prevalence of death in the ICU of Imam Reza Hospital of Shahrekord in a period of 5 years was 11.65% with the annual average being 16.68%. The death toll in the ICU in various countries has been different. In a review research, the death rate in the ICU was reported to range from 5.4% to 33% (Williams,2005). In a prospective study conducted by Friedrich et al in Toronto, the average death rate among those hospitalized in the ICU for a long term (with an average of 45 days) over a course of 3 years (2001 to 2003) was 32% (Friedrich,2006). The study conducted by Oliveira et al in the university hospital of Estadual in Sao Paulo reported a death toll of 13.5% (Oliveira,2010), while the study conducted by Kosma et al (2012) on all the hospitals of Finland in the course of eight years (2001 to 2008) reported a rate of 18.4% for the death tolls in ICU (RAATIKAINEN). Various studies conducted in different parts of Iran have also reported differing death tolls in the ICU. The following death rates were reported among the patients in the ICU of different cities of Iran over a period of 3 years: 37.4% in Sharekord (6), 18.2-43.8% in Semnan(Soleimani,2014), 25% in Arak (25%) and 17.9% in Qazvin (Soleimani,2014). The difference in the results of various studies can be attributed to demographic differences, the volume of the sample, the type and intensity of

the of the disease in the people studied, research methodology and the quality and quantity of the services in the ICU (West, 2014).

The greatest causes of death in the ICU were respiratory (31.3%), neurological (18.8%), digestive and kidney (14.6%) and cardiovascular (10.4%) disorders. In the study conducted by Abrishamkar in Ayatollah Kashani Hospital of Shahrekord, the most common cause of death in the ICU was reported to be respiratory disorders (Mayr,2006). The research conducted by Zand et al in Arak, cardiovascular disorders were reported to be the most common cause of death in the ICU (28.1%) (Zand and Rafiei, 2010). The studies conducted in other countries have also reported different causes for the death toll observed in the ICU (Abrishamkar, 2012).

The average age of those dead in the ICU was  $59.35 \pm 17.78$  in the present study. This is in line with the results of some researches (Amini,2009, Sakr,2013) and not in line with some others. The results of some of the studies indicate a relationship between age and high rate of death in ICU, although this correlation may be influenced by factors such as low sample volume (Boumendil,2007). In another research conducted with a large number of samples, no such results were achieved (Oliveira,2010). On the other hand, the influence of age on the prognosis of hospitalization in ICU might be associated with other correlating factors such as the intensity of the diseases and the performance of body organs (de Rooij, 2005).

There were 380 (58.3%) males and 532 (41.7%) females among the dead in this research rendering the results in line with the study conducted by Afhsar et al in Mostafa Khomeini Hospital of Tehran and the other research conducted by Oliveira et al in Clinicas Hospital of Sao Paulo(Martins,2002). But the results were not in line with the study conducted in New York (Sakr,2013). The research by Kamran Mahmood et al in order to determine the correlation between gender and the prognosis of the patients in ICU conducted on 261255 people hospitalized in the ICU of US hospitals from 2004 up to 2008 showed less death rate among women younger than 50 compared to men hospitalized in the ICU. However, no statistically significant difference was observed in the death toll of women older than 50 years and men (Mahmood, 2012). The significant influence of death age among women can be described by the hormonal theory. The results of some laboratory researches indicate the protective role of estrogens on the performance of heart and the nervous system (Choudhry,2006, Sperry and Minei, 2008).

In the present study, 190 people (20.8%) who died in the ICU were suffering from Sepsis of whom 70% were male. The death tolls caused by Sepsis in different countries are varying and all the indicators diagnosed by the intensity of disease and prognosis cannot justify the international difference in the death rate caused by Sepsis in ICU (Silva, 2012). The results of the study conducted by Sakr et al in Italy showed less cases of Sepsis among the women in the ICU, but more death tolls due to intense Sepsis are observed among women and being female is an independent risk factor for death toll among those suffering from intensive Sepsis in ICU (Sakr, 2013).

#### 4. CONCLUSION

Fewer death tolls among those suffering from respiratory, neurological and gastrointestinal disorders in the city of Kermanshah requires greater care in the ICU in order to reduce the death toll and undertake the interventions based on population.

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