**ORIGINAL ARTICLE**

# Patterns of Admission in Intensive Care Unit of Tertiary Care Hospital

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### ABSTRACT

**Background:** It is well known that early appropriate referrals of critically ill patients to an ICU can significantly reduce the mortality. At the same time, improper admissions to ICU limits bed availability that adversely affects ICU functioning. Objective: To determine the patterns of admissions and outcome in Medical and Surgical Intensive care Units.

**Material & Methods:** A retrospective review of all patients admitted in medical and surgical ICU of Pakistan Institute of Medical Sciences, Islamabad from 2014 to 2016 was done. Data was collected from admission registers and patients' files. Data was analyzed using SPSS software version 20.0. Chi-square test was applied and P-value < 0.05 was considered significant.

**Results:** Study recruited data of 1652 patients admitted to intensive care unit of PIMS hospital. There were 769(46.5%) males and 883(53.5%) females. Among all the patients, 503(30.4%) were admitted to medical intensive care unit while 1149(69.6%) were admitted to surgical intensive care Unit. 684(41.4%) had undergone mortality while 968(58.6%) remained alive. Overall mean length of hospital stay was $7.4\pm4.1SD$, mean length of mechanical ventilation $4.1\pm2.1SD$ and mean length of supplemental ventilation was $1.5\pm0.11SD$. Acute abdomen (13.1%) and head injuries (12%) were most common causes for admission in ICU. Statistically significant association between years (2014, 2015 & 2016) and disease (p=0.000), years and mortality (p=0.000), years and age (p=0.000), intensive care unit and gender (p=0.01), intensive care unit and age (p=0.02) was reported. **Conclusion:** Acute abdomen and Head injuries had highest number of admissions in Medical and Surgical intensive care unit of PIMS hospital. Developing a well-equipped trauma ICU with adequately trained staff will help improve the outcome of patients.

**Keywords:** Intensive care unit, trauma, pattern of admissions.

## Introduction

According to World Health Organization adult mortality rate was 149 per 1000 population in 2015, globally and half of deaths are due to unavailability of Intensive care unit services[1]. Intensive care unit (ICU) is an advanced service available in hospitals for potentially recoverable patients who could be benefited with detailed treatment and monitoring[2]. Intensive care unit is most expensive component of health care system, worldwide. Intensive care services vary in different countries according to their resources[3]. Some countries have intermediate level of care for critically ill patients known as high dependence

unit. Critically ill patients in ICU require continuous monitoring, complex diagnostic and supportive therapy[4]. In the United States, half of the population requires ICU services in last years of life and majority of them undergo mortality[5]. A retrospective study reported that 24% of patient's admission in ICU was classified as surgical cases while 72% of these cases were caused by trauma. The average length of stay in hospital was 2.3 days/patient[6]. A Nigerian study reported that majority of patients admitted to ICU were referred from the Department of Obstetrics / gynecology[7]. In United Kingdom (UK), 75% of ICU cases discharged to general wards, 20% to 30% undergo mortality while 3% were discharged to home[8].

Rapoport et al. reported that 65% of ICU admission was done after Post C-section. The mortality rate varies from 20-24%[9]. Evidence exist that some patients do not require ICU services but they were admitted due to a shortage of bed in respective wards. The average length of stay was 2.6 days±8.1 SD[10]. Asim et al reported that out of all admissions, 60% patients were admitted from a medical emergency, 10% from medical ward, 10 % from surgical emergency and 1.16% from surgical ward. Patients admitted to ICU had a high mortality rate as compared to patients in medical and surgical wards[11].

Pakistan Institute of Medical Sciences (PIMS) is a tertiary care hospital with advanced medical and surgical ICU services available at the public-sector level. Hospital performance measurement for critically ill patients in ICU is an important issue for hospital management, clinicians and health sector policymakers. Limited data is available on this topic in Pakistan. The study aims to determine Patterns of admissions in Medical and Surgical Intensive care Unit.

## Methodology

A retrospective review of all patients admitted in medical and surgical ICU of Pakistan Institute of Medical Sciences from 2014 to 2016 was done. All data was collected from admission registers and patients' files that included gender, age, mortality rate, the frequency of diseases, and length of stay in the hospital. Ethical approval was taken from an ethical review board of PIMS Hospital. Data was collected on prescribed proforma format sheet designed for the study. Data was analyzed using SPSS software version 20.0. Descriptive statistics (percentages, mean,

SD) was used to describe the data. Results were reported in percentages, tables and charts for different variables according to nature of the variable. Chi-square test was applied and P-value < 0.05 was considered significant.

## Results

The study recruited data of 1652 patients admitted to intensive care unit of PIMS hospital. There were 769(46.5%) males and 883(53.5%) females. Among all the patients, 271(16.4%) were in 10-17 years of age group, 423(25.6%) were in 18-40 years, 576(34.9%) were in 41-60 years age group, 253(15.3%) were in 60-70 years age group and 129(7.8%) were in age group >70 years. Among all the patients, 503(30.4%) were admitted to medical intensive care unit while 1149(69.6%) were admitted to surgical intensive care Unit. There was 41.4% (n=684) mortality while 968(58.6%) remained alive. Overall Mean length of hospital stay was 7.4±4.1SD, mean length of mechanical ventilation 4.1±2.1SD and mean length of supplemental ventilation was 1.5±0.11SD. Acute abdomen disease and head injuries are most common disease for patients' admission in intensive care unit as shown in Table 1.

**Table I: Disease pattern of patients admitted in medical and surgical ICU**

| Diseases | Frequency (N=1652) | Percentage (100%) |
|---|---|---|
| Encephalitis / Meningitis / ADEM | 193 | 11.7% |
| Status Epilepticus | 63 | 3.8% |
| GBS | 62 | 3.8% |
| Severe sepsis / DIC /Septic shock | 126 | 7.6% |
| Tetnus | 103 | 6.2% |
| Diabetic ketoacidosis | 67 | 4.1% |
| Hypokalemia periodic paralysis | 83 | 5% |
| ARDS | 75 | 4.5% |
| ESRD | 59 | 3.6 |
| Acute abdomen | 219 | 13.1% |
| Fat metabolism | 40 | 2.4% |
| Fluminant hepatic failure | 46 | 2.8% |
| Puerperal sepsis | 39 | 2.4% |
| Pancreatitis | 32 | 1.9 |
| Elective surgeries (abdomen & chest) | 120 | 7.3% |
| Polytrauma | 96 | 5.8% |
| Head injuries (EDH/SDH/SAH) | 198 | 12% |
| Others | 31 | 1.9% |

Year-wise distribution of diseases is shown in Table 2. A statistically significant association between years and disease was found ($x2 = 213.422$, p=0.000, df =38).

**Table II: Year-wise distribution of diseases**

|  | 2014 | 2015 | 2016 |
|---|---|---|---|
| **Encephalitis/Meningitis/ADEM** | 92(5.6%) | 60(3.6%) | 41(2.5%) |
| **Status Epilepticus** | 78(4.7%) | 78(4.7%) | 42(2.5%) |
| **Guillain-Barré syndrome** | 24(1.5%) | 24(1.5%) | 14(0.8%) |
| **Disseminated intravascular coagulation/Septic shock** | 18(1.1%) | 18(1.1%) | 12(0.7%) |
| **Tetanus** | 40(2.4%) | 40(2.4%) | 23(1.4%) |
| **Diabetic ketoacidosis** | 26(1.6%) | 26(1.6%) | 15(0.9%) |
| **Hypokalemic periodic paralysis** | 32(1.9%) | 32(1.9%) | 19(1.2%) |
| **Acute respiratory distress syndrome** | 27(1.6%) | 30(1.8%) | 18(1.1%) |
| **End stage renal disease** | 14(0.8%) | 28(1.7%) | 17(1.0%) |
| **Acute abdomen Medical** | 54(3.3%) | 95(5.05%) | 57(3.5%) |
| **Fat embolism** | 10(0.6%) | 20(1.2%) | 10(0.6%) |
| **Fluminant hepatic failure** | 14(0.8%) | 18(1.1%) | 14(0.8%) |
| **Puerperal sepsis** | 12(0.7%) | 15(0.9%) | 12(0.7%) |
| **Pancreatitis** | 8(0.5%) | 11(0.7%) | 13(0.8%) |
| **Elective surgeries (abdomen & chest),** | 30(1.8%) | 30(1.8%) | 60(3.6%) |
| **Polytrauma** | 24(1.5%) | 24(1.5%) | 48(2.9%) |
| **Head injuries (Epidural Haematoma, subdural hematoma etc)** | 19(1.2%) | 6(0.4%) | 38(2.3%) |
| **Severe sepsis** | 26(1.6%) | 0(0%) | 52(3.1%) |
| **Others** | 13(0.8%) | 0(0%) | 18(1.1%) |
| **Total** | 561(34%) | 568(34.4%) | 523(31.7%) |

Among all the patients who were admitted Mortality was 17.43% (n=236) in 2014, 7.3% in 2015 and 22.7% in 2016, respectively. ($x2 = 698.343$, p=0.000, df =2).

Among all the patients who were admitted in 2014, 561(34.0%), 218(13.2%) patients were in age group of 41-60 while all those who were admitted in 2015, 568(34.4%), maximum patients were in age group of 41-60 years. However, all those who were admitted in 2016, 523(31.7%), 79(4.8%) were in 10-17 years, 24(1.5%) in 18-40 years, 128(8.4%) in 41-60, 93(5.6%) in 61-70 years and 189(11.4%) in>70 years age group. ($x2 = 67.907$, p=0.000, df =8).

A significant association between intensive care unit, age (p=0.02) and gender (p=0.01) was found as shown in Table 3.

**Table III: Association between intensive care unit, gender and age**

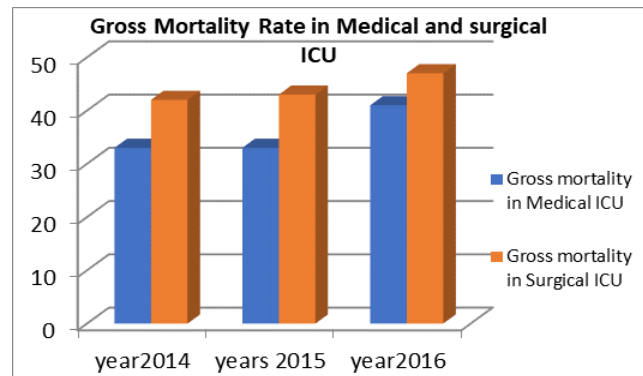| Gender | Intensive care unit | | Chi-square value | P value |
|---|---|---|---|---|
|  | Medical | surgical |  |  |
| Male | 219(13.3%) | 550(33.3%) | $x^2 = 20.65$ | 0.01 |
| Female | 284(17.2%) | 599(36.3%) |  |  |
| Total | 503(30.4%) | 1149(69.6%) |  |  |
| **Age group** |  |  |  |  |
| 10-17 | 86(5.2%) | 185(11.2%) | $x^2 = 41.377$ | 0.02 |
| 18-40 | 49(3.0%) | 80(4.8%) |  |  |
| 41-60 | 168(10.2%) | 408(24.7%) |  |  |
| 60-70 | 74(4.5%) | 179(10.8%) |  |  |
| >70 | 126(7.6%) | 297(10.0%) |  |  |
| Total | 503(30.4%) | 1149(69.6%) |  |  |



**Figure 1: Gross mortality rate in medical and surgical ICU**

## Discussion

Intensive care unit is an important component of tertiary care hospital that admits patients with severe and life-threatening conditions[12]. In ICU patients are undergone through constant and intensive monitoring, provided with advanced equipment and treatment for maintenance of normal physiological condition[13].

In the present study, 1652 patients were reviewed retrospectively. The study recruited 53% females. Among all the patients 1652(100%), 271(16.4%) were in 10-17 years of age group, 423(25.6%) were in 18-40 years, 576(34.9%) were in 41-60 years age group, 253(15.3%) were in 60-70 years age group and 129(7.8%) were in age group >70 years. Among all the patients, 503(30.4%) were admitted to medical intensive care unit while 1149(69.6%) were admitted to surgical intensive care Unit. Barnato et al. reported that mean age was 65.3 years±14.5 SD in low severity ICU while 73.9 years ±13.1SD in high severity ICU. There were 43.5% female in low severity while 49.8% female patients in high severity ICU[14]. Angus et al. reported that out of all hospital included, there were 22,734 low-severity ICU admissions (mean per hospital, 261 ± 187), 10,991 high-severity ICU admissions (mean per hospital, 126 ± 105), and 6,636 high-severity ward admissions (mean per hospital, 76 ± 48)[15].

Overall Mean length of hospital stay in our study was 7.4±4.1SD, mean length of mechanical ventilation 4.1±2.1SD and mean length of supplemental ventilation was 1.5±0.11SD. *Garland et al reported that average*

*number of no. of ICU episodes were 6016 while average cumulative ICU bed-days were 23.628 from 1999 to 2007.* Mean length of stay for ICU episodes restricted to the low-intensity ICUs were significantly shorter than for those including care in high-intensity ICUs (mean values $2.22 \pm 2.45$ vs. $4.32 \pm 7.58$ days, $P < 0.0001$)[16].

The present study reported a significant association between years (2014, 2015 & 2016) and disease of patients admitted in surgical and medical intensive care unit (($x^2 = 213.422$, $p = 0.000$, $df = 38$). Frensoo et al. reported that acute infection and cardiovascular disease accounts for 30% of total ICU admissions. Present study reported acute abdominal disease as major cause of maximum admission in ICU of PIMS[17]. However, Saferian & Afesssa reported that ketoacidosis with acute myocardial infection and complicated malaria was leading case if ICU admissions[18].

The present study reported that among all the patients who were admitted in 2014 561(34%), 236(1.43%) had undergone mortality while 325(17.6%) remained alive. Similarly, all the patients who were admitted in 2015 568(34.4%), 120(7.3%) had undergone mortality while 448(27.1%) remained alive. Among all those who were admitted in 2016 523(31.7%), 119(22.7%) had undergone mortality while 404(77.3%) remained alive ($x^2 = 698.343$, $p = 0.000$, $df = 2$). Haupt et al. reported that out of total, 16.7% (128) patients received invasive mechanical ventilation during their stay in ICU. Only 15% (34 patients) of all the cases of severe TBI patients received invasive mechanical ventilation. Mortality rate was 34.6% in this study[19].

## Conclusion

Acute abdomen and Head injuries had the highest number of admissions in Medical and surgical intensive care unit of PIMS hospital. Developing a viable trauma team and separately equipped trauma ICU with adequately trained staff will help improve the outcome of patients. Furthermore, the development and strict implementation of protocols for use in the management of ICU patients along with improved documentation will foster better prognosis for ICU patients in resource-poor settings.

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