

## A ten-year review of the management of surgical patients in the Intensive Care Unit

Abhulimen Victor <sup>1,\*</sup> and Oruobu-Nwogu Ayanate <sup>2</sup>

<sup>1</sup> Department of Surgery, Division of Urology, University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria.

<sup>2</sup> Department of Surgery, Department of Anaesthesiology, University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria.

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### Abstract

**Background:** The intensive care unit (ICU) is a distinct organizational and geographic entity for clinical activity and care, operating in cooperation with other departments integrated in a hospital. Surgical patients make up a significant number of those admitted into the ICU.

**Materials and Methods:** This is a ten-year retrospective study conducted at the University of Port Harcourt Teaching Hospital. Ethical approval for the study was sought and gotten from the hospital's ethical committee. The information gotten includes history, age, sex, diagnosis, length of admission, and outcome. The data collected was analyzed and presented in tables and charts.

**Results:** The mean age of surgical patients in the ICU was 35.88±18.17. More females (884, 56.9%) were admitted into the ICU compared to males (537, 34.6%). The highest bill paid by a patient was 493,000 naira. The maximum duration of stay in the ICU was 227 days. A total of 919 (59.2%) patients were transferred out of the ICU, while 78 (5%) were discharged from the ICU.

**Conclusion:** The importance of the ICU to the surgeon cannot be overemphasized. The mean age of patients admitted to the ICU was 35.88 years. Females were more common than males. Many patients (64.2%) admitted to the ICU recovered and were transferred out or discharged. Obstetrics and gynaecology department had the highest admission. Better prenatal and antenatal care may help reduce this trend

**Keywords:** Intensive care unit; Surgery; Duration of stay; Outcome; Bills paid; Obstetrics; Gynaecology

### 1. Introduction

An Intensive care unit is a specialized unit in the hospital that cares for patients with life-threatening conditions, who require constant care, close supervision, medication, and support to ensure normal body function<sup>1</sup>. An intensive care unit (ICU), is also known as an intensive therapy unit or intensive treatment unit (ITU), or critical care unit (CCU).<sup>1</sup> The intensive care unit (ICU) is a distinct organizational and geographic entity for clinical activity and care, operating in cooperation with other departments in the hospital.<sup>2</sup>

Surgical patients who require ICU admission include those who had extensive or prolonged surgeries and need some form of organ support (cardiovascular, respiratory, renal)<sup>3</sup>, those who have severe sepsis, post-trauma patients with multiple organ involvement, and those with severe burns<sup>4</sup>.

\* Corresponding author: Abhulimen Victor 0000-0002-9268-1725

Studies about ICU have been conducted in Port Harcourt, Nigeria<sup>5,6</sup>. These accounts were either published over 9 years ago or focused on only a specialty. The report by Mato et al.<sup>5</sup> was published in 2009 and that by Jaja et al.<sup>6</sup> was published in 2014 and this concentrated on head injury. Another publication on the ICU by Kejeh et al.<sup>4</sup> concentrated on burn patients alone while that by Green et al.<sup>7</sup> and Job et al.<sup>8</sup> focused on obstetrics patients alone. We intend to publish an account of all surgical patients admitted into the ICU in the last 10 years in all the surgical sub-specialties. This paper will add to the already increasing body of knowledge about the ICU in our locality.

## 2. Material and methods

This study was carried out in Port Harcourt, Rivers State, Nigeria. Port Harcourt is an industrial city located in the Niger Delta region of Nigeria. All surgical patients admitted into the ICU of the University of Port Harcourt Teaching Hospital UPTH from January 2013 to December 2022 were evaluated. Hospital ethical committee approval was sought and obtained from the hospital ethical committee.

Data were obtained from the ICU ward register, theatre register, discharge records, and medical records. Information gathered include name, age, sex, bill, duration of admission, sub-specialty, number of survivors, number discharged home, and number transferred out. Patients with incomplete records were excluded from the study. The data from the folders were collected and entered using Microsoft Excel 2016 version and transferred into the statistical package for social sciences (SPSS) for Windows (version 25) (IBM SPSS Inc. Chicago, IL) for analysis. A ninety-five percent confidence interval and a p-value less than 0.05 was considered significant. Frequencies, percentages, mean, and standard deviation were used to summarize the data as appropriate. Categorical data were presented in the form of frequencies and percentages using tables. Continuous variables were presented in means and standard deviation. Results were presented in tables and charts.

## 3. Results

Within the study period of ten years, a total of one thousand five hundred and fifty-three patients were admitted into the ICU with surgical challenges.

**Table 1** Ages, bills paid, and duration of stay in the ICU. The mean age of surgical patients in the ICU was 35.88±18.17. The highest bill paid by a patient was 493,000 naira. The maximum duration of stay in the ICU was 227 days

Statistics				
		Age (years)	Bill	Duration(days)
N	Valid	1537	1087	1421
	Missing	16	466	132
Mean		35.88	47114.67	4.98
Median		34.00	33000.00	3.00
Mode		30.00	21000.00	2.00
Std. Deviation		18.17	49692.45	8.811
Variance		330.312	2469339943.43	77.63
Range		91.00	491000.00	226.00
Minimum		.00	2000.00	1.00
Maximum		91.00	493000.00	227.00

**Table 2** Most surgical patients in the ICU were between the 30- and 39-year group. The least age group of surgical patients in the ICU was the greater than 90 years age group. There were more females than males amongst the surgical patients, as 884 females presented to the ICU within the study period as against 669 males. Five hundred and forty-four patients (35.1%) died, while 919 (59.2%) made significant recovery and were discharged

	N	%
<b>Age group</b>		
0-9	131	8.4
10-19	77	5.0
20-29	353	22.7
30-39	429	27.6
40-49	217	14.0
50-59	145	9.3
60-69	111	7.1
70-79	48	3.1
80-89	24	1.5
>90	20	0.1
Not stated	16	1.0
<b>Sex</b>		
Female	884	56.9
Male	669	43.1
<b>Outcome</b>		
Died	544	35.1
Discharged	78	5.0
Referred out	5	0.3
SAMA	7	0.4
Transferred	919	59.2
<b>Total</b>	<b>1553</b>	<b>100.0</b>

**Table 3** The most common age group in females who presented to the ICU was 307 (34.7%) between the age of 30 to 39years. For men, the most common presentation was 128(19.1%) between the age of 20 to 29years and this was statistically significant with a *p-value* of 0.0001

	Sex				Chi-square	<i>p-value</i>
	Female		Male			
	N	(%)	N	(%)		
<b>Age group</b>						
0-9	61	(6.9)	70	(10.5)		
10-19	34	(3.8)	43	(6.4)		
20-29	225	(25.5)	128	(19.1)		
30-39	307	(34.7)	122	(18.2)		

40-49	109	(12.3)	108	(16.1)	103.25	<0.0001
50-59	67	(7.6)	78	(11.7)		
60-69	56	(6.3)	55	(8.2)		
70-79	11	(1.2)	37	(5.5)		
80-89	6	(.7)	18	(2.7)		
>90	0	(.0)	2	(.3)		
Not stated	8	(.9)	8	(1.2)		
<b>Outcome</b>						
Died	283	(32.0)	261	(39.0)		
Discharged	52	(5.9)	26	(3.9)		
Referred out	2	(.2)	3	(.4)	18.23	0.006
SAMA	1	(.1)	6	(0.9)		
Transferred	546	(61.8)	373	(55.8)		
<b>Total</b>	884	(100.0)	669	(100.0)		

**Table 4** Young patients between the ages of 30 to 39 years old are more likely to be discharged (32,41%) and transferred out (244, 26.6%). Older patients are less likely to be discharged or transferred

	<b>Outcome</b>									
	<b>Died</b>		<b>Discharged</b>		<b>Referred out</b>		<b>SAMA</b>		<b>Transferred</b>	
	<b>N</b>	<b>(%)</b>	<b>N</b>	<b>(%)</b>	<b>N</b>	<b>(%)</b>	<b>N</b>	<b>(%)</b>	<b>N</b>	<b>(%)</b>
<b>Age group</b>										
0-9	46	(8.5)	3	(3.8)	0	(.0)	2	(28.6)	80	(8.7)
10-19	26	(4.8)	2	(2.6)	1	(20.0)	0	(.0)	48	(5.2)
20-29	117	(21.5)	1	(1.3)	1	(20.0)	2	(28.6)	232	(25.2)
30-39	152	(27.9)	32	(41.0)	0	(.0)	1	(14.3)	244	(26.6)
40-49	65	(11.9)	11	(14.1)	2	(40.0)	1	(14.3)	138	(15.0)
50-59	59	(10.8)	11	(14.1)	1	(20.0)	0	(.0)	74	(8.1)
60-69	37	(6.8)	10	(12.8)	0	(.0)	0	(.0)	64	(7.0)
70-79	22	(4.0)	5	(6.4)	0	(.0)	0	(.0)	21	(2.3)
80-89	10	(1.8)	2	(2.6)	0	(.0)	1	(14.3)	11	(1.2)
>90	1	(.2)	0	(.0)	0	(.0)	0	(.0)	1	(.1)
Not stated	9	(1.7)	1	(1.3)	0	(.0)	0	(.0)	6	(.7)

**Table 5** The mean bill paid by a patient in the ICU is 47,114.68 naira. Patients referred outside the hospital paid the highest bill with an average of 97,460 nairas. Patients who recovered and were transferred out paid the least average bill of 42,353 nairas

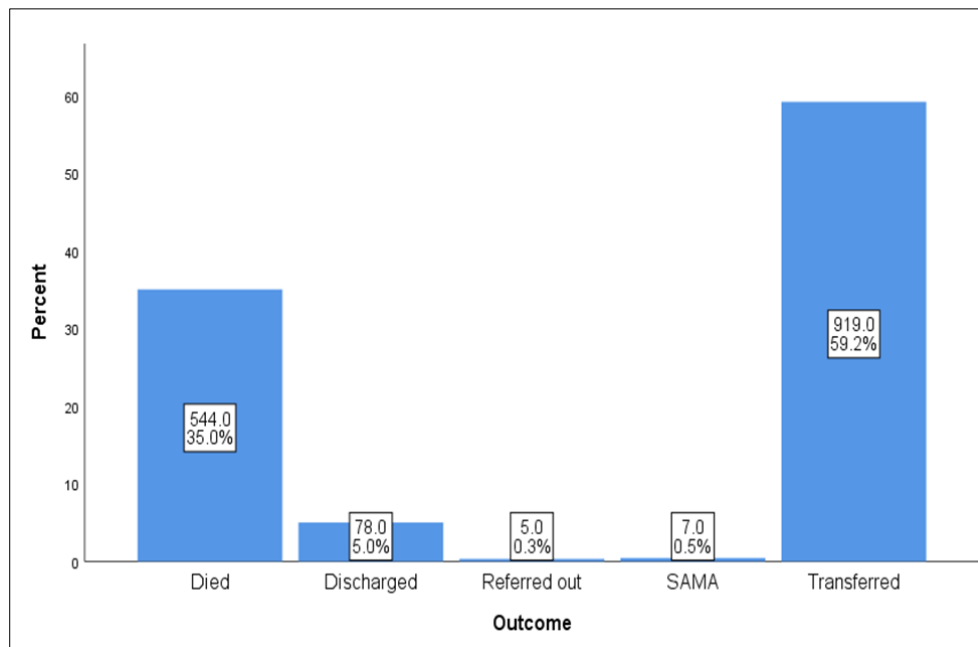
	Bill	Duration
	Mean	Mean
<b>Outcome</b>		
Died	53813.31	4.76
Discharged	76410.60	6.88
Referred out	97460.00	8.40
SAMA	57916.67	7.67
Transferred	42353.24	4.92
<b>Total</b>	<b>47114.68</b>	<b>4.98</b>

**Table 6** Surgical specialties that admitted patients to the ICU and the different outcomes. The obstetrics department has the largest admission into the ICU with 446 patients followed by the general surgery department with 436 patients admitted into the ICU. The highest percentage of death in the ICU was by the plastic department with 72 (74.2%) patients dying within the study period. The Oral Maxillofacial Surgery (OMS) department had the highest percentage of patients transferred out with 74(93.7%) of patients transferred out after treatment

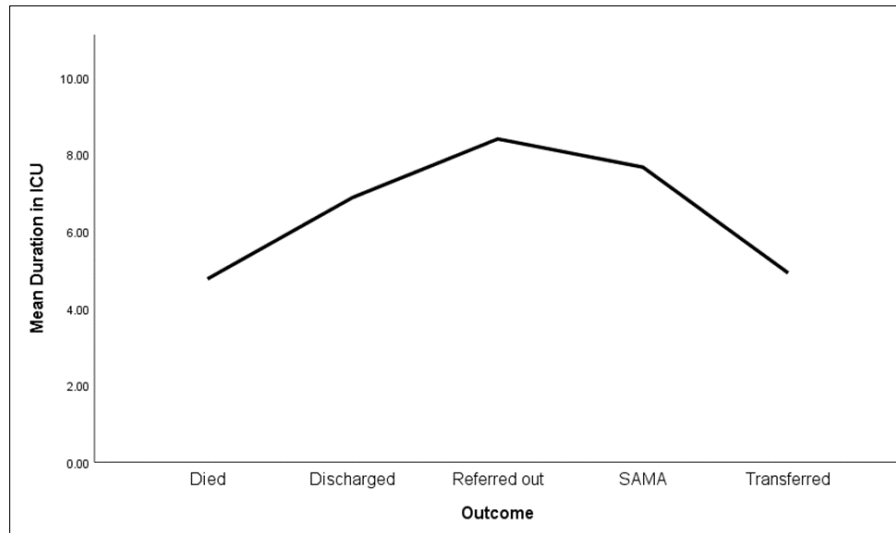
Unit	Outcome											
	Died		Discharged		Referred out		SAMA		Transferred		Total	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
CTU	24	(25.5)	4	(4.3)	1	(1.1)	1	(1.1)	64	(68.1)	94	(6.1)
ENT	10	(22.2)	0	(.0)	0	(.0)	0	(.0)	35	(77.8)	45	(2.9)
Neurosurgery	107	(48.6)	10	(4.5)	1	(.5)	4	(1.8)	98	(44.5)	220	(14.2)
O&G	133	(29.8)	23	(5.2)	0	(.0)	1	(.2)	289	(64.8)	446	(28.7)
OMS	5	(6.3)	0	(.0)	0	(.0)	0	(.0)	74	(93.7)	79	(5.1)
Orthopaedic	23	(23.2)	9	(9.1)	0	(.0)	0	(.0)	67	(67.7)	99	(6.4)
Paediatric surgery	1	(6.7)	0	(.0)	0	(.0)	0	(.0)	14	(93.3)	15	(1.0)
Plastic	72	(74.2)	3	(3.1)	1	(1.0)	1	(1.0)	20	(20.6)	97	(6.2)
Surgery	161	(36.9)	27	(6.2)	2	(.5)	0	(.0)	246	(56.4)	436	(28.1)
Urology	8	(36.4)	2	(9.1)	0	(.0)	0	(.0)	12	(54.5)	22	(1.4)

**Table 7** Mean age, mean bill paid by the patient, and mean duration of stay. The youngest and oldest mean age was by the paediatric surgery and Urology unit respectively. The largest and smallest mean bill was paid by patients in the neurosurgery department and OMS respectively. The smallest mean duration of stay in the ICU was 2.56 days for OMS patients

UNITS	Age	Bill	Duration
	Mean	Mean	Mean
CTU	34.24	43976.47	3.99
ENT	24.51	47270.27	3.45
Neurosurgery	38.37	72066.51	9.40
O&G	33.20	40629.95	3.81
OMS	31.31	29987.12	2.56
Orthopaedic	43.46	44690.99	5.13
Paediatric surgery	2.89	49050.00	4.45
Plastic	23.95	60605.07	6.96
Surgery	40.59	42039.37	4.17
Urology	59.50	48625.00	7.17



**Figure 1** 919 (59.18%) of the patients admitted to the ICU made a good recovery and were transferred from the ICU to other surgical sub-specialties while 537 (34.58%) died while being managed in the ICU



**Figure 2** Relationship between the mean duration in the ICU (days) against the outcome. The patients who died and those who were transferred from the ICU spent the least amount of time in the ICU

#### 4. Discussion

Surgery as one of the oldest and most respected fields in Medicine was built upon continuous innovation.<sup>9</sup> Improvements in anaesthesia, infection control, reduction in blood loss, and better postoperative care are great steps that improved the outcome of Surgery<sup>9</sup>. The intensive care unit has greatly improved the outcome of postoperative care, especially for major cases and severely ill individuals<sup>10</sup>. Increased collaboration between the different units and the ICU is also an important factor that led to this improvement<sup>11</sup>.

The mean age of surgical patients in the ICU was  $35.88 \pm 18.17$  in this study as shown in **Table 1** and this is in agreement with earlier studies carried out in the region by Mato et al.<sup>5</sup> with a mean age of  $31.7 \pm 5.6$  years. Studies by Green et al.<sup>7</sup> discovered that the majority of patients admitted (51.79%) were of the 21-30-year age bracket. Ibeanusi et al.<sup>4</sup> also noted a relatively young mean age of 25.3 years. A reason for the young mean age in this study may be because most patients were admitted by the obstetrics department and were of childbearing age, hence the young age. Most surgical patients and patients who had trauma are also relatively young, hence the young age of patients in the ICU<sup>12,13,14</sup>. The mean length of stay in the ICU was 4.98 days as shown in **Table 1**. Patients admitted into the ICU should be carefully selected to benefit maximally from ICU admission<sup>15</sup>. When this selection is adequately done the ICU is better utilized leading to shorter hospital stays, this ultimately provides space for other patients to be admitted into the ICU<sup>15</sup>.

More females (884) were admitted to the ICU compared to males (669) within the study period as seen in **Table 2**. The number of unbooked obstetric patients requiring ICU admission is a big reason for this discrepancy<sup>7</sup>. Better prenatal and antenatal care of pregnant women may reduce the burden these antenatal patients place on the ICU.<sup>7</sup> **Table 2** also reveals a high mortality rate of patients in the ICU of 35.1%. The seriousness of the illness, premorbid conditions, and level of injury of these patients account for this high mortality rate<sup>4,6,7,8</sup>. A previous study conducted in Port Harcourt noted a median age of 4.5 days and a mortality of 24.3%<sup>5</sup>. There seems to be an apparent increase in the mortality rate between both studies, however, there is an increased awareness about the use and abuse of ICU and this has led to many patients being sent to the ICU only when indicated. Moreover, in the earlier study, many (41.5%) patients admitted to the ICU had no justifiable reason for admission<sup>5</sup>. These factors could have accounted for this apparent increase in mortality.

For men, the most common presentation was 128(19.1%) between the age of 20 to 29 years and this was statistically significant with a *p-value* of 0.0001 even though the most common age group for admission in both sexes was between 30 to 39 years age group as shown in **Table 3**. Port Harcourt is an oil-producing city, so young males are likely to be involved in legal oil exploration activities or illegal bunkering activities which can lead to burns.<sup>4</sup> Younger males are also more likely to be involved in gunshot injuries and femoral fractures<sup>12-14</sup>.

Younger patients between the ages of 30 to 39 years old are more likely to be discharged (32,41%) and transferred out (244, 26.6%) compared to older people as shown in **Table 4**. The elderly is the continuation of life with a reduced

capacity for adaptation. Several studies have shown that younger postoperative patients fare better than elderly patients<sup>16-19</sup>. Younger patients with more metabolic reserve tend to do better postoperatively.

**Table 5** shows that the mean bill paid by a patient in the ICU is 47,114.68 naira. Patients who recovered and were transferred out paid the least average bill of 42,353 naira. While those patients who had to be referred outside the UPTH for any reason paid more with an average bill of 97,460. In Nigeria, the proposed minimum wage is 30,000 naira.<sup>20</sup> So many states have not been able to pay this minimum wage. Healthcare in Nigeria is mainly paid out of pocket and many households can not afford to pay for healthcare. The amount for ICU admission is above the minimum wage for an individual. Moreover, many elderly people who are unable to fend for themselves may be unable to pay for ICU admission, this may be another reason for the increased mortality in the elderly as seen in **Table 4**.

The different surgical subspecialties that use the ICU and their outcome is shown in **Table 6**. The obstetrics department has the largest admission into the ICU with 446 patients followed by the general surgery department with 436 patients admitted into the ICU. Previous studies carried out in the subregion can attest to this fact<sup>5,7,8</sup>.

The largest and smallest mean bill was paid by patients in the neurosurgery department (72066.51) and OMS (29987.12) respectively. The complex procedures and amount needed to carry out neurosurgical procedures may account for the increased bill paid in the ICU. The paediatric surgery unit is mainly involved with the management of paediatric patients and hence it has the least mean age of 2.89 years. The mean age of patients admitted into the ICU by the Urology unit is 59.50. The urology unit manages mainly men with prostatic pathology. Benign prostatic enlargement and prostate cancer are diseases of older men<sup>21-29</sup>.

A large number of patients (919, 59.2%) admitted into the ICU were transferred out of the ICU to other wards and 78(5%) were discharged directly from the ICU as shown in **Figure 1**. This makes a total percentage of 64.2% (59.2% plus 5%). In an earlier study conducted in Port Harcourt by Mato et al.<sup>5</sup> 41.3% of patients were transferred out and 24.3% of patients were discharged directly making a total of 65.6%.<sup>5</sup> The results of both studies can be said to be similar. These patients may have been saved largely because of the specialized care they received from the ICU.

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## 5. Conclusion

The importance of the ICU to the surgeon cannot be overemphasized. The mean age of patients admitted to the ICU was 35.88 years. Females were more common than males. Many patients (64.2%) admitted to the ICU recovered and were transferred out or discharged. Obstetrics and gynaecology department had the highest admission. Better prenatal and antenatal care may help reduce this trend.

### *Recommendations*

- Awareness about the needs, uses, and abuses of the ICU.
- Safer prenatal and antenatal practices
- Need to provide funds for older retired individuals who may require the use of the ICU because of its cost. This may reduce the mortality of the elderly.

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## Compliance with ethical standards

### *Acknowledgments*

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### *Disclosure of conflict of interest*

The authors declare no conflict of interest

### *Statement of ethical approval*

Ethical approval was sought and obtained from the hospital's ethical committee.



### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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