



ASA Physical Status Score as a Predictive Tool of Mortality in Emergency Postoperative Abdominal Injuries in the ICU

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

Background: The factors affecting the pattern and outcome of management of postoperative abdominal injuries in the intensive care unit of University of Uyo Teaching Hospital has never been investigated. This is especially important against a backdrop of limited resources in our intensive care unit.

Aim: This study seeks to determine the pattern and outcome of ICU management of postoperative abdominal injuries, and whether the American Society of Anesthesiologists physical status (ASA-PS) score is of any prognostic value with regards to outcome in this patient population.

Patients and Methods: This was a retrospective study of all postoperative patients admitted into the ICU on account of abdominal injuries (blunt and penetrating), between April 2006 and November 2014. Data for each patient was obtained from the ward and ICU records. Data collected were Age, Sex, Mechanism of Abdominal injury, ASA-PS score, ICU Length of Stay and Outcome of Management. Prolonged ICU length of stay was taken as >72 hours.

Results: Thirty-six patients with either blunt or penetrating abdominal injuries were studied. Thirty (83.3%) of these patients were males while six (16.7%) were females; giving a male to female ratio of 5:1. A majority of patients (36.1%) were between 25 and 39 years. There were more blunt 22

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(61.1%), than penetrating 14 (38.9%), abdominal injuries. Thirteen (36.1%) were ASA IIIE, 19 (52.8%) were ASA IVE and 4 (11.1%) were ASA VE. The ASA-PS score of patients had no significant association with the type of abdominal injury ($P = 0.722$). There was no significant association between the ASA-PS score of patients, and outcome of management, with the length of patient stay in ICU. Outcome of management was significantly associated with the ASA status of patient ($P = 0.001$).

Conclusion: The ASA-PS of emergency post laparotomy patients admitted to the ICU is possibly a viable tool for prognostication of outcome of management.

Keywords: ASA physical status score; abdominal injuries; outcome in the ICU.

1. INTRODUCTION

The abdomen is the third commonest region of the body injured in civilian trauma [1]. On the basis of mechanism of injury, abdominal injury is typically categorized as blunt or penetrating. Blunt trauma may result from a direct blow, impact with an object, or sudden deceleration. The spleen is the organ damaged most commonly, followed by the liver and a hollow viscus (typically the small intestine) [2].

Penetrating abdominal injuries may or may not penetrate peritoneum and if they do, may not cause organ injury. Stab wounds are less likely than gunshot wounds to damage intra-abdominal structures. Laparotomy is often done either because of the initial nature of the injury and clinical status of the patient (e.g., hemodynamic instability), or because of subsequent clinical decompensation [2].

The American Society of Anesthesiologists (ASA) proposed the physical status classification of preoperative patients for anaesthetic risk assessment in 1963 [3]. The ASA-PS score is a subjective assessment of a surgical patient's overall health that is based on five classes (I to V):

- I. Patient is a completely healthy and fit.
- II. Patient has mild systemic disease.
- III. Patient has severe systemic disease that is not incapacitating.
- IV. Patient has incapacitating disease that is a constant threat to life.
- V. A moribund patient who is not expected to live 24 hour with or without surgery.

For emergency surgeries, E is placed after the Roman numeral [4]. In 1980, ASA physical status class VI was added to take into account the brain-stem-dead organ donor - patients that are already dead before entering theatre [5].

The ASA-PS score can be used to quantify the amount of physiological reserve that a patient possesses at the time at which they are assessed for a surgical procedure. This may however change before the patient actually undergoes the procedure, either by optimization and improvement of their physical state or because they deteriorate and have less reserve [5]. It has been said that ASA-PS score should not be used as a sole predictor of operative risk to the patient because the patient still has that physical status whether he or she is having a skin lesion removed under local anesthetic or undergoing a pancreatectomy [6].

This study seeks to know if the ASA physical status score, in the absence of the usual ICU scoring tools and the prevailing poor funding of most health facilities, could be used as a prognostic tool for predicting the outcome of management of emergency postoperative abdominal injuries patients admitted into the intensive care unit.

2. MATERIALS AND METHODS

This was a retrospective study of all post-laparotomy patients admitted into the intensive care unit (ICU) of University of Uyo Teaching Hospital, Uyo, on account of abdominal injuries, both blunt and penetrating, between April 2006 and November 2014. Patients who had other injuries in addition to abdominal injuries were excluded. Data for each patient was obtained from the ward and ICU records. Data collected were Age, Sex, Mechanism of Abdominal injury, ASA-PS status, Length of Stay in the ICU and Outcome of Management.

Descriptive data was express in terms of percentages, frequencies and mean. The Chi-Square test was used for the inter-group comparisons of the categorical data. One-way analysis of variance (ANOVA) was used for comparing group means. The IBM-SPSS version

22.0.0.0 was the statistical package used for every data analysis. A p-value of less than 0.05 was considered statistically significant. Every patient was assumed to have had the same goal-targeted treatment protocol (e.g. antibiotics, adequate analgesia, oxygen therapy/elective mechanical ventilation and sedation as was appropriate, etc) as is the policy of our ICU. Prolonged ICU length of stay was taken as >72hours. Outcome of management of the patient was either a successful discharge from, or death in, the ICU.

3. RESULTS

Thirty-six patients, admitted during this period into the ICU after exploratory laparotomies for either blunt or penetrating abdominal injuries, met the stated criteria and were included in this study. Thirty (83.3%) of these patients were

males while six (16.7%) were females (Table 1): Male to female ratio of 5:1. Their ages ranged between 7 – 65 years, with a mean of 31.97 years. Most (13; 36.1%) of the patients were between 25 and 39 years. There were more blunt (22 (61.1%)), than penetrating (14 (38.9%)), abdominal injuries (Table 1).

With respect to the ASA physical status score of the patients, 13 (36.1%) were ASA IIIIE, 19 (52.8%) were ASA IVE and 4 (11.1%) were ASA VE (Table 2). The ASA-PS score of patients had no significant association with the mechanism of abdominal injury (P = 0.722). The ICU length of stay ranged between 6 – 240 hours, with a mean stay of 60.9 hours. Majority of patients, 28 (77.8%), stayed 72 hours or less in the ICU (Fig. 1). The ICU length of stay had no significant association with the ASA-PS score of patients (P = 0.198) or outcome of management (P = 0.056).

Table 1. Cross tabulation of mechanism of abdominal injury and sex of patients

Mechanism of abdominal injury		Sex of patients		Total
		Male	Female	
Penetrating		12	2	14
	% of Total	33.3%	5.6%	38.9%
Blunt		18	4	22
	% of Total	50.0%	11.1%	61.1%
Total		30	6	36
	% of Total	83.3%	16.7%	100.0%

Table 2. Cross tabulation of outcome of management and ASA classification

Outcome of management		ASA classification			Total
		ASA IIIIE	ASA IVE	ASA VE	
Discharged to Ward		12	14	0	26
	% Within Outcome of Management	46.2%	53.8%	0.0%	100.0%
	% Within ASA Classification	92.3%	73.7%	0.0%	72.2%
	% of Total	33.3%	38.9%	0.0%	72.2%
Died		1	5	4	10
	% Within Outcome of Management	10.0%	50.0%	40.0%	100.0%
	% Within ASA Classification	7.7%	26.3%	100.0%	27.8%
	% of Total	2.8%	13.9%	11.1%	27.8%
Total		13	19	4	36
	% Within Outcome of Management	36.1%	52.8%	11.1%	100.0%
	% Within ASA Classification	100.0%	100.0%	100.0%	100.0%
	% of Total	36.1%	52.8%	11.1%	100.0%

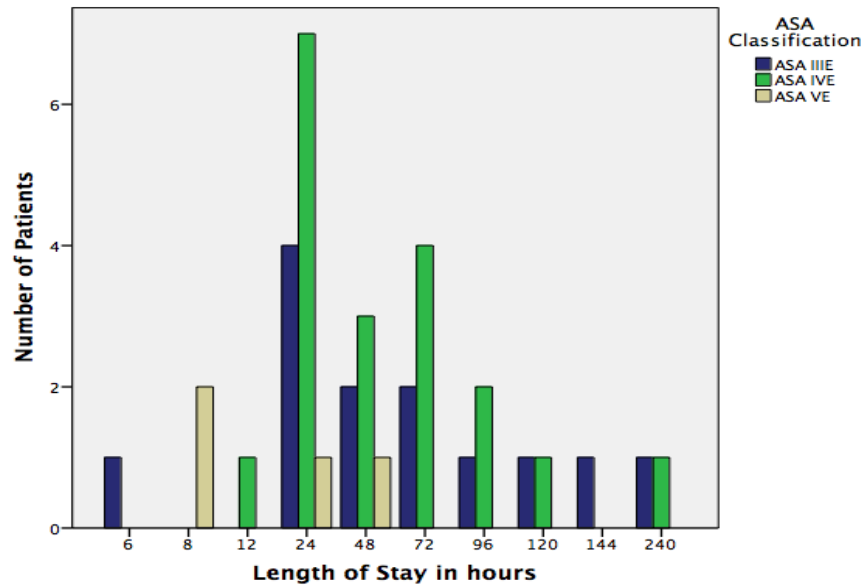


Fig. 1. Bar chart of ASA classification and ICU length of stay

While 26 (72.2%) of the patients [ASA III E 12 and ASA IVE 14] were discharged to the ward, 10 (27.8%) died in the ICU (Table 2). One-way analysis of variance revealed a statistically significant association between Outcome of management with the ASA-PS score of patient ($P = 0.001$). The mechanism of abdominal injury, sex, age, or ICU length of stay did not significantly impact on the outcome of management. All the patients with ASA VE died in the ICU (Table 2)

4. DISCUSSION

Association between ASA physical status score and outcome specific surgical procedures can be found in the literature. Tade [7] et al. reported ASA-PS score as a significant predictor of mortality in patients treated for typhoid intestinal perforation. Claudio [8] et al. submitted that the ASA score is important in predicting both short- and long-term outcome in patients undergoing hepatic resections, and was a useful tool in adapting individual therapeutic strategies in order to improve surgical outcome in patients with primary and secondary hepatic malignancies. The specific correlation of ASA scores with operating times, hospital length of stay, postoperative infection rates, overall morbidity and mortality rates following gastrointestinal, cardiac and genitourinary surgery has also been extensively studied [9].

Using univariate analysis, Wolters[10] et al. showed a significant correlation ($P < 0.05$) between ASA class and perioperative variables (intraoperative blood loss, duration of postoperative ventilation and duration of intensive care stay), postoperative complications and mortality.

In this study, there was a predominance of males (83.3%) in this patient population. This is similar to previous studies on abdominal injuries [11,12]. Most of the patients (36.1%) were between the age group of 25 and 39 years. While this age group still represents a very vibrant and dynamic work force of the community, it is not very different from other studies on abdominal injuries where the most affected age group was 21 – 30 years [13,14].

There were more blunt abdominal injuries than penetrating injuries. This was similar to the findings of other authors [15,16]. Road traffic accidents have been reported as the leading cause of blunt abdominal injury worldwide [17]. The mechanism of abdominal injury had no association with the ASA score of the patient ($P = 0.722$). This is because no consideration is given to the mechanism of the abdominal injury when the ASA-PS score is assigned. There was also no significant correlation between the ICU length of stay ($P = 0.319$), and the outcome of management ($P = 0.110$), with the mechanism of abdominal injury.

Prolonged ICU stay is associated with high morbidity, mortality and costs [18,19]. Since the financial burden of care of critically ill patients commonly rests on the patients' family in most developing countries, prediction of this prolonged stay will provide information for physicians and family and help with resource allocation [20]. The mean ICU length of stay in this study was 60.9hours, with 8 (22.2%) patients staying for greater than 72hours. Defining prolonged ICU length of stay as >72hours, this finding was similar to the 20.1% obtained by Kongsayreepong et al. [20]. The eight patients were divided equally between ASA-PS IIIIE and VIE. All the patients classified as ASA-PS VE died within 72hours of admission into the ICU.

Pearson Chi-Square analysis showed no significant association between ICU length of stay and ASA-PS score ($P = 0.198$). This is different from a similar study by Lupei et al. [21] who found that ASA-PS classification is associated with increased surgical ICU length of stay, mechanical ventilation, and vasopressor treatment duration. The association between ICU length of stay and outcome of management was equally not significant in this study ($P = 0.056$). This again is different from the findings by Arabi et al. [19]. It is important to note that clinical relevance may not always translate to statistical significance. The small population size of this study may be an important explanation for this disparity.

Chijiwa et al. [22] found ASA physical status score not to have a predictive quality towards morbidity and mortality after major abdominal surgery. This was not the case in this study as ASA physical status score was found to have a very significant association with outcome of management ($P < 0.001$). The mortality rates for the individual classes were 7.7% for ASA IIIIE, 26.3% for ASA IVE and 100% for ASA VE (Table 2). These are higher than the published absolute mortality rates by Farrow et al. [23]. Variations in mortality rates may be explained by differences in assessment of the patient's ASA physical status, patient population, sample size, operations performed and duration of postoperative monitoring.

Several authors [24-26] have reported considerable variations in ASA classification allocation as it does not consider the patient's sex, age, weight or gravidity. It does not also consider the nature of the planned surgery, the skill of the anesthetist or surgeon, the degree of

pre-surgical preparation or the facilities for postoperative care. Aronson et al. [27] demonstrated inconsistency of grading between anesthetists in studies using hypothetical adult patients scenarios.

One study reported various sources of variability between anesthesia providers including smoking, pregnancy and the nature of the surgery, potential difficult airway and acute injury [27]. Regardless of this variability, in uni-variate and multi-variate analyses of emergency surgical patients and mortality, ASA-PS score has consistently been shown to be a good predictor of death post-operatively [17,28,29].

5. CONCLUSION

The ASA-PS score was found to be a viable predictor of outcome of management of abdominal injuries admitted into the ICU after emergency laparotomy. In resource-limited settings, this simple scoring system could be a valuable tool for outcome prediction in patients with abdominal injuries.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

DISCLAIMER

The abstract of this manuscript was presented in the conference.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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