Section: Anaesthesiology

Original Research Article

COMPARISON OF SHAPE SCORE VERSUS ASA PHYSICAL STATUS SCORE FOR PREDICTION OF INTRA-OPERATIVE COMPLICATIONS AND POST-OPERATIVE ICU ADMISSION

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Received : 16/01/2026
Received in revised form : 05/03/2026
Accepted : 22/03/2026

Keywords:
SHAPE score, ASA physical status, intraoperative complications, ICU admission, perioperative risk assessment.

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DOI: 10.47009/jamp.2026.8.2.117

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2026; 8 (2); 630-635

ABSTRACT

Background: Preoperative risk assessment is a fundamental component of anesthetic practice as it helps identify high-risk patients, predict perioperative complications, and guide perioperative management strategies. The American Society of Anesthesiologists Physical Status (ASA-PS) classification is one of the most widely used tools for assessing preoperative risk. However, the ASA-PS classification is largely subjective and may not accurately predict intraoperative complications or postoperative intensive care unit (ICU) requirements. Recently, multidimensional scoring systems such as the SHAPE score have been proposed to provide a more objective and comprehensive assessment of perioperative risk. **Aim and Objective:** To compare the predictive accuracy of the SHAPE score and ASA Physical Status (ASA-PS) classification in predicting intraoperative complications and postoperative ICU admission. **Materials and Methods:** This prospective observational study was conducted in the Department of Anaesthesiology at LN Medical College and JK Hospital, Bhopal, from January 2026 to March 2026. A total of 110 adult patients undergoing elective surgical procedures under anesthesia were included. All patients were evaluated preoperatively using both ASA-PS classification and SHAPE score. Intraoperative complications and postoperative ICU admissions were recorded. Statistical analysis was performed using SPSS version 27.0. Categorical variables were analyzed using the Chi-square test, and a p-value <0.05 was considered statistically significant. **Results:** A total of 110 patients were included in the study with a mean age of 44.72 ± 13.58 years. Intraoperative complications occurred in 32 patients (29.1%). The incidence of complications increased significantly with higher ASA class, occurring in 8.3% of ASA I patients, 20.5% of ASA II patients, 41.2% of ASA III patients, and 62.5% of ASA IV patients ($p = 0.004$). According to SHAPE score categories, complications were observed in 10.9% of low-risk patients, 30.8% of moderate-risk patients, and 60.0% of high-risk patients ($p < 0.001$). Postoperative ICU admission was required in 20 patients (18.2%). ICU admission increased with increasing ASA class and SHAPE risk category, with the highest rate observed in the SHAPE high-risk group (44.0%). **Conclusion:** Both ASA-PS classification and SHAPE score were associated with perioperative risk. However, the SHAPE score demonstrated a stronger association with intraoperative complications and postoperative ICU admission. Incorporation of multidimensional scoring systems such as the SHAPE score into routine preoperative assessment may improve perioperative risk prediction and perioperative patient management.

INTRODUCTION

Preoperative evaluation is an essential component of anesthetic practice aimed at identifying patient-related and procedure-related risk factors that may influence perioperative outcomes. Accurate risk stratification enables anesthesiologists to optimize patients before surgery, anticipate potential complications, and plan appropriate perioperative management strategies to improve surgical outcomes and patient safety.[1] Effective risk assessment also assists in planning postoperative monitoring and appropriate allocation of healthcare resources such as intensive care unit (ICU) beds.

The American Society of Anesthesiologists Physical Status (ASA-PS) classification is one of the most widely used tools for assessing preoperative risk. First introduced in 1941, the ASA classification categorizes patients according to the severity of systemic disease and overall physical health status.[2] Due to its simplicity and universal acceptance, the ASA-PS classification has been widely used in clinical practice for perioperative risk assessment and prediction of postoperative morbidity and mortality.[3]

Despite its widespread use, several limitations of the ASA classification have been reported. The scoring system is largely subjective and dependent on the clinical judgment of the anesthesiologist, which may lead to significant inter-observer variability.[4] Furthermore, ASA classification primarily reflects systemic disease burden and does not incorporate other important perioperative variables such as physiological reserve, airway assessment, hemodynamic stability, and surgical complexity, which may significantly influence perioperative outcomes.[5]

In recent years, there has been increasing interest in developing more comprehensive perioperative risk prediction models that incorporate multiple clinical and surgical parameters. Multidimensional scoring systems such as POSSUM, APACHE, and other perioperative risk prediction models have demonstrated improved predictive accuracy for perioperative complications because they include both physiological and operative variables.[6,7] These models highlight the importance of integrating multiple clinical factors when assessing perioperative risk.

The SHAPE score is a relatively newer multidimensional risk assessment tool that integrates various patient-related and procedure-related parameters to provide a more objective evaluation of perioperative risk. The scoring system incorporates factors such as systemic health status, airway assessment, hemodynamic stability, physiological parameters, and anticipated surgical stress to generate a comprehensive perioperative risk profile for surgical patients.[8]

Accurate prediction of intraoperative complications is essential for improving perioperative safety. Adverse intraoperative events such as hypotension, arrhythmias, airway difficulties, oxygen desaturation, and excessive bleeding may significantly influence postoperative recovery and overall surgical outcomes.[9] Early identification of patients who are at increased risk of such complications allows anesthesiologists to plan appropriate intraoperative monitoring and management strategies.

In addition to intraoperative complications, prediction of postoperative ICU admission is an important component of perioperative risk assessment. Identifying patients who may require postoperative critical care enables clinicians to plan postoperative monitoring, arrange appropriate ICU facilities, and optimize hospital resource utilization.[10] Several studies have shown that accurate risk prediction models can significantly improve perioperative planning and patient outcomes.

However, comparative evidence evaluating the predictive ability of newer multidimensional scoring systems such as the SHAPE score with conventional ASA-PS classification remains limited. Therefore, the present study was conducted to compare the predictive accuracy of the SHAPE score and ASA-PS classification in predicting intraoperative complications and postoperative ICU admission among patients undergoing surgical procedures under anesthesia.

MATERIALS AND METHODS

Study Design

The present study was conducted as a prospective observational study to compare the predictive ability of the SHAPE score and the American Society of Anesthesiologists Physical Status (ASA-PS) classification in predicting intra-operative complications and postoperative intensive care unit (ICU) admission.

Study Setting

The study was carried out in the Department of Anaesthesiology at LN Medical College and JK Hospital, Bhopal, Madhya Pradesh, India, a tertiary care teaching hospital providing multidisciplinary surgical services.

Study Duration

The study was conducted over a three-month period from January 2026 to March 2026.

Study Population

The study population consisted of adult patients undergoing elective surgical procedures under anesthesia in the operation theatres of the hospital during the study period.

All eligible patients were assessed preoperatively and were assigned both ASA-PS classification and SHAPE score prior to surgery.

Sample Size

A total of 110 adult patients fulfilling the inclusion criteria were enrolled in the study during the study period after obtaining written informed consent. A convenience sampling method was adopted, and all eligible patients presenting during the study period were included. Patients aged 18 years and above who were undergoing elective surgical procedures under general or regional anesthesia were included in the study. Patients undergoing emergency surgical procedures, those who refused to participate, patients undergoing procedures under local anesthesia without anesthesiologist supervision, patients with incomplete clinical data, and patients who were already admitted to the intensive care unit prior to surgery after transfer from another hospital were excluded from the study.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Preoperative Assessment

All patients underwent a detailed pre-anesthetic evaluation, which included a comprehensive medical history, general and systemic physical examination, airway assessment, routine laboratory investigations, and evaluation of the cardiovascular and respiratory systems. Based on the findings of the clinical assessment, each patient was assigned an American Society of Anesthesiologists Physical Status (ASA-PS) classification according to the standard guidelines of the American Society of Anesthesiologists.

SHAPE Score Assessment

In addition to the ASA classification, the SHAPE score was calculated for each patient during the preoperative assessment. The SHAPE scoring system incorporates multiple clinical parameters, including systemic health condition, hemodynamic stability, airway assessment, physiological parameters, anticipated surgical stress, and other perioperative risk indicators. Based on the total SHAPE score obtained, patients were categorized into low-risk, moderate-risk, and high-risk groups for perioperative complications.

Intra-operative Monitoring and Data Collection

All patients were monitored intra-operatively according to standard anesthetic monitoring protocols, which included electrocardiography (ECG), non-invasive blood pressure monitoring, pulse oximetry, and capnography where applicable. During the surgical procedure, the occurrence of intra-operative complications was carefully recorded. These complications included hypotension, hypertension, arrhythmias, difficult airway or difficult intubation, oxygen desaturation, excessive bleeding, and any other anesthesia-related complication observed during the intra-operative period.

Postoperative Outcome Assessment

Following completion of surgery, patients were monitored in the post-anesthesia care unit (PACU) or transferred to the intensive care unit (ICU) depending on their clinical condition. The primary postoperative outcome measured in the study was postoperative ICU admission. The decision for ICU admission was made by the anesthesiology and surgical team based on clinical indications such as hemodynamic instability, respiratory compromise, requirement of ventilatory support, or high perioperative risk.

Data Collection

The following data were recorded for each patient using a structured data collection form: age, gender, type of surgery, ASA Physical Status (ASA-PS) classification, SHAPE score category, presence of intra-operative complications, and postoperative ICU admission. These variables were systematically documented for all enrolled patients to facilitate accurate analysis of perioperative risk factors and outcomes.

Statistical Analysis

The collected data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) software version 27.0.

Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequency and percentage.

Association between ASA-PS classification, SHAPE score, intra-operative complications, and ICU admission was analyzed using the Chi-square test. A p-value < 0.05 was considered statistically significant.

Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee of LN Medical College and JK Hospital, Bhopal.

Written informed consent was obtained from all participants prior to enrollment in the study. Patient confidentiality and anonymity were maintained throughout the study.

RESULTS

A total of 110 adult patients undergoing elective surgical procedures under anesthesia were included in the study and were evaluated preoperatively using both ASA Physical Status (ASA-PS) classification and SHAPE score. All enrolled patients were included in the final analysis.

Baseline Demographic and Clinical Characteristics

The baseline demographic and clinical characteristics of the study population are presented in Table 1. The mean age of the patients was 44.72 ± 13.58 years. Among the 110 patients included in the study, 64 were males and 46 were females, indicating a slight male predominance.

With respect to ASA Physical Status classification, most patients belonged to ASA II (40.0%), followed by ASA III (30.9%), ASA I (21.8%), and ASA IV (7.3%).

According to SHAPE score stratification, the majority of patients were categorized as low risk (41.8%), followed by moderate risk (35.5%), while 22.7% of patients were classified as high risk.

Table 1: Baseline demographic and clinical characteristics of the study population (n = 110)

Parameter	Value
Mean age (years)	44.72 ± 13.58
Gender (Male/Female)	64 / 46
ASA I	24 (21.8%)
ASA II	44 (40.0%)
ASA III	34 (30.9%)
ASA IV	8 (7.3%)
SHAPE Low risk	46 (41.8%)
SHAPE Moderate risk	39 (35.5%)
SHAPE High risk	25 (22.7%)

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Intra-operative Complications

A total of 32 patients (29.1%) experienced intra-operative complications during surgery. The incidence of complications increased progressively with increasing SHAPE risk category. A similar trend was observed with increasing ASA physical status classification, where patients belonging to higher ASA classes demonstrated a greater frequency of intra-operative complications.

Intra-operative complications occurred in 5 patients (10.9%) in the low-risk group, 12 patients (30.8%) in the moderate-risk group, and 15 patients (60.0%) in the high-risk group.

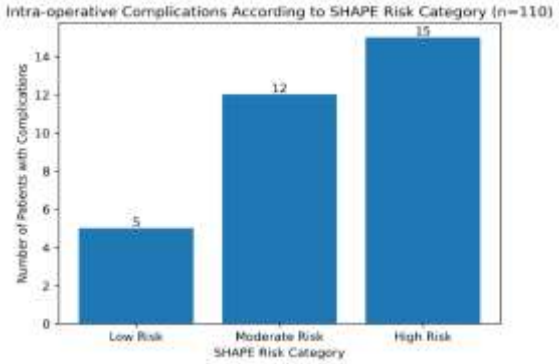

Figure 1: Bar graph showing intra-operative complications according to SHAPE risk category

The bar graph demonstrates that the frequency of intra-operative complications increased significantly with higher SHAPE risk categories, with the highest incidence observed among patients in the high-risk group.

Postoperative ICU Admission

A total of 20 patients (18.2%) required postoperative ICU admission following surgery. ICU admission was more frequent among patients belonging to higher SHAPE risk categories. Similarly, patients with higher ASA physical status classification showed an increased likelihood of requiring postoperative intensive care.

Postoperative ICU admission occurred in 2 patients (4.3%) in the low-risk group, 7 patients (17.9%) in the moderate-risk group, and 11 patients (44.0%) in the high-risk group.

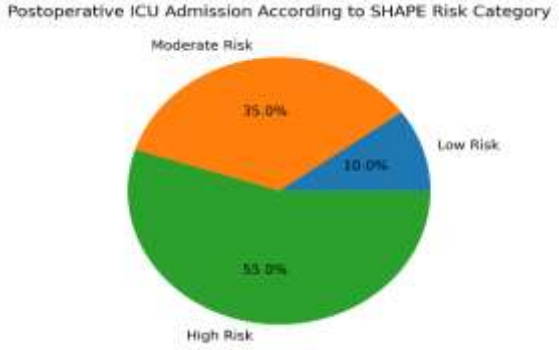

Figure 2: Pie chart showing distribution of postoperative ICU admission according to SHAPE risk category

The pie chart illustrates that the largest proportion of ICU admissions occurred in the high-risk SHAPE category, followed by the moderate-risk group, while only a small proportion occurred in the low-risk group.

DISCUSSION

Preoperative risk assessment plays a crucial role in anesthetic practice because it allows clinicians to identify high-risk patients, anticipate potential perioperative complications, and plan appropriate perioperative management strategies. Reliable prediction of intraoperative complications and postoperative intensive care unit (ICU) requirements helps improve patient safety and optimize healthcare resource utilization. Althammer et al,[11] emphasized the importance of accurate prediction models for identifying patients requiring postoperative intensive care, while Li et al,[10] reported that early warning models can significantly improve prediction of ICU admission following surgery.

The American Society of Anesthesiologists (ASA) Physical Status classification remains one of the most widely used systems for preoperative risk assessment because of its simplicity and ease of application. Hendrix et al,[2] described the ASA-PS classification as a practical tool for assessing perioperative risk in surgical patients. Numerous studies have demonstrated that increasing ASA class is associated with higher perioperative morbidity and mortality. For example, Al-Husinat et al,[12] reported that higher ASA grades were strongly associated with poorer surgical outcomes and increased postoperative complications.

However, despite its widespread use, the ASA classification has several recognized limitations. The scoring system is subjective and depends largely on the clinical judgment of the anesthesiologist, which may lead to variability in ASA grading between observers. Augustinus et al,[13] demonstrated significant inter-observer variability in ASA classification among surgeons and anesthesiologists. Furthermore, ASA classification primarily reflects systemic disease burden and does not incorporate other important perioperative factors such as physiological reserve, airway status, and surgical complexity, as highlighted by Hendrix et al.[2]

In the present study, the predictive ability of the SHAPE score was compared with the ASA-PS classification for predicting intraoperative complications and postoperative ICU admission. The baseline demographic characteristics of the study population showed a mean age of 44.72 ± 13.58 years with a slight male predominance. Similar demographic distributions have been reported in other studies involving adult surgical populations undergoing anesthesia. Gezer et al,[14] reported comparable demographic patterns in their evaluation of perioperative risk scoring systems.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

The majority of patients in the present study belonged to ASA physical status II and III, indicating that most patients had mild to moderate systemic disease. Comparable distributions of ASA classes have been reported in several previous studies evaluating perioperative risk among surgical patients. Sailo et al,[15] also observed that most surgical patients belonged to ASA grade II and III in their evaluation of perioperative risk prediction models.

One of the key findings of the present study was the progressive increase in intraoperative complications with increasing ASA classification. Patients categorized as ASA III and ASA IV experienced significantly higher complication rates compared with patients in lower ASA categories. These findings are consistent with previous studies demonstrating that higher ASA class is associated with increased perioperative morbidity and adverse outcomes. Hsu et al,[16] reported that patients with higher ASA classification had a significantly greater risk of intraoperative hemodynamic instability and postoperative complications.

However, when compared with ASA classification, the SHAPE scoring system demonstrated a stronger association with intraoperative complications. Patients categorized as high risk according to the SHAPE score showed a markedly higher frequency of intraoperative adverse events compared with patients in low-risk and moderate-risk categories. This observation suggests that multidimensional risk assessment tools that incorporate multiple physiological and perioperative variables may provide a more accurate prediction of perioperative risk.

Another important outcome evaluated in this study was postoperative ICU admission, which is an important indicator of perioperative risk and postoperative resource utilization. In the present study, ICU admission rates increased with increasing ASA class. Patients classified as ASA III and ASA IV required postoperative intensive care more frequently compared with patients in lower ASA categories. Similar findings have been reported in previous studies evaluating predictors of postoperative ICU admission. Gezer et al,[14] also demonstrated that higher perioperative risk scores were associated with an increased need for postoperative ICU care.

When ICU admission was analyzed according to SHAPE score categories, a stronger association was observed compared with ASA classification. Patients categorized as high risk according to SHAPE score had a substantially higher likelihood of requiring postoperative ICU care. This finding supports the concept that risk prediction models incorporating multiple clinical and physiological parameters may better identify patients who require advanced postoperative monitoring and critical care support. Similar observations were reported by Al-Husinat et al,[12] who found that comprehensive perioperative assessment improves prediction of adverse postoperative outcomes.

Accurate prediction of postoperative ICU admission is particularly important for perioperative planning and resource allocation. Early identification of high-risk patients allows clinicians to plan postoperative monitoring, ensure availability of intensive care facilities, and improve overall perioperative management. Li et al,[10] emphasized that predictive models for ICU admission can significantly enhance perioperative decision-making and optimize healthcare resource utilization.

The findings of the present study therefore support the growing body of evidence suggesting that multidimensional perioperative risk assessment tools may provide improved predictive accuracy compared with traditional classification systems such as ASA-PS.

Limitations

The present study has certain limitations. The study was conducted over a relatively short duration and included a moderate sample size, which may limit the generalizability of the findings. Additionally, the study was performed at a single center and long-term postoperative outcomes were not evaluated. Further multicenter studies with larger sample sizes and longer follow-up periods are required to validate the predictive accuracy of the SHAPE score in perioperative risk assessment.

CONCLUSION

Both ASA Physical Status (ASA-PS) classification and SHAPE score were found to be useful tools for perioperative risk assessment. However, the SHAPE score demonstrated a stronger association with intra-operative complications and postoperative ICU admission compared with ASA-PS classification. The findings suggest that multidimensional risk assessment tools such as the SHAPE score may provide better prediction of perioperative risk and assist anesthesiologists in identifying high-risk patients requiring closer monitoring and postoperative intensive care. Further larger multicenter studies are required to validate these findings.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556

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ISSN (O): 2687-5365; ISSN (P): 2753-6556