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RESEARCH ARTICLE

SURGICAL APGAR SCORE AS A GUIDE FOR PREDICTING POSTOPERATIVE ICU ADMISSIONS

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Abstract

Introduction: Immediate planned and appropriate postoperative intensive care unit (ICU) admission can increase the survival rate in patients undergoing high risk surgeries. Surgical Apgar Score is a simple, 10-point scoring system in which a low score reliably identifies those patients at risk for adverse perioperative outcomes. It can predict 30-day major complications or death after surgery. The aim of the present study was to evaluate the performance of the SAS for predicting complications 30 days after surgery in patients undergoing laparotomy surgeries

Methods: Total 50 patients undergoing laparotomies and emergency surgeries were included in the study. Outcome data were collected after 30 days during an outpatient consultation. The following intraoperative data were extracted from the anesthesia information management system and used to calculate the SAS: maximum estimated blood loss (EBL), lowest mean arterial pressure (MAP), and lowest heart rate (HR) (all intraoperative parameters)

Results: Our study was conducted on a total 50 patients, mean age of the patients in our study was 47.9%, among the study 58.5% were female, 91% underwent elective surgery. Majority of cases belong to ASA class II(62%). In our study 8% of population were transferred directly to ICU following surgery. In our study males were more likely to be admitted to ICU postoperatively than females (11.3%). And patients undergoing emergency surgeries were more likely to be admitted in ICU than elective surgeries. Patients were ASA grade III and IV have more chances of ICU admission. AGE DISTRIBUTION IMMEDIATE ICU ADMISSION <50 51.6% 4.1% 50-59 17.2% 8.1% 60-69 16.7% 13% 70-79 9.6% 12.4% >80 5% 18.6% SEX DISTRIBUTION: SEX PERCENTAGE ICU ADMISSION MALE 41.5% 11.3% FEMALE 58.5% 5.2%

Conclusion: SAS is an effective, simple score which is a practical and objective instrument that provides immediate feedback for predicting postoperative ICU admissions. Factors associated with a higher frequency of ICU admission are older age, male sex, emergency surgery, higher ASA class. Most patients had SAS of 7-8%(49.1%) and 9 -10 (19.3%). 86% of the cases had a ASA > 3. Patient with SAS of 0-2(46.2%) and 3-4(17%)were admitted post operatively directly to ICU

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Introduction:-

Immediate planned and appropriate postoperative intensive care unit(ICU) admission can increase the survival rate in patients undergoing high-risk surgeries. Surgical Apgar Score is a simple, 10-point scoring system in which a low score reliably identifies those patients at risk for adverse perioperative outcomes. It can predict 30-day major complications or death after surgery. The aim of the present study was to evaluate the performance of the SAS for predicting complications 30 days after surgery in 50 patients undergoing laparotomy surgeries in our hospital.

The surgical Apgar score (SAS)[1], which has been widely discussed over the past 10 years, is a simple formula that uses intraoperativehaemodynamics and blood loss to predict the postoperative complications and mortality rate.

According to theories SAS was positively correlated with postoperative complications and/or mortality[2] in patients undergoing vascular surgery, non-cardiac surgery, general surgery, esophagectomy, colorectal resection, emergency abdominal surgery, elective laparoscopic cholecystectomy, hepatectomy for hepatocellular carcinoma, liver transplantation, general oncologic surgery, laparotomy gynecological surgery, radical or partial nephrectomy for renal mass excision, hip or knee arthroplasty, transfemoral amputation, lumbar fusion for degenerative spine diseases, intracranial meningioma, and head and neck cancer[3].

The Apgar score was originally developed as a powerful tool in obstetrics to rapidly assess and gain feedback on a newborn's condition. The surgical Apgar score was piloted using general and vascular patients where the score was significantly associated with the occurrence of major complications or death within 30 days of surgery ($p<0.001$). The 10 point score is calculated from the estimated blood loss, lowest heart rate, and lowest mean arterial pressure during an operation. It uses routinely available data, and has been to shown to identify immediately and effectively those patients at higher and lower risk of complications and death postoperatively. Its limitations include its lack of validity in other cohorts of patients, lack of comparison between different institutions, and the potential for imprecision resulting from 'estimating' blood loss[4]. As a consequence, it may be considered one of the less applicable scoring systems in current clinical practice.

Hospitals and surgical teams strive to provide a consistently low occurrence of major complications for patients undergoing any given operation. Marked variability in outcomes is inevitable, if only because of differences in patients' preoperative risks. However, the degree to which intraoperative performance further contributes to variation in patients' risk of complications remains unclear.

Methods:-

Total 50 patients undergoing laparotomies and emergency surgeries were included in the study. Outcome data were collected after 30 days during an outpatient consultation.

The following intraoperative data were extracted from the anesthesia information management system and used to calculate the SAS[5]: maximum estimated blood loss (EBL), lowest mean arterial pressure (MAP), and lowest heart rate (HR) (all intraoperative parameters)[6]

Intra- operative parameters	0	1	2	3	4
EBL	>1000	601-1000	101-600	<100	-
Lowest MAP (mmhg)	<40	40-54	55-69	>70	-
Lowest HR (bpm)	>85	76-85	66-75	56-75	>55

Inclusion criteria:
Patients above 30yrs undergoing emergency and elective intra-abdominal surgeries were included in this study

Exclusion criteria:
Patients undergoing second abdominal surgery within 6 months are excluded from the study.

The surgical score was derived from a retrospective chart analysis and then validated. The primary outcomes measure was incidence of major complication or death within 30 days of surgery.

Depending upon the perioperative SAS score[7], following management was planned;

SAS 9–10: no additional actions required

SAS 5–8: prescribe antibiotic, stress ulcer and venous thromboembolism prophylaxis if considered beneficial, handover to a surgical colleague to review the patient in eight hours[8] (specifically including review of vital signs, urine output and pain) and then plan twice daily review for the next two days

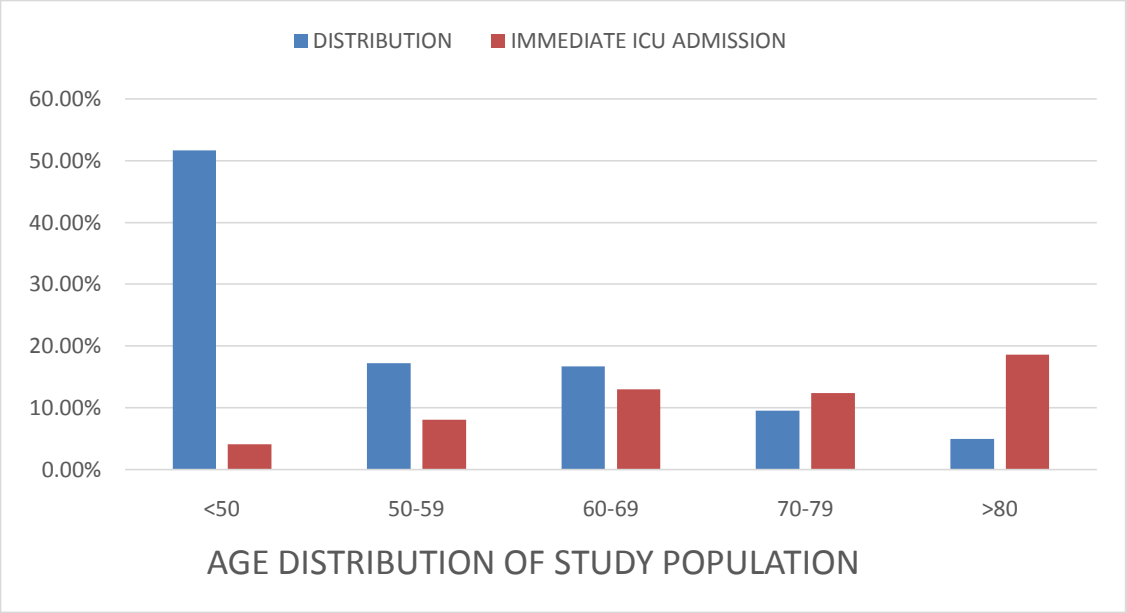
SAS 0–4: in addition to the above actions, seek the opinion of an interventionist to consider admission to critical care unit and plan an additional review in four hours.

Results:-

Total50 patients who had both emergency and elective laparotomiesbetween January 2020 to December 2021, were included in this study after the exclusion of patients with incomplete data and those undergoing repeated surgeries. The cohort was mostly composed of patients aged ≤ 50 years (51.6%), with a mean age of 46.8 years ($\pm$ 20.6). Among all patients, 58.5% were female, 68% underwent emergency surgery, and most were categorized into American Society of Anaesthesiologists (ASA) class II (61.2%). Approximately half of the cohort had an SAS of 7–8, and < 9% had an SAS of 0–4

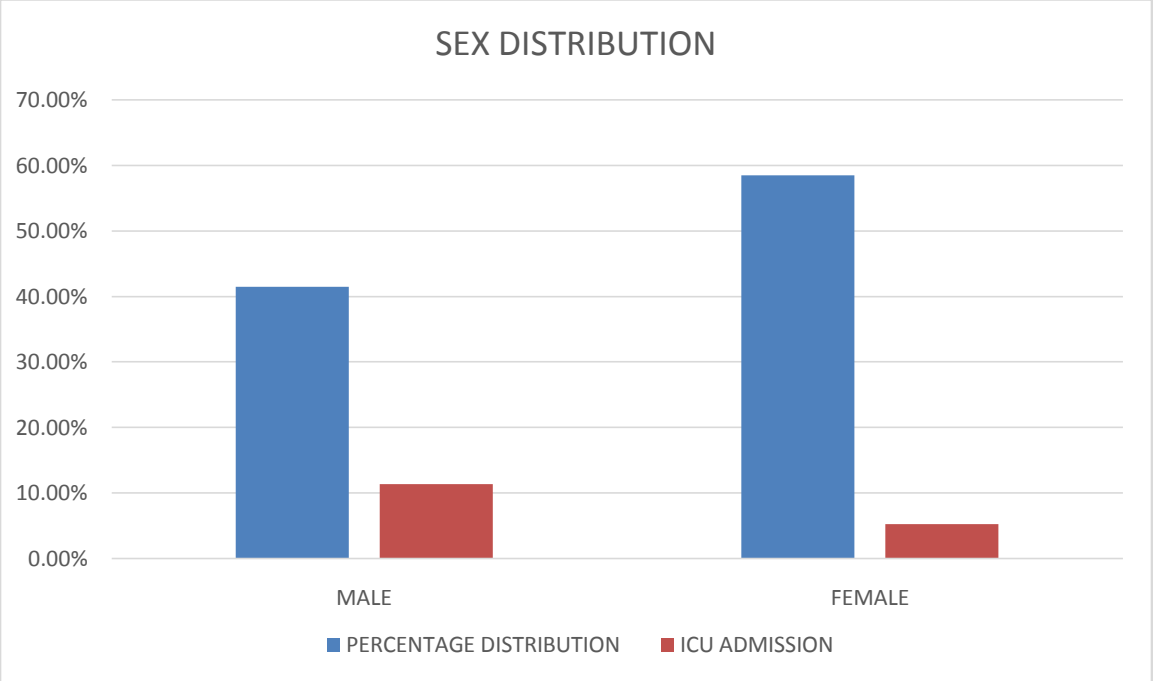
In our study, total of 7.8% were transferred directly from the operating room or post-anaesthesia care unit (PACU) to the ICU after the operation. Factors associated with a higher frequency of ICU admission included older age, male sex, emergency surgery, and higher ASA class. The type of operation also affected the rates of ICU admission. As the SAS decreased from 9–10 to 0–1, the frequency of ICU admission progressively increased from 3.2 to 46.2% ($P < 0.001$)

Age	Distribution	Immediate icu admission
<50	51.6%	4.1%
50-59	17.2%	8.1%
60-69	16.7%	13%
70-79	9.6%	12.4%
>80	5%	18.6%



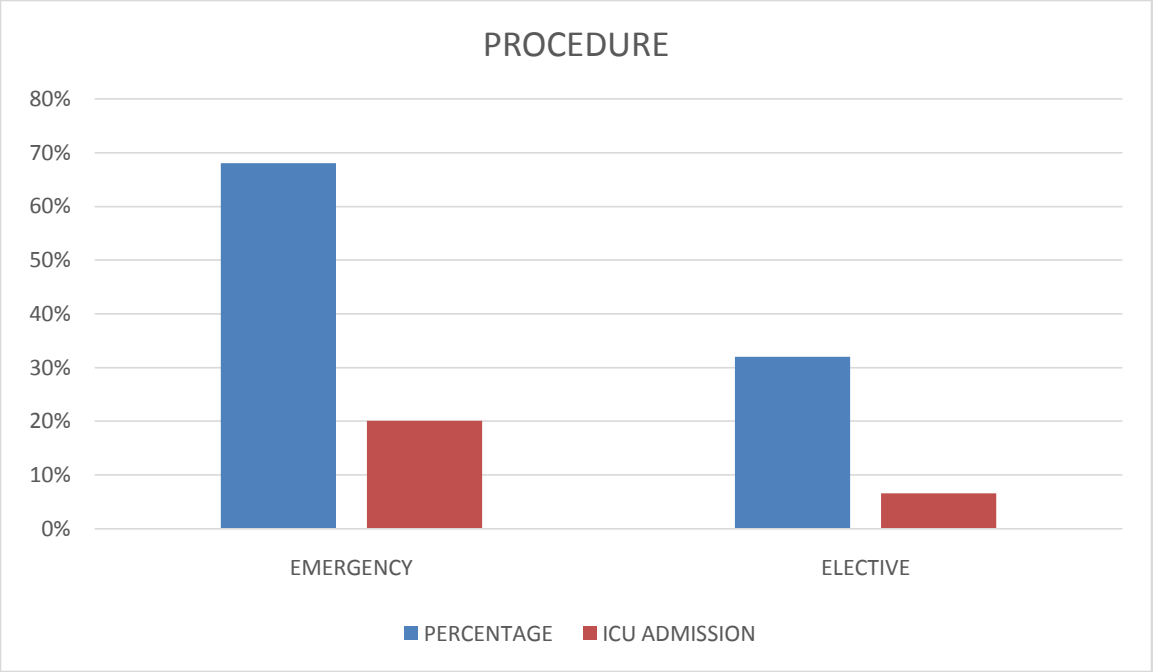
Sex distribution

Sex	Percentage	Icu admission
MALE	41.5%	11.3%
FEMALE	58.5%	5.2%



Procedure

Procedure	Percentage	Icu admision
EMERGENCY	68%	20%
ELECTIVE	32%	6.6%



Discussion:-

The Surgical Apgar Score was developed to allow healthcare providers to assess a patient's condition and risk of major complications or death based on an assessment at the end of any general or vascular surgical procedure[9].

The utility of the SAS is promising but so far it has not been tested in an impact study. It has therefore not yet been demonstrated whether the SAS can be used to guide postoperative care and consequently benefit outcome[10]. Main aim of our study was to asses the : a) postoperative care; and b) clinical outcome

Similar to previous studies, we found higher adjusted ORs for ICU admission associated with older age, higher ASA class, emergency operation, and low SAS. Although the trends in the overall results were similar the specific values were not. For example, Sobol et al. reported an OR of 14.4 for ICU admission in patients with SAS of 0–2, while our study reported an OR of 5. The inconsistency among these values may indicate differences among the patient characteristics and their baseline risk. Previous studies also noted an increased OR for ICU admission in patients with moderate to severe anemia, receiving anesthesia for more than 6 h or undergoing specific procedures, for example, esophagectomy, hepatobiliary and pancreatic surgery, cystectomy, prostatectomy, major vascular surgery, and exploratory laparotomy. For those with a history of chronic obstructive pulmonary disease (COPD), an increased OR for ICU transfer has also been reported. In retrospective analysis, patients with congestive heart failure, chronic kidney disease, peripheral vascular diseases, vascular diseases or higher BMI (i.e. BMI > 30) are found to be associated with unexpected postoperative ICU admission. Some procedure-specific risk factors are also linked to unplanned ICU admission. In brief, most studies are retrospective in design and show that age, BMI, ASA classification, type of procedure (or surgical risk), duration of surgery, emergency surgery, revision operation, estimated blood loss, anemic status and specific comorbidities may relate to postoperative ICU admission. Whether specific factors or composite scoring systems predict postoperative ICU admission best is still under passionate discussion

Other techniques of surgical quality assessment, such as the American College of Surgeons' National Surgical Quality Improvement Program (NSQIP)[11], 2–4 evaluate surgical performance indirectly, using multivariable adjustment for preoperative risk, and attributing disparities between observed and expected complication rates to the care provided. In the operating room, surgeons have relied principally on "gut-feeling" clinical assessments of the operative course to inform postoperative prognostication[16], and guide clinical care. Most believe that intraoperative management contributes importantly to overall outcomes, but quantitative metrics of operative care have not been available. Among intraoperative factors, alterations of patient condition, including hypotension, hypertension, hypothermia, bradycardia, tachycardia, and blood loss have been independently linked with adverse outcomes[12].

And some risk predictionmethods have integrated intraoperative variables, yet no consensus has been reached on how to directly evaluate performance and safety in the operating room[17].

The primary endpoint was the occurrence of any major complication within 30 days after surgery, as recorded in the NSQIP database[18]. The following NSQIP-defined[13] events were considered major complications: acute renal failure, bleeding requiring ≥4 units of red cell transfusion within 72 hours after surgery[17], cardiac arrest requiring CPR, coma for ≥24 hours, deep venous thrombosis, myocardial infarction, unplanned intubation, ventilator use for ≥48 hours, pneumonia, pulmonary embolism, stroke, wound disruption, deep or organ-space surgical site infection, sepsis, septic shock, systemic inflammatory response syndrome (SIRS)[14], and vascular graft failure. All deaths were assumed to include a major complication. Superficial surgical site infection and urinary tract infection[19] were not considered major complications. Patients having complications categorized in the database as "other occurrence" were reviewed individually and severity of the occurrence was evaluated according to the Clavien classification. "Other occurrences" involving complications of Clavien Class III and greater[15] (those that require surgical, endoscopic or radiologic intervention or intensive care admission, or are life-threatening) were considered major complications, in accordance with our previous methods.

Conclusion:-

Surgical Apgar Score can be used as an independant predictive factor for postoperative morbidity in major laparotomies, and when used in a predominantly high-risk population with an ASA≥3, it appears to offer a reliable sub-stratification. Routine implementation of the SAS would enable healthcare personnel to design strategies for continuous improvement and quality control in the service

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