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# IMPACT OF INTRAOPERATIVE HYPOTENSION ON POSTOPERATIVE CLINICAL OUTCOMES IN GENERAL AND SPINAL ANESTHESIA

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## Abstract

***Background:*** *Intraoperative hypotension is a common complication that occurs during anesthesia to up to 80% of patients. Although intra operative hypotension is very frequent, it has severe clinical outcomes, including a higher morbidity rate and mortality, cerebral hypo- perfusion, acute renal failure, and reduced cardiac output. Intra operative hypotension is associated with both spinal anesthesia and general anesthesia though the risk factors and causes may vary. To acquire effective prevention and care methods in case of intra operative hypotension, one should know how and why it happens, and what happens in the postoperative period. To provide the required information to the anesthesiologists and perioperative care teams with the aim of giving them pertinent insights, study will evaluate the impact of intra operative hypotension on the postoperative clinical outcomes the patients undergoing general and Spinal anesthesia.*

***Objective:*** *The main purpose of the proposed study is to investigate the effect of the intra operative hypotension on Postoperative outcomes in patients who are put under General and Spinal anesthesia.*

***Methodology:*** *There are 143 participants in this cross-sectional study, they were patients of CMA Hospital Lahore and Lahore General Hospital Lahore. Data collection involved the use of standard instruments. It was assured of the validity and reliability. The SPSS version 25 helped in data analysis.*

***Findings:*** *One hundred patients were used in the research. The average age is 55 years old (40%), high-risk females (55%), who have experienced being under weight (47) according to the data.*

***Conclusion:*** *To sum up, intraoperative hypotension in General anesthesia and Spinal anesthesia is a severe problem that can make a significant difference in the results of a Post operative patient. To prevent and treat intra operative hypotension, the findings of this paper will underline the importance of close attention to blood pressure and early treatment. Anesthesiologists and perioperative care team can decrease the frequency and*

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*effects of intra operative hypotension by identifying patients at risk and implementing evidence-based practices.*
***Recommendations:*** *The results of this study suggest us to promptly identify and intervene on intraoperative, hypotension, constantly monitor blood pressure in anesthesia.Individualize the methods of fluid management to each patient and his or her risks.Compliance to the standards and administration of vasoactive drugs.Diagnose intraoperative hypotension and prescribe diagnosis drugs and treatment*

## INTRODUCTION

Low arterial blood pressure (ABP) or intraoperative hypotension (IOH) is a frequent complication in patients who are have the non-cardiac surgery under the general anesthesia. Its etiology is multifactorial, which is linked with acute renal damage, myocardial infarction, and other extreme postoperative outcomes (1). Arterial blood pressure is one of the most important hemodynamic objectives in the perioperative stage. According to several observational studies, intraoperative hypotension has been observed to be associated with adverse outcomes in noncardiac and cardiac surgery, i.e., myocardial injury, acute renal damage, mortality, and noncardiac surgery. Decreasing the mean arterial pressure (MAP) by 10 percent about the baseline during the cardiopulmonary bypass was associated with an increased risk of the stroke during heart surgery. Also, intraoperative hypotension increased the risk of postoperative stroke by 1.013 times per minute (2).

Postoperative vasoplegia is more prevalent in patients who develop sepsis and following heart surgery. Hypotension, if arbitrarily defined as a systolic blood pressure of less than 90 mm Hg within 24 hours following surgery, has been seen in more than 30% of patients. According to the same definition, around 8% of patients experienced hypotension on postoperative days 1-4. However, the frequency of postoperative hypotension is frequently underestimated since arterial pressure is frequently only periodically checked in the postoperative ward. The 24 for instance, only roughly 50% of the patients who actually experienced MAP <65 mm Hg for at least 15 minutes had hypotension (<65 mm Hg) according to normal MAP monitoring (4-hourly) following abdominal surgery (3).

It is now feasible to forecast when a hypotensive event will take place in the next few minutes thanks to the creation of the Hypotension Prediction Index (HPI). Minutes before an intraoperative hypotensive episode occurs, the HPI can predict it with 88% sensitivity and 87% specificity. However, it's uncertain if proactively treating potential IOH causes with HPI- guided hemodynamic care also influences the severity and duration of POH (4). Intraoperative hypotension, a fairly general term for arterial hypotension in patients have the surgery under general anesthesia, is quite common and linked to poor patient. Since the pathophysiology of hypotension throughout the later phases of anesthesia differs, treatment should be customized to the particular clinical situation. It is clear that a reduction in blood pressure brought on by the use of anesthetics differs Patho physiologically from hypotension brought on by uncontrolled blood loss or intraoperative hypothermia during lengthy procedures.(5)

There are significant differences in the frequency of intraoperative hypotension between studies. More than the half of the patients undergoing high- risk, complex surgeries may experience it, or it may occur accidentally in individuals undergoing one-day surgery. The degree of reperfusion injury is also determined by individual variations in the definition of the lower limit of organ pressure auto regulation and the boundaries of the threshold value of intraoperative hypotension (6). Pre- induction blood pressure readings and hypotension thresholds expressed as a percentage of baseline have frequently been questioned. It is very important to note that absolute thresholds are easier to utilize in the treatment algorithm; preoperative values are frequently disregarded, and absolute IOH thresholds during surgery are unaffected by the stress of the impending procedure (7).

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WHO used twelve different approaches to mimic hypotension and eight different blood pressure thresholds to assess the relationship between hypotension, myocardial infarction, and acute renal injury. The degree of the connection varied from 0.89 to 1.69 after the controlling covariates, with fewer than half being statistically significant. Based on this, it is reasonable to assume that different modeling techniques lead to very diverse outcomes. Furthermore, important clinical data is missing from the included retrospective cohort studies. Readers may concur that the extended hypotension observed in these trials may be more indicative of refractory hypotension and that the majority of anesthesiologists would have probably tried intervention to reduce hypotension. Notably, the included studies do not take into consideration the use of inotropic drugs, fluids, or vasopressors. This area of research necessitates a deeper comprehension of how or when doctors intervene, as well as prospective studies where the main goal is to identify the hypotensive aetiology for safe and efficient therapy (8).

Surgical repair is a popular treatment for severe hip fractures because it encourages early movement and reduces the risk of complications including infections and pulmonary embolism. Surgery for serious hip fractures frequently results in intraoperative hypotension and significant blood loss. The American Society of Anesthesiologists (ASA) states that patients with hip fractures usually have a physical status of III or higher since they often have concomitant cardiac, pulmonary, and other problems. Even with early fracture treatment, about 8% of patients die within a month and 30% within a year of surgery. It is estimated that 20% of individuals have one or more complications after surgery (9).

The hemodynamic care of these patients during surgery has received a lot of attention. However, the criteria for intraoperative hemodynamic instability vary greatly, with reported rates ranging from 22.7 to 91.1%. These criteria include absolute thresholds and/or relative variations of the systolic blood pressure, mean arterial pressure (MAP), and even heart rate (HR). More significantly, the majority of these standards were established at random rather than in accordance with the risks of postoperative morbidity and mortality. Intraoperative hypotension has linked with an increased risk of acute kidney injury (AKI), myocardial infarction, psychosis, stroke, and even death in prior investigations of patients after non-cardiac surgery.

However, unfavorable outcomes have also been linked to intraoperative hypertension. Despite this, there is evidence that intraoperative hypertension may have less detrimental effects than intraoperative hypotension. Surgery for paraganglioma or pheochromocytoma increases the risk of extreme hypertension and hypotension. Therefore, we postulated that the emergence of postoperative problems was linked to intraoperative hypertension and/or hypotension (10).

Consensus statement on the intraoperative blood pressure and outcomes for elective surgery was recently released by with perioperative quality initiatives. It states that intraoperative mean arterial blood pressures below 60–70 mmHg are linked to postoperative morbidities such as myocardial and kidney damage as well as death. The workgroup also reported how long the hypertension was linked to the morbidities, in addition to how severe it was. Although there is little evidence from a large population, it is hypothesized that the association between intra operative hypotension patient outcomes mentioned in the statement would be comparable in Asia. Even the incidence of intraoperative hypotension has not been clearly shown in the Japanese population, despite the fact that over 3.5 million instances of non- cardiac surgery are conducted under general anesthesia each year (11).

Intraoperative hypotension (IOH) is a frequent and clinically severe side effect of noncardiac surgery performed under general anesthesia. The complicated interplay of factors that cause it includes hypovolemia from blood loss or inadequate fluid resuscitation, cardiac dysfunction such as impaired myocardial contractility or preexisting heart disease, and vasoplegia caused by anesthesia-induced vasodilation or systemic inflammatory reactions. IOH has been frequently linked to several significant postoperative outcomes, including increased short-term mortality, acute renal damage, myocardial infarction and the stroke. Its more than just a temporary drop in blood pressure. Although the

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importance of intraoperative the blood pressure is recognized, the threshold of acceptable intraoperative blood pressure is yet to be reached into a consensus.

This disagreement and discrepancy in the methods of monitoring like intermittent. compared to the continuous blood pressure reading, occasionally result in underidentification of hypotensive episodes. The Hypotension Prediction Index is one of the new prediction systems. Early detection of the impending hypotensive events by several minutes with the possibility of timely intervention. However, the impact of HPI-guided therapy on long-term surgical outcomes is still unknown. Certain patient populations, particularly the elderly or those undergoing complex, high-risk operations, are more vulnerable to IOH-related issues due to hemodynamic instability.

## CHAPTER 2 Literature Review

**Magyar CT, et al. (2025)** demonstrates that Intraoperative hemodynamics may have an impact on postoperative acute kidney damage (AKI) following laparoscopic liver resection, which is linked to hospital stay and mortality. Prolonged intraoperative hypotension was strongly associated with severe postoperative unfavorable outcomes, such AKI and serious sequelae (Clavin–Dindo ≥3a), in this prospective cohort of 360 patients (2010–2022). Risk was significantly elevated by mean arterial pressure (MAP) <60 mmHg for the ≥ 15 minutes and MAP < 55 mmHg for ≥20 minutes (OR 7.72, P<.001). While adjusted fluid volume, blood loss, and AKI did not exhibit any independent association, higher IV fluid volume was linked to more severe adverse outcomes during hypotension. (12).

**Xiao C et al. (2024)** explains the impacts of the intraoperative hypotension (IOH) on the short outcomes after off pump the coronary artery bypass grafting remain uncertain. This retrospective study looked at 494 OPCABG patients (2016–2023) to evaluate associations between intraoperative mean arterial pressure (MAP) levels and postoperative outcomes. AKI affected 31.8% of patients, and their in-hospital and 30-day mortality rates were 2.8% and 3.5%, respectively. When compare to MAP ≤55 mmHg for ≥10 minutes, maintaining MAP ≥65 mmHg ( 0.408, p = 0.008) and ≥75 mmHg (OR 0.479; p=0.024) significantly reduced the risk of AKI. Rather of being directly related to IOH, mortality was linked to prior myocardial infarction. Lower MAP was associated with longer hospital stays. AKI was also associated with longer ICU stays (13).

**Weinberg L, et al (2024)** describes that during non-cardiac surgery, intraoperative hypotension (IOH) is frequent and closely linked to poor cardiac, neurological, renal, and mortality outcomes. A precise and universal definition of IOH is crucial for management and preventative tactics because it is a modifiable risk factor. IOH definitions varied widely, according to a comprehensive evaluation of 318 research conducted under general anesthesia between 2000 and 2020. While 39.6% of studies employed relative blood pressure criteria, the majority (78.3%) used absolute thresholds, primarily SBP and MAP. The duration of hypotension was not taken into account by nearly half (48.1%). Merely 46.5% of respondents agreed with the POQI-3 consensus definition. Absolute thresholds were more successful in predicting unfavorable outcomes than relative BP changes. Poor postoperative outcomes were more closely correlated with IOH definitions that met or exceeded POQI requirements. The outcome association was enhanced by taking into consideration the length or quantity of hypotensive episodes (14).

**Katori N, et al (2023)** explains that Intraoperative hypotension (IOH) under general anesthesia is still a significant issue, even if its prevalence in Japanese population is unknown. The single-center of retrospective investigation evaluated the occurrence and characteristics of IOH in non-cardiac surgery at a university hospital. IOH was divided into four categories: mild (65– <75 mmHg), moderate (55– <65 mmHg), severe (< 55 mmHg) and extremely severe (<45 mmHg). At least one instance of MAP dropping was considered IOH. A total of 11,200 adult cases were analyzed. IOH that lasted one to five minutes was present in 86.3% of cases. IOH was severe or extremely severe in 48.5% of patients. Using logistic regression, it was discovered that female sex, vascular surgery, ASA-PS 4–5 emergency surgery, and concurrent epidural block were significant risk factors (15).

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**Shui M, et al (2023)** demonstrates the best method is still up for debate, lumbar spine surgery can be carried out under either general or regional (spinal/epidural) anesthesia. Using EMBASE, PubMed, and the Cochrane Library, a systematic review of randomized controlled trials was carried out. There were ten RCTs with 733 adult patients. Intraoperative hemodynamic events were the primary result, whereas PONV, analgesic need, blood loss, and hospital stay were the secondary outcomes. When compared to general anesthesia, spinal anesthesia dramatically decreased tachycardia and intraoperative hypertension. Additionally, it reduced the frequency of PONV and blood loss within 24 hours of surgery. Bradycardia or intraoperative hypotension did not differ significantly. Urinary retention, headache, PACU PONV, and postoperative analgesic needs were comparable between groups (16).

**Glassman SD, et al (2022)** reveals that during major surgery, intraoperative hypotension (IOH) with MAP <65 mmHg is linked to severe renal damage and neurologic impairment. 539 lengthy thoracolumbar fusion procedures involving more than six levels were examined in this retrospective research. Cumulative IOH duration for the first hour and the entire process was computed using minute-by-minute arterial MAP data. Infectious, gastrointestinal, pulmonary, cardiovascular, thromboembolic, neurological, and renal problems were among the postoperative complications. Complications were substantially correlated with longer IOH duration in the first hour (8.2 vs. 5.6 min) and overall surgery (28.1 vs. 19.3 min). Similar correlations were seen between severe consequences such SSI, respiratory failure, PE, ileus, and cognitive impairment. The longest early exposure to IOH was seen in patients with three or more problems. Patients with no problems used less vasopressors (17).

**Lai CJ, et al (2021)** explains that one typical side effect of general anesthesia is intraoperative hypotension. The Hypotension Prediction Index (HPI) was tested in this randomized controlled experiment to see if it may lessen the intensity and duration of hypotension. HPI-guided hemodynamic management or usual care was randomly assigned to sixty patients having surgery with invasive arterial monitoring. Each group's baseline MAP was comparable. When compared to controls, the intervention group's time-weighted average (TWA) MAP was considerably lower at <65 mmHg. For MAP <60 and <55 mmHg, comparable decreases were noted. The HPI group's median intraoperative MAP was noticeably higher. These results show that HPI monitoring successfully lowers exposure to intraoperative hypotension (19).

**D'Amico F, et al (2021)** tells that majority of the data supporting the link between intraoperative hypotension and poor postoperative outcomes comes from observational studies. Randomized trials comparing permissive (MAP ≈60 mmHg) versus targeted (MAP >60 mmHg) blood pressure treatment were assessed in this meta-analysis. A total of 9,359 participants from ten randomized studies were examined. There were no any significant differences in all cause mortalities between focused and permissive regimens. The incidence of atrial fibrillation was decreased in permissive group. Permissive management resulted in a slightly shorter hospital stay. Myocardial infarction, AKI, delirium, stroke, transfusion requirements, and ventilation time did not significantly differ. There were no discernible changes between cardiac and non-cardiac surgery subgroup studies (20).

**Zwane S, et al (2020)** reveals that intraoperative hypotension following spinal anesthesia for Caesarean sections is associated with maternal morbidity and mortality. Due to different definitions, the reported incidence of hypotension varies greatly (7–74%). Setting standard goals is challenging in the absence of a common definition. Common terminology was created by a recent consensus declaration and literature study. Prospective research conducted at Edendale Hospital using fifteen definitions revealed incidence ranging from 15.8% to 91.4%. It is advised to aim for systolic pressure >100 mmHg and mean arterial pressure >70 mmHg.If the systolic blood pressure is less than 90 mmHg or the MAP is less than 65 mmHg, vasopressors should be started. Before administering spinal anesthetic, practitioners should keep systolic blood pressure over 90% of baseline (21).

**Pingping Liao, et al (2019)** evaluated that intraoperative hypotension (IOH) and risk variables for AKI From November 2017 to November 2019, adult patients (≥18 years old) undergoing liver

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resection were examined. AKI was defined as a rise in serum creatinine of at least 50% within 48 hours after surgery. MAP <65 mmHg for more than 10 total minutes during surgery was considered IOH.AKI risk variables among 796 patients included age ≥65 years (OR 2.463; P = 0.008) and IOH (OR 2.565; P = 0.009).IOH (OR 3.547; P = 0.012) and RBC transfusion (OR 3.032; P = 0.036) raised the risk of AKI in individuals over 65.In conclusion, two major risk factors for postoperative AKI follow the liver resection IOH and age ≥65(22).

**E. M. Wesselink, et al (2018)** tells that it is still unclear how intraoperative hypotension (IOH) during general anesthesia affects the results of noncardiac surgery, however it may decrease organ perfusion. Using modified STROBE and CONSORT criteria, we conducted a systematic search of Web of Science, and CINAHL.The hazards of endorgan harm, such as acute renal injury, myocardial infarction, and stroke, were examined in high-quality research. We examined 42 papers that connected postoperative unfavorable outcomes to absolute and relative IOH criteria. Mean arterial pressure (MAP) <80 mm Hg for ≥10 minutes and shorter durations <70 mm Hg were associated with increased risks. For MAP <65–60 mm Hg or any exposure <55–50 mm Hg, risks rose even more. These results imply that the risk of organ damage increases with gradually decreasing MAP, particularly with chronic hypotension. It is impossible to determine clear safe blood pressure levels due to study heterogeneity and retrospective approaches (23).

**L. M. Vernooij, et al (2018)** reveals the relationships between intraoperative hypotension (IOH) and postoperative problems in 10,432 individuals over 50 who had non-cardiac surgery. Twelve techniques were utilized in this two-center cohort study to model IOH across eight predetermined blood pressure thresholds, including presence, duration, and area under the threshold (AUT).14.9% of patients experienced postoperative myocardial injury (POMI), and 14.8% experienced acute kidney injury (AKI).The IOH modeling technique and statistical strategy had an impact on the effect estimations. The highest chances were found for mean episode AUT and the absolute maximum BP decline (1.43 and 1.69 for MAP 50 mm Hg, respectively).The greatest standardized ORs, OR 1.12 for both absolute and relative maximum BP reductions, were obtained by depth-related approaches following normalization. In every circumstance, no single technique consistently yielded the greatest result. Nonetheless, across BP kinds, thresholds, outcomes, and centers, the approaches with the highest effect estimates were generally constant (24).

**TG Monk, et al (2015)** explains that Postoperative mortality may be impacted by intraoperative blood pressure variations, however crucial thresholds are still unknown. This retrospective cohort study examined relationships between the intraoperative blood pressure and 30-day mortality by analyzing data from six Veterans Affairs institutions. Absolute thresholds, percent change from baseline, and the population thresholds (AUT) were the three techniques employed. The equivalent thresholds were SBP<67 mmHg >8.2 min, MAP<49 mmHg >3.9 min, and DBP<33 mmHg >4.4 min; population thresholds indicated higher mortality for SBP AUT (OR 3.3), MAP AUT (2.8), and DBP AUT (2.4).The absolute thresholds for death were DBP<30 mmHg ≥5 min (3.2), MAP<49 mmHg ≥5 min (2.4), and SBP<70 mmHg ≥5 min (OR 2.9).Method of percentage change: MAP reduction >50% from baseline ≥5 minutes (OR2.7).30-day mortality and intraoperative hypertension were not associated. In conclusion, a higher 30-day operational mortality is linked to intraoperative hypotension but not hypertension
(25).

## CHAPTER 3 METHODOLOGY

### 3.1 : Objective:

This study aims to examine the impact of intra operative hypotension on Postoperative clinical outcomes in patients undergoing General and Spinal anesthesia.

### 3.2 : Hypothesis Formulation:

**Null hypothesis: (H0)**

There is not any statistically significant impact of intra operative hypotension on clinical outcomes in patients undergoing spinal and general anesthesia.

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**Alternative hypothesis: (HA)**
There is statistically significant impact of intra operative hypotension on clinical outcomes in patients undergoing spinal and general anesthesia.

**3.3 : Problem Statement:**
Intra operative hypotension during General and spinal anesthesia is associated with the adversed Postoperative clinical outcomes, but the relationship between intra-operative and the postoperative complications, as well as the comparative effects of spinal versus general anesthesia remain unclear. It is a common complication that can occur during general and spinal anesthesia, affecting up to 70% of patients undergoing surgery.

**3.4 : Operational Definition**
**Intra Operative Hypotension:** A mean arterial pressure (MAP) drop of at least 20% from the initial value or an absolute MAP of less than 65 mmHg for more than five minutes.

**General Anesthesia:** A Glasgow Coma Scale (GCS) score of < 8 indicates a state of unconsciousness, forgetfulness, and analgesia followed on by the use of anesthetic drugs.
**Spinal Anesthesia:** The reversible blockage of sensory, motor, and sympathetic nerve fibers caused from injection of a local anesthetic into the subarachnoid space.

**Clinical Outcomes:** Changes in a patient's health that may be measured, such as the length of hospitalization, postoperative discomfort, nausea, vomiting, and consequences including respiratory failure or wound infection.
**3.1 Study Design**:
Cross sectional descriptive research approach was used.

**3.2Study Settings:**
Data collected from the CMA hospital & Lahore General hospital Lahore.

**3.3Study Duration:**
The whole study was conducted over a period of 06 months from February 2025 in the selected hospital after approval of synopsis.

**3.4 Sample size:**
A total 143 subjects were included in the study based on the availability of eligible participants during the research tenure. n= $Z^2$ $P$ (1—$P$)
$d2$ were
n is required sample size
Z is Z-score (1.96 for the 95% confidence level) P = expected prevalence (from literature or pilot study) d = the margin of error
(precision), usually 0.05
$Z^2$=0.20 · 0.80 = 0.16 n=3.8416 · 0.16 = 0.614656
$\frac{614656}{143} = 0.00430$0.
d=
d=0.00430≈0.0656≈6.6%
So, with $P$ = 20%and 95% confidence, a
margin of error of ~6.6% gives a sample size of **143**.

**3.5 Sampling Technique:**
Convenience sampling technique used in the study.

**3.6 Sample Selection :**
To guarantee that the study population appropriately reflected the target group, sample selection was done using predetermined inclusion and exclusion criteria.

**3. 6.1Inclusion criteria:**
- Patients who under spinal or general anesthesia.
- Age limitations: 18-80 years old.
- Patient with available postoperative outcome data.
- Participate and consent voluntarily.

**3.6.2 Exclusion criteria:**
- Patients undergoing local or regional anesthesia.
- Patients with pre-existing conditions.
- Patients taking chronic medication.
- Refuse to take part in the research.

**3.7 Research tool/Equipment:**
3.7.1 **Anesthesia Information Management System (AIMS):** To obtain intraoperative information, such as blood pressure, anesthetic drugs, and surgery information.

3.7.2 **Electronic Medical Records (EMRs):** To obtain demographics of the patients, preoperative health issues, and postoperative results.

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**Patient Data Collection Forms:** To collect more data, including postoperative. pain, nausea, and vomiting.

3.7.3 **Observation Checklists:** In order to gather the information about intraoperative events, including hypotension, hypertension and anesthetic complications.

### 3.7.4 Postoperative Quality of Recovery (PQR) Questionnaire:

Postoperative quality of recovery (PQR) Questionnaire is a standardized tool that was used to measured effect of the intraoperative hypotension on the postoperative clinical outcomes general and spinal anesthesia. The questionnaire measures physiological stability, body comfort and functionality, emotional well-being and general patient satisfaction among other postoperative recovery areas.

**Ethical Consideration:**

The faculty CMA Hospital Lahore& Lahore General Hospital approached for permission before the collection of any data. The patients of CMA Hospital Lahore& Lahore General Hospital, who admitted in various departments, provide data for this study. They participated willingly after receiving approval from the Nursing Superintendent and received signed consent from the participants. The subject was made aware of their right to choose whether or not to participate, as well as the confidentiality of their personal information.

**Data Collection Procedure:**

The researcher approached the patients with the permission of the medical superintendent of hospitals, following approval from the ethical approval committee. In order to gather data, the researcher worked with the nursing superintendent to arrange for the collection of data from patients for 20 minutes at a time. Face-to-face interviews were conducted to gather data, and the researcher was watching practice segments. The intraoperative, postoperative and socio demographic characteristics of patients, including their age, gender, education and weight were collected.

**Data Analysis Plan:**

The computer program SPSS version 25 used to examine the data. For categorical variables, frequency and percentage were used to characterize the socio demographic data; for continuously distributed, normally distributed data, mean, median, and standard deviation were used

## CHAPTER 4
## RESULT S

**Table 1: Statistics analysis for the variables Genders mean, median and mode of ASA Physical status, Presence of comorbidities and hypotension occurrence.**

**Statistics**

| | Gender | ASA_Physical_Status | Presence_of_Comorbidities | Intraoperative_hypotension_occurence |
|---|---|---|---|---|
| N Valid | 143 | 143 | 143 | 143 |
| Missing | 0 | 0 | 0 | 0 |
| Mean | 1.3497 | 2.2168 | 1.9790 | 1.3636 |
| Median | 1.0000 | 2.0000 | 2.0000 | 1.0000 |
| Mode | 1.00 | 2.00 | 1.00 | 1.00 |

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For the study participants' gender, ASA physical status, comorbidities, and incidence of intraoperative hypotension, descriptive statistics were computed. For every variable, there were 143 valid cases in total, and no missing data was reported. The majority of individuals fell into the category categorized as 1, as known by the mean genders value of 1.3497 and the median and mode of 1.00. With a mean of 2.2168 and a median and mode 2.00, the ASA physical status indicated that the majority of patients fell into ASA class II. With the mean of 1.9790, a median of 2.00, and mode of 1.00, the prevalence of comorbidities demonstrated that these conditions were prevalent among the individuals, while their distribution varied. The average value of the intraoperative hypotension was 1.3636, mode, and median were equal to 1.00, which means that the majority of patients did not experience hypotension during surgery.

**Table 2: Statistics analysis for the variables of Genders. Gender**

| | | frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Male | 93 | 65.0 | 65.0 | 65.0 |
| | Female | 50 | 35.0 | 35.0 | 100.0 |
| | Total | 143 | 100.0 | 100.0 | |

The gender distribution of the study participants was analyzed as frequency statistics.
The case numbered 143 is valid, 50 cases were female in the sample constituting 35.0 and 93 males in the sample constituting 65.0. The percentages of this variable would be valid just like in the case of the overall percentages and it would not contain any missing values. The cumulative percentages show that study population was mainly male. Considering the clinical and statistical outcomes of the study, it should be remembered that such a distribution means that more male participants participated in the research.

**Table 3: Statistics analysis for the variables of ASA Physical health status.**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | I | 32 | 22.4 | 22.4 | 22.4 |
| | II | 69 | 48.3 | 48.3 | 70.6 |
| | III | 21 | 14.7 | 14.7 | 85.3 |
| | IV or Higher | | | | |
| | Total | | | | |

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| | | | | |
|---|---|---|---|---|
| | 21 | 14.7 | 14.7 | 100.0 |
| | 143 | 100.0 | 100.0 | |

The frequency statistics was employed to determine the distribution of ASA Physical Status among the research participants 32 out of 143 cases representing genuine cases were classified as ASA I which implies normal and healthy individuals. The vast majority of the participants were patients with mild systemic disease, 69 of which (48.3) had the ASA II classification. Moreover, 21 patients (14.7%), who had a severed systemic diseases, were classified as ASA III and another 21 patients (14.7%), who had a severe systemic disease and was the constant threat to life, were classified as ASA IV and above. The percentages of this variable would be valid just like in the case of the overall percentages and it would not contain any missing values. The cumulative percentages revealed that 70.6% of the respondents had a risk profile of low- to -moderate risk during preoperative, which implies that most of the patients experienced low- or moderate-risk profile in preoperative. On the whole, this distribution is relevant in the process of assessing perioperative and postoperative outcomes and provides considerable data on the underlying health condition of the study population.

**Table 3: Statistics analysis for the variables of Presence of Comorbidities.**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Hypertension | 49 | 34.3 | 34.3 | 34.3 |
| | Diabetes Mellitus | 48 | 33.6 | 33.6 | 67.8 |
| | Ischemic Heart diseases | 46 | 32.2 | 32.2 | 100.0 |
| | Total | 143 | 100.0 | 100.0 | |

The distribution of comorbidities among the participants of a research was investigated using frequency statistics. The total number of legitimate cases was 143, and there were no missing data. The commonest comorbidity was hypertension (49 patients, 34.3%). In second place was diabetes mellitus that was identified in 48 patients (33.6%), and ischemic heart disease that was identified in 46 patients (32.2%). The valid percentages were equivalent to the overall percentages which showed complete data reporting. As indicated by cumulative percentages, all participants had at least one of the given comorbid conditions. At the time of interpreting the perioperative care and postoperative outcome with respect to the current study, it is important to consider the relatively balanced distribution of the hypertension, diabetes mellitus and ischemic heart disease, which implies that the population of the study had a considerable number of chronic medical conditions.

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**Table 4 : Statistics analysis for the variables of Intraoperative hypotension occurrence.**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | yes | 91 | 63.6 | 63.6 | 63.6 |
| | No | 52 | 36.4 | 36.4 | 100.0 |
| | Total | 143 | 100.0 | 100.0 | |

The frequencies were employed to analyzed incidence of the intra operative hypotension in the research participants. A total of 143 valid cases were included in the analysis, and no data was missing. 52% (36.4) of the patients did not experience hypotension in the course of the surgery, and 91% (63.6) patients experienced intraoperative hypotension. The valid percentages showed that complete and trustworthy data reflected in the valid percentage being equal to the overall percentage. The cumulative percentages revealed that almost two-thirds of the subjects had intraoperative hypotension. Such findings suggest that intraoperative hypotension was a common phenomenon in the study population, which supports its potential relevance as a perioperative variable that may influence the final results of the treatment and the need to include it in a further analysis.

**Table 5: Statistics analysis for the variables of Case processing summary.**

| | Cases | | | | | |
|---|---|---|---|---|---|---|
| | Valid | | Missing | | Total | |
| | N | Percent | N | Percent | N | Percent |
| Intraoperative_hypotension_occurence * Number_0f_hypotensive_episodes_during_surgery | 143 | 100.0% | 0 | .0% | 143 | 100.0% |
| Intraoperative_hypotension_occurence * Duration_of_longest_hypotensive_episode | 143 | 100.0% | 0 | .0% | 143 | 100.0% |
| Intraoperative_hypotension_occurence * Treatement_used_for_hypotension | 143 | 100.0% | 0 | .0% | 143 | 100.0% |
| Intraoperative_hypotension_occurence * Postoperative_acute_kidney_injury | 143 | 100.0% | 0 | .0% | 143 | 100.0% |

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| | | | | | | |
|---|---|---|---|---|---|---|
| Intraoperative_hypotension_occurence * Postoperative_hospital_stay | 143 | 100.0% | 0 | .0% | 143 | 100.0% |

The summary of the case processing indicates that the information of the analyses that will focus on the occurrence of intraoperative hypotension and other related perioperative and postoperative variables are not incomplete. All the sets of examined variable pairs that included the number of hypotensive episodes during surgery, the duration of longer hypotensive episode, the type of medication administered to hypotension and postoperative acute kidney injury and postoperative hospital stay had 143 cases (100.0) of valid case and were included in the analysis.

The missing percentage of 0.0% tells that there was no missing data as reported on any of these variables. In each instance of a comparison, 143 cases were studied, which implies that all the analyzed results had complete data. This is a rich dataset that ensures that the observed relations are not distorted by data loss or biased reports and enhances validity and reliability of the subsequent statistical research.

**Table 6: Statistics analysis for the variables of Number of hypotensive episodes during surgery.**

Count

| | | Number_0f_hypotensive_episodes_during_surgery | | |
|---|---|---|---|---|
| | | 1 | 2-3 | Total |
| Intraoperative_hypotension_occurence | yes | 76 | 15 | 91 |
| | No | 13 | 39 | 52 |
| Total | | 89 | 54 | 143 |

Crosstab analysis used to examine the relationship between the number of hypotensive events that occur during a surgery event and the occurrence of intraoperative hypotension. Among the 91 patients with intraoperative hypotension, 76 patients experienced only one of this condition and 15 patients had between two and three episodes.

Conversely, out of the 52 patients who did not experience intraoperative hypotension, 39 experienced two or three episodes and 13 experienced single episode. The 143 patients analyzed experienced one hypotensive episode in 89, two or three in 54. These findings demonstrate a clear difference in distribution of hypotensive events among patients who get and do not get intraoperative hypotension, which points to a potential correlation between the prevalence of hypotensive events during surgery and the occurrence of hypotension.

In order to determine the significance of this relationships, further inferential statistical analysis is justified by this distribution which provides a very important descriptive summary.

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**Table 7: Correlational Statistics analysis of the variables for Chi Square Tests.**

| | Value | df | Asymp. Sig. (2-sided) | Exact Sig. (2-sided) | Exact Sig. (1-sided) | Point Probability |
|---|---|---|---|---|---|---|
| Pearson Chi-Square | 48.212 a | 1 | .000 | .000 | .000 | |
| Continuity Correction[b] | 45.754 | 1 | .000 | | | |
| Likelihood Ratio | 49.640 | 1 | .000 | .000 | .000 | |
| Fisher's Exact Test | | | | | | |
| Linear-by-Linear Association | 47.875 c | 1 | .000 | | | .000 |
| N of Valid Cases | 143 | | | .000 .000 | .000 .000 | |

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 19.64.

b. Computed only for a 2x2 table

c. Standardized statistics are 6.919.

Chi-Square test used to compare frequency of the hypotensive episodes in surgery and occurrence of intraoperative hypotension. Asymptotic significance (2-sided) of less than 0.001 and Pearson Chi-Square of 48.212 and one degree of freedom indicated a very statistically significant relationship between the two variables. The strength of the result was verified by the Continuity Correction which was computed on this 2x2 table and the Chi-Square value of the table was found at 45.754 with a significance value of less than 0.001. A significant correlation was also observed with the Likelihood Ratio test, the result was 49.640 with a significance value of less than 0.001.

The Exact test of both one-sided and two-sided tests indicated that the exact value of significance was less than 0.001, which suggested that the relationship is significant even under the conditions of accurate tests. The Linear-by-Linear Association test indicated a significant linear association between the number of intraoperative hypotensive events with the rate of increase in the number of hypotensive events with the significance of below 0.001, i.e. 47.875.

There were 143 valid examples in the analysis.

More importantly, the assumptions of the Chi-Square test were not violated since the lowest expected count of the cell is less than 5 (the expected count is 19.64). Our findings indicate that the number of hypotensive episodes during a surgical procedure is significantly and positively correlated with intraoperative hypotension.

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**Table 8: Statistics analysis for the variables of longest hypotensive eposodes.**

| Count | | Duration_of_longest_hypotensive_episode | | |
|---|---|---|---|---|
| | | < 5 minutes | 5-10minutes | Total |
| Intraoperative_hypotension_ occurence | yes | 47 | 44 | 91 |
| | No | 19 | 33 | 52 |
| Total | | 66 | 77 | 143 |

A crosstab analysis was used to determine the relationship between the length of longest hypotensive episode in the course of surgery and intraoperative hypotension. Among the 91 patients that experienced intraoperative hypotension, 44 experienced an episode of five to ten minutes and 47 experienced the greatest hypotensive episode of less than five minutes. Conversely, among the 52 patients that did not develop intraoperative hypotension, 19 experienced the events of intraoperative hypotension which took a period of less than five minutes, and 33 experienced events of less than five to ten minutes.

Out of 143 patients who were studied, 66 had episodes of hypotension that lasted fewer than five minutes, 77 had episodes that took five to ten minutes. These findings demonstrate differences in the distribution of the maximum hypotensive episode duration in patients with intraoperative hypotension and those without intraoperative hypotension, which demonstrates the possibility of a relationship between the duration of hypotensive episodes and the prevalence of hypotension. This descriptive study provides important background on which further inferential statistical tests can be done.

**Table 9: Pearson's correlation analysis of the variables Chi Square Tests.**

| | Value | df | Asymp. Sig. (2-sided) | Exact Sig. (2-sided) | Exact Sig. (1-sided) | Point Probability |
|---|---|---|---|---|---|---|
| Pearson Chi-Square | 3.040[a] | 1 | .081 | .116 | .058 | |
| Continuity Correction[b] | 2.462 | 1 | .117 | | | |
| Likelihood Ratio | 3.068 | 1 | .080 | .085 | .058 | |
| Fisher's Exact Test | | | | .116 | .058 | |
| Linear-by-Linear Association | 3.019[c] | 1 | .082 | .116 | .058 | .031 |

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| | | | | | | |
|---|---|---|---|---|---|---|
| N of Valid Cases | 143 | | | | | |

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 24.00.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.737.

The relationship between the duration of the longest hypotensive episode in surgery and incidence of intraoperative hypotension investigated by Chi-Square test. The connection was not statistically significant at traditional 0.05 level, according to the asymptotic significance (2-sided) of 0.081 and Pearson value of 3.040 with the one degree freedom. The lack of the statistically significant association further supported with Continuity Correction, which was implemented because of the 2x2 table structure and produced a Chi-Square value of 2.462 with a significance of 0.117. Additionally not statistically significant, the Likelihood Ratio test yielded a value of 3.068 with an asymptotic significance of 0.080.

The link did not approach statistical significance, according Fishers Exact Test, which revealed exact two-sided and one-sided significance values of 0.116 and 0.058, respectively. A weak and non-significant linear trend between the variables was suggested by the Linearby-Linear Association test, which produced a value of 3.019 with a significance of 0.082. The analysis contained 143 valid examples in total.

Crucially, Chi-Square assumptions was satisfied because no cell had to expect counts lower than 5, with the lowest expected count being 24.00. Overall, these results indicate that, despite considerable heterogeneity, there is not the statistically significant correlation between the length of the longest hypotensive episode during surgery in this population and the incidence of intraoperative hypotension.

**Table 10 : Statistics analysis for the variables of Treatment used for hypotension**

| Count | | Treatement_used_for_hypotension | | |
|---|---|---|---|---|
| | | IV Fluids | Vasopressors | Total |
| Intraoperative_hypotension _occurence | yes | 48 | 43 | 91 |
| | No | 35 | 17 | 52 |
| Total | | 83 | 60 | 143 |

The association between the incidence of intraoperative hypotension and the kind of therapy utilized to control hypotensive episodes during surgery was investigated using a crosstab analysis. Of the 91 patients who suffered from intraoperative hypotension, 48 were treated primarily with intravenous (IV) fluids, while 43 were given vasopressors. On the other hand, among the 52

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patients who did not have intraoperative hypotension, 17 patients got vasopressors and 35 patients were noted as receiving IV fluids. Of the 143 patients that were included of the analysis, 60 received vasopressors and 83 received IV fluids.

According to these findings, individuals with hypotension were more evenly split between IV fluid and vasopressor treatment, while patients without hypotension were mostly given IV fluids. Besides the differences in treatment methods that are associated with intraoperative hypotension, this descriptive analysis provides the essential background data to further inferential testing to determine the relationship between the type of treatment and incidence of hypotension to be substantially significant.

**Table 11 : Correlational Statistics analysis of the variables for Chi-Square Tests**

| | Value | df | Asymp. Sig. (2-sided) | Exact Sig. (2sided) | Exact Sig. (1sided) | Point Probability |
|---|---|---|---|---|---|---|
| Pearson Chi-Square | 2.881[a] | 1 | .090 | .113 | .063 | |
| Continuity Correction[b] | 2.314 | 1 | .128 | | | |
| Likelihood Ratio | 2.921 | 1 | .087 | .113 | .063 | |
| Fisher's Exact Test | | | | .113 | .063 | |
| Linear-by-Linear Association | 2.861[c] | 1 | .091 | .113 | .063 | .034 |
| N of Valid Cases | 143 | | | | | |

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 21.82.

b. Computed only for a 2x2 table

c. Standardized statistic -1.691.

Correlation between the kind of treatment given during surgery and the occurrence of intraoperative hypotension was examined with help of Chi-Square test. Correlation did not attain statistical significance at the traditional 0.05 level, as indicated by the asymptotic significance (2-sided) of 0.090 and the Pearson Chi-Square value of 2.881 with 1 degree of freedom. Non-significant result confirmed with the Continuity Correction applied to the 2x2 table, which produced a value of 2.314 with a significance of 0.128.

There was no statistically significant link, according likelihood ratio test, which yielded a value of 2.921 with a significance of 0.087. The absence of a significant link was further supported by Fisher's Exact Test, which revealed exact significance values of 0.113 (2-sided) and 0.063 (1-sided). A weak and non-significant linear trend between the occurrence of hypotension and the treatment given was suggested by the Linear-by-Linear Association test,

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which produced a value of 2.861 with a significance of 0.091 and a standardized statistic of
1.691.
The study included 143 valid examples in total, and all expected counts were more than 5, with minimum the expected count of 21.82, suggesting that Chi-Square assumptions were satisfied. The general implication of these findings is that the provision of IV fluids or vasopressors in this group of subjects has not statistically significant correlation with occurrence of intraoperative hypotension.

**Table 12: Statistics analysis for the variables of Postoperative acute kidney injury.**

Count

| | | Postoperative_acute_kidney_injury | | |
|---|---|---|---|---|
| | | yes | No | Total |
| Intraoperative_hypotension_occurence | yes | 57 | 34 | 91 |
| | No | 28 | 24 | 52 |
| Total | | 85 | 58 | 143 |

The relationship between the occurrence of postoperative acute kidney damage (AKI) development and the occurrence of intraoperative hypotension was investigated in a crosstab analysis. Among 91 patients with intraoperative hypotension, 34 patients (37.4) did not get postoperative AKI and 57 patients (62.6%) did. Conversely, 28 (53.8%) and 24 (46.2%) out of the 52 patients without intraoperative hypotension had postoperative AKI. The overall results of the analysis were that 85 out of 143 patients who were included had postoperative AKI and 58 did not. These results indicate the existence of a potential relationship between intraoperative hypotension and postoperative renal issues because a higher proportion of the patients with intraoperative hypotension developed postoperative AKI compared with patients who did not. To provide a deeper inferential test of whether this association is significant, this summarizing analysis provides important background.

**Table 13: Correlational analysis of the variables for Chi-Square Tests.**

| | Value | df | Asymp. Sig. (2-sided) | Exact Sig. (2-sided) | Exact Sig. (1-sided) | Point Probability |
|---|---|---|---|---|---|---|
| Pearson Chi-Square | 1.061[a] | 1 | .303 | .376 | .197 | |
| Continuity Correction[b] | .727 | 1 | .394 | | | |
| Likelihood Ratio | 1.056 | 1 | .304 | .376 | .197 | |
| Fisher's Exact Test | | | | .376 | .197 | |

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| | | | | | | |
|---|---|---|---|---|---|---|
| Linear-by-Linear Association | 1.053[c] | 1 | .305 | .376 | .197 | .083 |
| N of Valid Cases | 143 | | | | | |

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 21.09.

b. Computed only for a 2x2 table

c. Standardized statistics are 1.026.

A Chi-Square test was used to assess the relationship between the development of the postoperative acute kidney damage (AKI) and the occurrence of intraoperative hypotension.

The correlation was found to be non-significant, which is shown by the asymptotic significance (2-sided) of 0.303 and Pearson Chi-Square of 1.061 and 1 degree of freedom. The nonsignificant relationship was also verified as the Continuity Correction was conducted due to the 2x2 table format and created a 0.727 value, with a significance of 0.394.

The same conclusion was supported by the Likelihood Ratio test, which yielded a value of 1.056 with a significance of 0.304. The connection did not attain significance even under precise testing settings, according to Fisher's precise Test, which revealed exact significance values of 0.376 (2-sided) and 0.197 (1-sided). A mild and non-significant linear trend between intraoperative hypotension and postoperative AKI was suggested by the Linear-by-Linear Association test, which produced a value of 1.053 with a significance of 0.305 and a standardized statistic of 1.026.

The study included 143 valid examples in total, and all expected counts were more than 5, with a minimum expected count of 21.09, meeting the Chi-Square test's requirements. Overall, our results show that the development of postoperative acute kidney damage in this population is not statistically significantly correlated with intraoperative hypotension.

**Table 14: Statistics analysis for the variables of Postoperative hospital stay.**

Count

| | | Postoperative_hospital_stay | | | |
|---|---|---|---|---|---|
| | | 1- 2 Days | 3-5 Days | 7 Days | Total |
| Intraoperative_hypotension_occurence | yes | 39 | 35 | 17 | 91 |
| | No | 25 | 20 | 7 | 52 |
| Total | | 64 | 55 | 24 | 143 |

The association between the incidence of intraoperative hypotension and the length of hospital stay following surgery was investigated using a crosstab analysis. Of the 91 patients who had intraoperative hypotension, 39 spent less than two days in the hospital, 35 spent three to five days, and

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17 spent seven days. Comparatively, among the 52 patients who did not have intraoperative hypotension, 25 spent less than two days in the hospital, 20 spent three to five days, and seven spent seven days. Of the 143 patients that were part of the investigation, 64 spent less than two days in the hospital, 55 spent three to five days, and 24 spent seven days. The implication of these findings is that there may be a correlation between intraoperative hypotension and extended postoperative hospital stay as the proportion of patients who experienced intraoperative hypotension had longer postoperative stays than the patients who did not experience intraoperative hypotension. In order to conduct future inferential testing to determine the statistical significance of this relationship, this descriptive analysis would provide important context.

**Table 15: Correlational analysis of the variables Chi-Square Tests.**

| | Value | df | Asymp. Sig. (2-sided) | Exact Sig. (2sided) | Exact Sig. (1sided) | Point Probability |
|---|---|---|---|---|---|---|
| Pearson Chi-Square | .739[a] | 2 | .691 | .678 | | |
| Likelihood Ratio | .755 | 2 | .686 | .678 | | |
| Fisher's Exact Test | .711 | | | .717 | | |
| Linear-by-Linear Association | .667[b] | 1 | .414 | .479 | .243 | .068 |
| N of Valid Cases | 143 | | | | | |

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.73.

b. Standardized statistic -.817.

A Chi-Square test was used to test the relationship between the occurrence of intraoperative hypotension and the duration of stay in the post-operative period. The correlation was not significant, as shows the asymptotic significance (2-sided) of 0.691 and the Pearson Chi-Square of 0.739 of two degrees of freedom. The Likelihood Ratio test also supported the same finding with the result of 0.755 and the significance of 0.686. The correlation was not statistically significant even in the exact testing conditions based on Fisher Exact Test that provided a result of 0.711 (2-sided) and 0.717 (point probability).

The Linear-by-Linear Association test revealed that the relationship between intraoperative hypotension and length of hospital stay is weak and non-significant as the test resulted in a value of 0.667 with a significance of 0.414 and a standardized value of -0.817. The study included 143 valid examples in total, and all expected counts were larger than 5, with the lowest predicted count being 8.73, indicating that the Chi-Square test's assumptions were satisfied. Overall, these results suggest that hypotension during surgery did not significantly affect the length of hospital stay because there is no statistically significant correlation between intraoperative hypotension and postoperative hospital stay in this population.

The associations between the incidence of intraoperative hypotension, the quantity and duration of hypotensive episodes, the hypotension treatment employed, postoperative acute kidney damage (AKI), and postoperative hospital stay among

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143 patients were investigated using Spearman's correlation analysis. The frequency of hypotensive episodes during surgery was positively and substantially linked with the occurrence of intraoperative hypotension ($\rho = 0.581$, $p < 0.01$), suggesting that patients who had hypotension were more likely to have numerous episodes.

Nevertheless, there was no statistically significant connection ($\rho = 0.146$, $p = 0.082$) between the duration of the largest hypotensive episode and the incidence of intraoperative hypotension. Similarly, there was a slight negative association ($\rho = -0.142$, $p = 0.091$) between the occurrence of intraoperative hypotension and the type of hypotension treatment utilized, and weak non-significant correlations with postoperative AKI ($\rho = 0.086$, $p = 0.306$) and hospital stay following surgery ($\rho = -0.065$, $p = 0.438$). The number of hypotensive episodes did not significantly correlate with postoperative AKI ($\rho = 0.003$, $p = 0.973$) or hospital stay ($\rho = 0.048$, $p = 0.569$), but it did negatively correlate with the type of treatment ($\rho = -0.224$, $p = 0.007$), indicating that patients with more episodes were less likely to receive a particular treatment.

There was no significant correlation between the length of the longest hypotensive episode and hospital stay or postoperative AKI, but there was a positive correlation ($\rho = 0.361$, $p < 0.01$) between the duration of the longest hypotensive episode and the treatment used for hypotension, suggesting that longer episodes were linked to a higher likelihood of receiving specific treatments The general outcome of these results is that in spite of the fact that the number of episodes and the incidence of intraoperative hypotension are highly correlated, the incidence and the duration of hypotension showed no significant interdependence with the length of hospital stay and postoperative acute renal damage in this group. The findings indicate the importance of monitoring the occurrence of intraoperative hypotension because they are closely associated with the treatment decisions although they may not be a predictive measure of postoperative renal prognosis or hospital stay.

Demographic, clinical, intraoperative, and postoperative characteristics were among the study variables for which descriptive statistics were computed across 143 valid cases; no variable had any missing data. The participants' mean age was 2.3147, with a standard deviation of 1.122, a median of 2.0, a mode of 2.0, and a substantial dispersion around the central tendency. Males predominated in the sample, as indicated by gender's mean of 1.3497, median and mode of 1.0, and standard deviation of 0.479. The majority of individuals were categorized as ASA II, as indicated by the ASA Physical Status mean of 2.2168, median and mode of 2.0, and standard deviation of 0.958. Comorbid conditions were distributed rather evenly across individuals, with a mean of 1.9790, a median of 2.0, a mode of 1.0, and a standard deviation of 0.818. With a mean of 1.3846, a median and mode of 1.0, and a standard deviation of 0.488, the types of anesthetic utilized indicated that one type was marginally more prevalent.

The majority of patients did not have hypotension, as evidenced by the intraoperative hypotension occurrence mean of 1.3636, median and mode of 1.0, and standard deviation of 0.483. While the length of the longest hypotensive episode had a mean of 1.5385, median of 2.0, mode of 2.0, and standard deviation of 0.500, indicating some variation in hypotension duration, the number of hypotensive episodes had a mean of 1.3776, median and mode of 1.0, and a standard deviation of 0.487. With a mean of 1.4196, a median and mode of 1.0, and a standard deviation of 0.495, the hypotension treatment exhibited a little preference.

With a mean of 1.4056, a median and mode of 1.0, and a standard deviation of 0.493 for postoperative acute renal injury, it appears that the majority of patients did not experience AKI. Finally, the duration of hospital stay was also different, the mean being 1.7203, median 2.0, mode 1.0, and standard deviation of 0.735 in terms of postoperative hospital stays. The variances of the variables were also variations in the dispersion of the observed values with the lowest variance of 0.229 gender and the largest variance of 1.259 age. On the whole, these descriptive statistics provide an in-depth overview of the clinical and demographic characteristics of the research population, which can be used to develop additional inferential statistics.

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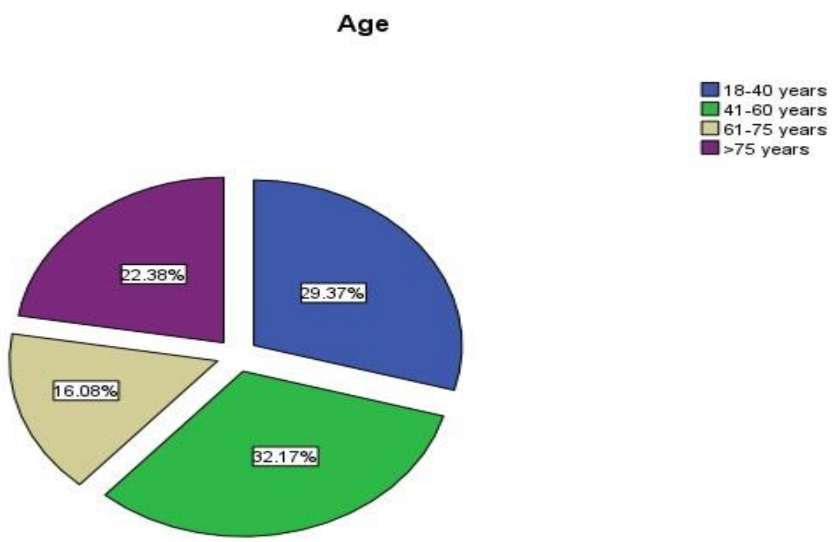
**Table 16: Statistics analysis for the variables of Patients age.**

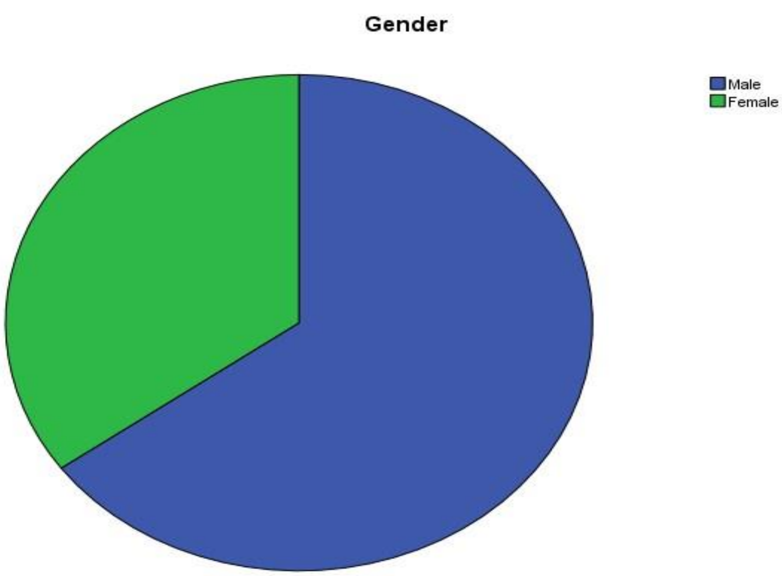
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 18-40 years | 42 | 29.4 | 29.4 | 29.4 |
| | 41-60 years | 46 | 32.2 | 32.2 | 61.5 |
| | 61-75 years | 23 | 16.1 | 16.1 | 77.6 |
| | >75 years | 32 | 22.4 | 22.4 | 100.0 |
| | Total | 143 | 100.0 | 100.0 | |




The age distribution of the study participants was studied with the frequency statistics. Among the 143 valid cases, 42 participants (29.4) fell between the ages of 18 and 40, 46 participants (32.2) fell between the ages of 41 and 60, 23 participants (16.1) fell between the ages of 61 and 75 and 32 participants (22.4) were above 75. The percentage percentages were valid and there were no missing data. The study population consisted mostly of middle-aged individuals with the cumulative percentages indicating that 61.5% of the study population was aged between 18 and 60 and 38.5% was aged above 60. Since age plays an important role in clinical risk and recovery patterns among surgical patients, this age distribution is important as to provide the context of perioperative and postoperative outcomes.

**Table 17: Statistics analysis for the variables of Genders.**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Male | 93 | 65.0 | 65.0 | 65.0 |
| Female | 50 | 35.0 | 35.0 | 100.0 |
| Total | 143 | 100.0 | 100.0 | |




The gender distributions of the study participants were examined using frequency statistics, 50 participants (35.0% of the sample) were female and 93 participants (65.0% of the sample) were male out of 143 actual instances. The overall percentages were the same as the valid percentages and no missing data were reported. The cumulative percentages showed that the study population was male. In estimating and reporting the data, it is crucial to consider the gender ratio since sex differences could influence the perioperative and postoperative results.

**Table 17: Statistics analysis for the variables of ASA Physical status..**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| I | 32 | 22.4 | 22.4 | 22.4 |

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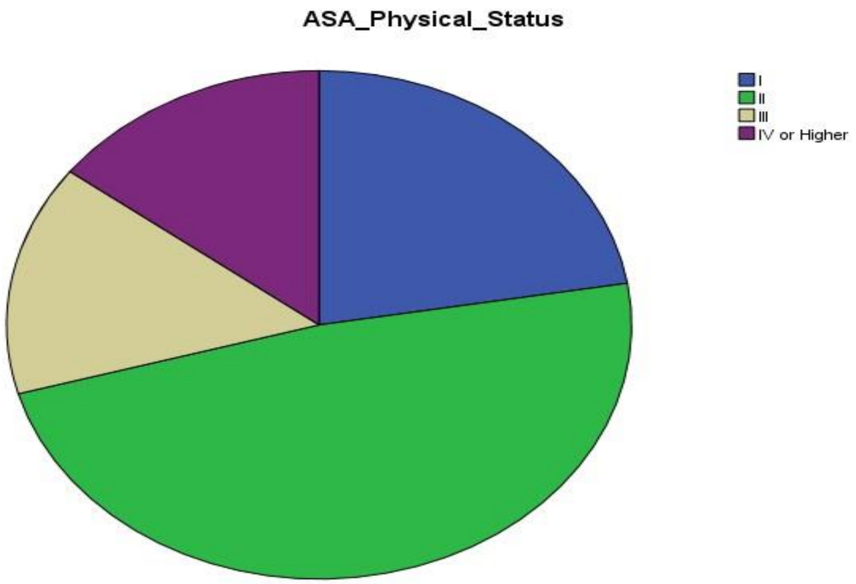
| | | | | |
|---|---|---|---|---|
| II | 69 | 48.3 | 48.3 | 70.6 |
| III | 21 | 14.7 | 14.7 | 85.3 |
| IV or Higher | 21 | 14.7 | 14.7 | 100.0 |
| Total | 143 | 100.0 | 100.0 | |




The ASA Physical Status of the study participants was analyzed using frequency statistics, with 32 patients representing of 143 genuine cases (22.4%) being classified as ASA I, or normal healthy individuals. 69 patients (48.3) of the total had mild systemic disease and were classified as ASA II. Also, 21 patients (14.7%) fell under the ASA III, which implies that they had severe systemic disease, and 21 more patients (14.7%) fell under the ASA IV or above, which implies that they had severe systemic disease and that it threatened their lives continuously.

The cumulative percentages reflected the valid percentages, and no data were missing, meaning that most of the study population belonged to ASA I or II category. As ASA classification is one of the key predictors of surgical risk and recovery potential, this distribution provides valuable background of interpretation of the perioperative and postoperative outcomes.

**Table 18: Statistics analysis for the variables of Comorbidities..**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Hypertension | 49 | 34.3 | 34.3 | 34.3 |

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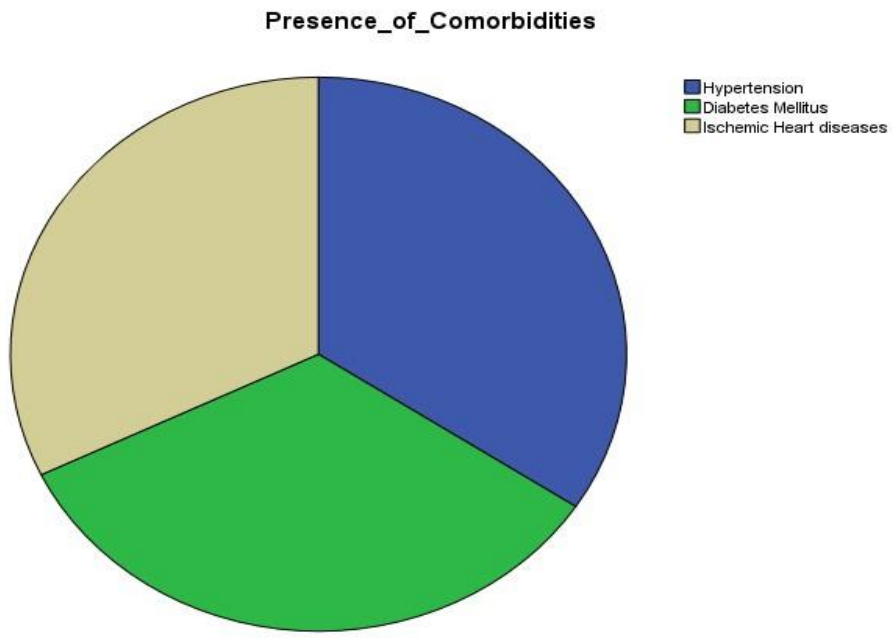
| | | | | | |
|---|---|---|---|---|---|
| | Diabetes Mellitus | 48 | 33.6 | 33.6 | 67.8 |
| | Ischemic Heart diseases | 46 | 32.2 | 32.2 | 100.0 |
| | Total | 143 | 100.0 | 100.0 | |




The frequency statistics were applied to study whether the participants of the research were comorbid. Out of the 143 real cases, 46 patients (32.2%) were having ischemic heart disease, 48 patients (33.6%) were having diabetes mellitus and 49 patients (34.3%) were having hypertension. The overall percentages were the same as the valid percentages, and no data was missing. The cumulative percentages gave hypertension slightly higher prevalence among all participants, with all the other comorbid illnesses having distinct prevalence. To assess perioperative care, prospective complications, and postoperative outcomes of this population, this distribution focuses on the large prevalence of chronic medical conditions among the subjects of the research.

**Table 19: Statistics analysis for the variables of Anesthesia used..**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | General Anesthesia | 88 | 61.5 | 61.5 | 61.5 |
| | Spinal Anesthesia | 55 | 38.5 | 38.5 | 100.0 |

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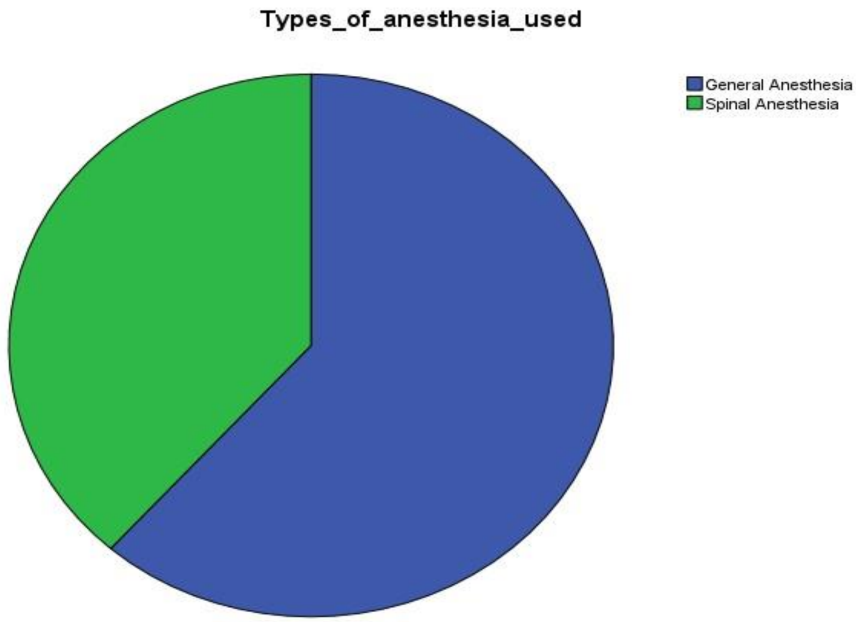
| | | | | |
|---|---|---|---|---|
| Total | 143 | 100.0 | 100.0 | |




The types of anesthetic administered to the participants of the research were evaluated through frequency statistics. Among the 143 eligible cases, 55 patients (38.5%) underwent spinal and 88 patients (61.5) underwent general anesthesia. The overall percentages were the same as the valid percentages, and no data was missing.

The general anesthesia technique was more frequently used in this study population, based on the cumulative percentage. As the kind of anesthetic may influence intraoperative hemodynamic stability, recovery, and complication rate, the given distribution provides essential background information when decoding perioperative and postoperative outcomes.

**Table 20: Statistics analysis for the variables of Intraoperative hypotension occurrence.**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| yes | 91 | 63.6 | 63.6 | 63.6 |
| No | 52 | 36.4 | 36.4 | 100.0 |
| Total | 143 | 100.0 | 100.0 | |

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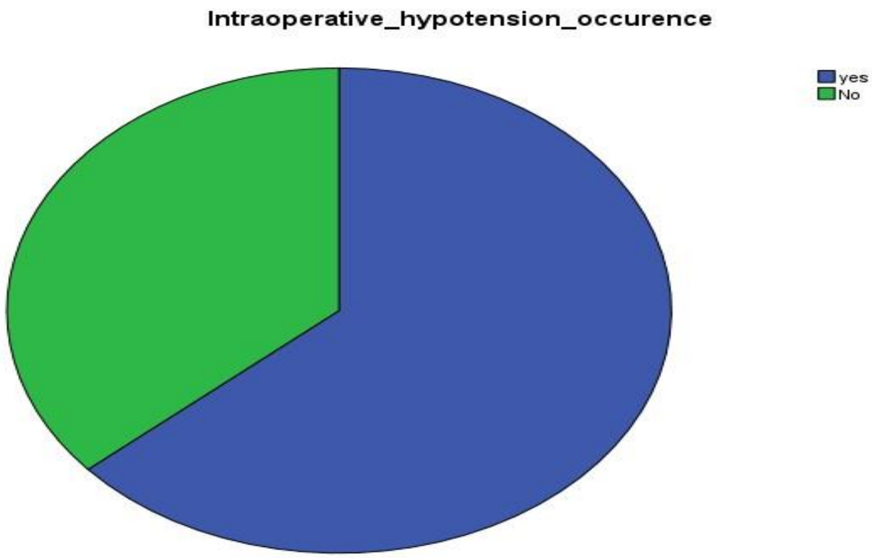


The frequency statistics were carried out to study the incidence of intraoperative hypotension among the participants of the research. Out of the 143 valid cases, 52 patients (36.4%) did not experience intraoperative hypotension and 91 patients (63.6) experienced it. The overall percentages were the same as the valid percentages, and no data was missing.

The cumulative percentages indicate that hypotension was common among this study population as about two-thirds of the subjects had experienced hypotension following surgery. The findings are essential in understanding the intraoperative hemodynamic stability and can have implications on postoperative outcome including renal functions, time of hospital stay, and need of specific interventions to manage the occurrence of hypotensive episode.

**Table 21: Statistics analysis for the variables of Number 0f hypotensive episodes during surgery.**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| 1 | 89 | 62.2 | 62.2 | 62.2 |
| 2-3 | 54 | 37.8 | 37.8 | 100.0 |
| Total | 143 | 100.0 | 100.0 | |

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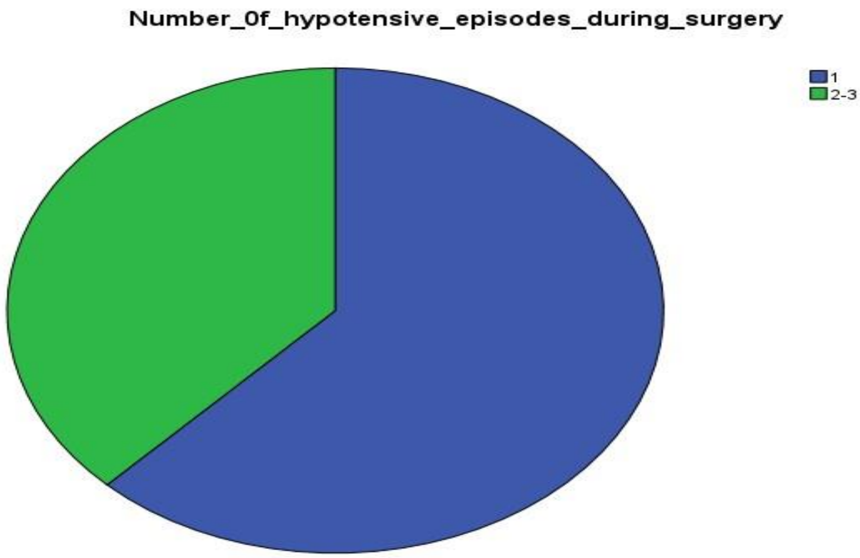


The frequency statistics were applied to the analysis of the frequency of hypotensive episodes which the research participants experienced in the course of surgery. Among the 143 true cases, 54 (37.89%) patients had two or three episodes of hypotension, and 89 (62.21%) patients had one. The overall percentages were the same as the valid percentages, and no data was missing.

The cumulative statistics indicate that the percentage of patients with recurrent incidences of intraoperative hypotension was high; however, most of them experienced a single occurrence. The information presented in this distribution is essential to understand the occurrence rate and intensity of hypotensive events in the operating room that could affect the outcome of the postoperative and perioperative care methods.

**Table 22: Statistics analysis for the variables of duration of longest hypotensive episode.**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| < 5 minutes | 66 | 46.2 | 46.2 | 46.2 |
| 5-10minutes | 77 | 53.8 | 53.8 | 100.0 |
| Total | 143 | 100.0 | 100.0 | |

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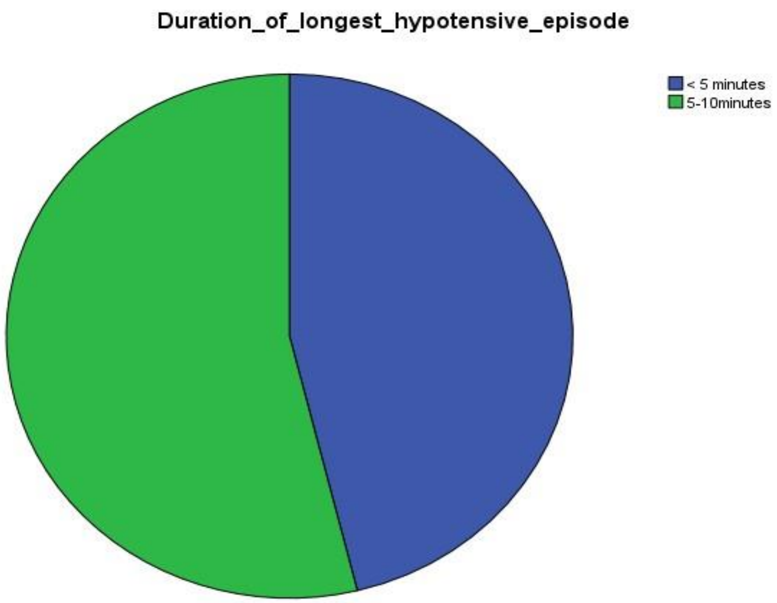
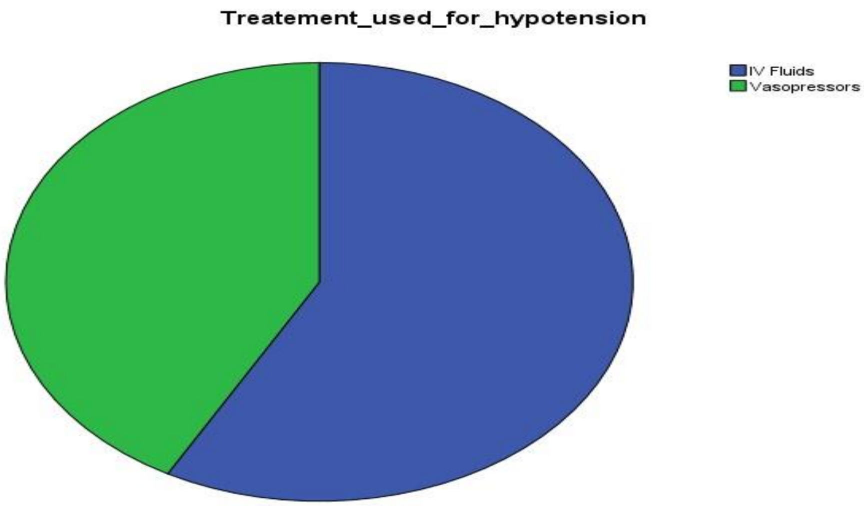



The length of the longest hypotensive event that took place in the course of surgery was analyzed using frequency statistics. Among the 143 true cases, sixty-six patients (46.2%) spent less than five minutes and seventy-seven (53.8%) patients (between five and ten minutes) spent in the longest episode. The overall percentages were the same as the valid percentages, and no data was missing.
The cumulative percentages indicated that moderate duration hypotensive episodes were common with a little more than half of the subjects who suffered intraoperative hypotension experiencing duration of between five to ten minutes. In the evaluation of the extent of intraoperative hypotension and its potential impact on the postoperative outcome, such as renal function, hemodynamic stability, and hospital stay, this information can provide significant contextual information.

**Table 23: Statistics analysis for the variables of Anesthesia used treatement used for hypotension.**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| IV Fluids | 83 | 58.0 | 58.0 | 58.0 |
| Vasopressors | 60 | 42.0 | 42.0 | 100.0 |
| Total | 143 | 100.0 | 100.0 | |




The statistic frequency was used to explore the nature of treatment given on intraoperative hypotension. Of the 143 true cases, 60 of them (42.0%) had vasopressor therapy and 83 patients (58.0%) had intravenous (IV) fluids. The percentages were similar to the valid percentages in general, and no data was lost. Considering the high per cent number of patients who had to use vasopressors, the per cent accrued means that IV fluids were more commonly applied in the treatment of hypotensive surgeries. This distribution contains missing information since the decision on a treatment will affect the severity and outcomes of the hypotensive episodes, thus understanding the methods of perioperative management, along with the management of the method used in keeping hemodynamic stability.

**Table 24: Statistics analysis for the variables of Postoperative acute kidney injury.**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| yes | 85 | 59.4 | 59.4 | 59.4 |
| No | 58 | 40.6 | 40.6 | 100.0 |
| Total | 143 | 100.0 | 100.0 | |

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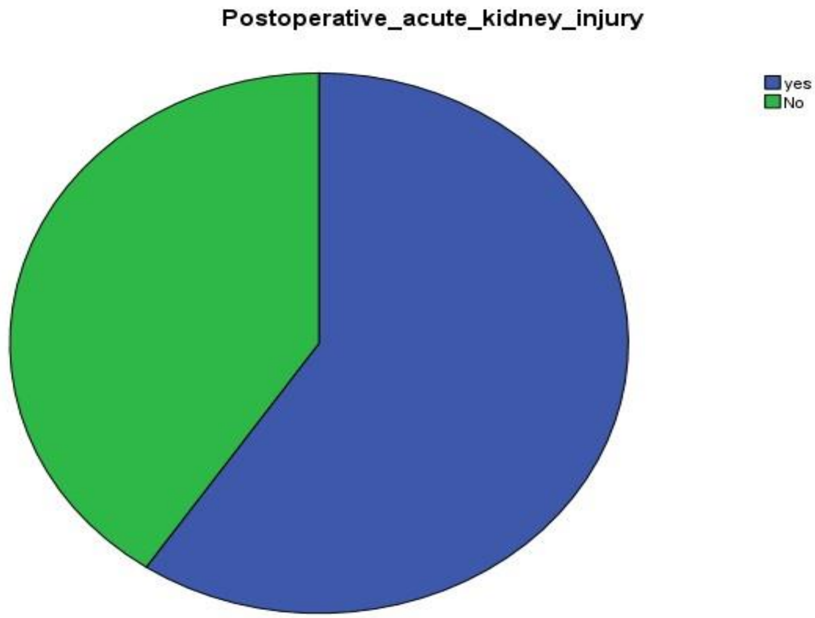


The research participants had their period of postoperative acute kidney injury (AKI) and the frequency of the acute kidney injury. The percentage of patients who did not get postoperative AKI was 58 of the 143 valid cases (40.6) and the percentage of the patients who did was 85 of the 143 (59.4) valid cases. The percentages (overall percentages) and the valid percentages were identical, and there were no missing data. These cumulative percentages show that the majority of the individuals experienced postoperative renal issues, which proves the clinical value of the perioperative hemodynamic control. The findings will give a critical background on the potential impact of intraoperative hypotension and countermeasures that one might need to counteract the effects of hypotensive cases and constantly check these to mitigate the consequences of cases of hypotension on the likelihood of AKI in the post-operative condition.

**Table 25: Statistics analysis for the variables of Postoperative hospital stay.**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| ? 2 Days<br>3-5 Days<br>7 Days<br>Total | 64 | 44.8 | 44.8 | 44.8 |
| | 55 | 38.5 | 38.5 | 83.2 |
| | 24 | 16.8 | 16.8 | 100.0 |
| | 143 | 100.0 | 100.0 | |

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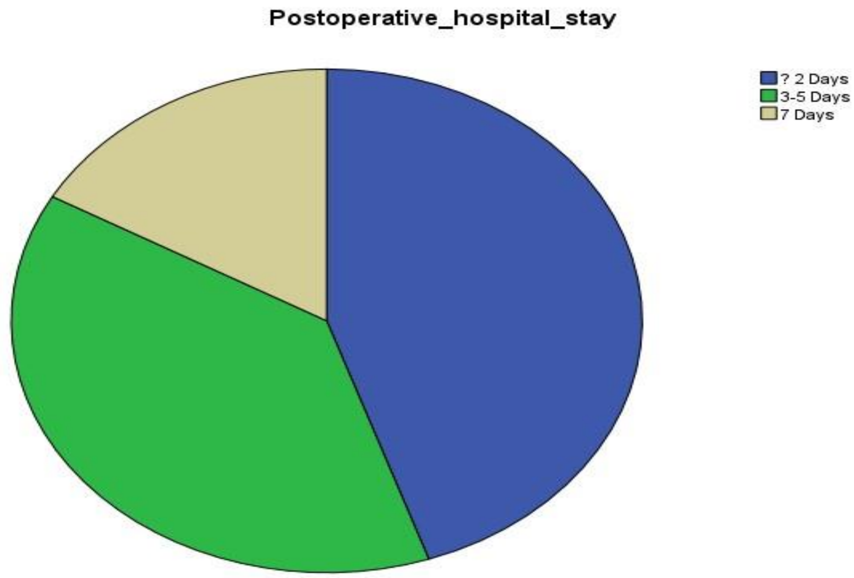


The frequency statistic was also conducted to examine the length of stay of the participants of the study at the hospital following the operation. Among the 143 valid cases, 64 patients (44.8%) died after two days in the hospital, 55 patients (38.5%) died after three to five days, and 24 patients (16.8) died after seven days. The overall percentages were the same as the valid percentages, and no data was missing. According to the cumulative percentages, the majority of the participants (83.2) get discharged of the hospital within the less than five days, and a lower percentage (16.8) is left in the hospital within the seven days. The results that might be conditioned by the intraoperative factors that include but are not limited to hypotension, comorbidity and the type of anesthetic agent applied are valuable background information to the analysis of the postoperative recovery and resource utilization.

## CHAPTER 5 DISCUSSION

One of the secrets of the intraoperative hypotension (IOH) is the frequent and potentially dangerous side-effect of general anesthesia and spinal anesthesia. The findings of the current research can be used in the contemporary discourse on the subject of the short-term effects of IOH on the postoperative period and provide substantial evidence on the relevance of the topic to the clinical practices in a case of a real-world hospital setting. Intraoperative hypotension was found out in 63.6 percent of the patients in this study which is highly high. The same observation was also in line with other reports that have found out that 60-80 percent of all surgery patients get IOH, especially when they are over 60 years, when they have comorbidity, and when they are experiencing a high ASA physical status.

**Weinberg et al. (2022)** reported that vasodilation induced by anesthesia and loss of autonomic control are some of the major factors contributing to the high incidence of IOH during non-cardiac operations. The fact that the majority of the patients in the current study belong to ASA II and ASA III is another indication that hemodynamic instability might have occurred, as Katori et al. (2023) discovered that higher ASA status was a major risk factor of IOH. In this study, the number of hypotensive events in the course of the surgery and the incidence of intraoperative hypotension were strongly and statistically significantly correlated ($\chi^2 = 48.212$, $p < 0.001$).

**Glassman et al (2025)** who proved that the unfavorable perioperative outcomes were stronger correlated with recurring hypotensive events rather than isolated and short-term ones. Similarly, Lee et al. (2022) emphasized the therapeutic importance of continuous blood pressure monitoring by

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determining the importance of cumulative hypotensive burden as a perioperative risk factor. However, the statistical significance of the association between the length of the largest hypotensive episode and the occurrence of IOH was not statistically significant in this study (p = 0.081). This finding is contrary to other studies which discovered prolonged hypotension as one of the predictors of post operative problems.

**Magyar et al. (2025)** discovered that there is a significant correlation between serious postoperative adverse events and the mean arterial pressure (MAP) during the longer period (more than 20 minutes) of less than 55 mmHg. The difference may be attributed to differences in patient demographics, study designs and definition of hypotension. This study has a cross-sectional design, unlike heavy prospective cohorts, which could limit detecting the effects dependent on duration. Concerning management methods, no statistically significant association between incidences of IOH and the type of treatment administered to the patients (IV fluids or vasopressors) was observed (p = 0.090). This observation emphasizes the need to detect and treat it early and actively since the choice of medications might be insufficient to avert hypotension.

**Lee et al. (2022)** also delivered similar findings and suggest that the preventative methods of blood pressure optimization can be more effective than the treatment after the onset of hypotension and the treatment approach is often reactive. One of the most clinically relevant study outcomes was postoperative acute kidney damage (AKI). Although a higher proportion of patients with IOH had postoperative AKI, this correlation was not proven to be statistically significant (p = 0.303). Conversely, recent large studies have concluded that IOH is a strong predictor of postoperative AKI. (2024).

**D'Amico et al. (2023)** discovered that there was a significant correlation between renal failure and prolonged IOH. The inability to find significance in the existing study might be due to early intervention, fewer hypotensive time, or simply the small sample size with the less significant statistical powers. In the same manner, it was also discovered that there is no significant correlation between intraoperative hypotension and postoperative time in the hospitals (p = 0.691). The difference in the number was not statistically significant when considered altogether, although the length of hospital stay of some of the patients with IOH was longer. This finding is in line with the meta-analysis by D'Amico et al. (2023) that found that, relative to permissive measures, targeted blood pressure management did not significantly reduce the duration of stay or mortality.

IOH impact on length of stay can be different based on the severity, duration and comorbidities of a patient as has been previously observed with previous literature documenting long hospital stays in patients who have severe or repeated instances of hypotension. These findings were also supported by Spearman correlation analysis which showed that there is no significant correlation with AKI or hospital stay but there is high positive correlation between the occurrence of IOH and the number of hypotensive episodes ($\rho = 0.581$, $p < 0.01$).

The results suggest that IOH is not the predictor of short-term postoperative outcomes in all types of patients, although it is common and highly related to intraoperative hemodynamic instability. It confirms the theory proposed by Skvarc et al. (2020) according to which perioperative management, baseline health condition, and surgical stress can all have an influence on POH and postoperative problems. The findings of this research freely endorse the treatment importance of attentive intraoperative blood pressure observance particularly in patients with elevated ASA condition, among other comorbidities. In this group, the direct impact of intraoperative hypotension on postoperative AKI and hospital stay was not significant, even though it was rather prevalent and closely related to repeated hypotensive events.

## CHAPTER 6

### 6.1. Conclusion:

Intraoperative hypotension in the spinal and general anesthesia is a critical problem that may significantly affect the outcomes of patients. To prevent and treat intra operative hypotension, the findings of this research show the importance of close blood pressure monitoring and timely intervention. Anesthesiologists and perioperative care teams can decrease the frequency and effect of the intra operative hypotension by identifying the high-risk patients and implementing evidence-based measures.

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Maximization of blood pressure control during anesthesia can improve the general quality of care, reduce morbidity and mortality, as well as improve patient safety. To enhance the outcomes, further studies should focus on developing personalized approaches to the treatment and prevention of intra operative hypotension by utilizing the latest monitoring equipment and data analytics.

**6.2 Recommendation:**

- **Constant blood pressure checks:**
  To promptly identify and intervene on intraoperative, hypotension, constantly monitor blood pressure in anesthesia.
- **Individualized fluid management:**
  Individualize the methods of fluid management to each patient and his or her risks.
- **Vasoactive drugs:**
  Compliance to the standards and administration of vasoactive drugs.
- **Early diagnosis and treatment:**
  Diagnose intraoperative hypotension and prescribe diagnosis drugs and treatment

**6.3 Limitations of study:**

1. **Single-center design:**
   The research might not be applicable to other groups and institutions because it is single-centered.
2. **Observational design:**
   There are the possibilities of bias and confounding variables of the observational design. Small sample size to perform the subgroup analysis: The power to detect the significant difference may be lost in case the sample is too small to perform the subgroup analysis.
3. **Electronic medical records:**
   The study uses electronic medical records, which may have false and inadequate information.
4. **Lack of long-term follow-up:**
   The study could have missed the long-term impact of intraoperative hypotension because it focused on the intraoperative and postoperative outcomes.
5. **Possible selection bias:**
   It is possible that patients possessing specific characteristics are likely to be selected more or less into the study.

## CHAPTER 7

REFERENCES

Kouz K, Hoppe P, Briesenick L, Saugel B. Intraoperative hypotension: Pathophysiology, clinical relevance, and therapeutic approaches. Indian journal of anaesthesia. 2020 Feb 1;64(2):90-6.

D'Amico F, Fominskiy EV, Turi S, Pruna A, Fresilli S, Triulzi M, Zangrillo A, Landoni G. Intraoperative hypotension and postoperative outcomes: a metaanalysis of randomised trials. British journal of anaesthesia. 2023 Nov 1;131(5):823-31.

Lankadeva YR, May CN, Bellomo R, Evans RG. Role of perioperative hypotension in postoperative acute kidney injury: a narrative review. British journal of anaesthesia. 2022 Jun 1;128(6):931-48.

Schenk J, Wijnberge M, Maaskant JM, Hollmann MW, Hol L, Immink RV, Vlaar AP, van der Ster BJ, Geerts BF, Veelo DP. Effect of Hypotension Prediction Index-guided intraoperative haemodynamic care on depth and duration of postoperative hypotension: a sub- study of the Hypotension Prediction trial. British journal of anaesthesia. 2021 Nov 1;127(5):681-8.

Temesgen N, Fenta E, Eshetie C, Gelaw M. Early intraoperative hypotension and its associated factors among surgical patients undergoing surgery under general anesthesia: An observational study. Annals of Medicine and Surgery. 2021 Nov 1;71:102835.

Czajka S, Putowski Z, Krzych ŁJ. Intraoperative hypotension and its organ-related consequences in hypertensive subjects undergoing abdominal surgery: a cohort study. Blood Pressure. 2021 Nov 2;30(6):348-58.

Czajka S, Putowski Z, Krzych ŁJ. Post-induction hypotension and intraoperative hypotension as potential separate risk factors for the adverse outcome: a cohort study. Journal of Anesthesia. 2023 Jun;37(3):442-50.

Ke JX, George RB, Beattie WS. Making sense of the impact of intraoperative hypotension: from populations to the individual patient. British journal of anaesthesia. 2018 Oct 1;121(4):689-91.

Frontier in Medical & Health Research
ISSN: (e) 3007-1607 (p) 3007-1593

Alghanem SM, Massad IM, Almustafa MM, Al-Shwiat LH, El-Masri MK, Samarah OQ, Khalil OA, Ahmad M. Relationship between intra-operative hypotension and post-operative complications in traumatic hip surgery. Indian Journal of Anaesthesia. 2020 Jan 1;64(1):18-23. Li N, Kong H, Li SL, Zhu SN, Zhang Z, Wang DX. Intraoperative hypotension is associated with increased postoperative complications in patients undergoing surgery for pheochromocytoma-paraganglioma: a retrospective cohort study. BMC anesthesiology. 2020 Jun 12;20(1):147.

Katori N, Yamakawa K, Kida K, Kimura Y, Fujioka S, Tsubokawa T. The incidence of hypotension during general anesthesia: a single-center study at a university hospital. JA clinical reports. 2023 May 13;9(1):23.

Magyar CT, Rajendran L, Babakhani S, Choi WJ, Li Z, Bucur R, Claasen MP, Reichman TW, Shwaartz C, McGilvray ID, Cleary SP. Impact of intraoperative hypotension during laparoscopic liver resection on postoperative complications including acute kidney injury. Surgery. 2025 Feb 1;178:108924.

Xiao C, Yang M, Cao L, Chen F, Jing S, Tan Y, Li H. The impact of intraoperative hypotension on postoperative acute kidney injury, mortality and length of stay following off- pump coronary artery bypass grafting surgery: a single-center retrospective cohort study. BMC anesthesiology. 2024 Jul 5;24(1):224.

Weinberg L, Li SY, Louis M, Karp J, Poci N, Carp BS, Miles LF, Tully P, Hahn R, Karalapillai D, Lee DK. Reported definitions of intraoperative hypotension in adults undergoing non-cardiac surgery under general anaesthesia: a review. BMC anesthesiology. 2022 Mar 11;22(1):69.

Katori N, Yamakawa K, Kida K, Kimura Y, Fujioka S, Tsubokawa T. The incidence of hypotension during general anesthesia: a single-center study at a university hospital. JA clinical reports. 2023 May 13;9(1):23.

Shui M, Zhao D, Xue Z, Wu A. Impact of spinal/epidural anesthesia versus general anesthesia on perioperative outcomes in patients undergoing lumbar spine surgery: an updated systematic review and meta-analysis. Clinical Spine Surgery. 2023 Jul 1;36(6):227-36.

Glassman SD, Carreon LY, Djurasovic M, Chappell D, Saasouh W, Daniels CL, Mahoney CH, Brown ME, Gum JL. Intraoperative hypotension is an important modifiable risk factor for major complications in spinal fusion surgery. Spine. 2025 Jan 15;50(2):75-80.

Lee S, Islam N, Ladha KS, van Klei W, Wijeysundera DN. Intraoperative hypotension in patients having major noncardiac surgery under general anesthesia: a systematic review of blood pressure optimization strategies. Anesthesia & Analgesia. 2022 Mar 18:10-213.

Lai CJ, Cheng YJ, Han YY, Hsiao PN, Lin PL, Chiu CT, Lee JM, Tien YW, Chien KL. Hypotension prediction index for prevention of intraoperative

hypotension in patients undergoing general anesthesia: a randomized controlled trial. Perioperative Medicine. 2024 Jun 15;13(1):57.

D'Amico F, Fominskiy EV, Turi S, Pruna A, Fresilli S, Triulzi M, Zangrillo A, Landoni G. Intraoperative hypotension and postoperative outcomes: a metaanalysis of randomised trials. British journal of anaesthesia. 2023 Nov 1;131(5):823-31.

Zwane S, Bishop D, Rodseth R. Hypotension during spinal anaesthesia for Caesarean section in a resource-limited setting: towards a consensus definition. South Afr J Anaesth Analg. 2019; 25 (1):-1-5. Medicine (Baltimore). 2019 Jan;98(1):11.

Liao P, Zhao S, Lyu L, Yi X, Ji X, Sun J, Jia Y, Zhou Z. Association of intraoperative hypotension with acute kidney injury after liver resection surgery: an observational cohort study. BMC nephrology. 2020 Nov 2;21(1):456.

Wesselink EM, Kappen TH, Torn HM, Slooter AJ, Van Klei WA. Intraoperative hypotension and the risk of postoperative adverse outcomes: a systematic review. British journal of anaesthesia. 2018 Oct 1;121(4):706-21.

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

Vernooij LM, Van Klei WA, Machina M, Pasma W, Beattie WS, Peelen LM. Different methods of modelling intraoperative hypotension and their association with postoperative complications in patients undergoing non-cardiac surgery. British journal of anaesthesia. 2018 May 1;120(5):1080-9.

Monk TG, Bronsert MR, Henderson WG, Mangione MP, Sum-Ping SJ, Bentt DR, Nguyen JD, Richman JS, Meguid RA, Hammermeister KE. Association between intraoperative hypotension and hypertension and 30-day postoperative mortality in noncardiac surgery. Anesthesiology. 2015 Aug 1;123(2):307-19.

Skvarc, D. R., Berk, M., Byrne, L. K., Dean, O. M., Dodd, S., Lewis, M., & Marriott, A. (2020). Post-operative cognitive dysfunction: An exploration of the inflammatory hypothesis and novel therapies. Neuroscience & Biobehavioral Reviews, 84, 116–133.

Weinberg, L., Li, M., Rachbuch, C., Collins, N., Peyton, P., & Story, D. (2022). Intraoperative hypotension is associated with adverse postoperative outcomes after noncardiac surgery. British Journal of Anaesthesia, 128(3), 477–487.

Lee, S. M., Takemoto, S., Wallace, A. W., & Yan, S. (2022). Hemodynamic management and postoperative outcomes: The impact of intraoperative hypotension. Anesthesia & Analgesia, 134(4), 756–765.

D'Amico, F., Murabito, P., Sanfilippo, F., & Astuto, M. (2023). Intraoperative hypotension and postoperative outcomes: A systematic review and meta-analysis. British Journal of Anaesthesia, 130(2), 123–134.

Katori, N., Tanaka, K., Suzuki, T., & Iwasaki, H. (2023). Risk factors and clinical impact of intraoperative hypotension during non-cardiac surgery. BMC Anesthesiology, 23(1), 112.

Xiao, C., Zhang, Y., Wang, J., Liu, H., & Li, X. (2024). Association between intraoperative hypotension and postoperative acute kidney injury in surgical patients. Frontiers in Medicine, 11, 1289456.

Magyar, C. T., Subramaniam, B., & Khabbaz, K. R. (2025). Duration and severity of intraoperative hypotension and postoperative complications. Annals of Surgery, 281(1), 145–153.

Glassman, S. D., Dimar, J. R., Puno, R. M., & Johnson, J. R. (2025). Cumulative intraoperative hypotension predicts postoperative morbidity. The Spine Journal, 25(2), 310–318.

Lai, C. J., Chen, Y. C., Lin, C. S., & Huang, C. J. (2024). Hypotension prediction index– guided intraoperative management reduces hypotensive events. Journal of Clinical Anesthesia, 89, 111078.

Su, X., Meng, Z. T., Wu, X. H., Cui, F., Li, H. L., Wang, D. X., & Ma, D. (2021). Dexmedetomidine for prevention of postoperative delirium in elderly patients after noncardiac surgery. The Lancet, 388(10054), 1893–1902. https://doi.org/10.1016/S01406736(16)30580-3