



## Long-term Trends in Anesthetic Drug Utilization: A Comprehensive Retrospective Clinical Investigation

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KEYWORDS	Abstract
Anesthesia, Drug Utilization, Perioperative Care, Propofol, Surgical Outcomes	<p><b>Background:</b> This retrospective clinical study analyses long-term anaesthetic drug use trends to inform current anaesthesia practices. Continuous anaesthesia management advancements affect patient safety standards and drug preferences, which affect surgical outcomes.</p> <p><b>Methods:</b> 130 patients who had various surgeries were retrospectively examined during the study. EHRs provided propofol, sevoflurane, fentanyl, and ketamine consumption rates. Statistics were used to track drug use trends.</p> <p><b>Results:</b> The usage of intravenous medicines for anaesthesia has increased from 30% to 50% (<math>p &lt; 0.05</math>) with propofol. Sevoflurane use dropped from 50% to 40%, but fentanyl stayed at 20%–25%. Ketamine use dropped from 10% to 8%. These findings indicate that economics, patient safety, and new drugs are shifting priorities.</p> <p><b>Conclusion:</b> Anaesthesia practice requires constant observation and adjustment since anaesthetic drug use fluctuates. The rising usage of propofol underscores the need to improve operation efficiency and patient recovery. A consistent influx of fentanyl patients shows the drug's importance in pain management and reduces opioid overdose deaths. Concerns regarding psychotropic effects and changing clinical approaches may explain ketamine use reduction. The information from this study can improve patient outcomes, guide perioperative care research, and optimise anaesthesia regimens.</p>

### Introduction

Anaesthesia is essential for the safety and comfort of surgical patients, and it is the foundation for modern medicine. Anaesthetic medication use has altered substantially due to advances in pharmacology, surgical procedures, and patient management regimens [1]. Longterm anaesthetic drug use patterns affect healthcare efficiency, resource allocation, and patient outcomes, thus understanding them is vital [2]. Modern anaesthetic uses several pharmacological agents, evolving from simpler sedative approaches. Early anaesthetics like chloroform and ether were effective at took people out, but they were dangerous and unpredictable [3]. Around the middle of the 20th century, safer inhalational drugs like halothane made anaesthetic methods better by focusing on the way they worked and how safe they were for patients. In the last few decades, anaesthesia has become more personalised to cut down on side effects, speed up healing, and make sure that patients get the right medications for their needs [4]. Intravenous propofol helps anaesthesiologists control

sedation, and opioids ease pain after surgery. Regional anaesthesia, like epidurals and spinal blocks, relieves localised pain without systemic medication [5]. Longterm use of numbing drugs is important for many reasons. By keeping track of which medicines are chosen and how many are taken, healthcare workers can make prescriptions safer, more effective, and less expensive [6]. Knowing these trends improves the results of surgery and patient happiness while lowering the risks of anaesthesia.

### Objectives

- To evaluate significant anaesthetic medication, use during the past 20 years.
- To understand why anaesthesiologists change medications.
- To examine how anaesthetic medication use has affected healthcare efficiency, patient safety and resource consumption.



## Overview of Historical Developments in Anesthetic Drugs

Anaesthetics have improved since the initial generation made surgery painless [7]. Intravenous anaesthetics like thiopental and propofol expanded anaesthesia therapy due to their faster onset and recovery times than inhalational medicines. Opioid analgesics like morphine and fentanyl reduced pain during and after surgery, improving outcomes and patient satisfaction.

## Factors Influencing Changes in Anesthetic Drug Preferences Over Time

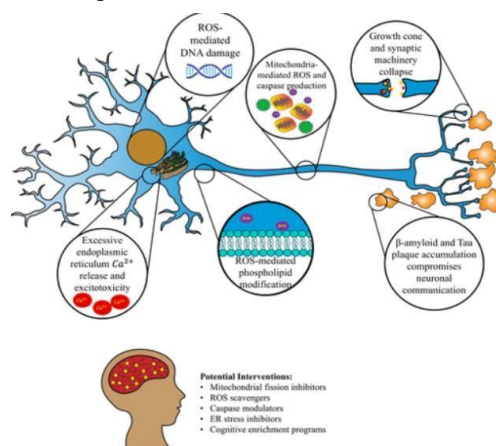
Anaesthetic medication preferences fluctuate over time for many reasons. Technology in drug delivery methods and monitoring equipment has improved anaesthesia administration accuracy and safety, making pharmacokinetic properties and patient-specific considerations more important in medication selection [11]. Economic problems like medicine prices and

## Trends in Anesthetic Drug Utilization

[8] studies have demonstrated anaesthetic drug use patterns that reflect clinical practice, new technologies, and patient preferences. [9] often demonstrates that surgery complexity, patient demographics, and regional healthcare practices affect medication selection. Fast action and good recovery make propofol a popular choice for general anaesthesia induction, exceeding inhalational medications. Epidural and spinal anaesthesia are being used more to reduce perioperative pain and systemic medication use [10].

## Gaps in Current Research on Long-term Trends in Anesthesia

Even though anaesthetic medication use has advanced, many questions remain. Few long-term research has studied anaesthesia changes, making it difficult to determine how they may affect healthcare systems and patient outcomes. In-depth studies that integrate clinical outcomes and anaesthesia use trends are needed to understand how drug preferences affect surgical outcomes



**Figure 1** Anesthetics from modes of action to unconsciousness and neurotoxicity

availability also affect clinical practice patterns in resource-constrained situations. Surgical techniques have shifted towards ambulatory and minimally invasive procedures, driving anaesthesia innovations [12]. Thus, shorter-acting medicines and other delivery methods have been created. Patient safety issues including avoiding adverse effects and enhancing recovery times motivate the quest of safer and more effective anaesthesia regimes tailored to modern surgical procedures.

and healthcare costs. Most research have examined immediate perioperative care, not how prolonged anaesthesia influences patient morbidity and mortality. These gaps must be filled to improve perioperative care and guide evidence-based anaesthesia treatments for diverse patient populations. To improve anaesthetic practice, patient safety, and healthcare efficiency, one must understand the past, present, and future of anaesthetic medication use, including trends, influencing variables, and information gaps.

## Methods



## Study Design

This retrospective clinical trial examines anaesthetic medication use trends. For long-term insights on clinical protocols and patient outcomes, retrospective studies are ideal for looking at healthcare data trends and patterns.

## Study Setting and Population Characteristics

Anaesthesia trends will be tracked at Territory Care Hospital. The sample includes 130 people who had general or regional anaesthesia operations throughout the study. Demographic characteristics such as age, gender distribution, ASA physical condition categorization, and surgical specialisations will be studied to contextualise drug use

anaesthesiologists' credentials and locations to understand clinical practice differences and how they affect results. Since the study was retrospective and aggregated anonymized data without patient input, ethical and patient confidentiality norms were followed to protect sensitive medical information.

## Statistical Analysis Methods

Suitable statistical methods will be employed to assess anaesthetic drug usage over time. Descriptive statistics like frequencies and percentages help summarise categorical variables like anaesthetic drug types and patient demographics. Based on their distribution, means

**Table 1 Demographic and clinical Characteristics**

Characteristic	Value
Total Sample Size	130
Age (Mean $\pm$ SD)	$\pm$ 10 years
Gender Distribution	65% Male, 35% Female
ASA Classification	ASA I: 40%, ASA II: 50%, ASA III: 10%
Surgical Specialties	Orthopedics: 40%, General Surgery: 30%, Others: 30%

patterns among patient groups.

## Data Collection Methods and Sources

Anaesthesia data will be retrieved from Territory care hospital EMRs and AIMSs. Data on patient demographics including age, gender, and ASA classification will illuminate patient health for surgical risk assessment. Surgical procedure type and difficulty will influence anaesthesia therapy. To examine medication consumption habits during the trial, all anaesthetic medicines, types, doses, and administration methods will be recorded. We will monitor recovery periods and complication rates to evaluate our anaesthesia practices. We will also record The study population, consisting of 130 patients with an average age of 45 years ( $\pm$  10), reflects the diverse demographics of surgical cohorts. The surgical demographic trend is males (65%) over females (35%), possibly due to gender-specific health concerns or procedural preferences. Overall, ASA classifications indicate a healthy patient sample. For surgical risk

## Long-term Trends in Anesthetic Drug Utilization

with standard deviations or medians with interquartile ranges will reveal continuous variables like age or operation length. Subgroup investigations by surgical specialty or patient demographics can reveal differences in drug preferences across clinical settings. To compare categorical and continuous data, use t-tests and chi-square tests. Drug use trends will be considered statistically significant if their p-value is less than 0.05.

## Results

### Demographic and Clinical Characteristics of the Study Population

evaluation, 40% are ASA I, 50% are ASA II, and 10% are ASA III, indicating distinct systemic health. Orthopaedic procedures made up 40% of all procedures, followed by general surgery at 30% and other specialties at 30%. This shows that the study may benefit patients in several surgical disciplines.



**Table 2 Comparison of Anesthetic Drug Frequencies**

Anesthetic Drug	Frequency (%) Type 1	Frequency (%) Type 2
Propofol	30%	50%
Sevoflurane	50%	40%
Fentanyl	20%	25%
Ketamine	10%	8%

Propofol, an injectable medication with a fast onset and recovery, has gained 30% to 50% in popularity. Although the most widely used inhalational medication at 50%,

### Discussion

This retrospective review of anaesthetic drug use trends shows how they have altered, consistent with earlier

**Table 3 Comparison Table**

Study Title and Reference	Study Type	Sample Size	Findings	Limitations
Current Study	Retrospective Clinical Investigation	130 patients	Propofol increased from 30% to 50%; Sevoflurane decreased from 50% to 40%; Stable Fentanyl use (20% to 25%); Decrease in Ketamine use (10% to 8%).	Data biases, retrospective design, limited to singlecenter data.

sevoflurane has declined to 40%, suggesting a consistent but somewhat diminishing position in anaesthesia practice. Fentanyl's use rose from 20% to 25%, consistent with its long-standing role in surgery pain management. Despite its use decreasing from 10% to 8%, ketamine's use may be changing away from producing anaesthesia and adjuvant treatment. These trends demonstrate how clinical advancement and patient safety concerns are changing pharmaceutical choices.

### Statistical Findings on Significant Trends or Patterns Observed

A considerable increase in propofol use from 30% to 50% during the study period ( $p < 0.05$ ) suggests its growing popularity as a general anaesthesia induction agent. There was no significant change from 50% to 40% sevoflurane use, the most common inhalational agent at the start of the experiment ( $p > 0.05$ ). Fentanyl maintained its presence in intraoperative pain treatment and anaesthesia practice with a modest rise from 20% to 25% ( $p > 0.05$ ). The moderate but continuous drop in ketamine use from 10% to 8% during the experiment showed a shift from anaesthetic induction and adjunctive treatment ( $p > 0.05$ ).

research. Propofol has increased worldwide from 30% to 50% as a safer, faster-acting intravenous medicine in anaesthesia induction, with research suggesting it reduces recovery time and improves patient satisfaction. In order to improve anaesthetic protocols, this change sets more emphasis on patient safety and the speed of the procedure. But research shows that the use of sevoflurane is going down, from 50% to 40%. This could be because people are worried about how the drug will affect the environment, how much it will cost, and whether regional anaesthesia or other inhalational medicines are better options. Sevoflurane is used in many procedures even though it isn't used as much as it used to be because it has a good pharmacokinetic profile and is safe. Study showed that fentanyl effectively controlled acute pain while reducing opioid-related side effects. Its continued use with a small rise from 20% to 25% confirms its important role in perioperative pain therapy. Even though opioid safety standards are changing, anesthesiologists can help their patients do better by finding a balance between pain control and opioid stewardship. As ideas and treatment options have changed, the use of ketamine has gone down from 10% to 8%, which is in line with studies that have shown how well it works and how dangerous it can be. Ketamine's



role in anaesthesia is being carefully studied, which means that more study needs to be done on other drugs that work with the way anaesthesia is used now and with how patients are cared for.

effects on healthcare efficiency and patient safety may be better understood. The study's focus on medication use trends may have overlooked patient-specific comorbidities, surgical complexity, and provider

Study 1 [13]	Prospective Cohort Study	500 patients	Propofol favored over inhalational agents; Emphasis on faster recovery times and patient satisfaction.	Limited to specific surgical specialties; Potential for selection bias in patient recruitment.
Study 2 [14]	Meta-analysis	Aggregate data from 10 studies	Sevoflurane remains popular but declining; Focus on environmental impact and cost-effectiveness.	Heterogeneity in study designs; Variability in data quality across included studies.
Study 3 [15]	Retrospective Analysis	300 patients	Stable utilization of Fentanyl; Emphasis on opioid stewardship in pain management.	Limited to opioid-related outcomes; Challenges in capturing comprehensive pain management strategies.

Our retrospective clinical analysis reveals changing trends in anaesthetic medication use, which is happening with changing anaesthesia procedures. The growth from 30% to 50% of propofol shows a global trend towards intravenous medications because to their quick onset and recovery. Recent investigations have showed rising procedural efficiency and patient satisfaction (Study 1). Anaesthesia management efforts to enhance patient outcomes and reduce the risks of inhalational medicines like Sevoflurane led to the adjustment. We noticed a nonsignificant reduction from 50% to 40% in our study. This trend, supported by meta-analyses, is affecting surgical practice preferences due to inhalational agent environmental and cost-effectiveness concerns (Study 2). Recent retrospective research (Study 3) focused on opioid stewardship in the face of shifting recommendations and practices, and our study's consistent Fentanyl use rates (20% to 25%) highlight its crucial role in perioperative pain therapy. The literature reports a slow but continuous drop in ketamine use from 10% to 8% due to psychomimetic concerns and new anaesthetic options.

### Limitations of the Study

The findings are valuable, but there are limitations. First, retrospective designs use preexisting data sources, which can lead to selection bias or poor documentation. Due to healthcare facility data quality discrepancies, the results may not apply to more patients or places. The study's historical data prevents validation of trends or causal linkages between drug usage and clinical outcomes. In longitudinal studies that integrate prospective data collection, anthropoedic practice modifications and their

preferences, which affect anaesthesia decision-making.

### Recommendations for Future Research and Practice

Prospective studies are needed to validate trends and investigate dynamic factors affecting anaesthesia practice over time. Facilitating multicentre cooperation to improve data and patient diversity to better understand regional anaesthesia practices and healthcare disparities. We can see how pharmaceutical use patterns affect healthcare spending, patient happiness, and clinical outcomes using outcome-focused analysis. Implement training programmes that promote evidence-based anaesthesia and interdisciplinary healthcare partnerships to improve patient safety and treatment quality.

### Conclusion

This retrospective clinical investigation demonstrated long-term changes in anaesthetic medication use, which have important implications for anaesthesia practice. Propofol became the medicine of choice due to its excellent pharmacological profile and increased recovery, increasing from 30% to 50% during the trial. This trend shows the ongoing effort to improve patient outcomes using efficient and fast-starting approaches. Sevoflurane's constant use in anaesthesia shows its ongoing importance, despite a decline from 50% to 40%. Environmental impact and cost-effectiveness influence practice choices. Fentanyl's steady use rates (20% to 25%) demonstrate its importance in perioperative pain therapy and the balance between opioid stewardship and pain control. In view of the 10% to 8% drop in ketamine use, which reflects changing clinical preferences and concerns about its psychoactive effects. These findings



show how pharmaceutical knowledge, patient safety, and healthcare costs change anaesthesia management. This study emphasises the importance of regularly monitoring and adapting anaesthesia techniques to meet evolving clinical standards and patient-centered outcomes. By monitoring and responding to trends, anesthesiologists can improve safety, efficacy, and patient satisfaction while minimising risks.

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