



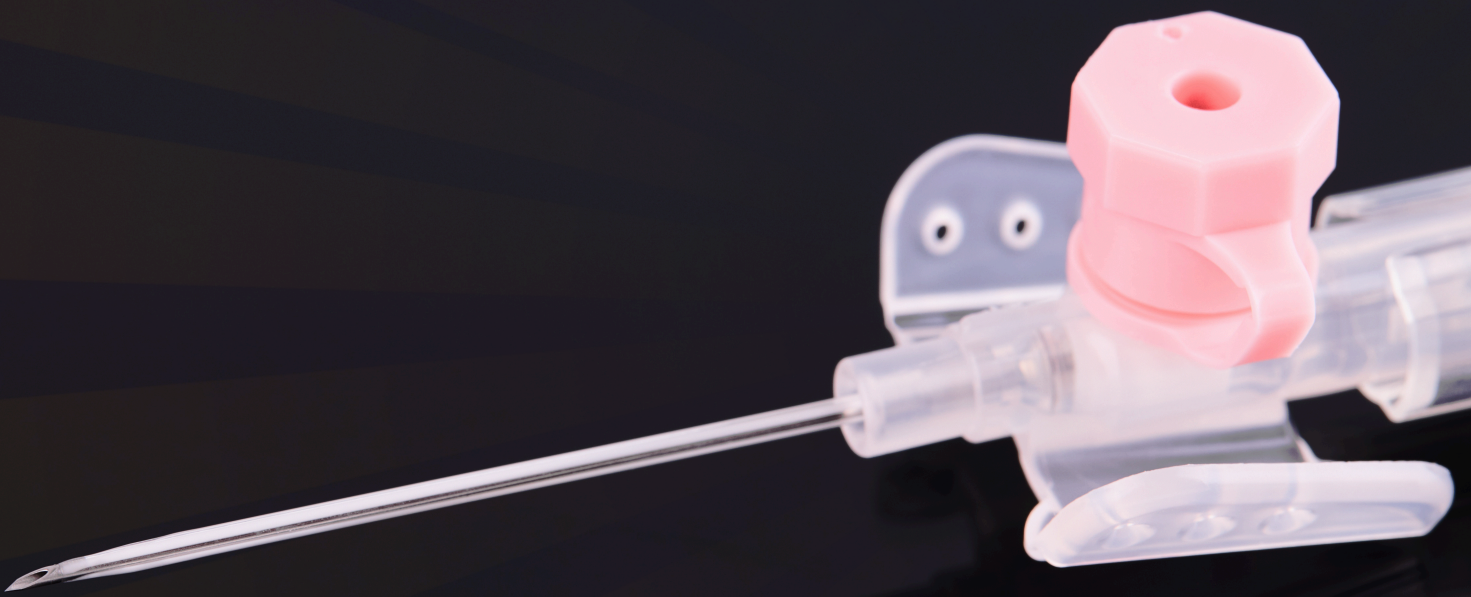
APSA

AIR REPORT ➤

ANAESTHESIA PATIENT SAFETY ASSOCIATION

NEWSLETTER

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In this issue...

There is a particular kind of attention that the very young and the very old demand from us. Not more vigilance — different vigilance. A child is not a small adult. An elderly patient is not simply an older one. The physiology is different, the margins are narrower, and the consequences of getting it wrong are felt more acutely. This edition of the APSA Newsletter is built around that idea. The articles on Paediatric Anaesthesia Safety and Geriatric Perioperative Risk are not checklists. They are an invitation to think differently about the patients at the extremes of age.

We open this edition with something rare and deeply personal. Dr. Sunil Pandya, National Chairman of APSA, takes us back to 1990 and his first month as an anaesthesia postgraduate at Osmania General Hospital, Hyderabad. No pulse oximeters. No guidelines. A mercury manometer, a hand on the pulse, and the kind of fear that nobody talks about but every trainee knows. In three cases spanning a single night duty, he captures what no textbook can: the moment when knowledge meets uncertainty, and the only thing standing between the patient and catastrophe is the person holding the circuit. It is a piece worth reading slowly.

The incident reports this month are many. That, too, is the point.

A difficult airway complicated by the choice of relaxant. In the moments before a failed intubation, every decision upstream matters. The question of one anaesthesiologist managing multiple operating theatres carries real safety implications and deserves the honest conversation this edition attempts to start. An epidural catheter that broke and remained in the patient — a complication that is preventable and manageable, but only if you know what to look for.

Undiagnosed conditions where catastrophic haemorrhage can occur without warning, particularly in the obstetric patient where the stakes are doubled. Positioning and eye injuries, still underreported and still underappreciated. A patient who moved at induction, a moment that catches even experienced anaesthesiologists off guard and one that has more causes than most of us consider.

A retained cap on a circuit. A missed equipment check before the second case of the day. Accidental extubations, desaturations, misconnections — events that happen in the space between routine and complacency. And two reports that sit at the heart of medication safety: unlabelled syringes and miscommunication leading to the wrong drug reaching the wrong patient.

Each incident is shared anonymously. The commentary that follows is not about blame. It is about the only question that matters: what do we do differently next time?

We are deeply grateful to the clinicians who reported these incidents. It takes honesty, and no small amount of courage, to share what went wrong. We thank our reviewers for their careful analysis, and our editorial and creative team for bringing this edition together.

Read it carefully. Discuss it with your team. And remember — the patients who need us most are often the ones who can tell us the least.

Dr Murali Thondebhavi
Project Lead, Anaesthesia Incident Registry



THE MONTH THAT MADE ME AN ANAESTHESIOLOGIST

(Osmania Medical College / Osmania General Hospital, Hyderabad: 1990-1993)

There are months in life... and then there are months that quietly rewire your brain, your instincts, and your respect for mortality.

My first month in anaesthesia was firmly in the second category.

The Era...This was 1990.

Monitoring?...A vigilant hand on the pulse... and a mercury manometer for blood pressure.

IV access?...A hypodermic needle, secured more by hope than by adhesive.

Drugs?...Thiopentone, Suxamethonium, Gallamine, Pentazocine, Promethazine, Metoclopramide....And for the privileged few, Pancuronium & most privileged, Vecuronium!

Spinals?...5% Hyperbaric Xylocaine for "short" cases... 0.5% Hyperbaric Bupivacaine for "long" ones.

Simple decisions. Complex consequences.



Dr Sunil T Pandya

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Lessons
Learned

Case 1: The Policeman Who Nearly Taught Me Too Much

OT-1, Surgery: Varicose vein stripping. ASA 1.

A sturdy traffic policeman, fit, confident, and unknowingly my examiner for the day!

First month postgraduate protocol: Think → Discuss → Get approval → Then act.

Plan cleared: spinal anaesthesia with 5% hyperbaric xylocaine.

Surgeon promised: "20 minutes, supine, then lateral."

IV secured (a brave 20G hypodermic needle), Ringer's Lactate flowing. Spinal given in lateral position, 22G steel needle, autoclaved, (unforgiving!). First attempt success. Confidence +10.

Then entered the surgeon, with a plot twist: "Let's start in prone!!". (An early lesson: surgical time estimates should be interpreted as poetry, not mathematics). Of course. I Called my Assistant Professor. Calm voice: "Wait 10 minutes. Then turn." I waited. I muttered internally. I questioned surgical philosophy. The Turn: Patient turned prone. My hand on the pulse. My eyes on the IV.

And then...

A small swelling at the IV site. A counter puncture. A silent betrayal. Within seconds— Bradycardia. Unresponsiveness. Time didn't slow down. It disappeared. We flipped him supine. No veins visible. None willing. The OT filled instantly, voices, urgency, adrenaline. I was administering 100% oxygen via Mapelson A, Magill's circuit from archaic Boyle's E Anaesthesia Machine... holding on to something that felt like control.

Then, like a scene written by fate, A final year PG appeared, almost theatrically, with a butterfly needle from his pocket. Access obtained, Atropine. Mephentermine....administered. Within 90 seconds, Life returned. Pulse returned. I returned.

Aftermath... Surgery proceeded. Patient did well. But I was no longer the same doctor.

That day I learnt: The distance between routine and catastrophe... is one unsecured IV line....!

That evening, I bought my first personal stash: Venflons. Butterfly needles. Not as equipment, but as insurance against regret.



Case 2: The Man Without a Pulse (Or So I Thought)

The very next day. Adjacent OT-2. Urology. Surgery - TURP.

Spinal with hyperbaric bupivacaine. All smooth. Almost suspiciously smooth. Patient positioned in lithotomy. Vitals stable. He drifted into a peaceful, snoring sleep. I began charting. Feeling... almost confident. Then, instinctively, I checked the pulse. Left radial, nothing. Pause. Right radial, nothing.

My own pulse? Racing at 150!

I called out to the patient. He opened his eyes, mildly annoyed, as if I had interrupted a good nap. No distress. No signs of collapse. Just... irritation. Confusion deepened. Rechecked pulse. Nothing. Then I looked at the BP cuff. Still inflated.

Stuck at 110 mmHg

I exhaled. But wait, why no right radial? Vaguely remembered Davidson and CMDT...absent pulse... Takayasu's ...Stroke!. Rechecked more carefully. There it was. Not where textbooks promised. But sitting quietly in the anatomical snuff box, an aberrant radial artery, mocking my assumptions.



Lesson: In anaesthesia, what you don't find... can be as important as what you do!

And more importantly: Never trust a single data point, especially when you are the monitor.

Epilogue: The Month That Changed Everything

Those two cases, within 48 hours, did what no lecture could.

They erased arrogance.

They installed vigilance.

They introduced humility... permanently.

I went on to read Miller cover to cover that year, not out of academic ambition, but out of respect for what I had almost missed.

“

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Case 3 & 4:**The Posting: First week in Obstetric OT. Government Maternity Hospital, Nayapul, Hyderabad.**

~30 Caesarean sections a day...Night duty meant one thing: If you were competent... you didn't sleep. Somewhere in that ecosystem, I had earned a reputation, First to enter OT. Last to leave. Hovering till every patient stabilised, as if my presence alone could prevent complications.... Partly dedication. Mostly fear!. Honestly, was worried about my cases, waited till spinal anaesthesia in the last patient of mine, regressed....!

Outwardly confident. Internally... one persistent question, Every night, the same quiet anxiety: What if I cannot intubate? What if she doesn't wake up? What if I fail to get spinal... No AIDAA, DAS ASA Guidelines!!

Only pulse, prayer, and preparation.

The Fear Nobody Talks About!

This was a pre-LMA era. Airways were not "managed"... they were conquered!. Magill's red rubber tubes. High pressure, low volume cuffs. No second chances.

11 PM: Cold Dinner, Hot Decisions

We were halfway through a cold, resigned dinner when the call came...

Severe preeclampsia. BP: 190/110 mmHg.

Treatment options (circa 1990): Sublingual nifedipine. Oral nifedipine. No IV labetalol. No fancy infusions.

Departmental gospel: "Severe PE? No regional. Always general anaesthesia."

The First Rebellion, Nine months into training had given me something dangerous *Knowledge* and just enough confidence to misuse it. I knew about: Sympathetic surge during intubation, Extubation response, Risks of intracranial catastrophe. Diagnostics? None at night, except grouping and typing. So I did something quietly radical.

I gave a spinal.

Assistant Professor was informed. Response? Not applause! But questioned annoyingly, Why spinal?! Don't repeat this "mistake!". Message received. Filed... but not obeyed.

Midnight: The Second Rebellion

Another case. Eclampsia. On Pritchard regimen. Groggy... but responsive. I gave spinal again. Surgeons? Delighted. Me? Slightly less terrified of my own decisions.

3 AM: Where Theory Ends!

Then came the real exam. Ruptured ectopic pregnancy... Pale like paper, Tachycardic, Hypotensive, Fragile... in every sense. I informed my Assistant Professor. Instruction came, crisp and distant: "Tell the surgeon to do under local anaesthesia."

The Moment, I looked at the patient. Young. In pain. Clinging to something, life, hope, or just physiology. And something inside me said: Not today!

The Third Rebellion (The One That Matters)...

Two wide-bore IV lines (Had personal stock of Butterfly needles and Venflons). Fluids running. Dopamine started. Ketamine, Suxamethonium, Intubation, clean, decisive, almost instinctive. Surgery began. 20 minutes later, Bleeding controlled. Three units whole blood transfused. She woke up. Smiled.

That smile... was my first real "degree" in anaesthesia.

I didn't inform my professor. Some truths... need daylight.

Morning Round: The Reckoning...

I reported: "Nine cases. Eight Caesareans. One ruptured ectopic."

Surgeons, Ecstatic. My department. Less so!

I had broken protocol. Twice. Maybe thrice.

I was now: A hero in OT...but ... A villain in my department. A rare dual certification!

In Retrospect, Perhaps I was reckless. Perhaps I was lucky. Perhaps I was both. But I now understand:

Protocols protect the many...Judgment saves the one in front of you. And sometimes, history quietly rewrites protocol, one uncomfortable decision at a time.

Aftermath: The Turning Point....That posting changed my trajectory. I stopped reading for exams.....and started reading for patients.

I consumed: Miller, Lee's Synopsis, Wylie, Stoelting, Artusio Q&A, McIntosh ...

Not as textbooks, but as survival manuals....so that protocols can be re-written!

Final Thought

Anaesthesia is not just about drugs, doses, and devices...

It is about: Courage under uncertainty, Calm in chaos, and occasionally...breaking a rule for the right reason.

Learned that, In anaesthesia, experience is not counted in years...but in the nights that changed you."



IN ANAESTHESIA, EXPERIENCE IS
NOT COUNTED IN YEARS...BUT IN
THE NIGHTS THAT CHANGED YOU."

The Unseen Block: A Critical Reminder for Equipment Checks

At the start of the day, my first case was a middle-aged man posted for laparoscopic umbilical hernia repair. After the routine call-out and attachment of standard monitors, I induced anaesthesia with fentanyl and propofol, maintaining a firm mask seal while awaiting capnography to confirm ventilation. Despite repeated attempts and an apparently well-fitted mask, the reservoir bag remained motionless, raising immediate concern. A quick check revealed the cause: the cap on the catheter mount had not been removed, silently preventing effective ventilation.

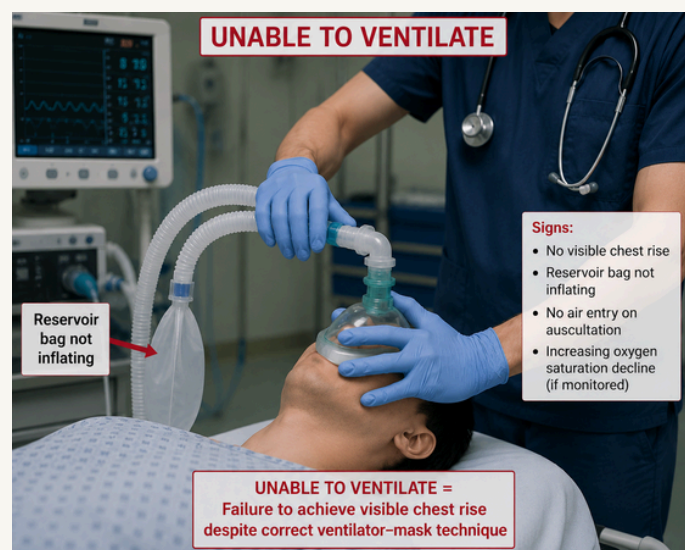
A tragic incident reported in the United Kingdom in 2001 highlighted a major patient-safety concern in anaesthesia practice. Following induction of anaesthesia for a minor surgical procedure in a child, complete airway obstruction occurred because a cap from an intravenous administration set became lodged within the angle piece connecting the circuit and filter to the face mask. As the cap was translucent, it was not readily visible within the coloured plastic angle piece. The resulting hypoxaemia led to the death of a nine-year-old boy (1).

This incident led to the formation of an expert committee on blocked anaesthetic tubing, which concluded that unsafe handling practices, particularly leaving disposable components open in trays containing other equipment, contributed to such events (2). A similar episode was later reported in India, where the cap covering a catheter mount had not been removed and the patient could not be ventilated. Fortunately, in that case, the obstruction was identified before serious harm occurred (3).

Although disposable components are routinely used in anaesthesia and replaced for each patient, their safe use depends on meticulous preparation and checking. In high-turnover areas such as minor operation theatres, time pressure and hurried workflow may increase the likelihood of incomplete equipment checks. In addition, the similarity between the dimensions of protective caps and the internal diameter of breathing circuit components creates a persistent risk of inadvertent obstruction.

The anaesthesia apparatus checkout recommendations clearly state that, although technical staff may assist in equipment preparation, the ultimate responsibility for ensuring proper function of the equipment rests with the anaesthesiologist (4). Therefore, failure to perform a complete check of the breathing system assembly before every case represents a serious lapse in patient safety and may amount to professional negligence.

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Silent Disconnects: Unplanned Extubation and Misconnection in Anaesthesia

During an elective tonsillectomy, the ventilator began alarming for low tidal volumes and leak, with reduced chest rise and a falling end-tidal CO₂. Closer inspection revealed that upward pressure during throat pack insertion had partially dislodged the endotracheal tube, with the tip now lying high in the oropharynx and an audible leak around the cuff. The throat pack was promptly removed, the tube was repositioned under direct laryngoscopy to an appropriate depth, and cuff pressure and fixation were reassessed. Ventilation parameters and gas exchange normalised, and surgery proceeded uneventfully.

Unplanned accidental extubation may occur when a patient intentionally dislodges or removes the endotracheal tube (self-extubation) or when external forces applied during patient movement, transport, or nursing care result in tube displacement (accidental extubation).⁽¹⁾ Such events may arise in the operating room, intensive care unit, emergency department, procedural areas, or during intra- and inter- hospital transport and are associated with considerable morbidity and mortality.⁽¹⁾ Reported risk factors include patient movement, manipulation of the endotracheal tube, inadequate sedation, inadequate tube securement, lack of physical restraints, restlessness or agitation, delirium or confusion, prone positioning, absence of clear policies and procedures related to weaning, lack of a clear plan for extubation, and inadequate staffing.⁽¹⁾ Immediate complications of unplanned extubation include injury to the vocal cords or trachea, hypoxemia, hemodynamic instability, respiratory failure, brain injury, cardiac arrest, and death.⁽¹⁾

Desaturation and misconnection represent related but distinct anaesthesia safety concerns, with misconnection constituting a preventable, equipment-related cause of desaturation.⁽²⁾ Reported errors include accidental connection of a patient to the exhalation valve of a transport ventilator, failure to switch on the ventilator, misconnection of the patient's breathing circuit to the anaesthesia machine, and attempts to ventilate a patient while the ventilator remained in self-test mode.⁽²⁾ Such misconnections have been associated with a spectrum of hypoxemia-related adverse outcomes, including vegetative state and death.⁽²⁾



In the setting of persistent desaturation, immediate management should include hand ventilation with 100% oxygen, application of the COVER mnemonic, and return of the patient to a supine position.⁽³⁾ The COVER mnemonic comprises Colour, Circulation, Capnography; Oxygen; Ventilation and Vaporisers; Endotracheal tube or Equipment; and Review.^{[1][2]} This is followed by the ABCD and A SWIFT CHECK sequence as secondary actions: Airway, Breathing, Circulation, Drugs, Air and Allergy, and a final structured review of the situation, including surgeon awareness, fluid balance, wound site, and temperature.^{[1][2]} Rigorous equipment checks and adherence to standardized crisis-management algorithms remain essential in preventing avoidable complications in anaesthesia practice.⁽³⁾

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The Real Airway Crisis : When Intubation Fails and Oxygenation Matters

A diabetic patient with a short neck, limited neck extension, and a positive palm print sign presented for ERCP under general anaesthesia. After induction, ventilation was initially easy, but direct laryngoscopy revealed a Cormack-Lehane grade 3 view; attempts with a McCoy blade and blind bougie insertion failed to achieve tracheal intubation. Mask ventilation was re-established, and the procedure was abandoned while the team secured the airway with a supraglottic device and prepared for possible front-of-neck access.

In airway management, the principal danger lies not merely in difficulty with tracheal intubation, but in the inability to maintain oxygenation when intubation fails. Anticipated difficult airway scenarios are therefore often most appropriately managed with awake tracheal intubation. However, when airway management is undertaken after induction of anaesthesia, the use of short-acting neuromuscular blocking agents may significantly improve intubating conditions. A critical patient- safety principle is that neuromuscular blockade should never be administered without preparation for failure; adequate preoxygenation, confirmation of ability to ventilate, availability of backup airway devices such as supraglottic airway devices, and a clear front-of-neck access plan must all be established before giving a muscle relaxant.[1,2] Apnoeic oxygenation may additionally be provided using nasal cannulae or high-flow nasal oxygen.[2]

Succinylcholine, a depolarizing neuromuscular blocking agent, has the fastest onset and shortest duration and has traditionally been preferred for rapid tracheal intubation. Rocuronium, when used in higher doses, also provides a rapid onset, although with a longer duration of action. Vecuronium and atracurium or cisatracurium have relatively slower onset times and intermediate durations.[3] Evidence from a Cochrane review further supports the use of neuromuscular blocking agents because avoidance of these agents was associated with a significantly increased risk of difficult tracheal intubation and upper airway discomfort or injury. [4] Sugammadex is recommended to be immediately available when rocuronium or vecuronium is used, as it can rapidly reverse profound neuromuscular blockade; neostigmine, in contrast, is slower and less reliable for reversal of deeper block.[5]

Continuous neuromuscular monitoring using train-of-four assessment, together with bispectral index monitoring and end-tidal anaesthetic concentration monitoring, is desirable to reduce the risk of awareness during paralysis, in addition to standard ASA monitoring. Adequate spontaneous ventilation, sustained head lift, and a train-of-four ratio of at least 0.9 should be ensured before extubation is attempted.[5] In failed intubation or failed oxygenation situations, failure should be declared early, repeated attempts should be limited, and help should be summoned promptly. Oxygenation should be maximized using mask ventilation or a supraglottic airway device while continuing nasal oxygen supplementation. Preparation for front-of-neck access should occur without delay, and once the airway is secured, post-crisis stabilization, detailed documentation, and team debriefing remain essential components of safe anaesthesia practice.[2,6]

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One OT, One Anaesthesiologist: A Policy Imperative

During a busy morning list, one anaesthesiologist was tasked with supervising two adjacent theatres while a stable ASA II patient was left under the immediate care of an anaesthesia technician. During the procedure, the surgeon repositioned the patient's head, inadvertently disconnecting the breathing circuit; at that moment, the technician had briefly stepped outside the operating room. Desaturation developed unnoticed until the anaesthesiologist happened to look into the theatre and saw the saturation drifting down to 88%, prompting immediate reconnection of the circuit and manual ventilation with 100% oxygen. Oxygenation rapidly normalised, and the case proceeded without adverse outcome, but the incident highlighted the risk of split supervision and unsupervised reliance on technicians.

One anaesthesiologist for one operating theatre is not excessive; it is a minimum patient-safety requirement. In 2022, a study published in *JAMA Surgery* demonstrated a 4–14% relative increase in major postoperative complications when one physician covered three to four rooms compared with one to two rooms. [1] Other studies have similarly shown that supervision lapses increase substantially as coverage expands, particularly during first-case starts and other critical portions of anaesthesia care.[2,3]

The implications are profound. When a qualified anaesthesiologist is absent from the operating theatre, even briefly, the risk of delayed recognition of hypoxaemia, airway compromise, haemodynamic collapse, drug error, or equipment failure rises sharply. Induction and emergence are especially vulnerable phases, and simultaneous inductions in multiple rooms by a single clinician create unsafe conditions. The hazard is further amplified when several short cases run in parallel. [3] A 1:1 anaesthesiologist-to-theatre ratio is therefore particularly essential in paediatric patients, emergency or poorly optimised patients, prolonged high-risk surgery, and those with ASA physical status greater than III.



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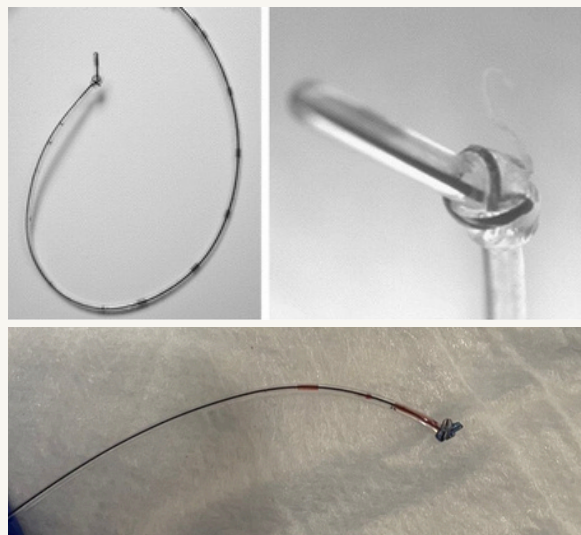
This position is strongly supported by professional and accreditation guidance. The Association of Anaesthetists standards, WHO-WFSA International Standards for a Safe Practice of Anesthesia, ISA practice guidance, and NABH COP.13(e) all reinforce continuous anaesthesiologist presence and appropriate monitored anaesthesia care as core safety expectations.[2,4-6] Continuous monitoring systems and trained assistants add an important layer of protection, but they cannot replace the vigilance, clinical judgment, and immediate intervention of an anaesthesiologist physically present in the operating theatre. Institutions should therefore adopt explicit staffing policies that guarantee one anaesthesiologist per operating theatre as a non-negotiable standard of safe perioperative care.

Beyond the Tip: Managing and Preventing Epidural Catheter Fracture

During epidural catheter removal on the first postoperative day after a caesarean section, resistance was felt as the anaesthesiologist gently pulled with the patient sitting and spine flexed. The catheter suddenly gave way, and inspection revealed only a shortened length with the distal segment missing, though the patient remained asymptomatic. The removal was stopped, the event documented and explained to the patient, and imaging plus neurosurgical consultation were arranged to localise the retained fragment and plan further management.

Epidural catheters are robust devices in routine anaesthesia practice, yet retained catheter fragments remain an uncommon but potentially challenging complication. Risk factors for catheter breakage include excessive depth of insertion, with resultant coiling or kinking, as well as damage related to patient movement or forceful manipulation of a resistant catheter. 1 When catheter breakage is suspected, all traction should be stopped immediately, and the event should be documented and disclosed to the patient. Appropriate imaging, such as MRI, CT, or fluoroscopy depending on catheter type and suspected location, should then be obtained to identify the retained fragment, and consultation with a neurosurgeon or spine surgeon should be sought. If the fragment is located in the subarachnoid space, is associated with cerebrospinal fluid leakage, carries a risk of neurological deficit or infection, or if future anticoagulation is anticipated, surgical removal may be necessary. However, when the retained fragment lies within the paravertebral or soft tissues, the patient remains asymptomatic, and there is no evidence of cerebrospinal fluid leakage, a conservative approach with regular follow-up, with Prevention remains the most important strategy.

Before insertion, the catheter should be visually inspected for manufacturing defects, sharp bends, or kinks. It should not be advanced more than 4–5 cm beyond the needle tip. After placement, the catheter should be secured with a loop and transparent adhesive dressing, and the exit site should be clearly labelled to reduce the risk of accidental traction. Repositioning should be performed with the spine flexed, and the needle and catheter should be moved together rather than independently. 2,3,4 In labouring patients, repositioning or removal should ideally be undertaken between contractions when the patient is more relaxed. 5 If resistance is encountered during removal, excessive force should never be applied. Conservative measures such as the tongue-blade technique may be attempted, and if resistance persists, sedation and fluoroscopic guidance may facilitate safe removal under direct visualization. 2,4



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Unlabelled and Unsafe: Why Syringe Labelling Saves Lives

Tranexamic acid was ordered intraoperatively for ongoing surgical bleeding, and the circulating nurse promptly drew it up and handed the syringe to the anaesthesiologist without any label. Amidst a flurry of tasks, the anaesthesiologist nearly administered it as an induction agent, having confused it with an adjacent, similarly appearing unlabelled syringe. The error was averted only when the anaesthesiologist paused to verbally reconfirm the drug.

Injectable medication administration remains a high-risk component of anaesthesia practice, with syringe misidentification recognised as a major contributor to preventable harm. The continued use of unlabelled or incompletely labeled syringes, particularly when medications are prepared outside the pharmacy or under time pressure, creates repeated opportunities for error in drug selection and dosing. In the fast-paced operating room environment, anaesthesia providers frequently manage multiple syringes of similar appearance, and reliance on memory, syringe position, or “pattern recognition” constitutes a fragile system that is highly vulnerable under stress. Cognitive overload, multitasking, and frequent interruptions further degrade recall and increase the likelihood of medication error. These failures can result in serious clinical consequences, including haemodynamic instability, intra-operative awareness, prolonged neuromuscular blockade, or even mortality, and syringe swaps or misidentification account for a substantial proportion of reported peri-operative medication incidents, with almost half of harmful events arising at the administration stage.

To address these risks, regulatory and professional bodies mandate that all medications prepared for anaesthetic use be labeled immediately with drug name and concentration, and that no syringe should leave a practitioner’s hand until appropriately labeled, encapsulated in the principle of “one drug, one syringe, one label”. Recommended strategies include the systematic use of standardised, colour-coded labels, clear separation of look-alike or sound-alike drugs, and, where available, technologies such as barcode-assisted verification and commercially prepared pre-filled syringes. However, technical solutions cannot replace professional accountability. Sustainable improvement requires a culture of safety in which labelling is non-negotiable, protocol deviations are actively discouraged, and teams are empowered to speak up when unsafe practices are observed, thereby reducing preventable medication harm and improving peri-operative outcomes.[1–3]

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Say It, Hear It, Check It: Closing the Loop on Drug Errors

During induction for an elective laparoscopic cholecystectomy, the anaesthesiologist began pre-oxygenation and noticed the patient becoming unusually drowsy despite no sedative having been administered. A rapid check of the workstation revealed the sevoflurane vaporiser still set at 4%, inadvertently left on after the machine check; the assistant later admitted seeing the dial at that setting but assumed an inhalational induction was intended and did not speak up.

Miscommunication is a major contributor to medication error in anaesthesia, where rapid decision-making, task density and team coordination are critical. Errors may occur at multiple points in the medication-use process—during verbal orders, drug preparation, intraoperative handovers or documentation—and in high-stakes environments such as the operating room, even minor lapses in information transfer can lead to administration of the wrong drug, incorrect dose or inappropriate timing, with potential for serious patient harm.[1] Verbal communication, although ubiquitous, is particularly vulnerable: background noise, similar-sounding drug names, ambiguous abbreviations and hierarchical barriers all increase the risk of misunderstanding.[1,2] For example, a hastily delivered verbal instruction without read-back confirmation significantly increases the likelihood of incorrect drug administration, while poorly structured handovers between anaesthesia providers can result in omission or duplication of medications.[2]

Human factors further compound these vulnerabilities. Fatigue, cognitive overload and time pressure may drive clinicians to rely on implicit understanding and assumptions, especially in teams that work together frequently. However, such unspoken expectations can be hazardous when team composition changes or when situational demands escalate. Addressing these risks requires structured and standardised communication strategies. Closed-loop communication, in which orders are explicitly repeated back and confirmed, has been shown to reduce errors, while the use of unambiguous drug nomenclature, avoidance of unsafe abbreviations and clear, contemporaneous documentation are essential components of safe practice.[1,3] Implementation of checklists and structured handover tools—such as the SBAR (Situation, Background, Assessment, Recommendation) format—has been associated with improved clarity and continuity of perioperative care.[3]

Ultimately, improving medication safety demands both individual vigilance and system-level interventions, including a culture that encourages open communication, flattens hierarchy and supports regular team training.[1-3]

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2. Nanji KC, et al. Evaluation of perioperative medication errors and adverse drug events. *Anesthesiology*. 2016;124(1):25–34.
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The Four Ts and a Ticking Clock: Managing Life-Threatening Obstetric Bleeding

During an emergency caesarean section in a woman with no antenatal diagnosis of placenta previa, a large torrential bleed occurred immediately after uterine incision and the patient rapidly progressed to pulseless collapse. Cardiopulmonary resuscitation was initiated on the table, the trachea was intubated, adrenaline given, and uncrossmatched blood rapidly transfused, with return of spontaneous circulation allowing delivery of the baby, who was transferred to the SNCU.

Catastrophic haemorrhage is a source of profound concern for both surgeons and anaesthesiologists, as it represents a form of exsanguinating blood loss that can prove fatal within minutes if not rapidly controlled. Haemorrhage is estimated to account for approximately 40% of trauma-related deaths and up to 80% of intraoperative deaths, underscoring its critical importance in perioperative care.⁽¹⁾ In obstetric practice, unexpected life-threatening bleeding during or after caesarean section is uncommon but always possible, with important causes including placenta accreta spectrum, uterine atony, caesarean scar rupture, uterine artery pseudoaneurysm and concealed postpartum haemorrhage.⁽²⁾

Postpartum haemorrhage (PPH) remains a leading cause of maternal morbidity and mortality, particularly in the setting of caesarean delivery. Massive PPH is typically defined as blood loss exceeding 2000 ml or more than 30% of the circulating blood volume.⁽³⁾ The aetiology of PPH is frequently conceptualised using the “four Ts”: uterine atony (Tone), retained placental tissue (Tissue), trauma to the genital tract (Trauma) and coagulation disorders (Thrombin).^(3,4) Management of bleeding parturients has two key components: initial resuscitation to restore circulating volume and oxygen delivery, followed by targeted treatment of the underlying cause using conservative, interventional radiological or surgical measures as appropriate.^(2,3)

Perioperative bleeding management more broadly depends on early identification of patients at increased risk, understanding the haemostatic impact of the planned procedure, ensuring timely access to blood and blood products, activating massive transfusion protocols when indicated and incorporating point-of-care coagulation testing into decision-making.^(2,3) Early recognition of catastrophic haemorrhage, coupled with a coordinated, multidisciplinary response involving obstetricians, anaesthesiologists, haematologists and critical care specialists, is essential to optimise maternal outcomes.



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2. Trikha A, Singh PM. Management of major obstetric haemorrhage. Indian J Anaesth. 2018 Sep;62(9):698–703.

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Blinded by Neglect: Preventing Eye Injuries Under Anaesthesia

A healthy 45-year-old ASA I woman underwent bilateral varicose vein ablation under general anaesthesia, with both eyes padded after induction using moist, packed gauze. The intraoperative course was uneventful and she was extubated with adequate respiratory efforts and stable vitals. In the recovery area she complained of burning and irritation in the left eye; examination revealed conjunctival redness consistent with a perioperative ocular surface injury.

The anaesthetised patient remains vulnerable to complications arising from both the actions and omissions of the anaesthesiologist, and perioperative ocular injury is a recognised, though rare, adverse event. The overall reported incidence of eye injury in non-ocular surgery is approximately 0.0056%, with complications ranging from transient mild symptoms to permanent visual loss.⁽¹⁾ Anaesthesia alters normal ocular protective mechanisms, including blink reflex, tear production and eyelid closure, thereby increasing susceptibility to injury. The risk is higher in lateral and prone positions and in procedures involving the face, head and neck, where direct pressure, trauma or chemical exposure are more likely. Documented injuries include corneal abrasion, conjunctivitis, “red eye”, chemical keratopathy, eyelid haematoma, ischaemic optic neuropathy and, in severe cases, blindness.⁽¹⁾

Corneal abrasion is the most frequently reported ocular complication during anaesthesia and, although many ocular injuries are treatable and reversible, postoperative visual loss (POVL) may occasionally occur and can be devastating for the patient.^(1,2) Observational data suggest that POVL is more commonly associated with cardiac and spinal surgery, likely reflecting longer operative times, substantial blood loss and prolonged prone positioning.^(1,2) Visual disturbances following non-ocular surgery are often misattributed to residual sedation or analgesia, which may delay recognition; therefore, a high index of suspicion is critical for early diagnosis and timely management. Simple measures such as careful eyelid taping during general anaesthesia can provide substantial protection against corneal injury. Additional precautions are required in the prone position, including the use of appropriate head supports, foam-based prone pillows and, where available, mirrors or optical devices to allow intermittent confirmation of eye position and freedom from external pressure, with recommended checks at least every 20 minutes.⁽³⁾ Prevention of POVL depends on systematic, collaborative efforts between surgeons and anaesthesiologists to minimise risk factors and prioritise ocular protection throughout the perioperative period.



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Jerks, Gags and Gas: Understanding Movement During Induction

After induction with propofol, bag-mask ventilation was confirmed to be adequate and a neuromuscular blocking agent was prepared for administration. As the drug was being injected, the patient suddenly moved and forcefully withdrew her arm, dislodging the intravenous cannula. Bag-mask ventilation was maintained throughout, a new intravenous line was promptly established in the opposite arm, and tracheal intubation was subsequently completed without further complication.

General anaesthesia is a drug-induced state characterised by loss of consciousness and attenuation of protective reflexes in response to anaesthetic agents. In this state, the patient does not respond to verbal, tactile or noxious stimuli; however, involuntary movement may still occur, particularly during the transition through the early stages of anaesthesia. In 1937, Guedel described the classical stages of anaesthesia, with stage 1 representing the induction phase and stage 2 the “excitement” phase.⁽¹⁾ During stage 2, patients may exhibit limb jerks, restlessness, irregular respiration, coughing, gagging, bucking or even laryngospasm, and the risk of complications is increased because airway reflexes remain relatively intact.⁽¹⁾ Consequently, induction should be conducted smoothly and efficiently to limit the duration of stage 2 and facilitate rapid progression to stage 3, the stage of surgical anaesthesia. Laryngospasm can be minimised by ensuring an adequate depth of anaesthesia, and propofol-based induction is generally preferred because it effectively suppresses laryngeal reflexes.^(1,3)

Involuntary movement during induction may also result from other factors. Irritant volatile agents such as isoflurane or desflurane can provoke breath-holding, coughing or agitation if used for inhalational induction, whereas intravenous agents like etomidate and propofol may cause myoclonus or painful injection, which can manifest as sudden limb movements or facial grimacing in the absence of neuromuscular blockade.^(2,3) Etomidate-induced myoclonus can be attenuated by pre-treatment with benzodiazepines, opioids or dexmedetomidine, while propofol-related myoclonic activity may be reduced using a combination of low-dose ketamine and sevoflurane.^(2,3) Inhalational induction, when required, is best undertaken with non-irritant agents such as sevoflurane to improve patient comfort and reduce airway reactivity.^(2,3) Recognising the physiological basis of movement during induction and applying appropriate prophylactic strategies enables clinicians to improve patient safety, airway control and operating conditions.



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Paediatric Anaesthesia Safety: Key Considerations and Common Pitfalls

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“
A child on the operating table is not a small adult.
”

Introduction

Paediatric patients are physiologically distinct, developmentally vulnerable, and offer narrower margins for error, less predictable pharmacological responses, and a critically short window when complications arise.

The first recorded death under general anaesthesia involved a child, Hannah Greener, a 15-year-old who died in 1848 during chloroform anaesthesia for a toenail procedure.(1)

Early estimates placed anaesthesia mortality in children at two to three times that of adults, with infants under one year at greatest risk.(2)

Today, in healthy patients within well-resourced settings, anaesthesia-related mortality has fallen to approximately 1 in 250,000, one of modern medicine's most dramatic safety achievements.(3)

Systematic audit, transparent adverse event reporting, technological advancement, and a culture of learning from error have driven this progress.

This article reviews the anatomical, physiological, pharmacological, and human factors considerations underpinning safe paediatric anaesthesia practice, and outlines the pitfalls that continue to cause preventable harm.

1. Anatomical & Physiological Considerations

1.1 Airway

The paediatric larynx sits more anteriorly and cephalad than in adults, the epiglottis is disproportionately large and floppy, and the subglottic space is the narrowest point.(4) Even 1 mm of oedema substantially increases resistance, varying with the fourth power of the radius, and can lead to haemodynamic consequences. Appropriately sized equipment is mandatory, and paediatric airway algorithms must guide management.(5)

1.2 Respiratory

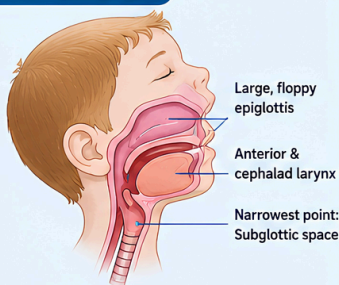
Infant oxygen consumption is approximately 6–8 mL/kg/min, double the adult value, and functional residual capacity is proportionally reduced as per weight, causing desaturation within seconds of apnoea.(6) Age-dependent respiratory rate norms must be familiar to the anaesthetist, as deviation is an early sign of compromise. Apnoea of prematurity must be anticipated postoperatively in ex-preterm infants.

1. Snow J. On Chloroform and Other Anaesthetics. London: John Churchill; 1858.
2. Bhananker SM, Ramamoorthy C, Geiduschek JM, et al. Anesthesia-related cardiac arrest in children: update from the Pediatric Perioperative Cardiac Arrest Registry. *Anesth Analg*. 2007;105(2):344–350.
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1. ANATOMICAL & PHYSIOLOGICAL CONSIDERATIONS

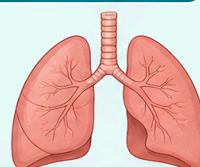
A CHILD IS NOT A SMALL ADULT

1.1 AIRWAY



- Even 1 mm of oedema substantially increases resistance ($\propto$ **fourth power of radius**).
- Can lead to haemodynamic consequences.
- Appropriately sized equipment is mandatory.
- Paediatric airway algorithms must guide management.

1.2 RESPIRATORY

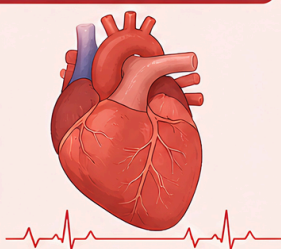


NORMAL RESPIRATORY RATE (BREATHS/MIN)

Neonate (0–1 m)	30–60
Infant (1–12 m)	25–40
Toddler (1–3 y)	20–30
Child (4–8 y)	18–24
Older child (9–12 y)	12–20

- Infant oxygen consumption is $\sim 6\text{--}8 \text{ mL/kg/min}$, double the adult value.
- Functional residual capacity is proportionally reduced, causing **desaturation within seconds of apnoea**.
- Age-dependent respiratory rate norms must be familiar to the anaesthetist—deviation is an **early sign of compromise**.
- Apnoea of prematurity must be anticipated postoperatively in ex-preterm infants.

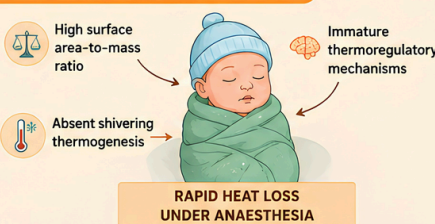
1.3 CARDIOVASCULAR



- Cardiac output in infants is **RATE-DEPENDENT**.
- Immature myocardium has limited capacity to augment stroke volume.
- Bradycardia is common during laryngoscopy, airway instrumentation, and visceral traction.
- Sustained bradycardia is a **HAEMODYNAMIC EMERGENCY**.

ATROPINE MUST BE IMMEDIATELY AVAILABLE AT EVERY PAEDIATRIC INDUCTION.

1.4 THERMOREGULATION



- HYPOTHERMIA LEADS TO:**
- Impaired drug metabolism
 - Prolonged recovery
 - Increased infection risk
 - Precipitation of arrhythmias

PREVENTION IS KEY

- Temperature monitoring
- Warming blankets
- Fluid warmers
- Controlled theatre temperature

1.3 Cardiovascular

Cardiac output in infants is rate-dependent; the immature myocardium has a limited capacity to augment stroke volume. Bradycardia is common during laryngoscopy, airway instrumentation, and visceral traction. Sustained bradycardia is a haemodynamic emergency in this age group. Atropine must be immediately available at every paediatric induction.⁽³⁾

1.4 Thermoregulation

A high surface area-to-mass ratio, immature thermoregulatory mechanisms, and absent shivering thermogenesis make heat loss rapid under anaesthesia. Hypothermia impairs drug metabolism, prolongs recovery, increases infection risk, and precipitates arrhythmias.⁽⁷⁾ Temperature monitoring, warming blankets, fluid warmers, and controlled theatre temperature are mandatory

2. Preoperative Assessment and Preparation

2.1 History and Examination

A focused airway examination must recognise that predictors of difficult intubation differ from adults. Retrognathia, macroglossia, limited mouth opening, and restricted neck extension are particularly relevant. Prior anaesthetic history should include any record of difficult airway, malignant hyperthermia susceptibility, or adverse drug reactions. The child presenting with an upper respiratory tract infection (URTI) poses a specific dilemma. Active URTI doubles the risk of laryngospasm, bronchospasm, and oxygen desaturation under anaesthesia, and the risks remain elevated for up to six weeks after symptom resolution.⁽⁸⁾ The decision to proceed must weigh the severity of the URTI, the urgency of surgery, the nature of the planned airway management, and the experience of the anaesthetic team.

2.2 Fasting

Nil-by-mouth fasting from midnight is not evidence-based and causes dehydration, hypoglycaemia, and distress particularly in infants.

7. Sessler DI. Perioperative thermoregulation and heat balance. *Lancet*. 2016;387(10038):2655–2664

8. von Ungern-Sternberg BS, Boda K, Chambers NA, et al. Risk assessment for respiratory complications in paediatric anaesthesia: a prospective cohort study. *Lancet*. 2010;376(9743):773–783.

Current ASA and ESAIC guidelines permit clear fluids up to 1–2 hours before elective procedures, breast milk up to 4 hours, and formula or light meal up to 6 hours. Emerging ESAIC data suggests even shorter clear fluid fasting intervals may be safe in healthy children. Apply the guidelines; do not default to midnight fasting out of institutional habit. (9)

2.3 Psychological Preparation

Preoperative anxiety in children is associated with increased emergence agitation, greater postoperative pain, and maladaptive behavioural changes persisting weeks after surgery. (10) Child and parental anxiety reinforce one another. A structured preoperative preparation programme including age-appropriate education, distraction techniques, oral or intranasal premedication (midazolam, dexmedetomidine), parental presence at induction, and play-based techniques significantly reduces anxiety and its sequelae and should be regarded as an integral part of perioperative care.

3. Equipment and Drug Considerations

3.1 Equipment

The paediatric anaesthetic workstation requires age- and weight-appropriate equipment prepared and checked before every case. This includes: correctly sized face masks, airways, laryngoscope blades, supraglottic airway devices, and endotracheal tubes (with one size above and below); paediatric breathing circuits with appropriately low dead space, intraosseous access needles, TIVA pumps with validated paediatric pharmacokinetic models, fluid warmers, and ultrasound for vascular access and regional techniques. (11)

Blood pressure cuff size is critical: an oversized cuff underestimates blood pressure, an undersized cuff overestimates it. Pulse oximetry probes designed for adults may not provide reliable readings on small fingers. Equipment checklists must be patient-specific and verified before induction.

3.2 Drug Dosing and Pharmacology

Pharmacokinetics differ substantially by developmental stage: drug distribution volumes, hepatic enzyme maturity, renal clearance, and plasma protein binding all change across the neonatal, infant, and paediatric periods. (12) Dosing references should be weight-based, age-specific, and independently verified for high-risk drugs.

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⚠ MEDICATION SAFETY MATTERS

10-FOLD DOSING ERROR

A small mistake. A huge difference.
Protect our children.



A misplaced decimal point is among the **most dangerous errors** in paediatric anaesthesia.



KEY SAFETY PRACTICES

THE RISK

INTENDED DOSE

✓

0.1 mg/kg

→

10-FOLD DOSE

✗

1.0 mg/kg

A 0 misplaced decimal point can cause **life-threatening overdose**.

INDEPENDENT DOUBLE-CHECKING IS MANDATORY



Double-check high-risk drugs: Neuromuscular blocking agents, Opioids, Vasoactive drugs

PRE-CALCULATED WEIGHT-BASED DOSING CHARTS

WEIGHT (kg)	DRUG X (mg)
5	0.5
10	1.0
15	1.5
20	2.0

Keep dosing charts visible and accessible at every workstation.

USE PRE-DILUTED, STANDARDISED CONCENTRATIONS



Use pre-diluted standardised concentrations wherever possible, not ad hoc preparation.

WHY IT MATTERS



Children are more vulnerable to drug errors.



Small doses. Big impact.



Prevention today, safety for a lifetime.

TAKE-HOME MESSAGE

CHECK TWICE. CALCULATE RIGHT.
SAFE DOSE. SAFE CHILD.



4. Intraoperative Management

4.1 Induction Strategies

Both inhalational (typically sevoflurane) and intravenous induction are appropriate in children, with choice guided by patient factors, parental and child preferences, and clinical context. The transition from halothane to sevoflurane, a less cardiotoxic volatile agent, was associated with a dramatic reduction in medication-related cardiac arrest in the POCA Registry, from 36% to 18% of anaesthesia-related arrests between the registry's two reporting periods.⁽³⁾ TIVA with propofol and remifentanyl is increasingly used; it requires appropriately validated paediatric TCI models.

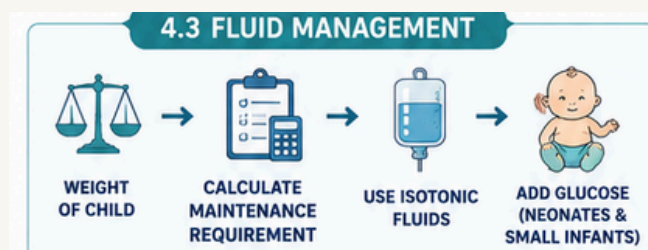
4.2 Monitoring

ASA Standards for Basic Anaesthesia Monitoring, continuous pulse oximetry, capnography for intubated patients, ECG, non-invasive blood pressure, and temperature represent the minimum floor.⁽¹⁴⁾ For high-risk cases and the neonatal population, arterial line for beat-to-beat monitoring or repeated ABGs, central venous access may be required. Near-infrared spectroscopy is increasingly being used to monitor cerebral perfusion in those at risk.

High respiratory rates, small tidal volumes, and partial rebreathing circuit effects can distort capnography waveforms in infants. A normal-appearing ETCO₂ trace does not exclude tube malposition; clinical confirmation - chest rise, auscultation, direct visualisation must accompany waveform interpretation at all times.

4.3 Fluid Management

Maintenance fluid requirements are calculated by weight, with isotonic fluids preferred to avoid hyponatraemia. Glucose-containing solutions may be required in neonates and small infants to prevent hypoglycaemia. Perioperative fluid management in children must also account for third-space losses and insensible losses adjusted for age and surgical exposure.⁽¹⁵⁾



4.4 Blood Loss

Children's circulating blood volume is small, approximately 80 mL/kg in neonates and 70 mL/kg in older children, meaning apparently modest surgical blood loss may represent a haemodynamically significant proportion of total volume. Maximum allowable blood loss must be calculated preoperatively and communicated explicitly to the surgical team, with ongoing intraoperative dialogue maintained throughout. Stored packed red cells carry elevated extracellular potassium, particularly in older or irradiated units and can cause life-threatening hyperkalemia. Rapid transfusion in small patients can precipitate fatal arrhythmias. Use fresh blood where available, wash irradiated units, infuse slowly through a warm line, and maintain continuous ECG monitoring, especially in neonates or infants receiving massive transfusion.⁽³⁾



13. Holdsworth MT, Fichtl RE, Behta M, et al. Incidence and impact of adverse drug events in pediatric inpatients. *Arch Pediatr Adolesc Med.* 2003;157(1):60-65.

14. American Society of Anesthesiologists. Standards for Basic Anesthetic Monitoring. Approved by ASA House of Delegates, last amended October 2015. Available at: www.asahq.org.

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5. Common Pitfalls and Specific Considerations

5.1 Laryngospasm

Laryngospasm is more common in children than adults and is the most frequent cause of anaesthetic respiratory emergencies, occurring in approximately 1–2% of paediatric anaesthetics.⁽¹⁶⁾ Triggers include secretions, airway instrumentation, and light anaesthesia during induction or emergence. Recognition must be immediate; the response must be rehearsed: jaw thrust, 100% oxygen with CPAP, deepening of anaesthesia (propofol 1 mg/kg IV), and succinylcholine (1–2 mg/kg IV or 4 mg/kg IM) for complete obstruction. Notably, none of the laryngospasm-related arrests in the initial POCA Registry had a fatal outcome when appropriately managed.⁽³⁾

5.2 Bronchospasm

Bronchospasm during anaesthesia in children particularly those with asthma or recent URTI manifests as increased airway pressures, wheeze, and oxygen desaturation. Management includes deepening anaesthesia with sevoflurane, salbutamol via metered-dose inhaler through the breathing circuit, intravenous magnesium sulphate, and in refractory cases, ketamine or epinephrine. Identification and avoidance of triggers including latex, cold dry gases, and airway instrumentation under light anaesthesia is preferable.

5.3 Emergence Delirium

Emergence delirium (ED) occurs in 10–80% of children following inhalational anaesthesia, particularly with sevoflurane, and is most common in the 2–6 year age group.⁽¹⁷⁾ It is characterised by inconsolable agitation, crying, and disorientation in the early recovery period, and is distinct from pain. Prevention strategies include propofol at the end of anaesthesia, dexmedetomidine, fentanyl, and midazolam premedication. Parental presence during emergence reduces its incidence. ED is distressing for staff and families and, at its extremes, poses a risk of self-injury.

5.4 Postoperative Apnoea

Ex-preterm infants (born at <37 weeks' gestation, corrected gestational age <60 weeks) are at significant risk of postoperative apnoea following general anaesthesia, up to 12 hours post-procedure.⁽¹⁸⁾ These infants require postoperative monitoring typically overnight regardless of the duration or complexity of surgery. Caffeine citrate administered preoperatively reduces but does not eliminate this risk. Regional anaesthesia, where feasible, may reduce the risk compared to general anaesthesia.

5.5 Medication Errors

Paediatric patients are at substantially greater risk of medication errors than adults a systematic review found that drug errors occur in 5.7% of paediatric medication orders in hospital settings.⁽¹³⁾ Weight-based dosing, unfamiliar concentrations, and time pressure under anaesthesia are compounding factors. Preventive strategies include standardised pre-diluted concentrations, independent double-checking of high-alert medications, the use of smart infusion pumps with paediatric drug libraries, and simulation training in drug preparation.

5.6 Neonates and Premature Infants

Neonates, and particularly ex-preterm infants, represent the highest-risk paediatric subgroup. Physiological immaturity affects every organ system: immature hepatic metabolism, renal concentrating ability, thermoregulatory capacity, and myocardial contractility all narrow the therapeutic window for anaesthetic management. These patients should be managed exclusively by anaesthetists with documented training and competence in neonatal anaesthesia, at centres with appropriate resources.⁽²⁾

5.7 Complex Comorbidities

Children with ASA physical status III or above carry substantially higher perioperative risk. Congenital heart disease, in particular, requires specialist preoperative assessment, an understanding of the underlying haemodynamic lesion and its implications for anaesthetic management, and for complex structural lesions multidisciplinary planning involving paediatric cardiology and cardiac surgery.

16. Mamie C, Habre W, Delhumeau C, et al. Incidence and risk factors of perioperative respiratory adverse events in children undergoing elective surgery. *Paediatr Anaesth*. 2004;14(3):218–224.

17. Sikich N, Lerman J. Development and psychometric evaluation of the pediatric anesthesia emergence delirium scale. *Anesthesiology*. 2004;100(5):1138–1145.

18. Cote CJ, Zaslavsky A, Downes JJ, et al. Postoperative apnea in former preterm infants after inguinal herniorrhaphy. *Anesthesiology*. 1995;82(4):809–822.

5.8 Neurotoxicity in children

The human data to date including the GAS trial and the PANDA study has been reassuring for brief, single exposures in otherwise healthy children. Significant neurodevelopmental differences at school age have not been demonstrated in these populations. The picture is less clear for repeated or prolonged exposures, particularly in the context of underlying illness. The current consensus is one of cautious optimism: avoid unnecessary anaesthesia in very young children; use regional techniques where clinically appropriate to reduce total anaesthetic exposure; keep duration of general anaesthesia as short as clinically feasible; and continue following the evidence as it develops.

5.9 Specialised Care

The evidence that specialised care improves paediatric anaesthesia outcomes is robust. In well-resourced settings, centralisation of complex paediatric cases to specialist centres is strongly advocated.

In India, however, a blanket application of this principle is neither practical nor realistic. Specialist paediatric anaesthesia remains concentrated in tertiary urban centres, while the surgical burden is distributed across a vast and heterogeneous healthcare landscape. To mandate centralisation risks denying timely care to children for whom transfer is neither safe nor feasible.

Anaesthesiologists outside specialist centres must appraise institutional capability against case complexity, ensure adequate equipment and monitoring, and maintain clear referral pathways for cases exceeding local competence. Proceeding with high-risk paediatric cases under local pressure or convenience, without adequate preparation, is inappropriate. The goal in the Indian context is not centralisation at all costs, but elevation of baseline standards everywhere.

5.8 System and Human Errors

A substantial proportion of adverse events in paediatric anaesthesia result from system failures and human factors rather than individual clinical error: failure or attention, communication breakdown at handover, failure to follow protocols, inadequate supervision of trainees, cognitive load under pressure, and production pressure in high-volume environments.⁽¹⁹⁾ Crew Resource Management training, simulation-based education in paediatric emergencies, structured handover protocols, and a non-punitive incident reporting culture are evidence-based mitigations. The parallel with aviation where crew communication failures, not mechanical failures, were identified as the primary cause of crashes has been extensively drawn, and the lessons applied to anaesthesia with measurable effect.

6.0 Future Directions

Converging advances across technology, pharmacology, and education are set to transform paediatric anaesthesia practice. AI-assisted monitoring shows early promise in predicting adverse events before clinical deterioration. Pharmacogenomics may enable individualised dosing, reducing both underdosing and accumulation toxicity. Closed-loop anaesthesia systems titrating depth via processed EEG feedback are under investigation, though validation in young children remains challenging. Point-of-care ultrasound will expand further as equipment miniaturises and training standardises. ERAS protocols and virtual reality-based simulation will continue to refine perioperative care and team preparedness respectively. Underlying all of this, however, is the continued cultivation of safety culture, near-miss reporting, open discussion of error, and treating adverse events as systems failures, which remains the most durable legacy of the anaesthesia safety movement.

6.1 The Infrastructure of Improvement and Quality Assurance

Collaborative quality improvement infrastructure has been transformative in paediatric anaesthesia. The POCA Registry and the Wake-Up Safe initiative aggregate serious adverse event data across institutions. The Pediatric Regional Anesthesia Network (PRAN) has prospectively collected data on over 100,000 regional blocks across 21 centres, providing accurate safety benchmarks and comparison for participating institutions. SmartTots, a collaborative between the FDA and the International Anesthesia Research Society, funds research specifically designed to address neurodevelopmental toxicity questions and establish evidence-based practice guidelines for the youngest patients. In India, the Anaesthesia Patient Safety Association (APSA) has taken early steps toward building a national safety culture, but multicentre registries, systematic adverse event reporting, and collaborative quality improvement initiatives have yet to gain momentum. The gap between what these tools have achieved internationally and what currently exists in the Indian context represents one of the more significant unmet needs in the field, and one where concerted effort from professional bodies, institutions, and individual practitioners could yield substantial returns for patient safety.



PAEDIATRIC ANAESTHESIA SAFETY

COMMON PITFALLS AND SPECIFIC CONSIDERATIONS



SAFE
ANAESTHESIA
DEMAND
CONTINUED
VIGILANCE,
TRAINING,
AND
ADVOCACY

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1 LARYNGOSPASM

- JAW THRUST
- 100% O₂ WITH CPAP
- DEEPEN ANAESTHESIA
PROPOFOL 1 mg/kg IV
- SUCCINYLCHOLINE
1-2 mg/kg IV
or 4 mg/kg IM

2 BRONCHOSPASM

- SALBUTAMOL (MDI VIA CIRCUIT)
- IV MAGNESIUM SULPHATE
- DEEPEN WITH SEVOFLURANE
- KETAMINE OR EPINEPHRINE (IF REFRACTORY)

AVOID TRIGGERS: LATEX, COLD DRY GAS, AIRWAY INSTRUMENTATION (LIGHT ANAESTHESIA)

3 EMERGENCY DELIRIUM

- PROPOFOL AT END
- DEXMEDETOMIDINE
- FENTANYL
- MIDAZOLAM PREMEDICATION
- PARENTAL PRESENCE

4 POSTOPERATIVE APNOEA

- RISK IN EX-PRETERM (<37 WEEKS GA, CORRECTED AGE <60 WEEKS)
- MONITOR UP TO 12 HOURS (OVERNIGHT TYPICALLY)
- CAFFEINE CITRATE PRE-OP
- CONSIDER REGIONAL ANAESTHESIA WHERE FEASIBLE

5 MEDICATION ERRORS

- 0.1 mg/mL
- 1.0 mg/mL
- WEIGHT-BASED DOSING
- STANDARDISED PRE-DILUTED CONCENTRATIONS
- INDEPENDENT DOUBLE CHECK
- SMART INFUSION PUMPS & PAEDIATRIC DRUG LIBRARIES
- SIMULATION TRAINING

6 NEONATES & PREMATURE INFANTS

- PHYSIOLOGICAL IMMATUREITY MULTIPLE SYSTEMS
- MANAGE BY TRAINED ANAESTHETISTS IN CENTRES WITH APPROPRIATE RESOURCES

7 COMPLEX COMORBIDITIES

- HIGHER PERIOPERATIVE RISK (ASA ≥ III)
- CONGENITAL HEART DISEASE
- SPECIALIST PRE-OP ASSESSMENT
- MULTIDISCIPLINARY PLANNING

8 NEUROTOXICITY IN CHILDREN

- HUMAN DATA REASSURING FOR BRIEF, SINGLE EXPOSURES
- AVOID UNNECESSARY ANAESTHESIA IN VERY YOUNG CHILDREN
- USE REGIONAL TECHNIQUES WHERE APPROPRIATE
- KEEP DURATION OF GENERAL ANAESTHESIA AS SHORT AS FEASIBLE
- CONTINUE FOLLOWING THE EVIDENCE



Conclusion

The safety of paediatric anaesthesia has improved dramatically over the past seven decades, from mortality rates of 1 in 1,500 to approaching 1 in 250,000 in well-resourced settings. This progress reflects the combined effect of monitoring advances, pharmacological improvements, evidence-based guideline development, and crucially a cultural shift toward transparent reporting and systematic learning from adverse events. The challenges that remain the disproportionate risk borne by neonates and infants, the irreducible burden of human error, and the stark global disparity in access to safe anaesthesia demand continued vigilance, training, and advocacy. The anaesthetist in the paediatric operating theatre is, above all, the child's advocate. That responsibility is not diminished by progress; it is defined by it.

Geriatric patients in the perioperative period: risk stratification and mitigation

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WHY THIS MATTERS NOW?

The elderly represent the fastest-growing surgical population worldwide, and awareness of age-related physiological changes is essential to provide optimal perioperative care. The geriatric population in India is growing rapidly, with 12% of the population being above 60 years of age (as of October 2025) and is projected to go up to around 230 million by 2036, making up about 15% of our total population.⁽¹⁾ With increasing global life expectancy, the proportion of elderly patients requiring surgery is on the rise. These patients are at a higher risk of postoperative complications like delirium, cognitive dysfunction, and delayed recovery.⁽²⁾ Unlike younger cohorts, geriatric patients exhibit unique physiological vulnerabilities, multimorbidity, and altered pharmacodynamics, making peri-operative management inherently complex. The challenge is not merely to ensure survival but to preserve functional independence, cognitive integrity, and quality of life. Risk stratification and mitigation in this population demand a comprehensive, multidisciplinary, and patient-centered approach. This article explores the key determinants of peri-operative risk in geriatric patients and outlines evidence-based strategies to optimize outcomes.

UNDERSTANDING THE AGING PHYSIOLOGY

Age-related pathophysiological changes which happen over a period of time can be summarised as follows:

1. Decreased end organ reserve
2. Decreased functional capacity
3. Increased imbalance of homeostatic mechanisms
4. Increased incidence of pathologic processes

The functional reserve capacity of all body systems starts declining with advancing age, and is termed 'homeostenosis'.⁽³⁾

Frailty is the Best Predictor:

There is a considerable difference in the age-related changes across organ systems in individual patients and they can vary widely with their chronological and biological age. Chronological age matters less than functional status. It is vital to assess the patient's ability to handle stress (e.g., metabolic equivalents or METS) rather than just their birth year.

Before we move ahead to risk stratification and mitigation, below is a brief summary of physiological changes which occurs in elderly and their implications on anaesthesia in perioperative period.

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TABLE 1: KEY PHYSIOLOGICAL CHANGES IN GERIATRIC PATIENTS RELEVANT TO ANAESTHESIA [4–9]

System	Age-related Change	Perioperative Implication
Cardiovascular	Reduced arterial compliance, impaired baroreflexes, ↓ β-adrenergic response	Increased risk of Hypotension, arrhythmias, myocardial ischemia
Respiratory	↓ Lung elasticity, ↓ chest wall compliance, reduced cough reflex	Increased risk of Hypoxia, atelectasis, pneumonia
Renal	↓ GFR, ↓ renal blood flow	Delayed drug clearance, fluid overload, AKI
CNS	Reduced neurotransmitter reserve, cerebral atrophy	Increased risk of Delirium, postoperative cognitive dysfunction, sensitivity to sedatives
Hepatic	Reduced hepatic blood flow and metabolism	Prolonged drug action
Musculoskeletal	Sarcopenia, osteoporosis, reduced mobility	Increased risk of Falls, delayed rehabilitation
Immune system	Immunosenescence	Increased infection risk

PREOPERATIVE ASSESSMENT:

- Estimate physiological reserve and METS (Metabolic equivalents)
- Assess co-existing diseases
- Optimise comorbidities and adjust concurrent medications
- Risk stratification

THE 2025 ASA FRAMEWORK

The 2025 ASA Practice Advisory emphasizes a broader geriatric-focused preoperative assessment extending beyond conventional ASA physical status grading. The advisory specifically recommends screening for frailty, cognitive impairment, functional status, nutritional health, and psychosocial factors as essential components of every older adult’s preoperative workup.

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FRAILITY ASSESSMENT & COGNITIVE SCREENING

Current evidence suggests frailty predicts perioperative complications and mortality more accurately than chronological age or ASA classification alone. It reflects a state of multisystemic diminished physiologic reserve.

The incidence of frailty is more than 20% in patients aged 80 years and above, 26% of the population over 85 years and 33% over the age of 90 years.⁽¹⁰⁾

The 2025 ASA Advisory strongly supports routine frailty screening for all patients ≥ 65 years.

Validated Frailty Tools

1. Clinical Frailty Scale (CFS) — 1–9 scale
2. Edmonton Frail Scale (EFS)
3. FRAIL Questionnaire (5 domains)
4. Short Physical Performance Battery
5. Fried Frailty Phenotype

Cognitive Screening

The 2025 ASA Advisory recommends screening all patients ≥ 65 years for baseline cognitive impairment, as undiagnosed dementia significantly increases the risk of postoperative delirium and POCD. The following validated instruments are endorsed:

1. Mini-Mental State Examination (MMSE) — sensitive for moderate-to-severe impairment
2. Montreal Cognitive Assessment (MoCA) — preferred for detecting mild cognitive impairment (MCI)
3. Mini-Cog — 3-item recall + clock drawing; rapid and highly predictive
4. Digit Span Test and Trail Making Test — for domain-specific executive function assessment

Frailty Risk Implications

1. 2–5× increased 30-day mortality
2. Higher rates of delirium & POCD
3. Prolonged hospital stay
4. Higher ICU admission rates
5. Risk of non-home discharge

Patients identified with MCI or dementia should be flagged for enhanced monitoring protocols, family/caregiver engagement, and delirium prevention bundles beginning preoperatively.

Functional Status & Prehabilitation

Functional status, measured in metabolic equivalents (METs), correlates strongly with cardiopulmonary reserve and perioperative risk. Structured exercise before elective surgery (prehabilitation) appears to be superior to similar interventions provided after surgery (rehabilitation).⁽¹¹⁾ When prehabilitation is included an exercise component, hospital length of stay was also significantly reduced. Nearly a quarter of the aged are vulnerable to malnutrition, due to decreased appetite, comorbidities, polymedications, metabolic causes and psychosocial issues.⁽¹²⁾

1. Target at least 4 METs preoperatively (e.g., climbing one flight of stairs, brisk walking)
2. Structured prehabilitation programs: 4–6 weeks of aerobic + resistance training
3. Nutritional optimisation — screen with MNA (Mini Nutritional Assessment)⁽¹³⁾ and address malnutrition. Prolonged preoperative fasting should be avoided except in cases with an intraabdominal pathology⁽¹⁴⁾

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2025 ASA ADVISORY & COMPREHENSIVE GERIATRIC ASSESSMENT

Smoking cessation ≥ 4 weeks before surgery reduces pulmonary complications

2025 ASA ADVISORY HIGHLIGHTS²⁵ — PREOPERATIVE CHECKLIST

Screen every patient ≥ 65 for: frailty (CFS or FRAIL), cognitive impairment (MoCA or Mini-Cog), depression (Geriatric Depression Scale), and functional status (METs or SPPB)

Engage multidisciplinary team (geriatrics, pharmacy, PT/OT, nursing, chaplaincy) for high-risk patients

Review and rationalize all CNS-active medications preoperatively (anticholinergics, benzodiazepines, antipsychotics)

Document baseline cognitive function as a reference for postoperative comparison.

Comprehensive Geriatric Assessment (CGA)

15-16

It is a structured, multidimensional evaluation of older adults designed to identify medical, functional, psychological, and social issues that may not be apparent in routine clinical assessment. It is especially valuable in perioperative care, chronic disease management, and frailty assessment.

At its core, CGA goes beyond diagnosing diseases—it focuses on how an elderly patient functions in daily life and how various factors interact to influence outcomes. The assessment is typically conducted by a multidisciplinary team, including physicians, nurses, physiotherapists, and social workers.¹⁵



Key domains of CGA include:¹⁶

Medical assessment: Comorbidities, polypharmacy, nutritional status, sensory impairments

Functional status: Activities of Daily Living (ADLs) and Instrumental ADLs (IADLs)

Cognitive function: Screening for dementia and delirium risk

Psychological status: Depression, anxiety, mood disorders

Social circumstances: Support systems, living conditions, caregiver availability

Frailty assessment: Identifying vulnerability to stressors and adverse outcomes

The ultimate goal of CGA is to develop a **coordinated, individualized care plan** that optimizes health, preserves independence, and reduces complications such as postoperative morbidity, prolonged hospital stay, or institutionalization.

In perioperative practice, CGA helps in **risk stratification, shared decision-making, and tailoring anaesthetic and surgical strategies** to improve outcomes in geriatric patients.

CGA directly informs:

Choice of anaesthesia: Regional vs general based on frailty and cognition

Drug dosing: Reduced requirements due to altered pharmacokinetics/dynamics

Monitoring: Need for invasive monitoring or ICU care

Delirium prevention strategies: Avoiding benzodiazepines, ensuring adequate analgesia

Postoperative planning: Early mobilization, geriatric co-management

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CHOICE OF ANAESTHESIA & INTRAOPERATIVE MANAGEMENT

Choice of Anaesthesia: General vs. Neuraxial

The 2025 ASA Advisory provides a nuanced and updated position: both general and neuraxial anaesthesia are acceptable options for older adults, with no definitive evidence that one technique is superior to the other for reducing postoperative delirium or cognitive decline. This updates older assumptions that neuraxial anaesthesia is uniformly preferable in the elderly.

However, regional and neuraxial techniques continue to offer meaningful advantages when appropriate: reduced systemic opioid use, superior pain control, lower pulmonary complications, and enhanced early mobilisation. Regional anaesthesia with ultrasound guidance is strongly advocated for peripheral nerve blocks given higher success rates and reduced complication risk.(17)

1. Hip fracture surgery: spinal anaesthesia remains a strong option with evidence indicating lower 30-day mortality in some populations(18)
2. Major abdominal surgery: ERAS with epidural or intrathecal morphine + light GA is a validated strategy
3. Opioid-free anaesthesia (OFA): emerging evidence shows benefit on postoperative delirium in recent trials(19)
4. Ultrasound-guided PNBs should be considered in patients with significant comorbidities(17)

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Volatile Agents & MAC Reduction

1. Sevoflurane is preferred over desflurane and isoflurane in elderly patients as it offers smoother haemodynamic profile, and is less pungent
2. Isoflurane and sevoflurane have shown neuroinflammatory and pro-apoptotic effects in animal models
3. Desflurane shows the highest incidence of POCD among volatile agents in comparative network meta-analyses(20)

Total Intravenous Anaesthesia (TIVA) with Propofol

Propofol-based TIVA is an increasingly used alternative to volatile anaesthetics in elderly patients.

1. Reduce induction dose: start at 0.5–1 mg/kg in frail elderly patients
2. Slower induction rates prevent burst suppression — a 2024 RCT (Munich/MGH) demonstrated that slow propofol induction in patients ≥65 years yields EEG signatures closer to younger brains (21)
3. EEG-guided propofol titration reduces burst suppression duration and vasopressor requirements. (22)

Haemodynamic management

1. Maintain MAP within 20% of the patient's baseline (preoperative BP) — not a population-average target
2. Phenylephrine is preferred for vasopressor support when cardiac output is preserved; norepinephrine when CO is reduced
3. Avoid abrupt fluid boluses in patients with diastolic dysfunction — risk of flash pulmonary oedema
4. Goal-directed fluid therapy (GDFT) with stroke volume variation or PPV guidance is endorsed by ERAS protocols for elderly
5. Cerebral oximetry (NIRS) monitoring during high-risk surgery can detect regional desaturation before clinical signs emerge.(23)

NEUROMUSCULAR BLOCKADE, TEMPERATURE & POSITIONING

Neuromuscular blockade

Residual neuromuscular blockade is an important factor to postoperative pulmonary complications in the elderly, where muscle strength is already reduced and ventilatory capacity is poor. Quantitative neuromuscular monitoring (acceleromyography or electromyography) is now the standard of care.(24)

- Cisatracurium is preferred in elderly patients with significant hepatic or renal impairment — eliminated by Hofmann degradation

- Routine use of sugammadex for reversal of rocuronium/vecuronium is recommended over neostigmine in elderly patients

- A train-of-four (TOF) ratio exceeding 0.9 must be confirmed prior to extubation; clinical assessment criteria alone are insufficient to exclude residual blockade.(25)

- The minimum effective dose of neuromuscular blocking agent consistent with satisfactory surgical conditions should be used, with reassessment of block depth at intervals of 15 to 20 minutes

Temperature management

Perioperative hypothermia is associated with significant morbidity in elderly patients. Even mild hypothermia (<36°C) increases bleeding, wound infections, and cardiac events in elderly patient.

1. Forced-air warming blankets initiated before induction — prewarming for ≥ 20 minutes
2. Fluid warmers for all IV fluids administered intraoperatively
3. Core temperature monitoring (oesophageal, nasopharyngeal, or bladder) throughout the case
4. Target core temperature $\geq 36.5^{\circ}\text{C}$ throughout the perioperative period

Positioning care

1. Extra padding at all bony prominences — sacrum, heels, elbows, occiput
2. Avoid forced positioning against resistance; assess joint range of motion preoperatively
3. Use gel pads and foam overlays for cases >2 hours to prevent pressure injuries
4. Bed-to-table transfers require coordinated team approach — use slide boards rather than manual lifts

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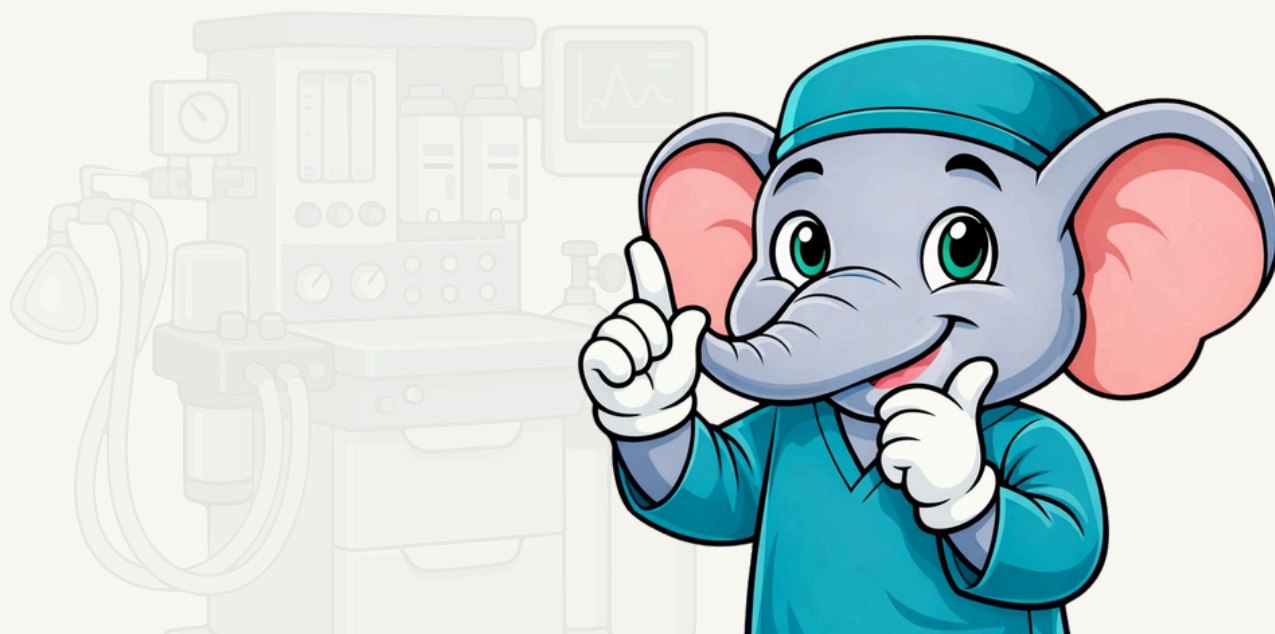
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PHARMACOKINETICS & PHARMACODYNAMICS

TABLE 2: DOSE ADJUSTMENTS OF DRUGS IN ELDERLY

Drugs	Usual adult doses	Suggested dose reduction in elderly	Doses for Elderly patients
Induction agents			
Propofol	Bolus 2-2.5 mg/kg, infusion 100-250 mcg/kg/min	40-50%, 30% in infusion dose	1-2 mg/kg bolus, 50-100 mcg/kg infusion dose
Thiopentone	4-5 mg/kg	50-67%	2-3 mg/kg
Etomidate	0.3-0.4 mg/kg	-	0.2 mg/kg
Ketamine	2 mg/kg	No available literature	0.3-1.5 mg/kg
Midazolam	0.05 mg/kg	50%	0.02 mg/kg
Inhalational agents			
Isoflurane	1.17% - 1 MAC	The MAC decreases by 6% per decade of age more than 40 years. Potency increases by 6% per decade after 40 years	
Sevoflurane	1.8% - 1 MAC		
Desflurane	6.6% - 1 MAC		
Halothane	0.7 - 1 MAC		
Opioids			
Morphine	0.1-0.2 mg/kg	50%	0.05-0.1 mg/kg
Fentanyl	1-2 mcg/kg for short term analgesia	50%	0.5-1 mcg/kg
Remifentanil	0.5-1 mcg/kg Infusion 0.25-0.5 mcg/kg/min	50%- as bolus 33%- infusion	0.25 mcg/kg bolus 0.05-0.2 mcg/kg/min
Neuromuscular blockers			
Vecuronium	0.1-0.15 mg/kg	30%	0.01-0.04 mg/kg
Rocuronium	0.6 mg/kg	-	0.05-0.4 mg/kg



The ACS/AGS Best Practices Guidelines for the Optimal Preoperative Assessment of the Geriatric Surgical Patients recommended that whenever possible, nonessential medications should be discontinued perioperatively and the addition of new medications should be kept to a minimum. (16)

INTRA-OPERATIVE EEG MONITORING

Processed EEG monitoring has evolved beyond awareness prevention and is increasingly used for individualized anaesthetic titration and perioperative neurocognitive protection.

EEG changes in the aging brain

- Lower frontal alpha-band power, ↓ spectral edge frequency
- Burst suppression is a marker of excessive neural suppression → increases POD risk More prone to burst suppression at low anaesthetic doses
- Occurs at lower MAC than younger patients

A 2025 meta-analysis showed that p-EEG guided general anaesthesia reduced POD incidence (26)

- Target BIS 40–60 (or equivalent)
- Avoid burst suppression (BSR > 0)
- Slow induction (propofol 75–100 mg/min)
- Technique matters → not just hitting BIS targets (ENGAGES insight)(27)
- Consider adding NIRS (rSO₂) for high-risk cases



ERAS in geriatrics

ERAS protocols target key perioperative concerns in older adults, including nutritional optimisation, opioid reduction, early mobilisation, and coordinated multidisciplinary care.(28)

- Preoperative carbohydrate loading (12.5% glucose solution 400 mL, 2 hours before surgery) — safe in non-diabetic elderly
- Goal-directed fluid therapy with colloid/crystalloid ratios adjusted for cardiac function
- Patient blood management: restrictive transfusion strategy (Hb trigger <8 g/dL) with iron supplementation
- Multimodal analgesia to minimize opioid use — epidural, intrathecal morphine, regional blocks
- Early mobilisation: day of surgery or POD1 in most ERAS protocols — requires PT/OT engagement
- Early oral feeding and nutrition support — malnutrition doubles complication risk

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2025 ASA ADVISORY

The 2025 ASA Practice Advisory for Perioperative Care of Older Adults

Key Recommendations:

1. Frailty + cognitive screening is now mandatory for all patients aged 65 and above undergoing inpatient surgery
2. Dexmedetomidine endorsed for delirium prophylaxis in selected high-risk patients
3. Benzodiazepines: avoid perioperatively as they raise delirium risk substantially
4. Multidisciplinary team (geriatrics, pharmacy, PT/OT) should be engaged for high-risk patients
5. Processed EEG monitoring recommended to guide anaesthetic depth
6. Regional anaesthesia preferred where feasible to reduce systemic opioid exposure
7. Prehabilitation programs recommended for elective surgery in frail patients
8. Advance care planning discussions should occur preoperatively
9. Postoperative cognitive screening at discharge and follow-up

CONCLUSION

As the surgical population continues to age, anaesthesia for the geriatric patient is among the most clinically demanding endeavors in modern perioperative medicine.

Geriatric anaesthesia is not merely about doing less - it is about doing more thoughtfully, more precisely, and with a deeper understanding of what aging means for every system, every drug, and every moment under our care.

KEY TAKEAWAYS:

1. Frailty predicts outcomes better than chronological age
2. Comprehensive Geriatric Assessment should be standard for all elderly surgical patients
3. Multimodal, opioid-sparing analgesia reduces delirium
4. EEG-guided anaesthesia helps prevent burst suppression and cognitive injury
5. ERAS protocols improve recovery and reduce complications
6. Regional anaesthesia offers significant advantages in this population
7. Multidisciplinary collaboration is essential for optimal outcomes
8. The 2025 ASA Advisory provides a framework for evidence-based geriatric perioperative care

APSA



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THANK YOU

ADVANCING SCIENCE THROUGH PEER REVIEW

Behind every high-quality publication is a reviewer who cares enough to make it better. Peer review remains the cornerstone of scientific excellence and academic integrity. The thoughtful evaluations, constructive feedback, and unwavering dedication of our reviewers play an indispensable role in strengthening the quality, credibility, and impact of our publication.

Your expertise not only refines individual manuscripts but also advances evidence-based practice, encourages meaningful scientific dialogue, and contributes to safer patient care and better clinical outcomes.

We deeply value the time, effort, and professionalism you devote to this process despite demanding clinical, academic, and personal commitments. Your contributions continue to inspire a culture of learning, collaboration, and excellence within our specialty.

On behalf of the editorial team, we extend our sincere gratitude to each reviewer for your invaluable support, insight, and commitment to advancing science through peer review.

Thank you for being an integral part of our journey.

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APSA AMBASSADORS

Driving Patient Safety Through Shared Insights

Every movement needs its energy, and ours comes from a remarkable team of early-career anaesthesiologists spread across the length and breadth of India.

When we put out the call, we were genuinely moved by the response. These are busy clinicians — residents, junior consultants, early-career specialists — who chose to raise their hands and say, *"Patient safety matters to me, and I want to do something about it."* That means a lot.

Our APSA Ambassadors are rooted in their own institutions and communities, yet united by a shared purpose — making anaesthesia safer for every patient. They will engage with peers through academic forums, social media, awareness campaigns and community outreach. They will be writing, presenting, debating, and most importantly, having real conversations about why safety culture matters in our specialty.

They are not just representatives — they are change-makers. And they are already making a difference simply by choosing to be here.

We are proud of this team. Not just for what they will do, but for who they already are — thoughtful, driven young doctors who understand that great anaesthesia is not only about skill, but about systems, awareness, and accountability.

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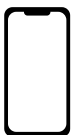


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