

Consensus statement on anaesthesia for day care surgeries

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ABSTRACT

The primary aim of day-care surgery units is to allow for early recovery of the patients so that they can return to their familiar 'home' environment; the management hence should be focused towards achieving these ends. The benefits could include a possible reduction in the risk of thromboembolism and hospital-acquired infections. Furthermore, day-care surgery is believed to reduce the average unit cost of treatment by up to 70% as compared to inpatient surgery. With more than 20% of the world's disease burden, India only has 6% of the world's hospital beds. Hence, there is an immense opportunity for expansion in day-care surgery in India to ensure faster and safer, cost-effective patient turnover. For this to happen, there is a need of change in the mindset of all concerned clinicians, surgeons, anaesthesiologists and even the patients. A group of nine senior consultants from various parts of India, a mix of private and government anaesthesiologists, assembled in Mumbai and deliberated and discussed on the various aspects of day-care surgery. They formulated a consensus statement, the first of its kind in the Indian scenario, which can act as a guidance and tool for day-care anaesthesia in India. The statements are derived from the available published evidence in peer-reviewed literature including guidelines of several bodies such as the American Society of Anesthesiologists, British Association of Day Surgery and International Association of Ambulatory Surgery. The authors also offer interpretive comments wherever such evidence is inadequate or contradictory.

Key words: Ambulatory surgical procedures, anaesthesia, day care, early ambulation, pain management, patient discharge, post-operative nausea and vomiting

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INTRODUCTION

Over the past three decades, day surgery rates have steadily increased in many countries across the world. The benefits of day-care surgery have been increasingly perceived by the medical professionals, health policymakers, healthcare providers and patients. The process has been facilitated by developments in medical technology, surgical skills, advent of new anaesthetic agents and techniques and improved methods of analgesia.^[1]

Indeed, the development of anaesthesia, in terms of improved technology, discovery of better anaesthetic

agents, acute pain management, as well as advances in monitoring, training, evaluation of patients and the evolution of perioperative care, are the main reasons for the safety in anaesthesia for day-care surgeries.^[1] The introduction of minimally invasive

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surgical techniques that result in less tissue damage and post-operative pain, along with economic factors and patient preferences, has provided additional impetus to the popularity of day-care surgery.^[2]

In day-care surgery units, patients receive treatment that is better suited and focused to their needs, allowing them to return home on the day of surgery and recover in a familiar home environment, which is especially important at the extremes of ages. Scheduling may be easier as chances of cancellation of surgery due to non-availability of indoor beds are reduced with dedicated day surgical units. It is cost-effective compared with inpatient surgery as hospitalisation time is reduced and night and weekend staffing is not required. The average unit cost can be reduced by up to 70% as compared to inpatient surgery [Figure 1].^[1]

Day-care surgery as a concept has been well established in developed countries but still in its infancy in developing countries such as India. Results of a survey conducted across 19 countries in 2006 showed an extremely wide variation in the percentage of day cases among countries, with <10% in Poland and over 80% in the United States and Canada.^[3] Despite bearing 20% of the world's disease burden, India only has 6% of the world's hospital beds. Hospital beds per 1000 population in India are <50% of that in developing countries such as Brazil and China and <35% of the world's average.^[4] With a population of 1.2 billion and recent huge expansion in the private sector, there is an immense opportunity for expansion in day-care surgery in India.^[5]

The consensus statement is largely based on the available literature on the subject as well inputs

of the experts. In addition, a small-scale sample survey provided credible information from amongst 250 randomly selected anaesthesiologists involved in day-care anaesthesia services in corporate, government as well as teaching institutions from the database of an organisation representing more than 900 such members from all over India. E-mails were sent through Google Forms, which is a free-to-use system for conducting online surveys. The respondents were approached only once through e-mails, and responses were automatically analysed by Google Forms to generate a report. A total of 162 responses (response rate: 64%) were received. A survey questionnaire [stated in Annexure 1] was framed by the author group taking into account their personal clinical experience in day-care anaesthesia. The questions covered topics such as the current practice of day-care surgery, patient selection criteria, anaesthetic techniques used, post-operative care and discharge criteria/protocols, post-discharge monitoring, criteria for readmission, infrastructure required and the future of day-care surgery in India. The survey results are mentioned at appropriate places in this article.

DEFINITION OF DAY-CARE SURGERY AND PRE-OPERATIVE REQUIREMENTS

The term 'day-care surgery', or 'ambulatory surgery', refers to the practice of admitting, on the day of surgery, carefully selected and prepared patients for a planned, non-emergency surgical procedure and their discharge within 24 h of that surgery [Table 1].^[3] In our survey, about 71% agreed to the definition of overnight stay and the rest agreed upon the definition of the same day discharge for day-care surgery.

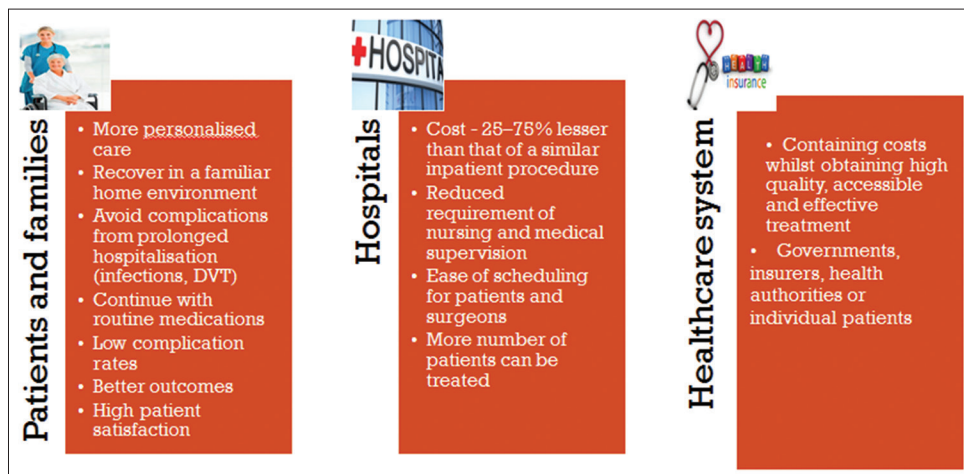


Figure 1: Potential benefits of day-care surgeries

Table 1: Internationally agreed terminology, abbreviations and definitions as proposed by the International Association for Ambulatory Surgery (© World Health Organization 2007)

Terminology	Synonyms and definitions
DS	AS, same-day surgery, day only
Extended recovery	23 h, overnight stay, single night Treatments requiring an overnight stay before discharge
Short stay	Treatments requiring 24-72 h in hospital before discharge
Office-based surgery	An operation or procedure carried out in a medical surgery/office or practitioner's professional premises, which provide appropriately designed, equipped service room(s) for its safe performance

DS – Day surgery; AS – Ambulatory surgery

Day-care surgery covers a wide spectrum of surgical procedures, embracing all surgical specialities, from operations under local anaesthesia to major ones under general anaesthesia (GA). The examples of advanced procedures successfully carried out in ambulatory setting include major laparoscopic gastrointestinal surgeries such as cholecystectomy, fundoplication, gastric banding (for obese), major gynaecological laparoscopic procedures including hysterectomies, breast cancer surgeries, cruciate ligament repairs, major plastic surgeries such as breast reduction, liposuction, paediatric and urologic surgeries.^[4]

In the United Kingdom, the British Association of Day Surgery Directory of Procedures provides a list of all surgeries appropriate for day-care surgery.^[6] In our survey, majority agreed that some of the most common procedures performed as day surgeries are laparoscopic surgeries, tonsillectomies and breast reduction procedures. We recommend the following principles to decide on day-care surgery and maximise the benefits and minimise complications:^[6]

- The procedure planned should carry minimal risk of major post-operative complications needing immediate intervention (haemorrhage, cardiovascular instability). Some urgent procedures such as drainage of abscesses and some trauma surgeries, etc., can benefit the patients if taken up as day-care cases
- There should be no requirement of prolonged specialist post-operative care or observation
- Abdominal and thoracic cavities should only be opened with minimally invasive techniques
- Post-operative pain is amenable to oral analgesics with or without regional anaesthetic techniques
- Rapid resumption of normal functions such as oral nutrition, early and safe mobilisation should be possible

- Anaesthesia-related side effects delaying discharge must be minimal (post-operative nausea, vomiting (PONV), drowsiness, urinary retention, etc.).

After surgery under GA, patients should have a responsible adult to accompany them home and remain with them for 24 h after surgery (it will not include patients living alone and not assured of presence of responsible attendant).

Geographical proximity to hospital is desirable; a travelling time >1 h is often a contraindication for certain procedures (e.g., day-case tonsillectomy) in some countries.^[6] Access to a telephone is generally not considered a problem these days as the teledensity in India has crossed 80%.^[7] Telephonic contact with patients can be done not only for post-operative follow-up but also for pre-operative interview and to avoid cancellations of scheduled surgeries. Apart from these safe practice standards, criteria based on regional or socio-economic needs should be considered, for example, sanitation facilities, overcrowding at home, etc.

Infrastructure required for day-care surgery

It is desirable to have a separate group or subgroup for day-care surgery with its own administrative infrastructure to manage patient flows and scheduling. There should be dedicated surgical and anaesthesiology consultants, dedicated staff and operation theatres or a separate free-standing day surgery facility.^[8]

In our survey, 70% of the anaesthesiologists felt that the infrastructure required for day-care surgery is different from that required for routine inpatient procedures. Overall, 77% reported that there is no dedicated setup for day-care surgeries in their hospitals and 94% said there were no dedicated anaesthesiologists for day-care surgery. Up to 90% of the anaesthesiologists also said that their setup does not have any patient information booklet related to day-care surgery. About 80% opined that infrastructural modifications in the form of operation theatre and recovery room reorganisation are imperative for day-care surgeries to take place.

PRE-OPERATIVE EVALUATION IN DAY-CARE SURGERY

Success of outcomes after day-care surgery depends on adequate pre-operative preparation. Final selection of patients shall be after thorough pre-operative assessment and optimisation of any medical risk factor.

Goals of pre-anaesthetic evaluation

- Create a rapport with the patients and their families and allay their anxiety
- Reduce the morbidity of surgery
- Reduce surgical delays and case cancellations and
- Decrease the cost of pre-operative care.

We recommend the following approaches to pre-operative evaluation:

- The patient should be healthy (American Society of Anesthesiologists [ASA] Physical Status Class 1); and as such chronic diseases such as asthma, diabetes, hypertension or epilepsy should have been well controlled^[9]
- Physiological status and fitness should be considered rather than arbitrary age limits (other than infants who were born prematurely and are within 60-week post-gestational age). Age >80 years is considered an indicator of increased perioperative risk^[10,11]
- Body mass index (BMI) or weight should not be the sole determinant of patient selection for ambulatory surgery. Patients with BMI ≤ 40 kg/m² may be appropriate candidates for outpatient surgery as long as comorbid conditions are well controlled. The super obese patients (BMI ≥ 50 kg/m²) are at higher risk of perioperative complications, hence there must be caution when selecting them for outpatient surgery. Those with BMI between 40 and 50 kg/m² are in a relatively grey zone and should be considered on a case-to-case basis. They should be thoroughly assessed preoperatively for identifying obesity-related comorbid conditions and should be considered for day-care surgery once their comorbid conditions are optimised and an anaesthetic plan has been designed that minimises potential complications^[12]
- Patients with a known diagnosis of obstructive sleep apnoea who are typically prescribed positive airway pressure (PAP) therapy may be considered for ambulatory surgery if their comorbid medical conditions are optimised and they are able to use a PAP device in the post-operative period^[13]
- While considering diabetic patients for ambulatory surgery, it is important to assess the stability of the disease and understanding of the patients regarding control of their own diabetic state.

In our survey, 65% responded that the most important criterion for patient selection for day-care surgery was the duration of surgery, parameters next in importance were the clinical status and comorbidities, and that surgery up to 2 h can be considered for day-care surgery. All the respondents were of the view that obese patients present a challenge for day cases. When asked what would be the cut-off limits of BMI, 52% felt BMI < 30 kg/m² would be appropriate to include as day cases while 48% felt that even BMI of 30–40 kg/m² would be appropriate for day cases in selected cases. As for the cut-off limits of age, majority (88%) felt that 1 year of age should be the lower limit of age, while for upper age limit, the opinion was divided – 49% felt it should be up to 70 years while 46% felt it should be up to 60 years of age. Only 5% believed that stable and well-preserved patients up to 80 years of age may be considered.

ANAESTHETIC TECHNIQUES FOR DAY-CARE SURGERY

Anaesthesia for day-care surgeries has evolved primarily as a result of safe perioperative care, multimodal pain control, aggressive treatment of PONV and from a variety of socio-economic factors.^[2]

Anaesthesia as a field had to also keep pace with changes and innovations in surgical techniques, contributing to increasing number of operations conducted on an ambulatory basis, whether outside of the operating room in a hospital facility, a freestanding ‘ambulatory surgical centre’ or a physician’s office.^[2]

Major advances have shaped the practice of anaesthesia in modern day-care surgeries.^[2] These include introduction of propofol, which offered rapid onset and recovery, reliable hypnosis and antiemetic properties and the development of halogenated inhalational agents which allowed rapid induction and emergence from GA, reduced incidence of PONV and excretion independent of liver and kidneys. Desirable properties of new volatile agents include minimal or no biotransformation, low solubility in blood and tissues, minimal cardiorespiratory depression and the ability to offer coronary and cerebral protection. Newer local anaesthetics (LAs) for regional anaesthesia have been developed with chlorprocaine, lignocaine, mepivacaine, bupivacaine and ropivacaine, offering favourable options in onset and duration of action. In addition to regional anaesthesia, infiltration of the

surgical wound with LA agents and non-steroidal anti-inflammatory drugs (NSAIDs) (when not contraindicated) have been found to be very useful in multimodal approach to post-operative pain control.

The ASA standards for anaesthetic monitoring have been widely adopted in almost all countries, including India. The combined routine use of pulse oximetry and capnography has helped reduce common anaesthesia mishaps by over 90%.

CURRENT CONCEPTS IN ANAESTHESIA FOR DAY-CARE SURGERIES

The choice of anaesthetic technique can have a significant effect on post-operative recovery and discharge. Although GA is commonly used in the ambulatory setting, there is also an increased emphasis on regional anaesthesia and monitored anaesthesia care (MAC). Pre-emptive and multimodal analgesia, as well as antiemetic therapy to reduce individual drug side effects and PONV have additionally improved the quality of recovery. Greater emphasis has been placed on outcome measurement and safety, patient satisfaction, cost-effectiveness and efficiency and improved access and convenience for the surgeon and the patient.^[14]

Preoperatively, usage of specific drugs for sedation, amnesia and anxiolysis is not associated with clinically significant delay in recovery times even after short ambulatory procedures.^[15] This was also corroborated in a Cochrane review which concluded that there was no difference in time to discharge from hospital, assessed by clinical criteria, in patients undergoing day-care surgery who received anxiolytic pre-medication.^[16] However, recent evidence shows that the use of anxiolytic-sedative agents may have a negative impact on the perioperative experience. Hence, it has been argued that they should be used in a minority of patients, and only when absolutely necessary.^[17]

The anaesthetic techniques chosen should have minimum stress and provide maximum comfort to patient in addition to minimal residual effects.^[6]

It should have rapid onset and offset, early return of cognition and minimal PONV, dizziness or drowsiness.^[6]

While these are properties desirable for all anaesthetic techniques, they are particularly important in the

day surgery patients due to the requirement for rapid return to oral nutrition, mobilisation and full cognitive function.^[6]

OPTIONS FOR ANAESTHESIA FOR DAY-CARE SURGERY

General anaesthesia

Total intravenous anaesthesia

Total intravenous anaesthesia (TIVA) techniques are increasingly being used in ambulatory settings.

Administration of TIVA offers the following key advantages:

- It does not require an anaesthesia machine and scavenging equipment^[18]
- It is associated with lower incidence of PONV^[18]
- Avoids the risk of malignant hyperthermia^[18]
- Provides rapid recovery without agitation.^[4]

Despite its advantages, TIVA has some limitations when compared with inhaled agents:^[18]

- TIVA lacks the muscle relaxant effects of inhaled anaesthesia
- In contrast to inhaled anaesthesia where the end-tidal concentrations can be used for prevention of recall, bispectral index (BIS) monitoring is recommended during TIVA.

The standard TIVA protocol consists of administration of propofol with or without remifentanyl. Propofol and remifentanyl have synergistic effect when used in combination allowing for reduction in doses of both drugs for the targeted effect. This also allows better haemodynamic stability and earlier recovery from anaesthesia. The infusion rates of either or both can be adjusted according to the degree of surgical stimulation and clinical responses. Complexity of drug pharmacokinetics, rapid and accurate achievement of a constant drug concentration at the effect site i.e., the central nervous system, is not feasible when TIVA is performed using manually controlled infusion devices. Thus, TIVA techniques using conventional infusion pumps can be challenging and may be considered empirical.^[18] Besides, remifentanyl is not available in Indian market currently. TIVA, when used for short surgical procedures and for ENT and ophthalmic surgeries in children, is associated with a rapid recovery time, no agitation or other behavioural disorders, even after prolonged infusion.^[15] Low-dose ketamine/dexmedetomidine can be used as adjuvants to day-care anaesthesia for appropriate patients, but we

feel potential side effects such as emergence delirium or delay in recovery must be considered before using these agents. In our survey, 40% of the respondents preferred GA with TIVA as the anaesthetic technique of choice.

Inhalational agents

Inhalational agents have been popular in anaesthesia care and this has been further augmented with the introduction of sevoflurane, desflurane and isoflurane. These agents carry better induction and recovery profiles with improved margins of safety.^[19] It is possible to monitor depth of anaesthesia based on their end-tidal concentration (there is no 'practical' equivalent in TIVA).^[4]

There is a lack of evidence, however, regarding superiority of a specific GA technique (e.g., inhaled versus TIVA) with respect to discharge after ambulatory surgery.^[20] In our survey, 37% opined that they prefer GA to inhalational agents.

SEVOFLURANE

The low blood–gas partition coefficient (0.69) and blood–brain coefficient (1.7) of sevoflurane promote rapid induction and rapid recovery as compared to older agents. Sevoflurane is an agent of choice in patients with chronic obstructive airway disease and bronchial asthma because of the marked bronchodilatation it produces.^[19] It compares favourably with other agents in regard to reduction in peripheral vascular resistance in a dose-dependent manner. Halothane, with its obvious limitations related to myocardial depression and arrhythmogenicity, is used in very few centres in India and is replaced by sevoflurane in many, with its better pharmacokinetic and pharmacodynamics profile for mask induction and maintenance of anaesthesia.

USE OF VITAL CAPACITY INDUCTION IN DAY-CARE SURGERIES

Vital capacity induction with inhalational agents has been used in day-care anaesthesia and found to be more effective than TIVA.^[21] Vital capacity induction with sevoflurane produces a faster loss of consciousness and the side effects, recovery times and patient satisfaction are similar to that of propofol induction in adults undergoing ambulatory surgery.^[21]

The potential advantages of sevoflurane include its relatively low blood–gas solubility and a relative

absence of pungency and moderate potency that make sevoflurane the ideal agent for volatile induction and maintenance of anaesthesia.^[22] Sloan *et al.* found sevoflurane to be more suitable than isoflurane for single-breath induction because it produces a smoother induction with a lower incidence of complications and better patient acceptance.^[23] It has also been suggested that maintenance of sevoflurane anaesthesia is associated with good titratability and short early recovery times. The rapidity and quality of recovery after sevoflurane anaesthesia are as good as or better than the other available agents.^[22] In our survey, 70% felt that vital capacity induction technique has a place in day-care surgery.

Desflurane

Desflurane is also associated with faster recovery (blood–gas partition coefficient - 0.42 and brain–blood partition coefficient - 1.3), but its irritant effect on the upper airway with risk of laryngospasm prevents its use as an induction agent. Desflurane is administered using a special vaporiser as it boils at room temperature.^[19]

In a study involving 130 patients undergoing superficial outpatient surgeries, propofol was used for induction and either sevoflurane or desflurane for maintenance of anaesthesia; laryngeal mask airway (LMA) was used in all. The incidence of coughing in desflurane group was 60% whereas it was only 32% in sevoflurane group. Desflurane group had faster emergence from anaesthesia, but in the late recovery period, there was no significant difference between the two groups.^[24]

Compelling evidences for or against various techniques in improving recovery profile and cognitive function are lacking. Patient- and procedure-specific protocols may be followed, with a combination of inhalation and intravenous (IV) techniques for superior outcomes.^[19]

Regional anaesthetic techniques

Regional anaesthetic techniques (neuraxial blocks, peripheral nerve blocks and IV regional anaesthesia [IVRA]) provide excellent anaesthesia and post-operative analgesia. Their use is associated with less sedation, with minimal cognitive dysfunction and hence especially useful in elderly patients. Incidence of PONV is also less, compared to GA techniques. In our survey, 21% opined that they prefer regional anaesthesia techniques for day-care surgery. The time taken for full recovery of the block may range from 6 to 18 h depending on the type of block and

adjuvants used. While this may be beneficial from the post-operative analgesia point of view, it may not be prudent to discharge patients before full recovery from the block in the Indian healthcare setting.

Spinal anaesthesia is suitable for surgeries on lower extremity, lower abdomen and perineum, for example, gynaecological and urological procedures. The administration of neuraxial anaesthesia with low dose of LAs and use of opioid adjuncts provide superior recovery profile.^[5] Techniques such as ‘unilateral’ spinal anaesthesia and selective spinal anaesthesia have been shown to provide high patient satisfaction levels and enable faster recovery compared to routine spinal anaesthesia.^[25] Post-dural puncture headache, transient neurological symptoms, PONV and pain seem to be the key concerns in spinal anaesthesia.^[15] IVRA technique is suitable for short-duration surgical procedures (<60 min) in distal extremities with lower incidence of side effects, improved recovery profile and cost-effectiveness.^[26,27] The use of ultrasound has greatly altered the landscape of peripheral nerve blocks as it allows more safety in the form of minimising nerve injury, reducing dose required for injection and allowing a rapid onset of action.^[27]

A meta-analysis of regional versus GA did not show an advantage of one technique versus the other in the reduction of surgical time.^[28] The advantage of central neuraxial or peripheral nerve blocks over GA is that they provide longer duration and better quality of post-operative analgesia. Reduction in opioid analgesic requirements leads to lesser incidence of PONV. Though administration of blocks reduces requirement of intensive post-operative monitoring, it does not shorten the duration of stay in the ambulatory care unit. In fact, the discharge time may be prolonged in patients who receive neuraxial blocks or regional nerve blocks.^[29] Unique circumstances regarding patient-specific history or surgical procedure may impact the decision to choose neuraxial blocks or regional nerve blocks.

Monitored anaesthesia care

The combination of local anaesthesia and/or peripheral nerve blocks with IV sedative and analgesic drugs is commonly referred to as MAC. The advantages of MAC include avoidance of multiple drugs and airway instrumentation and lack of significant effects on haemodynamics and rapid recovery compared to GA. Commonly used drugs for sedation include propofol, midazolam and dexmedetomidine. However, MAC

also has drawbacks in that it can lead to excessive sedation, respiratory depression and even oxygen desaturation and aspiration.^[27]

USE OF MUSCLE RELAXANTS

Residual paralysis can be a concern, especially in patients with morbid obesity, sleep apnoea and significant pulmonary disease. It can lead to increased incidence of critical respiratory events in the post-anaesthesia care unit (PACU) and in post-operative morbidity and mortality, both of which can prolong recovery time. Therefore, neuromuscular blockers should be used in the smallest possible dose that will provide optimal muscle relaxation for surgery. Only short- or intermediate-acting agents should be used. Cisatracurium, which has been recently introduced in India, can be an appropriate agent of choice. For reversal, routine administration of a full dose of neostigmine may not be appropriate. The dose of anticholinesterase inhibitor should be titrated to the intensity of neuromuscular blockade at the time of reversal.^[20]

Depth of anaesthesia

It is necessary to avoid deep anaesthesia as it may delay emergence from anaesthesia. Requirements of anaesthesia and analgesia vary from procedure to procedure and also at different levels of surgical stimuli (e.g., skin vs. intracavity incisions) with different grades of haemodynamic response. Using doses and concentrations of agents that can correlate with the required depth of anaesthesia and avoid awareness is difficult, but the nearest useful techniques for titration include end-tidal concentrations (0.7–1.3 minimum alveolar concentration values at equilibrium) for inhalational agents and BIS index for IV agents (propofol TIVA).^[20]

Use of laryngeal mask airway and airway management

Supralaryngeal devices (e.g., LMA) have become popular for management of airway in many surgical procedures. Their insertion does not need muscle relaxation and laryngoscopy, and their presence elicits lesser degrees of cardiovascular responses, thus preventing complications associated with laryngoscopy and tracheal intubation. They are also tolerated at lower anaesthetic concentrations and therefore allow for titration of anaesthetic concentrations to the surgical stimulus.^[20] Post-operative airway problems such as coughing or laryngospasm are minimal.

The main disadvantage is that the protection against aspiration is less compared to endotracheal tube. In this regard, the second-generation supralaryngeal devices have a gastric drain tube, improved pharyngeal seal and bite block and hence have obvious advantages over first-generation ones.^[5] With the patient breathing spontaneously, opioid requirements can be based on the respiratory rate while dosing requirements of sedative-hypnotic anaesthetics can be titrated to end-tidal concentrations of inhaled anaesthetics or brain function monitor. This may allow for an earlier emergence from anaesthesia and improve perioperative efficiency. However, endotracheal intubation may be preferred in patients at a high risk of regurgitation of gastric contents with obesity, pregnancy, gastro-oesophageal reflux disease and surgery in prone position.^[5,20]

The 'third-generation' device, the cuff-less Baska Mask™ with the additional bigger suction channel and smaller opening of the mask, may provide better protection against aspiration.

Pain management in day-care surgery

Pain after discharge remains the most common complication after ambulatory surgery. Moderate-to-severe pain prior to discharge may lead to extended stay in the recovery room. Pain after discharge affects sleep, delay early mobilisation and thus impair early return to normal function and work. In our survey too, 94% agreed that pain management is different in day-care cases.

Opioid analgesia-related side effects, such as sedation, respiratory depression and PONV can also cause readmission after ambulatory surgery. In an attempt to limit these complications and achieve a more rapid patient discharge, currently, multimodal, opioid-sparing, balanced analgesia strategy is used. Severe post-operative pain can lead to adverse long-term effects in adults as well as in children. Acute severe post-operative pain is, in itself, a risk factor for the development of chronic persistent post-surgical pain.^[29] Pre-emptive analgesia has also been tried but has yielded conflicting results. The newer trend is to adopt preventive analgesia which involves perioperative pain control with increased duration of analgesic treatment employing multimodal pain control techniques (described below).^[30]

We suggest a three-step approach for effective pain management of ambulatory surgery patients. These include:

- Identification of high-risk patients
- Implementation of multimodal opioid-sparing, LA-based analgesic strategies
- Ready availability of rescue analgesic regimens.

Along with pre-operative assessment, communicating information to the patient about various perioperative routines has been shown to reduce analgesic requirements postoperatively. Involving patients in decision-making about their anaesthesia regimen and pain management plan has been shown to improve patient satisfaction and reducing the possibility of patient complaints.^[14]

A history of increased pre-operative pain (e.g., patients with chronic pain) as well as assessment of increased pre-operative anxiety must be made during the pre-operative assessment. In addition, type of surgery is important as now there are data that certain surgical procedures including breast surgery and hernia repair surgery can be associated with increased risk of chronic post-surgical pain.^[31,32]

CONCEPT OF MULTIMODAL ANALGESIA

Multimodal or balanced analgesia is the gold standard for post-operative pain management and involves the use of more than one analgesic compound or modality of pain control [Figure 2]. Combinations of different medications with different mechanisms of action and/or working at different sites along the pain pathway are used to obtain additive (or even synergistic) pain relief, while leading to an opioid-sparing effect and thereby minimising adverse effects [Figure 3].^[31]

In addition, there has been a concern recently about opioid-induced hyperalgesia, which has

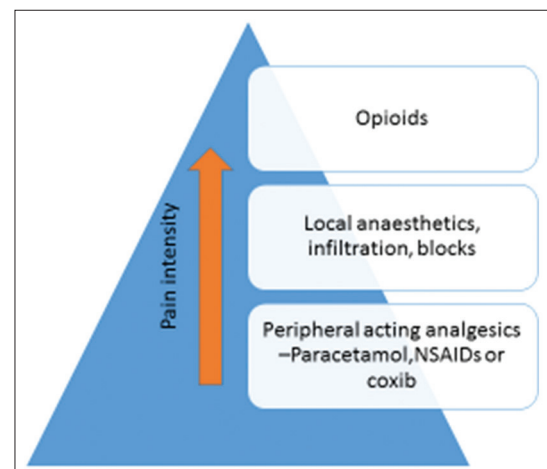


Figure 2: The basis of multimodal anaesthesia

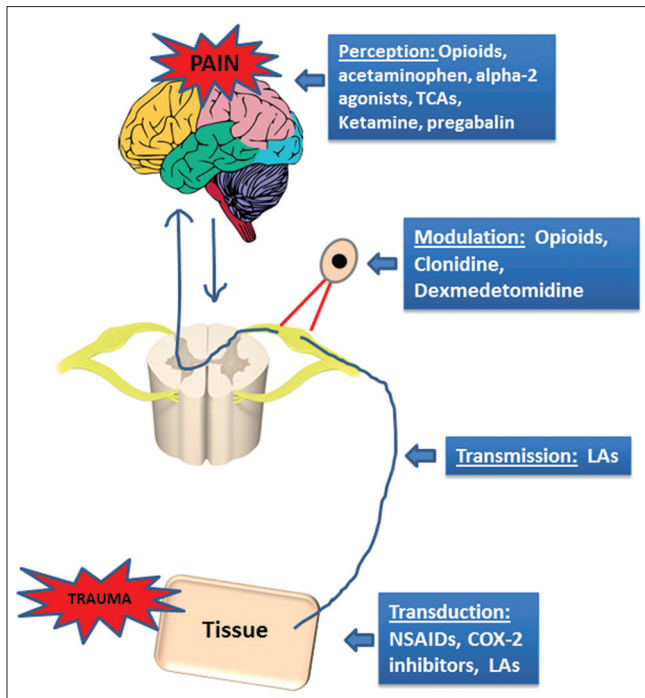


Figure 3: Multimodal analgesia and its sites of action

been demonstrated in animal models and human volunteers. A recent meta-analysis by Fletcher and Martinez concluded that high intraoperative doses of remifentanyl are associated with small but significant increases in acute pain after surgery.^[33] This, along with the opioid-related adverse effects, should be borne in mind while prescribing opioids for pain management.

Combinations for which benefits along the concept of multimodal analgesia have been identified include paracetamol, NSAIDs and coxibs, alpha-2-delta modulators (gabapentin and pregabalin), N-methyl-D-aspartate receptor antagonists (ketamine), alpha-2 receptor agonists (such as clonidine and dexmedetomidine) and LAs. Paracetamol is the most commonly used analgesic worldwide as it has very low rate of adverse effects and nearly no contraindications. It can not only be used on its own as an analgesic in day surgeries but also combined with NSAIDs for superior analgesia.^[31]

The use of adjuvants is one way to increase the duration of pain relief, but continuous peripheral nerve blocks through catheters are increasingly being used in ambulatory patients, too. Blocks such as transversus abdominis plane and rectus sheath, done under ultrasound guidance to minimise complications, can be used as an excellent method for providing intraoperative as well as post-operative analgesia and to reduce opioid requirements.^[34] It is

necessary to emphasise that planning of discharge medications needs a balancing act between the requirements for provision of good analgesia and the risk of opioids going out into the community.^[31] The recently published guidelines on the management of post-operative pain by the American Pain Society recommend the use of peripheral regional anaesthesia techniques for post-operative pain management.^[35] In our survey, 97% reported the preferential usage of multimodal analgesia for post-operative pain management.

WOUND INFILTRATION

LAs have been used with benefits for post-operative analgesia, either alone or with adjuvants. The LAs administered through catheters are also effective but to a limited extent. Long-term catheterisation for delivery of LAs carries a risk of infection. Benefits are also seen when the LAs are injected into tissue planes during surgery in larger volumes. The use of single doses of LAs, which is a common practice, provides shorter duration of analgesia but is an economical method. The advent of long-acting formulations of LAs (liposomal bupivacaine, etc.) may have a potential for prolongation of effect. Some side effects, especially with larger than normal doses of LAs, may be associated with toxicity.^[36] Prolonged intra-articular injection of bupivacaine in higher concentrations may be associated with a risk of chondrotoxicity. Safety of wound infiltration analgesia can be ensured with use of proper dosage but adequate volumes as part of multimodal analgesic techniques.^[36]

In a recent study by Xu *et al.*, continuous wound infusion of ropivacaine was compared to IV continuous constant dose analgesia with flurbiprofen axetil, pentazocine and palonosetron in thoracolumbar spinal surgery, and the outcomes assessed were acute PONV and presence of chronic pain at 3 months. In the group of patients which received ropivacaine, not only was the incidence of PONV significantly less but these patients also had significantly less incidence of chronic pain at 3 months.^[37]

MANAGEMENT OF POST-OPERATIVE NAUSEA AND VOMITING

PONV is distressing to patients. PONV if not controlled may lead to prolongation of PACU stay and unanticipated hospital admission, both of which can lead to an increase in healthcare costs. Day-care

surgeries are typically shorter in duration and also less invasive as compared to inpatient procedures. Therefore, day-care surgeries have a lesser rate of PONV in the PACU. However, after discharge, patients undergoing day-care surgeries do not have access to fast-acting parenteral antiemetics and are not under monitored care as in hospitals. Therefore, post-discharge nausea and vomiting (PDNV) is a significant risk in these patients. In our survey, 95% agreed with the fact that vomiting is indeed a major issue to be considered prior to discharge.^[38]

As per the Society for Ambulatory Anesthesiology consensus guidelines, various classes of drugs can be used for the management of PONV and PDNV such as corticosteroids (methylprednisolone), 5-hydroxytryptamine type-3 (5-HT₃) receptor antagonists (ondansetron, granisetron and palonosetron), neurokinin-1 receptor antagonists (aprepitant), phenothiazines (haloperidol, droperidol) and anticholinergic drugs (dimenhydrinate, promethazine and scopolamine). These guidelines also state that for patients at high risk for PONV (both adults and children), multimodal combination therapy is to be used with two or more agents for prophylaxis. The combinations to be used for prophylaxis include 5-HT₃ antagonists (ondansetron, dolasetron, granisetron and tropisetron) with either dexamethasone or droperidol or dexamethasone with droperidol. Except dexamethasone, which is administered at the induction of anaesthesia, other drugs are administered at the end of surgery. For the treatment of PONV, it should be administered with an antiemetic from a pharmacologic class which is different from the prophylactic drug initially given, or if no prophylaxis was given, the recommended treatment is a low-dose 5-HT₃ antagonist.^[38]

DISCHARGE PLANNING

Post-operative discharge is based on the following three phases of recovery:^[5]

- Phase 1: Fit to go towards from recovery - patient is awake, pain is controlled (ward readiness); assessment is made based on Aldrete score. In this phase, patient is in the PACU, which should be equipped and staffed to the same standards as an inpatient facility, with the exception that trolleys are to be used rather than beds
- Phase 2: Home readiness; assessment is made based on post-anaesthesia discharge scoring system (PADSS) - patients who achieve a score

of 9 or more can be discharged with an adult escort. In this phase, patient can be transferred from PACU to the day-care ward, which should be equipped and staffed to deal with common post-operative problems (PONV, pain) as well as emergencies (haemorrhage, cardiovascular events). The anaesthesiologist and surgeon (or a deputy) must be contactable to help deal with problems. Nurse-led discharge using agreed protocols is also appropriate

- Phase 3: Late recovery – full physiological and psychological recovery; this may take weeks or months.

Simple psychomotor tests such as memory and sensory motor coordination; recovery of motor and sensory functions, two successive orthostatic mean arterial blood pressure readings showing decrease of 10% or less; and prior to ambulation, patient assessment of normal perianal sensation (S4-5), ability to plantar flex the foot and proprioception of the big toe, all help in taking a final decision on discharge.^[15]

In our survey, 97% said they followed discharge criteria such as PADSS, 99% said they advise the patient on post-discharge care and 86% enquired about the availability of a caregiver at home when discharging a patient: 54% were of the view that readmission, after discharge, is frequent in patients while 46% opined that readmission is a rare phenomenon. It is advisable to follow a checklist for discharge after day-care surgery [Table 2] and it may be modified as per local requirements.^[39] Protocol-driven nurse-led discharge can also be effective and permissible in day surgeries. The nurse initiates and leads the discharge process as per the discharge criteria or protocol of the local setup, with the involvement of the multidisciplinary team.^[40]

As mentioned in Table 2, oral intake of fluids and spontaneous voiding are no longer considered mandatory prerequisites for discharge. Mandatory drinking may lead to nausea and vomiting and delay the discharge. Voiding, as a criterion for discharge, should be stressed only for patients at high risk for urinary retention. In others, in whom there is an inability to void within 6–8 h, instructions on measures to take including return to the facility should be provided. Patients, and their escorts, should be given clear verbal and written post-discharge instructions and should be warned of any symptom that might be experienced. They should also be cautioned against driving vehicles in the first 24 h as cognitive function could

Table 2: Discharge checklist for day surgery

Discharge authorised by a member of the medical team or trained nurse
Vital signs stable
Orientated to time, place and person
Passed urine (if applicable)
Able to dress and walk (where appropriate)
Oral fluids tolerated (if applicable)
Minimal pain
Minimal bleeding
Minimal nausea/vomiting
Cannula removed
Responsible escort present
Has care taker for 24 h postoperatively
Written and verbal post-operative instructions provided
Knows who to contact in an emergency
Follow-up appointment entered
Follow-up appointment date given for suture removal
Referrals done if required
Sickness certificate provided
Given take-home medication (especially analgesics) with information leaflet
Information given on when to resume other regular medications
Instructions regarding driving and alcohol consumption

be impaired. Ambulation and resuming activities of daily living should be encouraged in patients as early as possible.^[41]

SUMMARY

While much has been done internationally, there is still much to be as yet defined for anaesthesia for day-care surgeries in India. The most important aspect of day-care surgery is the anaesthetic agent and technique which allows the patient to consistently achieve rapid recovery to his/her normal functioning after the termination of surgery. Pain management is the next essential aspect. Opioid-related adverse effects may be associated with delayed recovery and thus opioids should be used judiciously, and non-opioid analgesics and regional anaesthetic techniques should be used whenever possible. Increasing use of LAs either by wound infiltration or peripheral nerve blocks is recommended.

Majority of the practising anaesthesiologists concur that the patient undergoing day surgery has obvious health- and cost-related benefits. However, lack of widespread acceptance of day-care surgeries is observed in India. As evidenced in the sample survey, the reasons given by them are the need for a proper training for anaesthesiologists, lack of insurance coverage by insurance companies, infrastructural issues and the mindset of patients in India of the fear

to get discharged early. The limitation of this survey was that it was conducted in a small sample size of 162 anaesthesiologists. However, this being the first survey of this kind, the results can be considered as a stepping stone for other researchers and clinicians. While it is indeed important for the issues mentioned above to be addressed for the progress of day-care surgery, other factors such as appropriate documentation, usage of standard equipment and standard monitoring practices and backup for the personnel in case of emergencies will go a long way in improving the efficiency and safety of day-care anaesthesia. As a first step, it needs a multi-pronged approach to expand the scope of day-care surgeries in India and to fine tune the aspects of anaesthesia in day-care surgeries. In future, the consensus statement can be revised or replaced by guidelines for Indian conditions based on additional evidences.

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Conflict of interest

There are no conflicts of interest.

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ANNEXURE

Annexure 1: Questionnaire used for sample survey on 'Day Care Surgery in India-current perceptions'

1. How do you define day-care surgery?
 - a. Surgery and discharge on the same day
 - b. 24 h time for surgery and discharge
 - c. Office-based surgery
2. Do you perform day surgeries?
 - a. Yes
 - b. No
3. Do you have a dedicated day-care surgery unit?
 - a. Yes
 - b. No
4. Who decides that a patient can go in for day-care surgery?
 - a. The surgeon
 - b. The anaesthesiologist
 - c. Both together
5. What type of surgeries are included in day-care surgeries?
 - a. Laparoscopic surgeries
 - b. Breast surgery
 - c. Tonsillectomy
 - d. All of the above
 - e. Any other
6. Is the infrastructure for day-care procedures different as compared to normal inpatient procedures (such as day-care theatres, staff level, separate OT beds)?
 - a. Yes
 - b. No
7. Are there dedicated anaesthesiologists for day-care surgeries?
 - a. Yes
 - b. No
8. Does your setup have patient information booklets regarding day-care surgery?
 - a. Yes
 - b. No
9. Which is the most important parameter which you assess as part of the pre-operative assessment of the patient for day-care surgery?
 - a. Clinical status
 - b. Duration of anaesthesia/procedure
 - c. Patient with comorbidities
10. Surgical cases up to what duration will you consider fit for day-care surgery?
 - a. One hour
 - b. Two hours

- c. Three hours
 - d. Four hours
11. Does an obese patient present a challenge in day-care surgeries?
- a. Yes
 - b. No
12. What will be your cut-off limits of BMI (kg/m²) for obese patients in day-care surgery units?
- a. Less than 30
 - b. 30–40
 - c. 40–50
13. What will be your acceptable lower limits of age for patients in day-care surgery units?
- a. Up to 1 month of age
 - b. Up to 3 months of age
 - c. Up to 6 months of age
 - d. Up to 1 year of age
14. What will be your acceptable upper limits of age for patients in day-care surgery units?
- a. Less than 60 years
 - b. Less than 70 years
 - c. Less than 80 years
15. What is the most preferred anaesthesia technique used for day-care surgery?
- a. Regional anaesthesia
 - b. GA with inhalational agents
 - c. GA with TIVA
 - d. LA with sedation
16. Do you think there is a place for vital capacity induction in day-care surgery?
- a. Yes
 - b. No
17. Is pain management different for a person undergoing day-care surgery?
- a. Yes
 - b. No
18. Do you use multimodal pain relief measures for day-care surgeries?
- a. Yes
 - b. No
19. Does day-care surgery offer advantage to the patient in minimising the complication of DVT?
- a. Yes
 - b. No
20. Does day-care surgery offer advantage to the patient in minimising hospital-acquired infections?
- a. Yes
 - b. No

21. Do you follow any discharge criterion or home readiness score system such as PADSS?
 - a. Yes
 - b. No

22. Is the patient advised on post-discharge care?
 - a. Yes
 - b. No

23. Do you assess whether there is a caregiver at home when discharging a patient after day-care surgery?
 - a. Yes
 - b. No

24. Is it common for patients to be readmitted after day-care surgery with symptoms such as vomiting, bleeding and pain?
 - a. Very often
 - b. Sometimes
 - c. Rarely

25. Is nausea and vomiting a major issue to be considered for discharge?
 - a. Yes
 - b. No

26. Does the OT and recovery room need reorganisation for a day-care surgery?
 - a. Yes
 - b. No

27. Do you think anaesthesiologists need training in day-care anaesthesia?
 - a. Yes
 - b. No

28. Does the patient have a cost benefit in day-care surgeries?
 - a. Yes
 - b. No

29. Does the patient get insurance coverage in day-care surgeries?
 - a. Yes
 - b. No

30. Why has day-care surgery not grown in India?
 - a. Lack of trained personnel
 - b. Patients are afraid to go home so soon
 - c. Infrastructure needs to be improved for day-care surgeries
 - d. All of the above