

Anaesthesia care beyond Operating Rooms: Newer opportunities & Challenges.

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Technological progress in medical science leads to more interventional procedures, with which we are able to give symptom relief for sicker patients who may not be a candidate for a major surgical procedure. The risk involved in providing anaesthesia for the sicker patients for the interventional procedure is much more than the regular surgery. As a critical care and resuscitation expert and with special skills/ knowledge of Anaesthesia, the services of the anaesthesiologists are demanded by non surgical specialists who do not make use of the regular operation rooms for the work.

Providing anaesthesia care in out of operating room situations may be challenging, as changed and variable environments pose unique problems. When providing care at such locations, anaesthesiologists must maintain the same high standard of anesthetic care provided in the operating suite. The anaesthetizing location must be surveyed by the anaesthesiologist to determine whether anaesthesia care can be delivered safely in that location before delivery of that care. The requirements for anaesthesia and the patient's underlying condition do not vary merely because of location, but the conditions under which the anaesthesia care is delivered may vary greatly because of the space and equipment available in these locations. Large, mobile pieces of radiologic equipment, radiation hazards, intense magnetic fields, paramedical personnel not familiar with the anaesthesia team, and other factors may compromise the delivery of quality anaesthesia care.

Despite the availability of detailed guidelines, a recent analysis of closed anaesthesia claims demonstrated greater injury severity and more substandard care than seen with operating room closed claims. Drug interactions were the most common associated factor, followed by drug overdose, inadequate monitoring, inadequate skills for cardiopulmonary resuscitation, inadequate evaluation before sedation and premature discharge from medical supervision were other

incidents noted as contributory to the events in outside OR procedures. Presence of a dedicated person for monitoring the patient and following the proper guidelines can minimize the events.

Guidelines for anaesthetic care delivered outside the Operating Room American Society of Anaesthesiologists (ASA) 1994 Guidelines for Non-Operating Room Anaesthetizing Locations include recommendations for

- (1) A reliable oxygen source with backup as required.
- (2) A working suction source with all proper connections & suction catheters.
- (3) Waste gas scavenging system.
- (4) Adequate monitoring equipment to meet the standards for basic anaesthesia monitoring and, in addition, a self-inflating hand resuscitator bag/ transport ventilator.
- (5) Sufficient safe electrical outlets.
- (6) Adequate illumination of the patient and anaesthesia machine with battery-powered backup.
- (7) Sufficient space for the anaesthesia care team.
- (8) An emergency cart with a defibrillator, emergency drugs, and other emergency equipment.
- (9) A means of reliable two-way communication to request assistance.
- (10) Compliance of the facility with all applicable safety and building codes.

It is the responsibility of the anaesthesiologist providing care to ensure that the anaesthetizing location in which that care is delivered meets all applicable standards.

Patient population: Wide range of patients from new born to geriatric patients, healthy to critically sick patients will be subjected for the anaesthesia care outside OR procedures. Children, unconscious/ uncooperative or anxious patients, elderly or confused patients all require anaesthesia care. The reasons may be needle phobia, claustrophobia, painful procedures or procedures requiring absolute immobile patient, co morbidity requiring constant monitoring and resuscitation during the procedure. When very advanced and costly procedures are being carried out physi-

cians and patients prefer TOTAL CARE especially when the additional expenditure for anaesthesia care is negligible compared to the procedure charges.

Monitoring:

ASA standards for basic anaesthesia monitoring require presence of qualified anesthesia personnel throughout conduct of the course of anesthesia and continuous evaluation of the patient's oxygenation, ventilation, circulation, and temperature . Provision is made for the absence of anaesthesia personnel from the immediate vicinity of the patient if required for safety (i.e., in the presence of radiation hazards), provided that adequate patient monitoring is continued despite the physical separation of the anesthesiologist from the patient. Oxygen concentrations of inspired gas should be monitored with the use of a low-concentration alarm, blood oxygenation should be monitored with pulse oximetry, and ventilation should be monitored by observation of the patient. When present, the position of the endotracheal tube must be verified by observation and by detection of end-tidal carbon dioxide. Continuous end-tidal carbon dioxide analysis should be performed. When mechanical ventilation is used, a disconnect alarm with an audible signal must be present. Circulation is monitored by continuous display of the electrocardiogram, as well as by measurement of arterial blood pressure at a minimal interval of 5 minutes, in addition to other assessments such as auscultation, palpation of pulse, invasive blood pressure monitoring, or oximetry. When changes in body temperature are anticipated or suspected, patient temperature should be assessed. There should be no hesitation to use invasive monitoring if the patient condition warrants so in case for OR procedure.

GOALS: The goals of sedation/ anaesthesia outside OR can be summarized as follows

- Guard the patient's safety and welfare
- Minimize Physical discomfort and pain
- Control anxiety, minimize psychological trauma and maximize the potential for amnesia
- Control behavior and / or movement to allow safe completion of the procedure

- Return the patient to a state in which safe discharge from medical supervision is possible.

Problems: Unfamiliar locations and working conditions pose certain problems like

- Related to physical layout of the facility
- Remoteness from available help.
- Difficult or limited access to patients.
- Unfamiliar or outdated anaesthesia equipment.
- Untrained personnel.

General Precautions:

- Proper check up of anaesthesia machine & equipment
- Availability of adequate number of gas cylinders
- Obsolete and poorly functioning equipment should be discarded.
- Proper grounding of electrical equipment
- Availability of adequate persons and materials for the procedure and monitoring
- Facility for post procedure care/ PACU.

Medications: Monitored anaesthesia care (MAC), general anaesthesia (GA) or regional anaesthesia may be required. Midazolam, Fentanyl, Propofol, and Ketamine are frequently used drugs. Dexmedetomidine is useful for conscious sedation as well as for facilitating smooth anaesthesia and recovery when GA is needed. When Spinal anaesthesia is needed for day care patients, ROPIVACAINE is a better choice due to less motor block and early recovery.

Patient transport to Recovery Room/ post anaesthesia care unit:

Frequently, anesthesia provided in remote locations requires transport of the patient over longer distances to the recovery location than similar care provided in the operating suite does. The patient must be medically stable before transport. The patient must be accompanied to the recovery area by the individual providing the anesthesia or sedation/analgesia care, and monitoring used according to the patient's medical condition must be maintained. Provision of oxygen delivery and monitoring while the patient is on the transport cart may be required. Appropriate recovery facilities and staff must be provided. In the recovery area, the patient's condition must be documented and continually assessed. Immediate availability of personnel trained in ad-

vanced cardiac life support should be ensured. Patients should not be discharged until they have met specific discharge criteria. Clear directions are to be given in writing and explained to the care taker at the time of discharge.

Anaesthesia work outside OR: the areas of involvement

1. Anaesthesia for diagnostic neuroradiological procedures:

- Computed Tomography (CT)
- Magnetic Resonance Imaging (MRI)
- Pneumoencephalography
- Angiography: Includes mainly spinal cord and cerebral angiography

Patients in the radiology suite may have severe underlying medical conditions such as cardiovascular, pulmonary, or neurologic disease. Indeed, they may be in the radiology suite, as opposed to the operating suite, precisely because their severe underlying disease precludes operative intervention. Finally, anesthesiologists may be summoned relatively late in the care, after failure of sedation/analgesia administered by the radiologist or nonanaesthesia personnel. Clearly, this situation is undesirable, and open communication between the departments of radiology and anesthesiology is essential. Special precautions should be taken in MRI due to the effect of magnetic field on ferrous objects.

2. Anaesthesia for interventional radiology.

Angiograms, angioplasty and angio-embolization are becoming a regular work in many radiology labs. Most of the procedures can be done as a Monitored Anaesthesia Care and moderate sedation / Conscious Sedation, but some require complete immobilization and require General Anaesthesia with controlled ventilation. Radio Frequency Ablation of the solid tumour mass in the lungs, Liver and bones is another area where similarly anaesthesia service could be utilized. Some of the RFA patients will benefit from continuous regional block with catheter for Post procedural pain relief. The iodinated contrast media used in the radiology and neuroradiology suites, as well as the cardiac catheterization laboratory, may cause significant adverse reactions, and patients receiving contrast media require close monitoring.

3. Anaesthesia for radiotherapy

Intra Operative Radiation Therapy (IORT) & external beam radiation: MAC or moderate to deep sedation may be needed for anxious patients to keep without moving during the CT SIMULATION and External RT especially in paediatric patients who may require 5/7 days sedation/TIVA that too for a month or so depends upon the number of fractions needed. Peripherally inserted CV Access will be useful in these patients.

Intra Cavitory Radio Therapy (ICRT/ BRACHYTHERAPY): Compared to Low Dose Rate therapy taking nearly 24 hours time the High Dose Rate with Iridium 192 the treatment time is only 20 minutes and the whole process will be over in 3-4 hours time. ICRT will be used in Carcinoma Cervix patients and these patients could be managed as Day Care patients under regional anaesthesia /CS/GA. Subarachnoid Block with ROPIVACAINE and FENTANYL works for the period of complete treatment and avoids involuntary movement of the lower limbs causing displacement of the applicator / implants and if there is any misplacement it allows to correct the applicators after confirming under IMAGE.

4. Coronary angiography and cardiac catheterization:

5. Anaesthesia for electroconvulsive therapy (ECT):

6. Anaesthesia in Emergency Room/ Trauma care Unit:

7. Anaesthesia in Ophthalmology and Dental clinics:

8. Anaesthesia for IVF & GIFT: To be aware of the Ovarian Hyper Stimulation Syndrome.

9. Anaesthesia for ERCP& Endoscopy: Risk of managing patients with deranged Liver function.

10. Anaesthesia for children in Oncology/ Rheumatology/ Nuclear Medicine etc.

Anaesthesia care in remote locations: These include war fronts and other mass casualties, including disasters and terrorist violence etc. The guiding principles of care are same as envisaged in “minimum monitoring and safety standards”, advocated by the ISA. There is no justification in giving anaesthesia (other than field and local blocks) without ensuring the availability of a reliable oxygen source, facilities to establish definitive airway and pulse oximetry. On the oth-

er hand resuscitation for basic and advanced life support and comprehensive trauma life support (CTLS) should be undertaken whenever and wherever necessary and feasible. The techniques and extent of the life support instituted will depend upon the place, available facilities and resuscitator's expertise.

Conclusion: The role of anaesthesia outside the operating rooms is rapidly expanding and evolving along with the advances in interventional radiology and other invasive modalities. However, we must understand that there are many constraints, as the co-morbid conditions of the patients are similar and often more severe than what we face in the operating rooms, and increasingly complex diagnostic and therapeutic procedures are being performed on sicker patients. Understanding the anaesthetic constraints and complexities and keeping abreast with the current developments are crucial in ensuring the maximal benefits to and safety of the patients.

Suggested reading:

Miller's Anesthesia Seventh edition: Ronald D Miller et al, Chapter 79 – Anesthesia at Remote Locations, Paul E. Stensrud

A Practice of anesthesia for Infants and Children: Charles J Cote et al, Chapter 48 – Sedation for Diagnostic and Therapeutic Procedures Outside the Operating Room: R. F Kaplan, J P Cravero, M Yaster and C J Cote (pages 1024-1048) www.expertconsult.com