Patient Safety for Anesthesia in Remote Areas

Essay
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In Anesthesiology

By
Eman Elsaeed Ibrahim Ahmed
M.B., B.Ch.
Faculty of Medicine- Ain Shams University

Under Supervision of

Prof. Dr. Nabila Abd Elaziz Fahmy
Professor of Anesthesia and Intensive Care
Faculty of Medicine- Ain Shams University

Dr. Sherif George Anis
Assistant Professor of Anesthesia and Intensive Care
Faculty of Medicine- Ain Shams University

Dr. Raham Hasan Mostafa
Lecturer of Anesthesia and Intensive Care
Faculty of Medicine- Ain Shams University

Faculty of Medicine
Ain Shams University
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Eman Elsaed Ibrahim

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List of Abbreviations

Abb.	Meaning
AICD	Automated implantable cardiovertive defibrillator
ALARA	As Low As Reasonably achievably
ASA	Alcohol septal ablation
ASA	American society of anesthesiologists
ASD	Atrial septal defect
AVF	Arterio venous fistula
AVM	Arterio venous malformation
BP	Blood pressure
CCL	Cardiac catheterization laboratory
CNS	Central nervous system
CO2	Carbon dioxide
CPR	Cardiopulmonary resuscitation
CT	Computed Tomography
CVA	Cerebrovascular accident
CVS	Cardiovascular system
ECG	Electrocardiography
ECT	Electroconvulsive therapy
ED	Emergency department
EGD	Esophagogastroduodenoscopy
EP	Electrophysiology
EPL	Electrophysiology laboratory
EPS	Electrophysiology studies
ERCP	Endoscopic retrograde cholangeopancreatography
ETT	Endotracheal tube
EVAR	Endovascular aneurysm repair
FIO2	Flow of inspired oxygen
GA	General anesthesia
GABA	Gamma amino- butyric acid
GI	Gastrointestinal

Abb.	Meaning
ICDs	Implantable cardioverter defibrillators
ICP	Intracranial pressure
IM	Intramuscular
IN	Intranasally
INR	Interventional neuroradiology
IV	Intravenous
LMA	Laryngeal mask airway
MAC	Monitored anesthesia care
Min	Minute
MR	Magnetic resonance
MRA	Magnetic resonance angiography
MRI	Magnetic resonance imaging
N2O	Nitrous oxide
NBCA	N butyl cyanoacrylate
NIBP	Noninvasive blood pressure
NMDA	N-methyl-D-aspartate
O2	Oxygen
OR	Operating Room
PAVR	Percutaneous aortic valve replacement
PCI	Percutaneous coronary intervention
PET	Positron emission tomography
PFO	Patent foramen ovale
PONV	Postoperative nausea and vomiting
PVCs	Premature ventricular contractions
RF	Radiofrequency
RFA	Radiofrequency ablation
SAH	Subarachnoid hemorrhage
TEE	Transoesophageal echo
TIVA	Total intravenous anesthesia
TOE	Transoesophageal echocardiography
Vd	Volume of distribution
VSD	Ventricular septal defect
XRT	External beam radiation therapy

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مقدمة من

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بكالوريوس الطب والجراحة

كلية الطب - جامعة عين شمس

تحت إشراف

الأستاذة الدكتورة/ نبيلة عبد العزيز فهمى

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كلية الطب - جامعة عين شمس

كلية الطب

جامعة عين شمس

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Introduction

The demand for anesthesia care for procedures performed outside the operating room has dramatically increased in recent years. The delivery of safe anesthesia care may be difficult out-of operating room (OR) settings, due to a variety of challenges, including cramped, dark rooms, inadequate anesthesia support, unfamiliar environment, and variability of monitoring modalities. Although the majority of procedures in remote locations are relatively non-invasive, serious adverse outcomes can occur (**Metzner et al., 2009**).

In the context of anesthesia, a remote site generally refers to a location, which is distant from where the main operating rooms are situated. Remote sites can be classified as follows:

1. A location not designed for the administration of anesthesia, e.g. emergency room, psychiatric wards where electroconvulsive therapy is undertaken, on the ward, e.g., cardioversion, burns dressing changes.
2. A location with fixed equipment, e.g., neuroradiology suite, computerized tomography (CT), magnetic resonance imaging (MRI) and radiation therapy.

3. Specially built operating rooms outside the main operating room complex, e.g. dental surgery, day surgery suites, obstetric and burn suites.
4. Specialized diagnostic suites, e.g., gastroendoscopy where anesthesia is requested for the exceptional patient.

(Tan and Manninen, 2000)

Monitired Anesthesia Care (MAC) in remote locations poses a significant risk for oversedation and inadequate oxygenation/ventilation due to delays in recognition of respiratory depression. Knowledge of the pharmacokinetic properties of sedative/analgesic drugs, careful monitoring of respiration including capnography, and vigilance can minimize the risk of patient injury in these challenging settings. In addition, general anesthesia with endotracheal intubation may be safer than deep sedation in some patients e.g., obstructive sleep apnea and procedures e.g., prone position, MRI scanner, poor access to patient's airway (**Metzner et al., 2009*).***

The types of complications that are commonly assessed include: aspiration events, unscheduled admissions to the hospital, or unplanned admission to an intensive care unit as a direct result of the sedation or anesthesia (ie, because of protracted emesis, prolonged

sedation, or respiratory or cardiac complication), failed procedures resulting from inadequate or problematic anesthesia or sedation, airway injury, position injuries, respiratory arrest and hypoxemic events and cardiac arrest (**Campbell et al., 2014**).

Aim of the Work

To discuss anesthetic consideration for patients anesthetized in remote areas and to highlight patients' safety precautions in remote areas.

Chapter 1
Meaning of the Remote Site

Introduction

In the context of anesthesia, a remote site generally refers to a location, which is distant from where the main operating rooms are situated. Remote sites can be classified as follows:

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4. Specialized diagnostic suites, eg, gastroendoscopy where anesthesia is requested for the exceptional patient ***(Tan and Manninen, 2000).***

Services are requested at many different locations for a diverse range of procedures *(Table 1).* These may be elective or emergency, diagnostic or potentially lifesaving interventions, and

may last from seconds (e.g. cardioversion) through to all-day affairs in the electrophysiology laboratory. The patient group is equally diverse, covering all ages and co-morbidities **(Dallimore and Daly, 2011).**

Table (1): Different locations for a diverse range of procedures in remote areas

Location	**Procedure**
Emergency department	Assistance for resuscitation/difficult airway
Radiology department	Computed tomography (CT)/ magnetic resonance imaging
Interventional radiology -Neuroradiology -Vascular	Cerebral aneurysm coiling, AVM embolization, localized thrombolysis Elective EVAR, carotid stents Emergency embolization of e.g. pelvic haemorrhage
Cardiac catheter laboratory	PCI, AICD insertion, EPS, PFO/ASD/VSD closure, ASA, PAVR
Cardiac unit/coronary care	Cardioversion, TOE
Endoscopy suite	Upper and lower gastrointestinal endoscopy, ERCP
Psychiatric hospital	Electroconvulsive therapy
Dental surgery	Dental treatments

Burns unit	Dressing changes
Urology suite	Lithotripsy
Radiotherapy department	Radiotherapy
Hematology unit	Bone marrow biopsies
Obstetric unit	Labour analgesia

AICD, automated implantable cardioverter defibrillator; ASA, alcohol septal ablation; ASD, atrial septal defect; AVM, arteriovenous malformation; EPS, electrophysiology studies; ERCP, endoscopic retrograde cholangiopancreatography; EVAR, endovascular aneurysm repair; PCI, percutaneous coronary intervention; PFO, patent foramen ovale; PAVR, percutaneous aortic valve replacement; TOE, transoesophageal echocardiography; VSD, ventricular septal defect

(Metzner et al., 2009)

The demand for anesthetic expertise outside the operating theatre is increasing. The complexity and diversity of the cases has also increased as interventional radiological procedures replace major surgical procedures, for example, coiling replacing open subarachnoid aneurysm repair and endovascular aneurysm repair (EVAR) replacing open aortic aneurysm repair.

Many of the procedures are undertaken in geographically remote locations, for example electroconvulsive therapy (ECT) in isolated psychiatric units. Such environments require appropriate staffing levels, skill mix and facilities ***(Brennan and Nevin, 2014).***