

Recent Updates in Safety Guidelines during Anaesthesia in Remote Areas

Essay

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالَ

سُبْحَانَكَ لَا يَعْلمُ لَنَا
إِلَّا مَا عَلِمْتَ إِنَّكَ أَنْتَ
الْعَلِيمُ الْعَظِيمُ

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List of Contents

<i>Subject</i>	<i>Page No.</i>
List of Abbreviations.....	i
List of Tables.....	iv
List of Figures	v
Introduction	1
Aim of the Study	3
Remote Locations	4
Monitoring and Equipment.....	17
Anaesthetic Considerations	31
Recovery Care (PACU).....	71
Summary	83
References	86
Arabic Summary	—

List of Abbreviations

Abbr.	Full-term
AICD	: Automated implantable cardioverter defibrillator
ASA	: Alcohol septal ablation
ASA	: American Society of Anaesthesiologists
ASD	: Atrial septal defect
AVF	: Arterio venous fistula
AVM	: Arterio-venous malformations
BIS	: Bispectral index
CCL	: Cardiac catheterization laboratory
CNS	: Central nervous system
CO₂	: Carbon dioxide
CT	: Computed tomography
CTA	: Computed tomography angiography
CVP	: Central venous pressure
CVS	: Cardio vascular system
DNA	: Deoxyribonucleic acid
EBRT	: External beam radiotherapy
ECG	: Electrocardiography
ECT	: Electroconvulsive therapy
EEG	: Electroencephalography
EP	: Electrophysiology
EPL	: Electrophysiology laboratory
EPS	: Electro-physiological studies
ERCP	: Endoscopic retrograde cholangiopancreatography
ESWL	: Extracorporeal shock wave lithotripsy

ETCO₂	: End-tidal carbon dioxide
ETT	: Endo-tracheal tube
g	: Gram
GA	: General anaesthesia
GCS	: Glasgow Coma Score
GI	: Gastro intestinal
IBP	: invasive arterial blood pressure
ICP	: Intra cranial pressure
IM	: Intramuscular
INR	: Interventional neuroradiology
IV	: Intravenous
kg	: Kilogram
kPa	: Kilopascal
LMA	: Laryngeal masks airway
MAC	: Monitored anaesthesia care
mg	: Milligram
mm Hg	: Millimeter mercury
MOASS	: Modified Observer's Assessment of Alertness/Sedation Scale
MR	: Magnetic resonance
MRA	: magnetic resonance angiography
MRI	: Magnetic resonant imaging
NIBP	: Non-invasive blood pressure
OR	: Operating room
PaCO₂	: Arterial carbon dioxide tension
PACU	: Post anaesthesia care unite
PAVR	: Percutaneous aortic valve replacement
PCI	: Percutaneous coronary intervention
PEEP	: Positive end-expiratory pressure

PET	: positron emission tomography
PFO	: Patent foramen ovale
PO	: Per oral
PR	: Per rectal
PVCs	: Premature ventricular contractions
RF	: Radio frequency
RFA	: Radiofrequency ablation
RSS	: The Ramsay Sedation Scale
SAH	: Subarachnoid hemorrhage
T	: Tesla
TOE	: Trans-Oesophageal Echocardiography
VSD	: Ventricular septal defect

List of Tables

Table No.	Title	Page No.
Table (1):	Different locations for a diverse range of procedures in remote areas	15
Table (2):	Sedation scores used in clinical practice	23
Table (3):	Commonly Used Drugs for Procedural Sedation and Analgesia in Adults	32
Table (4):	Commonly Used Drugs for Procedural Sedation and Analgesia in Pediatrics	34
Table (5):	Postanaesthesia care unit recovery and discharge scoring(Modified Aldrete Scale).....	82

List of Figures

Figure No.	Title	Page No.
Figure (1):	Sedation during CT scan in Pediatrics	6
Figure (2):	Normal capnography.....	21
Figure (3):	Different airway equipment.....	29
Figure (4):	Zones of MRI	42
Figure (5):	Optimizing the position of the anaesthesiologist to minimize radiation exposure in the cardiac catheter and EP laboratories	61

Introduction

The Royal College of Anaesthetists defines a remote site as any location at which an anaesthetist is required to provide general or regional anaesthesia or sedation away from the main theatre or an aesthetic department where it cannot be guaranteed that the help of another anaesthetist will be available. This may be either within or away from the base hospital. The relative isolation may be created by horizontal (e.g. corridors and roads) or vertical (e.g. stairs and lift) separation (*Missant and Vande Velde, 2011*).

The provision of anaesthesia or deep sedation in remote sites presents potentially significant risks for the patient related to:

Unfamiliarity of the anaesthetist with one or more of the following:

- The isolated environment.
- The available equipment.
- The assistance being provided.
- The procedure being undertaken.

Difficulties in communication and the immediate availability of senior assistance (*Peden, 2014*).

Wherever possible, anaesthesia in remote sites should be provided by appropriately experienced consultants. All anaesthetists should be fully familiarized with all remote areas of anaesthetic provision prior to undertaking anaesthetic procedures in that location.

n. Wherever possible, all anaesthetic equipments should be standardised across all areas providing anaesthesia (**Peden, 2014**).

Mandatory monitoring should be as for any location where anaesthesia is conducted: a pulse oximeter, non-invasive BP cuffs, ECG and end-tidal CO₂ are a minimum requirement (**Buhre and Rossaint, 2009**).

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A fully trained and dedicated anaesthetic assistant should be available at all times to allow the provision of an identical level of anaesthetic support to that being provided in non-remote sites (**Alladi, 2010**).

Patients who have had a procedure under general anaesthesia or deep sedation require expert recovery care. This may be provided either in the procedure room by appropriately qualified recovery staff or the patient may be transferred to the recovery room of operating theatres. In this latter situation, the availability of and familiarity with appropriate equipment during transfers should be verified prior to the procedure being undertaken (**Michael, 2015**).

Accurate documentation of the anaesthetic procedures should be done as well as a detailed record of the patient's vital signs is essential in all cases (**Hatfield and Tronson, 2014**).

Aim of the Study

The aim of this work is to study the factors which improve the patient's safety during anaesthesia in remote areas to reduce the incidence of morbidity and mortality and to specify what are the remote locations, the essential monitoring, equipment needed, anaesthetic consideration of the procedure done and the essential preparation of the recovery care unit.

Chapter(1)

RemoteLocations

Definitionoftheremotelocations:

The definition of the remote location according to the Royal College of Anaesthetists is any site at which an anaesthesiologist is required to give general or regional anaesthesia or sedation outside the main theatre or the department of anaesthesia where it cannot be guaranteed that the help of another anaesthesiologist will be available. This may be inside or outside the base hospital. This relative separation may be horizontal (e.g. corridors and roads) or vertical (e.g. stairs and lift) separation (*Missant and Vande Velde, 2011*).

Examples of remote locations:

1. Radio-diagnosis

Magnetic Resonant Imaging (MRI)

Technical principles:

Magnetic Resonant Imaging uses the static and gradient magnetic fields with RF pulses to produce accurate images of the body. The range of the strength of the magnetic field in MRI systems is from 0.15 to 3.0 tesla. The quality of the image depends on the strength of the MF (*Yamashita et al, 2016*).

The success of the MRI study requires the patient to lie without movement. The expertise of the anaesthesiologist can make the difference between a diagnostic image filled with artifacts and one

fsuperiorquality.As aresult, anaesthesiologistsarebeingcalledo
ntoprovidetheirservicesforMRIstudies(*Yamashitaet al,2016*).

Anaesthesiacoverageisnotnecessaryforthemostofpatien
tsundergoinganMRIscan,patientswhobenefitfromanaesthesias
ervicesinclude:children,impairedcognitivestates,claustrophob
icpatient,patientwithseverepainandcriticallyillpatient(*Schulte
-Uentrop,2010*).

ComputedTomography(CT)

Technicalprinciples:

ComputedTomographyproducesatwo-dimensional,cros
s-sectionalimagebyrotatinganx-raybeamaroundtheareaofthep
atient'sanatomyofinterest.Eachcrosssectionrequiresafewseco
ndsofradiationexposure,andthetypicalscancomprises20ormor
esections,patientimmobilityisrequiredduringeachexposure(*Ya
mashitaet al,2016*).

Mostpatientscantoleratetheprocedurethatisshort,withouta
ny sedationbut somecategorieswillbenefitfromanaesthesia:

- Children
- Patientsufferingfromclaustrophobia
- Mentallyimpairedpatients(*Masonet al,2011*).



Figure (1): Sedation during CT scan in Pediatrics, quoted from *Mason et al, 2011*.

2. Radiotherapy

Radiation therapy (also radiotherapy or radiation oncology) is the medical use of ionizing radiation in the treatment of cancer to control malignant cells. It works by damaging the Deoxyribonucleic acid (DNA) of cells. The cause of damage is a proton, electron, photon, neutron, or ion beam either directly or indirectly ionizing the atoms which make up the DNA chain (*Bielsa and Vljakovic, 2013*).

Types of radiotherapy: