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Foreword

It is my pleasure to introduce the first case review booklet of the Special Committee Investigating Deaths Under Anaesthesia (SCIDUA).

SCIDUA has been reviewing deaths following anaesthetic administration since 1960. The peer review undertaken by SCIDUA has provided valuable insights into improvements in anaesthetic administration and contributed to the significant decline in anaesthesia-related deaths.

In NSW, more than one million individual episodes of anaesthesia care are recorded annually in all public and private hospitals. Anaesthesia is very safe in Australia. Modern anaesthetic techniques have made much of today’s surgery possible and brought great benefits to patient safety. The estimated anaesthesia-related mortality in NSW was 1:25,692 procedures in 2014. The reporting of anaesthesia-related deaths to SCIDUA has helped ensure the high quality and safety of anaesthetic administration.

This booklet presents the learning points of reviewed cases where the patient died within 24 hours of anaesthetic administration in a NSW hospital. The case profiles highlight the importance of pre-operative assessment and planning, supervision of junior staff, team work, situational awareness, clinical judgement and decision making as key competencies for safe anaesthetic administration.

The case profiles on aspiration and futility reinforce the learnings published in the 2014 casebook of the Collaborating Hospitals’ Audit of Surgical Mortality (CHASM). Aspiration has been a recurrent theme for both CHASM and SCIDUA over the past years. In this booklet, SCIDUA identifies the preventative options and the risk factors for early recognition in the pre-operative period to prevent aspiration.

The decision to operate or not on elderly and/or high risks patients has been a topic of interest for many decades. The learnings from the case profile on futility highlight the importance of patient centred care which involves partnering with patients to address their health care needs.

I hope you find this publication a useful educational resource and welcome any constructive feedback.

Dr David Pickford
Chairperson
SCIDUA
SCIDUA Committee Membership 2015

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The Special Committee Investigating Deaths Under Anaesthesia (SCIDUA) has operated continuously in NSW since 1960, apart from a short break in the early 1980s due to issues with confidentiality. SCIDUA was re-established in July 1983 with statutory privilege.

Composition

SCIDUA has eight members who were appointed by the Secretary, NSW Health under delegation by the Minister for Health, pursuant to section 20 of the Health Administration Act 1982 (NSW). SCIDUA is supported by a secretariat team appointed by the Clinical Excellence Commission (CEC). The secretariat team also supports the Collaborating Hospitals’ Audit of Surgical Mortality (CHASM).

Terms of reference

i. To register, investigate and classify deaths occurring during or within 24 hours of a procedure performed under anaesthesia or sedation.

ii. To determine whether further information is required to complete the above investigation, and if so to request such information under guarantee of confidentiality from the attending practitioner(s).

iii. To examine information acquired and identify any issues of management which were instrumental in the patient’s death.

iv. To report the Committee’s findings confidentially to the practitioners involved in the patient’s care.

v. To report annually to the Secretary, NSW Health, drawing attention to any matters which require action to improve the safety of anaesthesia and sedation in New South Wales.

vi. To acquaint the medical profession in general, and anaesthetists in particular, with any matters to which special attention needs to be paid to ensure the safety of anaesthesia and sedation.

vii. To submit for publication in appropriate peer-reviewed journals the results of the Committee’s investigations in such a way as to preserve undertakings of confidentiality given to respondents.

viii. To make available the expertise of its members to the CEC in pursuit of systemic improvements to patient care in the fields of anaesthesia and sedation.

ix. To share the audit findings of a notified death with other statutory committees that have special privilege under section 23 of the Health Administration Act 1982, if the same death has been notified to them.

Introduction

The Special Committee Investigating Deaths Under Anaesthesia (SCIDUA) has operated continuously in NSW since 1960, apart from a short break in the early 1980s due to issues with confidentiality. SCIDUA was re-established in July 1983 with statutory privilege.
Legislative protection

SCIDUA has special privilege under section 23 of the Health Administration Act 1982 (NSW). This legislation makes it an offence for a person who obtains information in connection with the work of SCIDUA to:

- disclose the information
- answer any questions or produce any documents relating to the information in any proceedings

The penalty for breaching this provision is a fine of $1100 or a term of imprisonment for six months. Information can only be released with the consent of the person who provided the information, or the approval of the NSW Minister for Health. Documents can be produced and oral evidence given only with the approval of the NSW Governor.

Reporting of anaesthesia and sedation related deaths

In NSW, the notification of deaths arising after anaesthesia or sedation for operations or procedures, is a legal requirement stipulated in s84 of the Public Health Act 2010 (NSW) and applies:

‘if a patient or former patient dies while under, or as a result of, or within 24 hours after, the administration of an anaesthetic or a sedative drug administered in the course of a medical, surgical or dental operation or procedure or other health operation or procedure (other than a local anaesthetic or sedative drug administered solely for the purpose of facilitating a procedure for resuscitation from apparent or impending death).’

Health practitioners are required to notify the death by completing the state form (SMR010.511): Report of death associated with anaesthesia/sedation.
Review of notified deaths

When a death is notified to SCIDUA by an anaesthetist, a medical practitioner, or is referred from other mortality review committees, the case is initially reviewed by the SCIDUA’s triage sub-committee. The triage process determines whether a more detailed questionnaire needs to be sent to the anaesthetist, or whether the case can be classified based on the available information. A questionnaire is always sent if there is any suspicion anaesthetic or sedation was involved, or if the patient died during the procedure or in the recovery room.

Committee meetings are generally held once a month, depending on the number of cases prepared. SCIDUA uses the classification system developed by the Australian National Anaesthetic Mortality Committee to classify the cases and determine if they are related to anaesthetics. It relies on expert opinion and consensus. The review process is a retrospective appraisal of the reported cases. The Committee reviews whether alternative management may have altered the outcome.

Each anaesthetist or medical practitioner who completes a questionnaire for the committee receives a confidential feedback letter from the chairperson explaining the Committee’s views on his or her case.
Anaesthesia Learning Points
Aspiration

The Committee regularly identifies problems with inadequate airway maintenance, with aspiration being one of the most common causes of patient mortality. Indeed, the Collaborating Hospitals Audit of Surgical Mortality (CHASM) finds aspiration a frequent factor in the deaths of surgical patients.

Aspiration, as a contributing factor, has been seen in both elective and emergency settings. Patients may be at risk of aspiration either due to their inter-current illness (e.g. bowel obstruction) or pre-morbid state (e.g. morbid obesity). Some patients do not have obvious risk factors but aspirate during the procedure with a poor outcome.

Aspiration has been seen as an unexpected event in fasted patients, but in general, the patients have either been frail, unwell or had risk factors. The timing of the aspiration has been at induction (e.g. lack of rapid sequence induction), during maintenance (e.g. laryngeal mask used in an inappropriate patient) as well as during emergence (deep extubation) in at-risk patients. The Committee has been critical of the failure to use an appropriate rapid sequence induction with a suitable rapidly acting muscle relaxants in known at-risk patients.

CHASM also recommends the use of a nasogastric tube to decompress the stomach of patients with bowel obstruction during their pre-operative care.

Even with careful planning, these events still occur. There have been 16 cases of aspiration leading to death reported over the past 10 years.

REFERENCES

ANAESTHESIA LEARNING POINTS
- The incidence of aspiration in association with anaesthesia is about 1:3200 cases. In emergency cases, this increases to about 1:900 cases, while death results from about five per cent of all aspiration events.
- Aspiration was the most common cause of death in cases reported to the 4th National Audit Project of The Royal College of Anaesthetists and The Difficult Airway Society in the United Kingdom.
- Identification of risk factors is important pre-operatively, including:
  - patient factors (increased gastric contents, incompetence of lower oesophageal sphincter, decreased airway reflexes)
  - surgical factors (position e.g. lithotomy; procedure e.g. emergency, laparoscopic)
  - anaesthetic factors (airway choice, gastric insufflation, depth of anaesthesia).
- Preventative options to consider on an individual basis include:
  - fasting times
  - pharmacological interventions: antacids, proton pump inhibitors, prokinetics
  - physical: gastric emptying methods, rapid sequence induction
- Recognition of a difficult airway pre-operatively and a plan for failed intubation in place prior to induction is of extreme importance.
- Cases involving high risk patients undergoing high risk surgery require a higher level of anaesthetic supervision.
A regular feature of any emergency list is the elderly patient who falls over and suffers a neck of femur fracture.

These patients typically have associated co-morbid conditions which may or may not have been optimised.

Surgical interventions to treat the fracture may involve the use of bone cement.

Anaesthetists should appreciate the sequelae which can occur during cementing and surgical manipulation of the fracture site. The Committee has noted that the majority of these cases are consistent with the typical “bone cement implantation syndrome”, which begins with sudden hypotension and hypoxaemia, and progresses to cardiovascular collapse. Echocardiography undertaken at the time may show particulate matter moving through a dilated right side of the heart.

Other patients become progressively hypotensive towards the end of surgery, leading to a cardiac arrest in the recovery room or a short time later.

There have been 54 cases reviewed over the past 10 years where bone cement has been implicated in a patient’s death.

**ANAEOSTHESIA LEARNING POINTS**

- Patients suffering from neck of femur fractures are often elderly and frail with multiple significant co-morbidities – most commonly cardiovascular and respiratory disease.
- Thorough pre-operative assessment in these patients is extremely important.
- There should be a very low threshold for instituting invasive arterial monitoring prior to the induction of anaesthesia.
- There is little evidence to support the use of one anaesthetic choice over another. The choice of providing general or regional anaesthesia should be determined by the individual anaesthetist’s experience and current practice.
- A combination of both regional and general anaesthesia predisposes these patients to more extreme hypotensive events.
- Communication between the surgeon and anaesthetist during the procedure is critical, especially with regard to warning prior to cement placement.
- Bone cement implantation syndrome (BCIS) typically occurs around the time of cementation, prosthesis insertion, reduction in the joint or deflation of the limb tourniquet.
- BCIS has a wide spectrum of clinical features ranging from transient desaturation and hypotension to cardiac arrhythmias and cardiovascular collapse. The cause is multifactorial, but it always seems to involve right ventricular failure due to an acute rise in pulmonary arterial pressure.
- Treatment should be instituted early and based on general principles – 100 per cent oxygen, fluid resuscitation and cardiovascular support.
- A trans-oesophageal echocardiogram may be helpful in guiding further management post initial stabilisation.

**REFERENCE**

Anaphylaxis

Anaphylaxis can occur at any stage of an anaesthetic but based on our case reports, is most common at induction and thereafter during maintenance.

Previous exposure to a drug may be reassuring, but is not a guarantee against the development of anaphylaxis.

A high index of suspicion and immediate treatment will allow the best chance of recovery.

There have been 11 cases of anaphylaxis leading to death over the past decade. The most common drugs involved were muscle relaxants (rocuronium, suxamethonium, and vecuronium) and antibiotics.

### ANAESTHESIA LEARNING POINTS

- Anaphylaxis is a life-threatening emergency.
- Early recognition and treatment may avoid death or permanent disability.
- Commonly encountered triggers in an anaesthetic environment include neuromuscular blockers, antibiotics, colloids, blue dyes, chlorhexidine and latex.
- Anaphylaxis can present with a wide spectrum of symptoms and signs including skin (erythema, urticaria, piloerection, oedema), cardiovascular (tachy or bradycardia, hypotension which may be unresponsive to vasopressors), bronchospasm and/or hypoxia (or difficulty with ventilation), and abdominal cramping and gastrointestinal disturbance in awake patients.
- When anaphylaxis is recognised or suspected, adrenaline administered early and in adequate doses, is the mainstream of treatment. Refer to the Australian and New Zealand Anaesthetic Allergy Group (ANZAAG) guidelines for the treatment of anaphylaxis associated with anaesthesia.
- Intravenous (IV) adrenaline should only be used if there is IV access, if haemodynamic monitoring is in place and the treating doctor is familiar with titrating adrenaline intravenously. Adrenaline should be intramuscular in the absence of these conditions. NEVER use 1:1000 adrenaline dilution intravenously UNLESS in cardiac arrest.
- Adrenaline infusions are recommended if more adrenaline is required after initial boluses.
- Hypotension should be treated with aggressive fluid replacement.
In the presence of hypotension, anaesthesia should be maintained with minimal amounts of agent (use depth of anaesthesia monitors) until the situation is stabilised.

- Arterial monitoring is recommended.
- Mast cell tryptase assays should be sent at one hour and further samples at four hours and 24 hours post event.
- Secondary treatment should be with steroids and oral antihistamines, though benefit has not been demonstrated for these. NEVER administer IV promethazine as this may precipitate hypotension.
- A decision on whether to abandon surgery should be made, weighing up factors of reaction severity, patient condition and urgency of the procedure.
- Referral to an anaesthetic allergy clinic is essential post-discharge for suspected or confirmed anaphylaxis cases for identification of the agent(s) responsible. Nearest testing centres can be found on the ANZAAG website. Details of the reaction and possible causes for the reaction should be given to the patient to carry with them until their testing, should a need for an urgent procedure arise.

Anaesthesia learning points kindly edited by Dr Michael Rose, Chairman of the Australian and New Zealand Anaesthetic Allergy Group.

REFERENCE/FURTHER READING

Beach Chair Surgery

Surgical procedures no longer take place in the supine position solely.

New surgical techniques and new equipment have enabled or required the performance of surgery in many unique positions.

Whether the position be beach chair, lithotomy, trendelenburg or lateral, an appreciation of the unique physiological consequences is necessary to ensure patient safety.

There have been four beach chair associated deaths in the past 10 years, which have been related to failure of different organ systems.

**ANAESTHESIA LEARNING POINTS**

- Any head-up position for surgery has unique physiological implications which need to be considered in any pre-operative assessment.

- A normal blood pressure for a supine - anaesthetised patient may not be adequate for a patient in the upright position. An adequate blood pressure target intra-operatively may be indicated by the blood pressure measured preoperatively in the awake and sitting patient.

- In the Australian and New Zealand College of Anaesthetists (ANZCA) Bulletin December 2013 edition, an article with regards to beach chair surgery was written in the Quality and Safety section.

- It stated:
  - The primary aim of anaesthetic management is to maintain mean arterial pressure and to ensure adequate cerebral perfusion. This involves appropriate monitoring, vigilance and intervention when required.
  - The potential effects of the Beach Chair Position on the cerebral circulation may be limited by:
    - proper patient hydration within normal fasting guidelines
    - intravenous fluid loading prior to induction
    - use of compression stockings
    - gradual elevation into beach chair position
    - pre-treatment with vasopressors
    - avoidance of hyperthermia
    - avoidance of hypocapnia
  - The discrepancy between blood pressure measured at the brachial artery and blood pressure in the cerebral vessels can be considerable.
• For tall patients, or for patients with known hypertension or cerebrovascular disease, this discrepancy may be of more importance. This concept needs to be understood and taken into account by any anaesthetist providing anaesthesia for head-up surgery.
• There should be a low threshold for invasive arterial blood pressure monitoring in these cases. If this is done, placing the transducer at the level of the tragus is recommended.
• Indirect measures of cerebral perfusion in the head-up patient may be useful. These include a pulsatile trace from a saturation probe placed on the nose or ear, measurement of cerebral activity on an electroencephalogram (EEG) monitor, use of a cerebral oximetry monitor or transcranial doppler measurement of cerebral flow.
• Cerebral vasodilators may increase cerebral flow in the upright position. In the normal pressure brain, volatile anaesthesia (as opposed to total intravenous anaesthesia (TIVA)) and keeping CO₂ levels in the high-normal range may better maintain cerebral flow.
• The vessels supplying the brain are subject to mechanical obstruction. Care should be taken to ensure neutral head position and avoid high pressures on the neck (from neck ties, pressure from the beach chair head rest, etc).

Following a 2013 coronial inquest into one such case, the Office of the NSW Coroner recommended all anaesthetic departments in NSW hospitals develop guidelines for the appropriate adjustments for hydrostatic gradient when calculating mean arterial pressure for beach chair surgery. Please refer to your local hospital guidelines.

REFERENCE
Futility

The Committee is receiving increasing numbers of reports on the administration of anaesthesia for procedures to patients who had little or no chance of survival.

We have seen cases where patients had severe multi-trauma injuries as well as patients suffering from catastrophic medical compromise before their proposed procedure (imminent cardiac or respiratory arrest or comatose patients pre-procedure).

There have been 56 cases over the past 10 years that have been classified as futile.

REFERENCES


ANAESTHESIA LEARNING POINTS

- “In a clinical situation where an anaesthetist believes surgery to be futile they must remember that the primary duty of care is to the patient.”

- “Informed consent should also incorporate long and short term survival rates in order to be of any significance for the patient and their relatives in deciding to go ahead with the proposed treatment.”

- “It may not be in the patient’s best interest to refuse to anaesthetise just because of the possibility of imminent death of the patient if the consensus view is that the benefits outweigh the morbidity of the surgery and anaesthetic.”

- “An anaesthetist’s experience will guide them as to whether the patient is able to undergo and recover from the anaesthetic necessary for that operation and surgical stress involved, taking into account the general condition and intercurrent health of the patient.”

- “While we may pride ourselves on our safety and skill, we must recognise that the provision of anaesthesia for unnecessary procedures does the patient no service.”

- “There is every reason to challenge proposed surgery if there is ethical doubt as to its efficacy.”

- The concept of having a “goals of care” discussion with the patient and family prior to the acute event or a complication of treatment is a large topic, which is only now getting the attention it deserves. Physicians and surgeons alike are now grappling with this task and even more importantly, the timing of when these discussions should take place.
Frail elderly patients with multiple medical conditions presenting for a quick urology procedure (e.g. cystoscopy or stone lithotripsy) are common place.

However, having a quick urological procedure does not necessarily translate into a quick recovery.

Urosepsis can be catastrophic and can occur in a matter of minutes. There have been six cases reported to the Committee over the past 10 years.

Unfortunately, the patient population having these procedures have very little physiological reserve to deal with the sequelae of sepsis.

Urosepsis from manipulation of the urinary tract can be catastrophic, despite antibiotic prophylaxis and sterile pre-operative urine.

JJ stents are normally in place for only a few weeks due to their potential to cause urosepsis.

Septic complications most often occur within the first six hours of surgery.

Mortality after urosepsis can be as high as 40%.

Pre-operative predictors of urosepsis include:
- patient physical status
- presence of urinary infection
- anatomy of the urinary tract

Intra-operative predictors include:
- duration of procedure
- hydrostatic pressure generated by irrigation fluid and stone manipulation (resulting in bacterial and endotoxin translocation into the systemic circulation).

Treatment of urosepsis comprises four major aspects:
- early diagnosis – features suggestive of sepsis include fever, tachycardia, hypotension, peripheral shut down and altered mental state
- early goal-directed therapy – oxygenation, fluid resuscitation, inotropic support and broad spectrum antibiotic treatment
- identification and control of the causative factor in the urinary tract – including broad spectrum antibiotics
- specific sepsis therapy – referral to intensive care facility for inotropes and ongoing monitoring and treatment.

REFERENCES
Preoperative Assessment

Patients with multiple medical conditions are generally managed by multiple specialist physicians.

A thorough appreciation of the patient’s intercurrent disease processes will enable a suitable anaesthetic to be delivered.

The Committee has seen many reports where patients have not been assessed completely prior to their surgery (either due to a lack of time or information). Failures to assess the severity of the patient’s disease has led to inappropriate operations, and inadequate peri-operative and post-operative planning. Appropriate assessment may avoid inadequate monitoring or the failure to organise appropriate high dependency care.

Poor pre-operative assessment has been a factor in 56 deaths reviewed over the past decade.

ANAESTHESIA LEARNING POINTS

- Pre-operative assessment is an essential part of the delivery of anaesthetic care.

- The ANZCA professional document on pre-anaesthetic assessment states:
  - “Consultation by a medical practitioner is essential for the medical assessment of a patient prior to anaesthesia. This pre-anaesthesia consultation should:
    - ensure the patient’s state of health has been optimised
    - plan the anaesthesia (including pre- and post-) management
    - allow appropriate prior discussion with the patient and/or guardian
    - obtain informed consent for the anaesthesia and related procedures.”

- There are often pressures in public and private hospitals to limit the time between cases, but this should not take priority over thorough assessment of the patient.

- Assessment of complex patients can take considerable time and should not be performed in the anaesthetic bay just before surgery. Many hospitals now have systems in place whereby patients can be assessed well before the intended procedure.

- Good communication between the treating surgeon and anaesthetist is essential to ensure adequate time for patient work-up before arrival at the theatre.

- Adequate assessment can influence many aspects of the choice of anaesthetic management: the choice of general versus regional anaesthesia; the choice of airway; the choice of monitoring; and choice of post-operative care.
Most importantly, pre-operative assessment may identify the need for further investigation of the patient’s co-morbidities or the need for a referral to a physician prior to their surgery.

Although difficult, anaesthetists should accept that there are times where it is safer for a patient to be deferred for surgery in order to optimise their medical status before surgery.

REFERENCE
Anaesthetists are very familiar with propofol and nearly every general anaesthetic given involves its use, but like any drug the dose must be titrated to the individual patient.

The Committee have reviewed cases where propofol or propofol in conjunction with other agents, has contributed to deaths in the operating theatre, cardiac procedure room and endoscopy units. Typically, the patient experienced refractory hypotension or cardiac arrest. In some cases, the Committee was surprised at the dosages used in elderly and frail patients, or those with significantly diminished cardiovascular reserve, but in some cases the doses given were very small.

The Committee reviewed 39 cases over the past 10 years, where the dose of propofol, or propofol in conjunction with other drugs, was deemed to have directly contributed to a patient’s death.

### Inappropriate Propofol Dosage

**ANAESTHESIA LEARNING POINTS**

- Propofol is an effective anaesthetic agent that is very commonly used.
- Despite anaesthetists’ familiarity with Propofol, its direct and indirect effects should always be considered when using this medication.
- Cardiovascular effects include a decrease in heart rate, blood pressure and cardiac output.
- Dosage should take into account:
  - the patient’s characteristics (age, height, weight)
  - patient’s concomitant disease state
  - other medication being administered concurrently.
- For a given dose in older patients, a higher peak plasma concentration is observed. This, combined with a decreased volume of distribution and clearance, is the basis of a decreasing dose requirement with increasing age and the increased sensitivity seen in older patients.
- As with other anaesthetic agents, careful titration of propofol should be exercised in patients with cardiac, respiratory, renal or hepatic impairment, or in hypovolaemic or debilitated patients.
The induction dose requirements of propofol will need to be reduced in patients concurrently receiving narcotic and sedative medication, e.g. fentanyl and midazolam premedication. These agents may increase the anaesthetic effects of propofol and may also result in more pronounced decreases in systolic, diastolic and mean arterial pressures and cardiac output\(^1\).

REFERENCES


ERCP

There have been 14 reported deaths which occurred after Endoscopic Retrograde Cholangiopancreatography (ERCP) procedures in the past 10 years.

The common contributing factors to these deaths include medically compromised patients and the administration of sedation for procedures in geographically remote locations with little anaesthetic assistance. These patients had significant intercurrent disease and some were septic or moribund pre-procedure.

**ANAESTHESIA LEARNING POINTS**

- ERCP are not ‘just light sedation’. They are often performed in sick patients, with some element of ileus, undergoing a procedure in the prone position with a shared airway and in a remote location. They should be managed by senior anaesthetists whenever possible.

- Ensuring intravenous access, which is both reliable and in a suitable location for the procedure, is essential.

- Invasive monitoring and a protected airway should be utilised if the anaesthetist deems the circumstances to be deserving. This may slow the efficiency of the list, but will result in a safer procedure.

- Patient selection is particularly important in smaller hospitals and day surgical centres, as the level of intra- and post-operative support will be limited.
Inadequate Monitoring

The time delay between detecting an adverse acute event and treating it, can sometimes be the difference between a patient surviving or not.

In cases where the level of monitoring was deemed inadequate, the concern was either the patient’s co-morbidities (e.g. significant cardiovascular disease) or the nature of the procedure being performed (e.g. lengthy operations with anticipated blood loss).

Early detection of cardiovascular instability would have led to early intervention and the prevention of further compromise.

The Committee has reviewed 26 cases where inadequate monitoring was deemed a critical factor in the patient’s death.

ANAESTHESIA LEARNING POINTS

• One of the fundamental duties of the anaesthetist is to monitor patients’ physiological variables during a procedure.

• The degree of monitoring instituted should be based on the patient’s current health state, their co-morbidities, and the nature of the procedure being undertaken.

• The ANZCA guidelines on monitoring during anaesthesia states¹:
  • “The clinical monitoring of a patient undergoing any type of anaesthesia should include regular assessment and recording of the following:
    – Circulation: The circulation must be monitored at frequent and clinically appropriate intervals by detection of the arterial pulse and supplemented, where appropriate, by measurement of arterial blood pressure
    – Ventilation: Ventilation must be monitored continuously by both direct and indirect means.
    – Oxygenation: Oximetric values must be interpreted in conjunction with clinical observation of the patient. Adequate lighting must be available to aid with assessment of patient colour”.

• Relevant monitoring and auditory alarm systems facilitate early detection of deviation from normal physiological ranges and allow intervention to be performed in a timely manner.

REFERENCE

ACKNOWLEDGEMENT

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