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AN OVERVIEW OF SEDATION MEDICATION DURING RADIOLOGICAL PROCEDURES AMONG UNCOOPERATIVE PATIENTS, AND AVOIDING ERROR

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Abstract:

To obtain high-quality CT and MRI scans, children may need to stay immobile in a particularly uncomfortable environment for a reasonable length of time. Although young infants may sleep after a feed and older children can be accommodating, many infants and children are not cooperative. The use of sedation or anaesthetics in children to provide a sleep-induced state and reduce anxiety is therefore often necessary for successful radiological practice. We conducted a search through electronic databases; PubMed, Embase and other, to all relevant studies published in English language up to April,2022. The ideal drug for sedation should be predictable in its effect on the conscious level, free from adverse events especially cardiorespiratory depression and allow quick awakening; an ideal that does not currently exist.

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INTRODUCTION:

Interventional radiology is becoming increasingly prevalent, with radiologists undertaking invasive therapeutic treatments such as vascular embolization, peripheral angioplasty, abscess drainage, and trans-jugular intrahepatic portocaval shunts, as well as diagnostic procedures such as biopsies. These interventional procedures cause the patient some degree of pain and discomfort. Anxiety heightens the patient's sense of pain and decreases his or her tolerance for the operation [1,2].

Sedation refers to the use of pharmacologic and nonpharmacologic techniques to depress the central nervous system (CNS) and reduce anxiety and irritation in patients. Anxiolysis (a state of decreased apprehension) and, in some cases, forgetfulness are outcomes of adequate sedation (a loss of memory of events during the procedure). In an effort to specify specific endpoints for medication administration, the stages of sedation have been characterized [3].

Analgesia is the relief of pain without the purposeful induction of a mental state alteration. Pre-assessment. The administration of safe and effective sedation involves an understanding of the patient in order to identify the baseline functional capability and the required amount of sedation and analgesia, and this can be accomplished by pre-procedural examination. Pre-procedural assessment increases the probability of satisfactory mild sedation, decreases the risk of adverse events, and is a vital aspect of patient care [2,3].

The incidence of side effects associated with the administration of sedation and analgesia is minimal, but they can result in severe morbidity and mortality. Sedation demands a holistic strategy with thorough pre- and post-procedural evaluations, regular monitoring, and a fully staffed and equipped department. In addition, it necessitates that competent healthcare practitioners possess a solid understanding of the pharmacology of the pharmaceuticals used, identify high-risk patients, and handle consequences appropriately. Non-anesthesiologists are regarded safe to administer moderate sedation (conscious sedation) if they have undergone enough training and have the necessary equipment, facilities, and staff [4,5,6].

DISCUSSION:

The architecture of radiology departments should include pre-assessment facilities, recuperation areas, and treatment rooms that are large enough to accommodate a resuscitation trolley and the personnel required in the event of resuscitation [7]. To enable emergency reactions, anesthetic and resuscitation equipment should be organized similarly to operating rooms, and patients should be cared for on rolling gurneys. Access to crash carts and crash call systems should be simple and intuitive for all radiology department healthcare staff [8]. Dedicated radiology nurses attached to the department should be available both during and outside of normal business hours. Patients who are treated promptly, typically after hours, and who are frequently critically ill with several co-morbidities have the highest post-intervention mortality [9]. Therefore, nursing support is essential, and some even urge anesthetic presence as a standard of care for out-of-hours procedures involving critically ill patients [10]. Recovery spaces should be staffed with nurses who are trained to monitor sedated patients and care for them until they meet requirements for discharge. The minimal requirements for the nurse responsible for observing sedated patients are: solid knowledge of the pharmacology of the drugs used for sedation and analgesia, as well as their respective reversal agents; the ability to recognize adverse events and manage them appropriately; and 5-yearly updates on resuscitation techniques, including advanced life support [10,11].

The American Society of Anaesthesiologists recognizes the following sedation levels [12]: The drug-induced state of mild sedation (anxiolysis) in which patients respond normally to verbal directions. Cognitive function and coordination may be reduced, although the respiratory and cardiovascular systems are unharmed. (2) Moderate sedation (conscious sedation) is a drug-induced reduction of consciousness in which patients respond intentionally to verbal directives alone or in conjunction with light tactile stimuli. There are no interventions necessary to preserve spontaneous ventilation. (3) Deep sedation is a drug-induced depression of consciousness in which patients cannot be easily woken but respond to frequent or painful stimulus with intent. Patients with insufficient spontaneous breathing may require assistance. (4) General anesthesia is a drug-induced state of unconsciousness in which the patient cannot be roused by painful stimulus [12].

Avoiding errors and adverse effects:

A comprehensive medical history and thorough physical examination should highlight any major organ system abnormalities and identify high-risk patients (extreme age, morbid obesity, and those with airway disease) [13]. The American Society of Anaesthesiologists (ASA) classification is a valuable instrument for describing a patient's baseline functional capacity. The patient's drug history must

include current medications, drug allergies, possible drug interactions, sedation or anesthetic history, and alcohol or illicit drug addiction history [14]. With the exception of an allergy to the sedative drug, there are no absolute contraindications for sedation. However, the medical history may show relative contraindications.

Due to the fact that oxygen desaturation can occur without manifesting clinical discomfort, monitoring is focused on detecting hypoxaemia. Pulse oximetry is recommended for drowsy patients because it detects oxygen desaturation with greater sensitivity than the clinical average. Normal saturation levels of oxygen exceed 95%. A saturation of 90 percent corresponds to an oxygen pressure (Po,) of 60 mmHg. This number resides at the steepest region of the oxygen-haemoglobin dissociation curve, where a small decrease in the Po will result in a substantial reduction in the amount of oxygen carried. This level of oxygen saturation demands the delivery of supplemental oxygen in order to maintain a level greater than 95%. Ideally, a person must be able to monitor and measure: (1) Saturation of oxygen using a pulse oximeter [15].

The following patient populations are at increased risk for sedation-related complications: those with conditions associated with an increased risk of pulmonary aspiration; patients with a depressed consciousness level; patients with a possibility of airway obstruction or respiratory irregularities; a history of sleep apnoea; raised intracranial pressure, or other conditions in which an increase in PaCO2 could be harmful; renal or hepatic dysfunction, which may alter drug kinetics; severe cardiac or pulmonary disease; pregnancy; extremes of age. as well as patients who are uncooperative In such cases, pre-procedural consultation with a suitable medical specialist and/or anesthetist minimizes both the risk of sedation and the occurrence of adverse effects [16]. Immediate access to an anesthesiologist improves the likelihood of a positive outcome. Depending on the medication and dose administered, patients should be informed not to drive for at least 24 hours following sedation, and appropriate transportation should be arranged [16].

On the day of the treatment, regular medications, with the exception of diabetic medications and anticoagulants, should be taken as prescribed with minimal water. Warfarin and clopidogrel should be ceased 5 days beforehand, whereas aspirin should be discontinued 3 days beforehand. [17] Low molecular weight heparin (LMWH) can be used to treat high-risk patients.

In the radiology area, appropriate sedative and analgesic drugs, as well as their respective reversal agents, must be readily available. In the operating room, an oxygen source, suction equipment, nasal cannulae, oral airways of suitable size, and a bag-valve mask should be available. There must be a cardiac monitor, an automated blood pressure cuff, and a pulse oximeter in intervention radiology rooms. The required emergency supplies must be readily accessible. All radiology departments should be equipped with a cardiac monitor/defibrillator, a laryngoscope, age-appropriate cuffed endotracheal tubes, and resuscitation drugs. Anxiolysis is the fundamental purpose of sedative medication, and therapeutic environments should strive to reduce patient anxiety. A plethora of aural and visual stimuli that induce anxiety are offered to conscious individuals undergoing procedures. It has been demonstrated that adjusting these stimuli by giving music and reducing ambient noise can reduce the need for analgesics and sedatives, however the research is mixed on this point [18,19,20].

Sedative Drugs:

Benzodiazepines (BZDs) interact with -aminobutyric acid receptor sites, resulting in a dose-dependent CNS depression. They also have an anticonvulsant effect and induce anxiolysis, antegrade amnesia, and hypnosis. They lack analgesic properties. It is possible to cause general anesthesia with large doses. In vulnerable patients, especially the elderly and those with chronic obstructive airway disease, smaller dosages may cause respiratory depression and apnea [21,22].

Due to its short half-life, midazolam, the most often used benzodiazepine for sedation, is water soluble. For sedation, midazolam can be administered intravenously, through rectum, nasally, buccally, and orally. Midazolam is not approved for conscious sedation in children less than 6 months, nor is it approved for oral, nasal, or buccal administration. The brief duration of action of midazolam has resulted in success rates between 50 and 73 percent. Due to its brief sedative duration, 0.2 mg/kg of intranasal midazolam was found to be 86% effective for various imaging investigations, more so for CT than MRI. It has been used successfully for sedation during unpleasant procedures, but it must be combined with an analgesic. It was shown that oral midazolam at 0.5 mg/kg had a similar duration of sedation to that of chloral hydrate (75 mg/kg) in less than eight years, but had poor success rates for neuroimaging (50 percent against 100 percent). In this study, however, the

numbers were minimal. 7 Time to peak sedation with intravenous midazolam is 5 to 10 minutes, and the duration of action is 30 to 120 minutes. Compared to chloral hydrate, it has a higher rate of failure, 13% versus 5%, but less adverse effects, such as gastrointestinal disturbances and motor imbalance [23,24].

It is possible to administer diazepam orally, intramuscularly, rectally, or intravenously. In aqueous form, it produces injection pain and thrombophlebitis. When administering diazepam intravenously, a lipid emulsion preparation is therefore preferred. It exhibits a predictable beginning of effect within 2–3 minutes when administered in increments of 1–2 mg. Due to its active metabolite desmethyldiazepam, its duration of effect is at least 6 hours, with a hangover effect. Diazepam is less suitable for usage as a sedative than midazolam due to its weaker amnesic effects, longer duration of effect, and longer hangover effect [25].

It is possible to administer lorazepam orally, sublingually, intramuscularly, or intravenously. Typically, it is administered orally or sublingually in a dose of 0.5 to 1.0 mg. Its onset of action can take up to 60–90 minutes, and its duration of action is variable with a protracted amnesic impact. Due to its sluggish onset and sustained action, it is unsuitable for use as a titratable sedative. Do not operate machinery for 48 hours after taking this medication [25,26].

Propofol is an intravenous general anesthetic induction drug that is frequently used by anesthesiologists for supervised anesthetic care. It is supplied by continuous infusion or as a bolus of 10 to 20 mg. Onset of action is 60 seconds, lasting 3–5 minutes. Significant research has been conducted on the use of propofol as a sedative for patients undergoing endoscopic and IR procedures. Numerous of these papers assert that propofol's profile of adverse effects and sedative effects are superior to those of intravenous midazolam and opioids. However, even at relatively low sedative dosages, propofol can result in unpredictable loss of airway reflexes. In high doses, propofol can rapidly induce apnea, and bigger boluses may trigger dystonic reflexes in patients withdrawing from painful stimuli. Additionally, it produces substantial hemodynamic depression in susceptible patients. [27,28]

Ketamine is a dissociative anesthetic and a procyclidine derivative. It is commonly used as a sedative for unpleasant procedures, especially in emergency departments, due to its superior analgesic and amnestic properties. Low intravenous doses (0.25–0.5 mg/kg) offer appropriate analgesia and moderate sedation; however, high intravenous doses (1–2 mg/kg) cause anesthesia. It has been reported to produce potentially life-threatening consequences, such as apneas, laryngospasm, and airway blockage. In research comparing midazolam and ketamine administered rectal and intravenously with general anesthesia, both groups had a 100% success rate; however, the midazolam/ketamine group had quicker recovery and discharge durations. It is commonly suggested not to use ketamine in patients with suspected elevated intracranial pressure; however, this guideline is now being contested in the medical literature, and additional research are needed to confirm or reject it [29,30].

CONCLUSION:

Providing sufficient sedation and analgesia to patients undergoing invasive diagnostic or therapeutic procedures in the radiology department increases patient satisfaction and allows optimal patient care by decreasing unintended movement and stabilizing hemodynamic condition. Sedation and analgesia are associated with a high risk of side consequences, especially respiratory compromise. However, understanding of sedative and analgesic medications and their safe administration, thorough monitoring of sedated patients before and after interventional procedures, and adequate training of support people to notice and respond to difficulties reduce the patient's risk of lasting harm. When utilizing sedatives, one of the most important factors is safety. Studies have also shown that a single medication is less likely to generate side effects than a combination of sedatives/analgesics. Another significant concern for the administration of oral sedative drugs in children is their palatability; however, many commonly administered medicines are not considered to be tasty.

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