Critical Care Guideline

Guideline ID	CCG for Sedation within Enhanced and Critical Care
Version	1
Title	Critical Care Clinical Guideline: Sedation within Critical and Enhanced Care
Approved by	Enhanced and Critical Care Group
Date Issued	23/03/2021
Review Date	23/03/2021
Directorate	Clinical
Authorised Staff	☐ Ambulance Care Assistant ☐ Newly Qualified Paramedic ☐ Emergency Care Assistant ☐ Nurse ☐ Student Paramedic ☐ Paramedic (non-SP) ☐ Advanced Technician ☒ Critical Care Practitioner ☐ Ambulance Practitioner ☒ Doctor
Publication Category	**Deviation permissible - with senior medical support.**

1. Scope

1.1 This Guideline outlines the training process and clinical governance of procedural sedation practice by Enhanced and Critical Care clinicians within South Western Ambulance Service NHS Trust (SWASFT). For the purposes of this document all Specialist and Advanced Practitioners in Critical Care will be referred to as Critical Care Practitioners (CCPs). For guidelines on Pre-hospital Emergency Anaesthesia (PHEA), refer to CG02 and for Post ROSC sedation, refer to CCG12.

1.2 This document will apply to all enhanced or critical care providers, including HEMS and BASICS.

2. Introduction

2.1 Sedation is a continuum of consciousness level, ranging from normal alertness through to complete unresponsiveness (Royal College of Emergency Medicine, 2012) and is used by enhanced and critical care resources in a variety of manners to facilitate clinical interventions whilst ensuring patient safety.

2.2 There are a variety of guidelines nationally that describe safe sedation within the hospital environment and it is appropriate that a specific pre-hospital

guideline is developed to ensure the safe sedation of patients within SWAST.

2.3 This Guideline represents the consensus opinion of the Enhanced and Critical Care Clinical Sub-Group of SWASFT and aligns with recommendations by the Royal College of Emergency Medicine and Royal College of Anaesthetists.

3. Definition of Terminology

3.1.1 Sedation

Is an intentionally induced pharmacological depression of consciousness along a continuum from normal alertness to complete unresponsiveness. Patients are induced and recover along this consciousness continuum and it is often difficult to accurately assess the precise level of sedation. There are no validated tools to measure levels of sedation in the pre-hospital setting

3.1.2 Minimal sedation

Is a drug induced state during which patients respond normally to verbal commands. Although cognitive function and coordination maybe impaired, ventilatory and cardiovascular function are unaffected. Entonox is the most common method of achieving this level of sedation.

3.1.3 Moderate sedation/analgesia (Conscious sedation)

Is a drug induced depression of consciousness during which patients respond purposefully to verbal commands, either alone or accompanied by light tactile stimulation. No interventions are required to maintain a patent airway, and spontaneous respirations are adequate. Cardiovascular function is maintained.

3.1.4 Deep sedation

Is a drug induced depression of consciousness during which patients cannot be easily roused, but respond purposefully following repeated or painful stimulation. The ability to independently maintain ventilatory function may be impaired. Patients may require assistance in maintaining airway patency and spontaneous ventilation may be inadequate. Cardiovascular function is usually maintained.

3.1.5 Dissociative Sedation

Is defined as a trance like cataleptic state characterised by profound analgesia and amnesia with retention of protective airway reflexes, spontaneous respirations and cardiopulmonary stability. This is unique to ketamine sedation and does not fit the standard definitions described above.

3.1.6 Procedural Sedation

Is a technique of administering a sedative and analgesic or dissociative agent which incorporates analgesic effects to induce a state that allows the patient to tolerate unpleasant procedures while maintaining cardio-respiratory function.

3.1.7 Maintenance of Sedation

Is the use of a sedative or dissociative agent, either in titrated bolus doses or continuous infusion form, to sustain the desired level of sedation after induction.. For example, to provide ongoing sedation throughout the journey to the receiving hospital should this be clinically indicated.

3.2 Competent Person

This is a person who has been formally recognised by SWASFT to autonomously use/perform/practice the skills or equipment s/he is demonstrating and/or assessing.

4. Initial Training and Education Process

4.1 The training and education process is intended to benchmark the minimal standards of exposure and experience required to be deemed competent to perform sedation as part of a Critical Care/Enhanced Care Team.

4.2 The minimum standard required for SP-CC sedation sign off is documented within the SP-CC Training and Education Policy and associated training portfolios. SP-CCs will be unable to undertake independent sedations until this pathway has been completed.

4.3 Enhanced or Critical Care Doctors require sign off by their lead doctor or by the Acute Care Medical Director to be able to undertake independent sedations.

5. Ongoing Demonstration of Competence

5.1 A sedation log should be kept as evidence demonstrating the circumstances of the case and reflect on the technical and non-technical skills used. The log must contain the reason for sedation, drug/s used, the drug dosage, physiological parameters, complications and co-morbidities. The Logbook in Annex 1 can be used, however any logbook that includes the information outlined in the attached Logbook (Annex 1) may be used.

6. General Sedation Principles

6.1 This guideline does not cover sedation as part of providing a Pre-Hospital Emergency Anaesthetic (PHEA).

6.2 Consent must be gained by patients prior to sedation being performed. Where the patient is unable to give consent clinicians must act in the patients best

interest and within their professional competency and code of practice. This should be documented on the electronic patient record.

6.3 The minimum staffing levels required for pre-hospital procedural sedation are:

1. Sedationist (operator 1)- A qualified SP-CC, AP-CC, Critical Care Doctor or an Enhanced Care Doctor with sedation competencies.
2. Proceduralist (operator 2)- An experienced registered pre-hospital clinician that is able to perform the required intervention e.g. straightening of a lower limb fracture.
3. Assistant- any grade of SWASFT clinical staff including ECA's. An assistant is not required if the sedation is being undertaken by a dual CCP or CCP and Enhanced or Critical Care Doctor team.

6.4 The patient should have an airway assessment undertaken prior to the procedure to risk assess potential airway problems during the sedation. All airway assessments should be documented appropriately. This must include the consideration of how a BVM would be utilised if respiratory depression as a result of over-sedation were to occur.

6.5 Clinicians should ascertain or estimate the patient's actual body weight, and this must be documented.

6.6 The SWASFT pre and post sedation checklist should be used for all procedural sedations and their use documented. See Appendix 2 for the SWASFT approved procedural sedation checklists.

6.7 Where possible, all patients should undergo a minimum of two minutes' pre-oxygenation with a non-rebreather mask at 15 litres per minute prior to administration of drugs, unless this level of Oxygen is contra-indicated. Where this cannot be achieved, a risk v benefit assessment should be undertaken to determine whether continuing with sedation remains appropriate and sufficiently safe. Where it is decided to continue with sedation Oxygen should be applied as soon as can be achieved.

6.8 The minimum standard of monitoring to deliver sedation are:

- Oxygen saturations (SpO2)
- End Tidal carbon dioxide (EtCO2)
- 3 lead ECG or pad monitored ECG
- Non-invasive blood pressure (NIBP) on a minimum of 3 min cycles

6.9 Observation should be continuous, where possible and the patient clinical record should have as a minimum a pre-sedation, during procedure and post sedation observations documented. The pre-sedation observations should be from just prior to drugs being administered where possible.

6.10 Where comprehensive continuous monitoring is not possible, for example during the period of extrication from a confined space, a minimum of SpO2 and EtCO2 monitoring should be used throughout this process and full monitoring reapplied once extrication has been achieved.

6.11 For combative patients or those in extremis, where monitoring is unable to be achieved this should be documented in the patient record. Monitoring should be applied as soon as possible e.g. once the patient has settled.

6.12 Prior to all sedations, as per the checklist, an airway plan and consideration of potential airway problems should be discussed and shared with the whole team caring for the patient.

6.13 For CCP led sedations, please refer to the relevant patient group directive (PGD) for clinical circumstances, inclusion and exclusion criteria.

6.14 Dosing is guided in the PGDs, but it remains the responsibility of the clinician to make appropriate dosing choices based on the clinical experience. The doses in the PGD must not be exceeded (unless being authorised by a suitably qualified SWASFT prescriber who is on scene Note: it is not legal to take a verbal order for a schedule 2 or 3 controlled drug), but care should be taken with vulnerable or compromised patients to reduce doses as appropriate to avoid adverse reactions.

6.16 Any significant complications should be documented and escalated to local governance or via Datix as appropriate. Section 13.6 ad 13.7 give details of specific adverse incidents which must be reported.

6.17 All patients, who have received sedation must be escorted to hospital by a clinician who is competent in sedation, with the exception of some ketamine only recipients described in section 7.4. When a sedation competent clinician is escorting a patient, they must travel with the patient inside the ambulance.

7. Procedural Sedation

7.1 CCPs that are undertaking procedural sedation should ensure that the clinical indication is within the relevant PGD, prior to commencing the sedation.

7.2 Ketamine is the approved first line sedation agent used in conjunction with midazolam to reduce/mitigate emergence delirium, if required. If other sedation drugs are used this should be documented clearly as to the clinical reasoning behind that decision.

7.4 Enhanced or critical care clinicians do not need to escort patients to hospital following sedation with ketamine, if **ALL** of the following can be achieved:

- The patient has fully recovered from the effects of Ketamine (GCS 15 with no lingering effects)
- The patient has no ongoing requirement for ketamine
- The patient has no potential requirement for post-Ketamine anxiolytic therapy
- The patient has no other requirement for enhanced or critical care
- Where patient deterioration is extremely unlikely.
- The lead clinician on the conveying resource is happy to take over responsibility for caring for the patient

7.5 If not escorting the patient to hospital, the minimum clinical grade to accompany the patient must be a SWASFT employed paramedic (excluding NQPs) or ambulance nurse. Care may not be handed over to a private contracted ambulance provider.

7.6 If care is handed over to another SWASFT resource, the enhanced or critical care clinicians must ensure that the sedation and procedure is fully documented on the patient clinical record prior to the patient arriving at hospital.

7.7 If any sedating agent other than Ketamine is administered (i.e. Propofol, Midazolam or Diazepam) or is Fentanyl is administered, then the patient must be accompanied by a suitable enhanced or critical care clinician to hospital.

8. Post Return of Spontaneous Circulation Sedation (ROSC)

8.1 Sedative drugs are indicated following ROSC to support patients with oxygenation and/or ventilatory abnormality, agitation, or physiological signs of distress.

8.2 There are a number of sedative drugs available to enhanced and critical care clinicians and clinicians must act within their own clinical competency and/or within their relevant PGDs.

8.3 CCPs should be aware of the inclusion and exclusion within the ketamine and midazolam PGD's to guide their practice and drug choice to ensure optimum sedation. For SP-CC, two drugs are available to provide post ROSC sedation:

- Midazolam
- Ketamine.

Critical Care doctors and other authorised prescribers have access to alternatives.

8.4 In certain circumstances, clinicians should consider the use of a neuromuscular blocking drug (NMBD) for this patient group. CCPs should discuss the requirement for a NMBD administration with their top cover consultant; refer to CCG 012 for more details. Were a NMBD is utilised care should be taken to ensure the patient remains adequately sedated.

8.5 Ketamine should be given with caution in patients in a post cardiac arrest syndrome, who are suspected to have an acute coronary syndrome (ACS) and acute heart failure as this may increase myocardial oxygen consumption.

8.6 When using midazolam, another appropriate analgesic (most commonly Morphine) should be administered as midazolam has no analgesic properties.

8.7 Ketamine when indicated provides both sedation and analgesia so further analgesia may not be required.

8.8 Please refer to CCG012 Managing Post Cardiac Arrest Syndrome for further guidance on the management of this patient group.

9. Sedation for Cardioversion

9.1 Patients who are suffering from a compromising tachyarrhythmia who require pre-hospital cardioversion should be provided with sedation to tolerate the procedure.

9.2 Due to the cardiovascular compromise and reduced cerebral perfusion, these patients typically require a smaller dose to achieve the same sedative endpoint, and time to achieve onset is often prolonged due to extended arm-to-brain circulation time.

9.3 CCG010 Pre-hospital Cardioversion provides guidance on the indications and procedure to be undertaken for safe cardioversion.

10. Sedation for Pacing

10.1 Transcutaneous pacing is used in the management of bradycardic arrhythmias in line with CCG011 Pre-hospital Transcutaneous Pacing for enhanced and critical care clinicians.

10.2 Transcutaneous pacing can cause significant patient discomfort therefore ongoing sedation and analgesia are required to tolerate this,

10.3 Ketamine is an appropriate agent and can, in certain circumstances, be administered by CCPs under the relevant ketamine sedation PGD.

10.4 Patients who are suffering from a bradyarrhythmia who require pre-hospital transcutaneous pacing should be provided with sedation; initial dosing and administration considerations are similar to those described in section 9.2.

10.5 Patients may have an increasing sedation requirement during pacing following mechanical capture as their cardiac output and cerebral perfusion improve. These patients will require maintenance sedation using either bolus doses or infusion via syringe driver. These doses should be titrated to effect to optimise patient comfort and physiological state.

10. Maintenance of Sedation

10.1 The purpose of sedation maintenance is to facilitate ongoing physiological optimisation and reduce the risk for potential further harm by preventing severe pain.

10.2 Ongoing sedation can be achieved by regular sedation boluses or via an infusion. Where possible, infusions via a syringe pump should be used as they provide continuous sedation and ensure safe patient delivery.

10.3 Prolonging sedation increases the risk of an adverse event occurring so the decision to prolong sedation must carefully consider the risks and benefits of doing so.

10.4 CCPs should consider contacting their top-cover to support decision making when considering the need for prolonging sedation.

10.5 Where prolonged sedation is used, minimum monitoring must be maintained throughout and the sedationist must continually monitor the patient. Any complications must be reported as described elsewhere.

10.6 The target for prolonged sedation is to keep the patient in the minimally sedated state required to safely transport. Clinicians should be familiar with the movement and reactions of patients that are normal whilst appropriately sedated and be aware of not over-sedating in response to these.

10.7 Post ROSC patients should have sedation targeted to ensure that physiological parameters are optimised namely oxygenation, ventilation and neurological distress.

10.8 Where a neuromuscular blocking drug has been used in post-ROSC patients other physiological signs should be closely monitored for evidence of distress or in more extreme cases the risk of awareness developing. These include increasing hypertension and tachycardia, lacrimation and developing tachycardia. Many of these signs are non-specific so alternative diagnoses must also be considered and excluded.

11. Prevention and management of recovery agitation

11.1 Recovery agitation (also known as emergence phenomenon) is a well-recognised complication of utilising high-dose analgesic or sedation ketamine. It is characterised by euphoria, vivid dreams, illusions, hallucinations and delirium. Individuals experience different reactions, though significant proportion of patients treated with Ketamine report distressing and unpleasant psychological experiences.

11.2 Recovery agitation increases risk of further injury, requires more care and support, and results in lower patient satisfaction. Many patients experience distressing and upsetting experiences without appearing outwardly distressed.

11.3 Younger age (though less in paediatrics), higher doses (>1mg/kg) and prolonged duration of treatment are associated with a greater risk of significant agitation developing.

11.4 Strategies which are advocated to try and minimise the risk of recovery agitation include:
- Ensuring a quiet and calm environment
- Warning the patient about the sensations they may experience
- ‘Dream planning’ or encouraging the patient to think of a positive experience
- Providing reassurance once experiencing the effects of Ketamine.
Whilst common practice, evidence for these strategies improving patience experience is poor.

11.5 The use of small prophylactic doses of benzodiazepines, typically Midazolam, may reduce the incident of adverse neuropsychological events. When this would be appropriate is a clinical decision, the following are examples where it may be of more benefit:
- Patients already demonstrating significant psychological distress, anxiety or agitation prior to receiving Ketamine

- Patients where prolonged administration of Ketamine is anticipated
- Patients who have a known history of emergence from Ketamine use.

11.6 When being administered prophylactically, typically only small doses of Midazolam will be required. CCPs should refer to the relevant PGD for dosing directions.

11.7 The risks of adverse effects due to prophylactic dosing with midazolam are likely to outweigh the potential benefits in the following patient groups:
- Entrapped patients
- Poly trauma patients
- Patients with haemodynamic instability
- Patients who have received high doses of opiate analgesia, due to pharmacodynamic synergism.

11.8 Caution should be used when administering prophylactic doses to elderly or frail patients. Reduced doses should be used. CCPs should refer to the PGD for dosing directions.

11.9 Caution should be used in patients requiring subsequent midazolam boluses alongside maintenance of sedation to ensure that iatrogenic midazolam over-sedation does not occur. Early indications of this may include:
- Significant respiratory depression

11.10 CCPs have access to Flumazenil. Should the use of Flumazenil be required this would be indicative of a significant benzodiazepine overdose and a Datix must be completed if it is administered.

11.11 When managing active recovery agitation it is likely that larger doses of Midazolam may be required, CCPs should refer to the relevant PGD. Despite this, care should be taken to ensure a patient is not inadvertently over-sedated.

11.12 The duration of effect of Midazolam is likely to be longer than a short-lived recovery agitation event. As with prevention, the minimum appropriate dose should be used to ensure patient safety.

12. Equipment

12.1 The following equipment must be immediately available at all times during sedation:
- Basic airway adjuncts (OPA / NPA)
- Supraglottic airways (iGel)
- Surgical airway kit
- A ventilatory circuit with PEEP (Mapleson C-circuit or bag valve mask with PEEP valve).
- 2 x Sources of Oxygen with sufficient supply to last for the duration of sedation
- Suction

13. Clinical Governance

13.1 Each clinician practicing autonomous sedations must have an up-to-date sedation log that is available for review at any time.

Failure to provide satisfactory evidence of appropriate sedation, as demonstrated in the log and application to this guideline, will prevent the clinician from being deemed competent to provide autonomous sedation until satisfactory evidence can be given. In these circumstances the clinician will be unable to perform any autonomous forms of sedation.

13.2 The clinician can only then redeem competency by undergoing a recertification plan approved by the unit clinical lead and Specialist Lead Enhanced and Critical Care. This plan will vary depending on a Training Needs Analysis performed with the clinician.

13.3 The unit Air Operations Officer, or nominated deputy, will be responsible for managing the training records that will capture evidence of the sedation records.

13.4 The Air Operations Officer/Medical Lead will be responsible for reviewing the sedation logs of each clinician as part of an annual review and on request by the Trust.

13.5 The Operations Manager EPRR will ensure that an appropriate deployment strategy is put in place ensuring that appropriately trained individuals are sent to any incident that is likely to involve the requirement for sedation.

13.6 Following the administration of sedation, if any of the following complications occur whilst the patient is still experiencing the effects of the medication, or within 30 minutes since the last administration (whichever is longer) then a Datix must be submitted;

- Any incident where inadvertent anaesthesia is achieved
- Airway obstruction, requiring insertion of a supraglottic airway or surgical airway
- Requiring sustained supported ventilation (>60 seconds).
- Flumazenil use
- Cardiovascular instability requiring intervention (i.e. tachyarrhythmia thought to be caused by the administration of Ketamine)
- Cardiac arrest following sedation administration, except for post-ROSC patients
- PGD did not allow for adequate dosing.

13.7 Following the administration of sedation, if any of the following complications occur whilst the patient is still experiencing the effects of the medication, or within 30 minutes since the last administration (whichever is longer) the incident must be discussed at local governance and can be escalated via Datix if required:

- Cardiac arrest following sedation in a post-ROSC patient

- Requiring supported ventilations (<60 seconds)
- Any period where SpO2 drops to 92% or below for > 30 seconds

14. Audit and documentation

14.1 All sedations undertaken should be audited by individual enhanced and critical care teams annually. For HEMS units, the Air Operations Officer and lead base doctor (or nominated deputies) will be accountable for making sure the audit information is available to the Trust on request.

14.2 All incidents should include the following information on the patient clinical records:

- Date
- Incident Number
- Name and clinical grade of the sedationist
- Name and clinical grade of proceduralist
- Name and clinical grade of assistant (where relevant)
- Consent or best interest decision
- Airway assessment
- Weight
- Checklist use
- Oxygen use and delivery
- Sedation drug and dosage
- Monitoring (including SpO2, EtCO2, 3 lead ECG and NIBP)
- Complications (including hypoxia and emergence)
- Clear rationale for sedation indication

14.3 It is the responsibility for the clinician undertaking the sedation to ensure that it is accurately recorded on the EPCR. For services not currently using the EPCR (i.e. BASICS) the clinician must ensure that the sedation is accurately recorded on the EPCR if one is available so that the receiving hospital is aware of procedure undertaken. A verbal handover on its own is not sufficient.

14.4 The minimum audit standard, individual units should audit and review annually are:

- Clearly documented procedural sedation reason
- Consent
- Airway assessment
- Drugs administered
- Checklist compliance
- Initial ketamine dose = 0.5mg/kg or less
- Total dose does not exceed PGD limits
- Observation documentation
- Oxygen delivery
- Any complications

15. Associated Documents

15.1 SWASFT Critical Care Practitioner Training and Education Policy
15.2 Ketamine training portfolio
15.3 CCP Ketamine Sedation PGD
15.4 Trainee SPCC Ketamine Sedation PGD
15.5 Midazolam with Ketamine PGD
15.6 Midazolam post-ROSC PGD
15.7 Critical Care Guideline: Pre-Hospital Cardioversion
15.8 Critical Care Guideline: Pre-Hospital Transcutaneous Pacing
15.9 Critical Care Guideline: Managing Post Cardiac Arrest Syndrome

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Annex 1: Ketamine Sedation Logbook

Ketamine Log Cover Sheet

Date	Brief Incident description	Analgesia / Sedation	Total Dose (mg/kg)	Supervising Clinician

Ketamine Log Log:

Incident No:	**Date:**	**Location:**
Patient weight:	**Analgesia / Sedation**	**Supervising clinician:**
Brief description of incident:		
Rationale for use of ketamine:		

Total dose administered:	**Desired effect achieved:** Yes / No
Adverse effects: Trainset apnoea SpO2 <92% Agitation Airway obstruction Inadvertent sedation	**Role (tick all relevant)**
	Observing only
	Sedationist
	Procedureist
	Supervising colleague in training

Reflection on case (including management of adverse effects if required):
Comments from supervisor (if required):

Pre-ketamine obs		**Post-ketamine obs**		**Core topics**	Tick
HR		HR		Young, fit patient (including adolescents)	
RR		RR		Older patient with chronic co-morbidity	
BP		BP		Patient who has already received morphine	
SpO_2		SpO_2		Patient who is entrapped	
E_TCO_2		E_TCO_2		Patient requiring sedation	
GCS		GCS			
Pain score		Pain score			

Annex 2: Pre Sedation Checklist

PRE-SEDATION CHECKLIST	
Position of patient	IDEALLY 360° ACCESS
Role allocation	SEDATIONIST, PROCEDURALIST, ASSISTANT
Airway assessment & Oxygenate	AIRWAY ASSESSMENT, OPTIMISE AIRWAY POSITION PRE-OXYGENATE 2 MINS
Equipment	2 X OXYGEN, PEEP VENTILATION CIRCUIT, SUCTION, AIRWAY EQUIPMENT • OPA / NPA • IGEL (CONFIRM SIZE) • SURGICAL AIRWAY KIT PROCEDURE SPECIFIC EQUIPMENT
Sedation Plan	VERBALISE PLAN AND SPECIFIC ROLES AIRWAY DISCUSSION AND PLAN FOR POTENTIAL COMPLICATIONS: - APNOEA - LARYNGOSPASM IS PROPHYLACTIC ANXIOLYTIC THERAPY REQUIRED?
Monitoring	ECG, NIBP 3 MINUTE CYCLE, SATS, ETCO2
Vascular access	APPRORIATE IV or IO ACCESS CONFIRMED PATENT THROUGH FLUSHING
Sedation drugs	INITIAL SEDATION DRUG AND DOSE MIDAZOLAM DOSE, IF REQUIRED RESCUE DRUGS AVAILABLE

Annex 3: Post Sedation Checklist

POST-SEDATION CHECKLIST	
Recovery	HAS THE PATIENT RECOVERED? IS THERE A REQUIREMENT FOR ANXIOLYTIC THERAPY?
Further Medications	WHAT FURTHER ANALGESIA OR SEDATING MEDICINES ARE REQUIRED?
Packaging and Transport plan	WHAT PACKAGING IS REQUIRED HOW IS THE PATIENT BEING TRANSPORTED
Complications	HAVE ANY COMPLICATIONS BEEN RESOVLED? DO COMPLICATIONS REQUIRE REPORTING? IS A DEBRIEF REQUIRED?