## Document Title:
DEXMEDETOMIDINE INFUSIONS IN BURNS INTENSIVE CARE FOR ADULTS

<table>
<thead>
<tr>
<th>Document Reference/Register no:</th>
<th>15026</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version Number:</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Document type:</strong></td>
<td>Guideline</td>
</tr>
<tr>
<td><strong>To be followed by:</strong></td>
<td>Medical and Nursing staff, Burns ITU</td>
</tr>
<tr>
<td><strong>Ratification Issue Date:</strong></td>
<td>2nd April 2019</td>
</tr>
<tr>
<td><strong>Review Date:</strong></td>
<td>1st April 2022</td>
</tr>
<tr>
<td><strong>Developed in response to:</strong></td>
<td>Best practice Review of local guidelines</td>
</tr>
<tr>
<td><strong>Contributes to HSC Act 2008 (Regulated Activities) Regulations 2014(Part 3); and CQC Regulations 2009 (Part 4) CQC Fundamental Standards of Quality and Safety:</strong></td>
<td>9,11</td>
</tr>
<tr>
<td><strong>Issuing Division/Directorate:</strong></td>
<td>Burns and Plastics</td>
</tr>
<tr>
<td><strong>Author/Contact:</strong></td>
<td>Peter Berry, Anaesthetic Consultant &amp; Lead for Burns Intensive Care</td>
</tr>
<tr>
<td><strong>Hospital Sites:</strong></td>
<td>✓ MEHT</td>
</tr>
<tr>
<td></td>
<td>□ BTUH</td>
</tr>
<tr>
<td></td>
<td>□ SUH</td>
</tr>
<tr>
<td>Consultation:</td>
<td>(Refer to page 2)</td>
</tr>
<tr>
<td><strong>Approval Group / Committee(s):</strong></td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>Date: n/a</td>
</tr>
<tr>
<td><strong>Professionally Approved by:</strong></td>
<td>Rebecca Martin, Burns ICU Consultant</td>
</tr>
<tr>
<td><strong>Date:</strong></td>
<td>27th March 2019</td>
</tr>
<tr>
<td><strong>Ratification Group(s):</strong></td>
<td>Document Ratification Group</td>
</tr>
<tr>
<td><strong>Date:</strong></td>
<td>28th March 2019</td>
</tr>
<tr>
<td><strong>Executive and Clinical Directors</strong></td>
<td>Date: April 2019</td>
</tr>
<tr>
<td>(Communication of minutes from Document Ratification Group)</td>
<td>Distribution Method: Trust Intranet, Burns Reference Folder in Metavision</td>
</tr>
</tbody>
</table>
### Consulted With:

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jackie Wallis</td>
<td>Pharmacist</td>
<td>7th February 2019</td>
</tr>
<tr>
<td>Joseph Hussey</td>
<td>Burns ICU Consultant</td>
<td></td>
</tr>
<tr>
<td>Arawwawala Dilshan</td>
<td>Consultant ICM and Anaesthesia</td>
<td></td>
</tr>
<tr>
<td>Deborah Lepley</td>
<td>Warner Library</td>
<td></td>
</tr>
</tbody>
</table>

### Related Trust Policies (to be read in conjunction with)

- 04071 Standard Infection Prevention
- 04072 Hand Hygiene
- 08086 Clinical Record Keeping Standards Policy
- 15027 Paediatric Dexmedetomidine Infusions in Burns ICU

### Document Review History:

<table>
<thead>
<tr>
<th>Version No</th>
<th>Authored/Reviewer</th>
<th>Summary of amendments/Record documents superseded by</th>
<th>Issue Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Dr Chiraag Talati</td>
<td></td>
<td>22nd December 2015</td>
</tr>
<tr>
<td></td>
<td>Dr Dilshan Arawwawala</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>Peter Berry</td>
<td>Full Review</td>
<td>2nd April 2019</td>
</tr>
</tbody>
</table>
INDEX

1. Purpose
2. Equality Impact Assessment
3. Scope
4. Staffing & Training
5. Indications
6. Contraindications
7. Cautions
8. Side Effects and Adverse Reactions
9. Overdosage
10. Usage in Patients with Burn Injuries
11. Interactions
12. Drug Preparation and Shelf Life After Dilution
13. Compatibility
14. Infusion Regimen
15. Adjusting Other Sedative Infusions
16. Stopping Dexmedetomidine
17. Audit
18. References
19. Appendices

Appendix A: A Flow Chart for the Initiation, Titration and Termination of Dexmedetomidine
Appendix B: Dilution, Dosage Calculation and Check Calculation
Appendix C: Preliminary Equality Analysis
1. **Purpose**

1.1 This guideline describes the usage and prescription of Dexmedetomidine intravenous infusion for the sedation of adult patients in the Burns Intensive Care Unit (ICU).

1.2 Dexmedetomidine is licenced in the United Kingdom for use in adult Intensive Care patients, to maintain sedation at a level not deeper than arousal in response to verbal stimulation (corresponding to Richmond Agitation Sedation Scale, RASS: -3 to 0).

1.3 Dexmedetomidine may be associated with shorter duration of mechanical ventilation, reduced ICU length of stay and a reduction in the risk of delirium when compared to traditional sedative agents, such as propofol or midazolam.

2. **Equality Impact Assessment**

2.1 Mid Essex Hospital services NHS Trust is committed to the provision of a service that is fair, accessible and meets the needs of all individuals. (Refer to Appendix C)

3. **Scope**

3.1 This clinical guideline is applicable to adults with major burn injury or skin loss that are nursed in Burns ITU (E220).

3.2 For the purpose of this guideline, adults are patients who are over 16. Patients 0-16 should be managed in line with “Paediatric Dexmedetomidine Infusions in Burns ICU”; register number 15027.

4. **Staffing & Training**

4.1 This clinical guideline is for registered medical and nursing staff working within Burns ITU. Staff unfamiliar with dexmedetomidine should be supported and trained by more senior and experienced colleagues.

5. **Indications**

5.1 Maintain sedation for Adults in Burns Intensive Care at a level responsive to verbal stimulation (licensed).

5.2 Dexmedetomidine can be used for patients irrespective of their mode of ventilation (invasive, non-invasive or self-ventilation).
6. **Contraindications**

6.1 The following are contraindications to the use of Dexmedetomidine:

- Previous allergy to Dexmedetomidine or other alpha-2 agonists;
- Second- or third-degree heart block (unless paced);
- Uncontrollable hypotension;
- Acute cerebrovascular disorders.

7. **Cautions**

Please exercise caution in the following clinical settings:

7.1 Monitor respiratory function in non-intubated patients, despite Dexmedetomidine not having significant respiratory depressant effects.

7.2 Do not commence Dexmedetomidine if a patient is hypovolaemic and/or hypotensive. Dexmedetomidine decreases sympathetic activity, and there is a risk of cardiovascular adverse events, which may be more pronounced in elderly, diabetics, chronic hypertension, severe valvular stenosis or regurgitation, and severe coronary heart disease. There are however, beneficial advantages to attenuation of sympathetic drive in specific cases, including reducing early post-operative ischaemic events in high-risk patients.

7.3 Local vasoconstriction at a higher concentration may be of greater significance in patients with ischaemic heart disease or severe cerebrovascular disease, and these patients should be monitored closely. Dose reduction or discontinuation should be considered in a patient developing signs of myocardial or cerebral ischaemia.

7.4 Transient hypertension during a loading dose has been observed. No specific treatment for this hypertension is required and decreasing the infusion is sufficient. This guideline does not advise a loading dose.

7.5 Patients should have continuous cardiac monitoring whilst on a Dexmedetomidine infusion. Data on patients with bradycardia (heart rate < 60/min) are limited and one should exercise caution in those patients with slow resting heart rates. Treatment of bradycardia is not usually required, although it usually responds to dose reduction or anti-cholinergic treatment.

7.6 Effects on patients with impaired autonomic activity (e.g. spinal cord injury) are not predictable, so exercise caution.

7.7 The manufacturer advises caution in hepatic impairment (liver metabolism); a reduced maintenance rate is advised.

7.8 There is no data on safety in pregnancy or breast-feeding; risks, benefits and alternatives should be considered.

7.9 The usage of Dexmedetomidine in paediatrics is not within the scope of this guidance.
7.10 No dose adjustment is required in renal impairment.

7.11 Safety in malignant hyperthermia sensitive individuals is not known and hence not recommended.

7.12 It is not to be used as an induction agent for intubation.

7.13 It is not recommended for status epilepticus or head injury patients.

7.14 Currently there is no time limit for infusions, but data is limited after 14 days.

8. Side Effects and Adverse Reactions

8.1 The most frequent adverse reactions are: hypotension (25%), hypertension (15%) and bradycardia (13%).

8.2 Common adverse reactions (1-10%) include: hyperglycaemia, hypoglycaemia, agitation, myocardial ischaemia/infarction, tachycardia, nausea, vomiting, dry mouth, withdrawal syndrome and hyperthermia.

8.3 Uncommon adverse reactions (0.1% to 1%) include: metabolic acidosis, hypoalbuminaemia, hallucination, first degree atriventricular block, reduction in cardiac output, dyspnoea, abdominal distension, ineffective therapeutic effect of the drug and thirst.

9. Overdosage

9.1 Overdosage reactions are predominantly cardiovascular including hypo/hypertension and bradycardia. Deep sedation may also occur.

9.2 When overdosage is suspected, reduce or stop the infusion and treat the cardiovascular effects as clinically indicated. Cases of sinus arrest have reversed spontaneously or with administration of atropine/glycopyrolate.

9.3 No death has been reported with overdosage.

10. Usage in patients with Burn Injuries

10.1 Dexmedetomidine administered as a 1 microgram/kg intramuscular injection (unlicensed) for dressing changes in patients with burns (in conjunction with tramadol and ketamine) had significantly less side effects and better visual analogue scores, compared to patients not receiving Dexmedetomidine. It can also be administered intra-nasally (unlicensed), to facilitate dressing changes; the intra-nasal dose is 1 to 3 microgram/kg.

10.2 Dexmedetomidine administered as a 1 microgram/kg intravenous infusion over 10-minutes with ketamine provided more haemodynamic stability for dressing changes, than compared to midazolam with ketamine.
10.3 Administration of Dexmedetomidine infusions to Paediatric Burns Intensive Care patients, showed a good safety profile with minimal adverse effects with a mean infusion rate of 0.5 microgram/kg/hr. This has also been reproduced by a more recent study.

11. Interactions

11.1 Co-administration with anaesthetics, sedatives, hypnotics and opioids is likely to lead to an enhancement of effects.

11.2 Enhanced hypotensive and bradycardic effects may be seen with other drugs that have these effects e.g. beta-blockers, although additional effects in an interaction study with esmolol were modest.

11.3 Dexmedetomidine has been shown to inhibit or induce some CYP450 enzymes in-vitro. Thus an effect on drug substrates to these enzymes in-vivo cannot be excluded. The clinical significance of this is unknown.

12. Drug Preparation and Shelf Life After Dilution

12.1 Dexmedetomidine is available in the United Kingdom as ‘Dexdor’ (Orion Pharma).

12.2 It is a clear, colourless solution in a 4ml ampoule containing 400 microgram, giving a concentration of 100 microgram/ml.

12.3 Dexmedetomidine (Dexdor) should be diluted to 8 microgram/ml for intravenous infusion.

12.3.1 A 4ml ampoule containing 400 microgram should be diluted with 46ml of 0.9% normal saline or 5% glucose to achieve the required concentration of 8 microgram/ml.

12.4 Shake gently to mix well. Do not use if there is any particulate matter or discolouration.

12.5 Shelf life after dilution: chemical and physical in-use stability has been demonstrated for 24 hours at 25°C. From a microbiological perspective, the product should be used immediately. If not used immediately, in-use storage times and conditions prior to the use are the responsibility of the user and would not normally be longer than 24 hours at 2-8°C.

13 Compatibility

13.1 Dexmedetomidine (Dexdor) is compatible when administered with the following: lactated Ringers, 5% glucose, 0.9% saline, 20% mannitol, thiopental sodium, etomidate, vecuronium bromide, pancuronium bromide, succinylcholine, atracurium besylate, mivacurium chloride, rocuronium bromide, glycopyrolate bromide, phenylephrine hydrochloride, atropine sulphate, dopamine, noradrenaline, dobutamine, midazolam, morphine sulphate, fentanyl citrate, and a plasma-substitute.
13.2 Dexmedetomidine should not be bolused. Therefore do not co-administer with any other drug infusion or fluid that may be bolused.

14. **Infusion Regimen (intubated or non-intubated patients)**

14.1 Commence only on the advice of a Burns ICU Consultant.

14.2 Can be administered via a central or peripheral intravenous line.

14.3 Use ‘actual’ bodyweight for infusion dosage calculations.

14.4 No loading dose or bolus dose at any point.

14.5 Initiate the infusion at 0.7 microgram/kg/hour. (a lower starting rate can be considered in frail patients)

14.5.1 Refer to Appendix A for an Infusion Flow Chart.

14.5.2 Refer to Appendix B for Calculation of rate in ml/hour.

14.6 The infusion is normally titrated by 0.2 microgram/kg/hour every 15-minutes to achieve the target sedation level (RASS 0 to -3). However, speed of titration and dose increments should be adjusted to the needs of the patient.

14.7 The maximum infusion rate is 1.4 microgram/kg/hour.

14.8 If the heart rate decreases to 60 beats per minute or less, reduce the rate by 0.2 microgram/kg/hour.

14.9 If satisfactory sedation level is not achieved with the maximum dose, consider alternative drugs, and do not continue Dexmedetomidine for greater than 48 hours.

15. **Adjusting Other Sedative Infusions**

15.1 Reduce propofol or other sedative infusions by 25-50% every 60-minutes until off.

15.2 Reduce opioid infusion rate by 25-50% every 60-minutes and titrate it to an acceptable pain score.

15.3 For patients with acute alcohol withdrawal, continue the usual Benzodiazepine regimen, as Dexmedetomidine has no anti-convulsant properties.

16. **Stopping Dexmedetomidine**

16.1 Do not alter Dexmedetomidine rate during daily sedation holds.

16.2 Once the target sedation level is achieved, continue Dexmedetomidine for 48-hours before starting to wean.
16.3 When sedation is no longer required, Dexmedetomidine can either be stopped or if preferred the remainder of the infusion can be run until complete, reducing the dose gradually. This may be preferred especially after very prolonged treatment.

17. **Audit**

17.1 The use of this guideline will be monitored by review of any reported incidents and annual audit.

17.2 Any significant complications related to Dexmedetomidine infusions will be reviewed at the monthly Burns Mortality and Morbidity meetings and the minutes distributed to the Burns MDT.

18. **References**

British National Formulary; [online] Available at: https://bnf.nice.org.uk/drug/dexmedetomidine.html


A Flow Chart For The Initiation, Titration And Termination Of Dexmedetomidine

Find actual body weight to calculate starting dose of 0.7mcg/kg/hour
DO NOT use loading dose [range 0.2 to 1.4mcg/kg/hour]

Dexdor® concentrate must be diluted prior to use. Administer as a diluted IV infusion via peripheral or central line using syringe driver / infusion pump

* Use either sodium chloride 0.9% or glucose 5% to dilute dexdor® to concentration 8mcg/mL.

Run for 15 minutes then assess patient for desired level of sedation
RASS score achieved?

No

Titrate dose stepwise at 15 minute intervals using 0.2 mcg/kg/hr to achieve desired RASS score within the first hour.
Continue other sedation until dexdor® reaches target effect

Yes

Wean other sedation by 25 – 50% per hour
Continue cardiac monitoring
Reduce infusion rate if bradycardia or hypotension occur
NB: max dose 1.4mcg/kg/hr

To stop dexmedetomidine:
Reduce infusion rate stepwise by 0.4mcg/kg/hr to 0.2mcg/kg/hr increments over a few hours and run until finished.
If no withdrawal symptoms after 30 minutes, simply allow infusion to run out
Note: can be continued during and after extubation
**APPENDIX B**

**Dilution, dosage calculation and check calculation**

<table>
<thead>
<tr>
<th>Volume of dexdor® concentrate 100mcg/ml</th>
<th>Add to this volume of diluent * (NaCl 0.9% or Glucose 5%)</th>
<th>The total volume of diluted infusion 8mcg/ml will be:</th>
</tr>
</thead>
<tbody>
<tr>
<td>4mL</td>
<td>46mL</td>
<td>50mL</td>
</tr>
<tr>
<td>8mL</td>
<td>92mL</td>
<td>100mL</td>
</tr>
<tr>
<td>20mL</td>
<td>230mL</td>
<td>250mL</td>
</tr>
<tr>
<td>40mL</td>
<td>460mL</td>
<td>500mL</td>
</tr>
</tbody>
</table>

**Dexmedetomidine infusion dosage calculation:**

- Use ‘actual’ body weight
- For drug concentration at 8 microgram/ml
- infusion rate at ml/hr = \( \frac{\text{Weight} \times \text{'Target' microgram/kg/hr}}{8} \)
- e.g. infusion rate for 70 kg for a target 0.7 microgram/kg/hr

\[
= 70 \times 0.7 / 8 = \text{6.13 ml/hr}
\]

Then check calculation using table below at the intersection of weight + dose:

<table>
<thead>
<tr>
<th>Dose in microgram/kg/hour</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
<th>75</th>
<th>80</th>
<th>85</th>
<th>90</th>
<th>95</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>1.25</td>
<td>1.38</td>
<td>1.5</td>
<td>1.63</td>
<td>1.75</td>
<td>1.88</td>
<td>2.13</td>
<td>2.25</td>
<td>2.38</td>
<td></td>
</tr>
<tr>
<td>0.3</td>
<td>1.88</td>
<td>2.06</td>
<td>2.25</td>
<td>2.44</td>
<td>2.63</td>
<td>2.81</td>
<td>3.19</td>
<td>3.38</td>
<td>3.56</td>
<td></td>
</tr>
<tr>
<td>0.4</td>
<td>2.5</td>
<td>2.75</td>
<td>3</td>
<td>3.25</td>
<td>3.5</td>
<td>3.75</td>
<td>4</td>
<td>4.25</td>
<td>4.5</td>
<td>4.75</td>
</tr>
<tr>
<td>0.5</td>
<td>3.13</td>
<td>3.44</td>
<td>3.75</td>
<td>4.06</td>
<td>4.38</td>
<td>4.69</td>
<td>5</td>
<td>5.31</td>
<td>5.63</td>
<td>5.94</td>
</tr>
<tr>
<td>0.6</td>
<td>3.75</td>
<td>4.13</td>
<td>4.5</td>
<td>4.88</td>
<td>5.25</td>
<td>5.63</td>
<td>6</td>
<td>6.38</td>
<td>6.75</td>
<td>7.13</td>
</tr>
<tr>
<td>0.7</td>
<td>4.38</td>
<td>4.81</td>
<td>5.25</td>
<td>5.69</td>
<td>6.13</td>
<td>6.56</td>
<td>7</td>
<td>7.44</td>
<td>7.88</td>
<td>8.31</td>
</tr>
<tr>
<td>0.8</td>
<td>5</td>
<td>5.5</td>
<td>6</td>
<td>6.5</td>
<td>7</td>
<td>7.5</td>
<td>8</td>
<td>8.5</td>
<td>9</td>
<td>9.5</td>
</tr>
<tr>
<td>0.9</td>
<td>5.63</td>
<td>6.19</td>
<td>6.75</td>
<td>7.31</td>
<td>7.88</td>
<td>8.44</td>
<td>9</td>
<td>9.56</td>
<td>10.13</td>
<td>10.69</td>
</tr>
<tr>
<td>1.0</td>
<td>6.25</td>
<td>6.88</td>
<td>7.5</td>
<td>8.13</td>
<td>8.75</td>
<td>9.38</td>
<td>10</td>
<td>10.63</td>
<td>11.25</td>
<td>11.88</td>
</tr>
<tr>
<td>1.1</td>
<td>6.88</td>
<td>7.56</td>
<td>8.25</td>
<td>8.94</td>
<td>9.63</td>
<td>10.31</td>
<td>11</td>
<td>11.69</td>
<td>12.38</td>
<td>13.06</td>
</tr>
<tr>
<td>1.2</td>
<td>7.5</td>
<td>8.25</td>
<td>9</td>
<td>9.75</td>
<td>10.5</td>
<td>11.25</td>
<td>12</td>
<td>12.75</td>
<td>13.5</td>
<td>14.25</td>
</tr>
<tr>
<td>1.3</td>
<td>8.13</td>
<td>8.94</td>
<td>9.75</td>
<td>10.56</td>
<td>11.38</td>
<td>12.19</td>
<td>13</td>
<td>13.81</td>
<td>14.63</td>
<td>15.44</td>
</tr>
<tr>
<td>1.4</td>
<td>8.75</td>
<td>9.63</td>
<td>10.5</td>
<td>11.38</td>
<td>12.25</td>
<td>13.13</td>
<td>14</td>
<td>14.88</td>
<td>15.75</td>
<td>16.63</td>
</tr>
</tbody>
</table>
## Appendix C: Preliminary Equality Analysis

### This assessment relates to: 15026 Adult Burns ICU Dexmedetomidine Infusions

<table>
<thead>
<tr>
<th>A change in a service to patients</th>
<th>A change to an existing policy</th>
<th>X A change to the way staff work</th>
</tr>
</thead>
<tbody>
<tr>
<td>A new policy</td>
<td>Something else (please give details)</td>
<td></td>
</tr>
</tbody>
</table>

### Questions

#### 1. What are you proposing to change?

- Full review of guideline

#### 2. Why are you making this change? (What will the change achieve?)

- 3 year review as per process

#### 3. Who benefits from this change and how?

- Patients and clinicians

#### 4. Is anyone likely to suffer any negative impact as a result of this change? If no, please record reasons here and sign and date this assessment. If yes, please complete a full EIA.

- No

#### 5. a) Will you be undertaking any consultation as part of this change? b) If so, with whom?

- Refer to pages 1 and 2

---

**Preliminary analysis completed by:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Job Title</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peter Berry</td>
<td>Anaesthetic Consultant &amp; Lead for Burns Intensive Care</td>
<td>07/02/2019</td>
</tr>
</tbody>
</table>