Dose and Indications

**Analgesia in Self-ventilating Patients**

*Intravenous Bolus*

0.5 to 1 microgram/kg, a repeat dose may be given at the discretion of the treating consultant.

**Analgesia and Sedation in Ventilated Patients**

*Intravenous bolus*

0.5 to 4 microgram/kg as a single dose.

Repeated as required (usually every 2 to 4 hours)

*Intravenous Infusion*

1 to 5 microgram/kg/hour (titrate to response)

**Intubation for Ongoing Ventilation**

*Intravenous Bolus*

4 microgram/kg/dose

**In-Out Intubation for Surfactant Therapy**

*Intravenous Bolus*

1 to 2 microgram/kg/dose
Preparation and Administration

**Intravenous**

**Fentanyl 10 microgram/mL prefilled syringe**

*Dilution instructions to make Fentanyl 10microgram/mL (if prefilled syringe unavailable)*

Dilute 1 mL of the 100 microgram/2 mL fentanyl solution with 4 mL of compatible fluid (to a total volume of 5 mL). The resulting solution contains 10 micrograms/mL fentanyl:

<table>
<thead>
<tr>
<th>Dose</th>
<th>Volume</th>
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</thead>
<tbody>
<tr>
<td>1 microgram</td>
<td>0.1 mL</td>
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<tr>
<td>3 microgram</td>
<td>0.3 mL</td>
</tr>
<tr>
<td>5 microgram</td>
<td>0.5 mL</td>
</tr>
<tr>
<td>7 microgram</td>
<td>0.7 mL</td>
</tr>
<tr>
<td>9 microgram</td>
<td>0.9 mL</td>
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</tbody>
</table>

Shake well to ensure thorough mixing.

Administered as a push **over at least 3 minutes**

Rapid administration of fentanyl is associated with hypotension, bradycardia, apnoea, respiratory depression and muscle rigidity.

Discard remaining solution.

**Continuous Intravenous Infusion**

Select the strength required based on the weight of the infant in the context of any fluid restrictions. Fentanyl Concentration Selection Tables can be found on the following pages of this guideline to assist prescribers to gauge which strength is best for the patient.

Dilute the appropriate volume of 50microgram/mL fentanyl injection using compatible fluid; and administer by continuous infusion. The dilution solution is stable at room temperature for 24 hours.

The three standard strengths available are:

> Fentanyl  4 microgram/mL
> Fentanyl  8 microgram/mL
> Fentanyl 16 microgram/mL

**Formulae**

To calculate infusion rate (mL/hr):

Rate (mL/hr) = \( \frac{\text{dose (microgram/kg/hour) \times weight(kg)}}{\text{Strength (microgram/mL)}} \)

To calculate the dose (microgram/kg/hour):

Dose (microgram/kg/hr) = \( \frac{\text{Rate (mL/hr) \times Strength (microgram/mL)}}{\text{Weight (kg)}} \)
Fentanyl

100 microgram/2 mL injection
20 microgram/2 mL pre-filled syringe

Fentanyl Concentration Selection Table

**Fentanyl 4 microgram/mL**

To make 25 mL syringe:
Dilute 2 mL fentanyl (100 microgram/2 mL) with 23 mL of compatible fluid (total of 25 mL). This makes a 4 microgram/mL solution.

To make 50 mL syringe:
Dilute 4 mL fentanyl (100 microgram/2 mL) with 46 mL of compatible fluid (total of 50 mL). This makes a 4 microgram/mL solution.

Recommended for neonates weighing less than 1 kg

<table>
<thead>
<tr>
<th>Rate (mL/hr)</th>
<th>0.2</th>
<th>0.3</th>
<th>0.4</th>
<th>0.5</th>
<th>0.6</th>
<th>0.7</th>
<th>0.8</th>
<th>0.9</th>
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<tbody>
<tr>
<td>Weight (kg)</td>
<td>Approximate microgram/kg/hour</td>
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<tr>
<td>0.5</td>
<td>1.6</td>
<td>2.4</td>
<td>3.2</td>
<td>4</td>
<td>4.8</td>
<td>5.6</td>
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<td>0.5</td>
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<tr>
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<td>0.8</td>
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<td>4</td>
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<td>1.3</td>
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<tr>
<td>2</td>
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<td>0.6</td>
<td>0.8</td>
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<td>1.1</td>
<td>1.3</td>
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<tr>
<td>3</td>
<td>0.3</td>
<td>0.4</td>
<td>0.5</td>
<td>0.7</td>
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<td>0.9</td>
<td>1.1</td>
<td>1.2</td>
<td>1.3</td>
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</table>

**Fentanyl 8 microgram/mL**

To make 25 mL syringe:
Dilute 4 mL fentanyl (100 microgram/2 mL) with 21 mL of compatible fluid (total of 25 mL). This makes an 8 microgram/mL solution.

To make 50 mL syringe:
Dilute 8 mL fentanyl (100 microgram/2 mL) with 42 mL of compatible fluid (total of 50 mL). This makes an 8 microgram/mL solution.

Recommended for neonates weighing 1 kg to 3 kg

<table>
<thead>
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<th>0.4</th>
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<tbody>
<tr>
<td>Weight (kg)</td>
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<td>1.6</td>
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<tr>
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<td>1.3</td>
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<td>1.9</td>
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<td>2.1</td>
<td>2.3</td>
<td></td>
<td>3.5</td>
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</table>
Fentanyl 16 microgram/mL

To make 25 mL syringe:
Dilute 8 mL fentanyl (100 microgram/2 mL) with 17 mL of compatible fluid (total of 25 mL).
This makes a 16 microgram/mL solution.

To make 50 mL syringe:
Dilute 16 mL fentanyl (100 microgram/2 mL) with 34 mL of compatible fluid (total of 50 mL).
This makes a 16 microgram/mL solution.

Recommended for neonates greater than 3 kg

<table>
<thead>
<tr>
<th>Rate (mL/hr)</th>
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<td>4.8</td>
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</table>

Compatible Fluids
Glucose 5%, sodium chloride 0.9%
Glucose 10% (stability data not available, however accepted in clinical practice)

Adverse Effects

Common
Laryngospasm, respiratory depression, miosis, urinary retention, constipation, rash, erythema and bradycardia.
May have a lower incidence of vomiting and constipation than other opioids

Infrequent
Chest wall rigidity, bronchospasm, tremor, hypothermia, tachycardia, hypertension, ureteric or biliary spasm, urticaria, muscle rigidity and myoclonus

Rare
Syndrome of inappropriate antidiuretic hormone hypersecretion (SIADH) and seizures
Fentanyl
100 microgram/2 mL injection
20 microgram/2 mL pre-filled syringe

Monitoring

- Continuous cardiorespiratory monitoring and SpO₂
- Close observation of the neonate for at least 30 minutes is required to assess for respiratory depression
- Pain is best monitored by using a pain score
- Urine output (continuous infusion) to monitor for urinary retention

Practice Points

- Physiological dependence and tolerance may occur with prolonged use (i.e. greater than 5 days of continuous dosing)
- Use with CAUTION in neonates:
  - not receiving assisted ventilation
  - with high intracranial pressure or convulsions
  - with urinary retention
  - with bradyarrhythmias or hypotension
- Fentanyl has a shorter half-life and greater cardiovascular stability than other opiates
- If fentanyl is used in conjunction with other sedative medications (e.g. midazolam) the dose of each must be reduced
- Naloxone should be available for reversal of opioid adverse effects.

Document Ownership & History

Developed by: SA Maternal, Neonatal & Gynaecology Community of Practice
Contact: Health.NeoMed@sa.gov.au
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<th>Who approved New/Revised Version</th>
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<td>18/10/2023</td>
<td>V5.0</td>
<td>Domain Custodian, Safety and Quality</td>
<td>Updates to dose and indications, prep and administration, compatible fluids, adverse effects, and monitoring</td>
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<td>SA Health Safety and Quality Strategic Governance Committee</td>
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