ICU Management Protocol No. 6

INTENSIVE INSULIN INFUSION

Introduction
- The role of intensive insulin treatment is to maintain tight control of blood glucose in critically ill patients.
- In a prospective, randomised, controlled study of mechanically ventilated adults, intensive insulin therapy reduced mortality to 4.6% compared with a conventional treatment group which had a mortality rate of 8%. The greatest reduction in mortality involved deaths due to multi-organ failure with a proven septic focus.
- You may choose to use either Protocol A or Protocol B

Protocol A

1. This protocol is not suitable for patients with diabetic ketoacidosis or children under the age of 16 years old.

2. The aim of blood glucose level (BGL) is between 5.1 – 8.0 mmol/l.

3. Start protocol when BGL exceeds 8.0 mmol/l after 2 consecutive readings in 2 hours.

4. Insulin Infusion: Use Soluble Insulin 50 units in 50 ml 0.9%NaCl infused through a dedicated cannula or central line lumen.

5. Blood glucose monitoring: Initially hourly monitoring, then 2-4 hourly when there is no rate change in 2 consecutive hours.

6. Patients who develop symptoms of severe hypoglycaemia should be treated as if BGL < 3.5 mmol/l. Symptoms include tremors, tachycardia, sweating, confusion and agitation leading to fitting and coma.

7. Feeding: Continuous feeding is recommended. Give IV dextrose 10% at 25ml/h until EN is tolerated or TPN is started. If EN is discontinued for any reason, recommence IV Dextrose 10% infusion at 25ml/h and continue insulin infusion.

8. Stop protocol when patient is taking food orally.

9. Other infusions (especially antibiotics) should be made up with water or saline if possible.

10. Patients should be converted to a standard hospital intermittent regimen (if required), before ICU discharge.
INTENSIVE INSULIN INFUSION IN THE ICU

AIM TO MAINTAIN BLOOD GLUCOSE LEVEL (BGL) 5.1-8.0 MMOL/L

ICU ADMISSION

Monitor BGL 2 hourly. Can be monitored less frequently when patient is stable. (Minimum – 1/day)

If BGL > 8.0 mmol/l check again in 1 hour.

IF BGL STILL > 8.0 START INSULIN INFUSION

INITIAL INSULIN INFUSION RATE

<table>
<thead>
<tr>
<th>BGL (mmol/l)</th>
<th>Infusion rate (U/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1-8.0</td>
<td>0</td>
</tr>
<tr>
<td>8.1-11.0</td>
<td>2</td>
</tr>
<tr>
<td>11.1-15.0</td>
<td>3</td>
</tr>
<tr>
<td>&gt;15.1</td>
<td>4</td>
</tr>
</tbody>
</table>

- START or maintain 10% Dextrose infusion at 25ml/h until EN tolerated (i.e. 40 ml/hr with < 200 ml aspirate) or TPN started
- Check BGL HOURLY and adjust infusion rate until 2 consecutive hours require no rate change, then check BGL 2-4 hourly. If adjusting the insulin infusion rate or changing between dextrose/Enteral Nutrition/TPN, revert to hourly BGL monitoring.

ONGOING INSULIN INFUSION RATES

WHAT IS LATEST BLOOD GLUCOSE?

- < 3.5
  - STOP INSULIN
  - Give 20-50 mls of 50% Dextrose
  - Check BGL in 15 min.
  - When BGL > 5.0 mmol/l, halve previous infusion rate

- 3.6-5.0
  - How much BGL changed since last value?
  - How much BGL changed since last value?
  - Decreasing trends
  - Halve infusion rate by 0.5 U/h

- 5.1-8.0
  - No rate change
  - Increasing trends
  - No rate change

- 8.1-11.0
  - How much BGL changed since last value?
  - How much BGL changed since last value?
  - Increasing trends
  - Halve infusion rate by 0.5 U/h

- 11.1-15
  - (Check ketone)
  - No rate change
  - Decreasing trends
  - No rate change

- > 15
  - No rate change
  - Increasing trends
  - Double infusion rate
  - ICU MO Review

Ensure EN tolerated or D10% or TPN commenced
Protocol B

1. Intensive insulin therapy is recommended to maintain serum glucose levels between 5 to 8 mmol/l in all ICU patients.

2. Continuous intravenous insulin infusion (CIVII) through a pump is preferred as it offers smooth control.

3. Dilute 50 units of soluble insulin in 50 ml of normal saline in a syringe and deliver it by an infusion pump.

4. Start CIVII with scale 1 or 2 initially.

5. Blood glucose level (BGL) should be monitored at 2 h intervals. Depending on whether the blood glucose improves 4 h later, the sliding scale may be switched to one with a higher initial CIVII rates. (e.g. from scale 1 to scale 3)

6. BGL may be monitored less regularly (i.e. 4 h intervals) once stable.

### Continuous intravenous insulin infusion

<table>
<thead>
<tr>
<th>Blood glucose (mmol/l)</th>
<th>Scale 1 (U/h)</th>
<th>Scale 2</th>
<th>Scale 3</th>
<th>Scale 4</th>
<th>Scale 5</th>
<th>Scale 6</th>
<th>Scale 7</th>
<th>Scale 8</th>
</tr>
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<tbody>
<tr>
<td>≥ 22</td>
<td>3.0</td>
<td>4.0</td>
<td>5.0</td>
<td>6.0</td>
<td>7.0</td>
<td>8.0</td>
<td>10.0</td>
<td>11.0</td>
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<td>4.0</td>
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<tr>
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<td>0.5</td>
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<td>1.0</td>
<td>1.5</td>
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<tr>
<td>&lt; 5</td>
<td>Stop IV insulin infusion and inform doctor</td>
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References