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## Neonatal Hypoglycaemia: Prevention and Management

Hutt Maternity Policies provide guidance for the midwives and medical staff working in Hutt Maternity Services. Please discuss policies relevant to your care with your Lead Maternity Carer.

### **Purpose**

The purpose of this document is to describe the prevention and management of neonatal hypoglycaemia at Hutt Hospital.

### **Scope**

This policy applies to all medical, nursing and midwifery staff caring for infants at Hutt Hospital.

### **Definitions**

SGA: small for gestational age (less than 10<sup>th</sup> centile)

LGA: large for gestational age (greater than 95<sup>th</sup> centile)

Hypoglycaemia: blood glucose <2.6mmol/L

### **Roles and Responsibilities**

It is the responsibility of all medical, nursing and midwifery staff caring for infants at Hutt Hospital to ensure that infants at risk of hypoglycaemia are screened appropriately, and then treated as required.

### **Guideline**

#### **1. HYPOGLYCAEMIA IN INFANTS**

Hypoglycaemia in infants is defined as a blood glucose < 2.6 mmol/L. Glucose is an essential nutrient for the brain, and low levels of glucose may cause cerebral injury and neurodevelopmental delay. Current evidence suggests that repeated blood sugar values < 2.6 mmol/l may be associated with long term neuro-cognitive deficits.<sup>1-3</sup> Hypoglycaemia is common, with as many as half of those identifies as being at risk becoming hypoglycaemia.<sup>4-5</sup>

#### **2. MEASUREMENT OF BLOOD GLUCOSE**

- Use a heel prick sample unless the baby has a badly bruised heel
- Use the blood glucose analyser
- If the blood glucose is <2.0mmol/L, a venous blood sample needs to be sent to the lab (but do not wait for result before starting treatment).

#### **3. HIGH RISK INFANTS**

Infants at risk of hypoglycaemia include:

- Infant of diabetic mother

- **Small for gestational age (SGA)** <10<sup>th</sup> centile on [customised centile chart](#)<sup>6</sup> } as per 'GROW' chart
- **Large for gestational age (LGA)** >95<sup>th</sup> centile on [customised centile chart](#) }
- If customised charts not available, all infants <10<sup>th</sup> centile or >95<sup>th</sup> centile for gestation on standard centile charts\*
- If standard centile charts not available, all **term** infants with a **birth weight < 2.8kg or > 4.5kg.**
- Preterm Infants (<37 weeks gestation)
- Stressed infants with
  - Perinatal asphyxia (5 minute APGAR <7)
  - Traumatic delivery
  - Respiratory distress or sepsis
  - Hypothermia, temperature <36.6°C

\* (the centile determination for "small" and "large" needs to be pragmatic. For growth charts showing the 9<sup>th</sup> and 98<sup>th</sup> centiles, these are the appropriate thresholds to use.)

SGA: Note that some significantly growth restricted infants are above the 10<sup>th</sup> percentile; if the infant appears very thin and dysmature then treat as SGA.

#### 4. SYMPTOMS OF HYPOGLYCAEMIA

- |                      |                           |
|----------------------|---------------------------|
| • Jitteriness        | • Poor feeding            |
| • Irritability       | • Seizures                |
| • Lethargy           | • Hypothermia             |
| • Hypotonia          | • Temperature instability |
| • Apnoea or cyanosis | • Poor/inadequate suck    |

#### Admit to SCBU the following infants

- Infants <35 weeks
- Birth weight <2.3kg
- Babies of mothers requiring insulin in pregnancy **combined** with one or more of the following **additional risk factors**:
  1. Prematurity <37 weeks
  2. Perinatal asphyxia (e.g. 5 minute Apgar score <7)
  3. Small for gestational age
  4. Large for gestational age

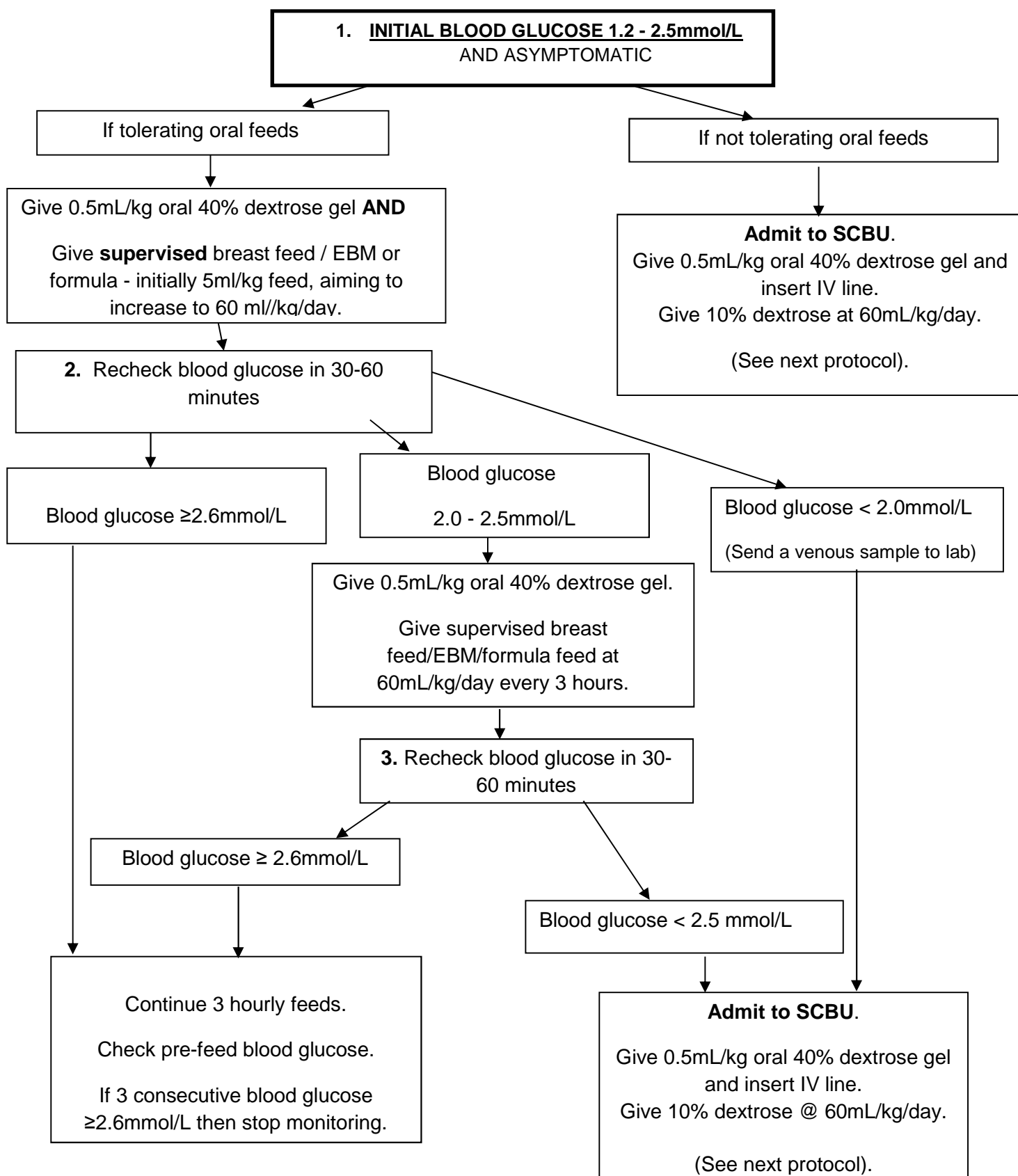
#### 5. WHEN TO MONITOR

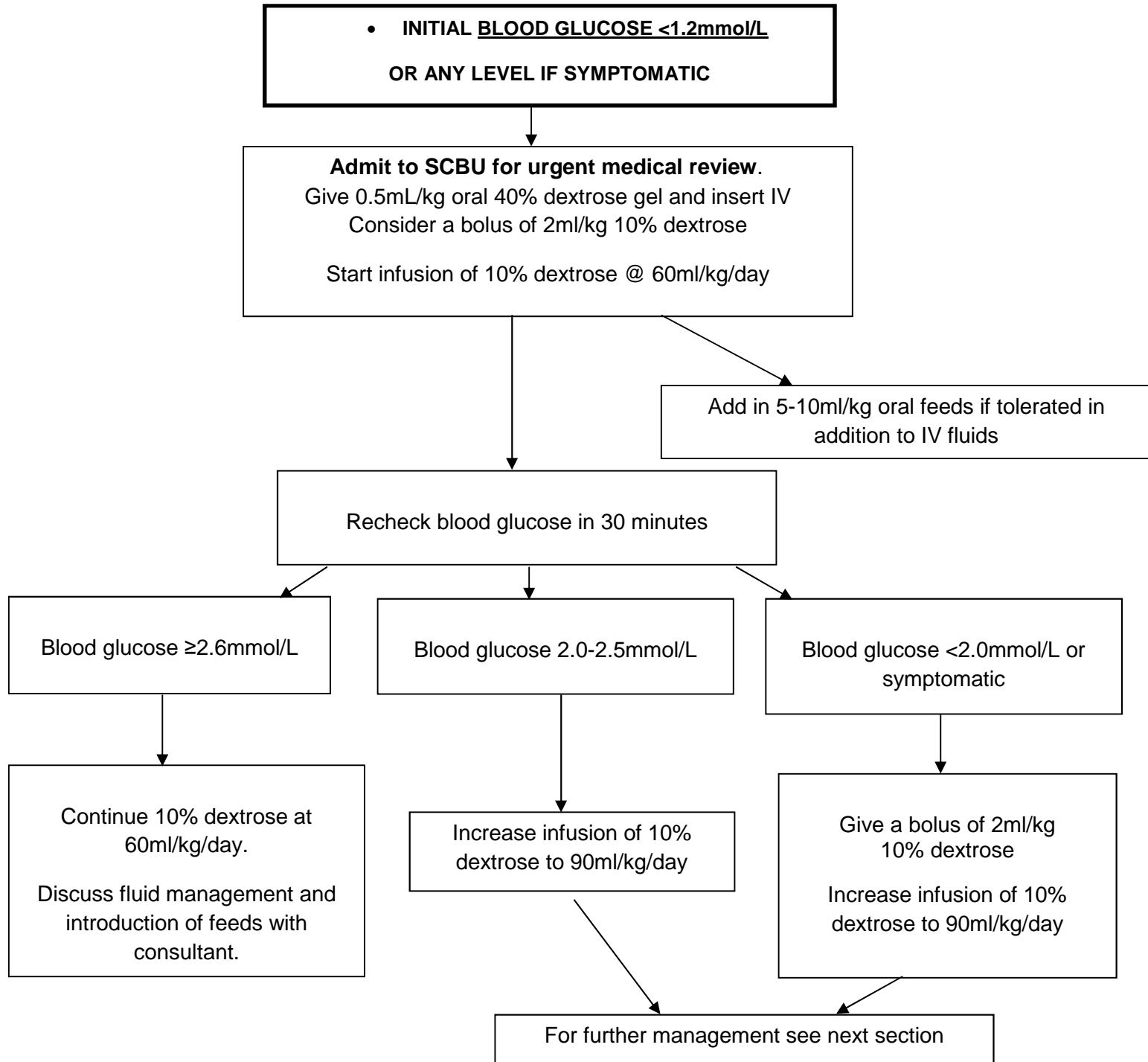
1. All high risk infants (see above) should receive milk feeds (either breastfeed or formula – maternal preference) or intravenous dextrose as soon as feasible, ideally within **first 1 hour of life**.
2. Check blood glucose 1 hour after first feed (< 2 hours of age).
3. Monitor glucose 3-hourly, pre-feeds
4. Stop monitoring once feeding well and has 3 consecutive blood glucose >2.5mmol/L

Note: If the baby has symptoms of hypoglycaemia (see 4.), check the blood glucose before the above recommended times.

- Maintain baby's temperature at 36.6 – 37.0°C
- **Inform the paediatrics SHO/registrar of any blood glucose < 2.6mmol/L**

## 5. INITIAL MANAGEMENT OF HYPOGLYCAEMIA





Do not increase oral feeds >100mls/kg/day in the first 24 hours.  
Feeding with low birth weight formula in order to maintain blood sugars is discouraged.

**See Appendix 1 for standing orders for how to give dextrose gel.**

## 7. SCBU MANAGEMENT OF PERSISTENTLY LOW BLOOD GLUCOSE

Once the baby is on intravenous dextrose, calculate the mg/kg/min of glucose being administered:

$$\text{mg/kg/min} = \frac{\% \text{ dextrose} \times \text{rate (ml/hr)}}{\text{weight} \times 6}$$

- The initial intravenous dextrose infusion should deliver 6-8 mg/kg/min to be effective.
- The glucose can be increase to 12mg/kg/min, but a more concentrated glucose solution may be required to achieve the higher rate.
- If >10mg/kg/min of IV glucose is required, perform the investigations detailed below.

### Increasing the dextrose concentration

If the infant is fluid restricted or already on 105mls/kg/day of IV fluid in the first 24 hours, the dextrose concentration may require to be increased to deliver sufficient mg/kg/min:

- A dextrose concentrations >12.5% requires a central line (UVC or longline).

Note: The percentage of dextrose in a bag = the number of grams of dextrose per 100ml e.g. 10% dextrose contains 10g of dextrose in 100ml water for injection

### Preparation using a burette:

Intravenous fluids are to be prepared and administered aseptically and administered to the patient directly following preparation. **Please double check all calculations**

1. Ensure solution of 50% dextrose vial is clear and free of any particulate matter
2. Withdraw the required volume of 50% dextrose and add to the required volume of 10% dextrose in the burette to **create a final total volume of 100ml.**

**See table below:**

Dextrose Concentration	12.5%	15%	17.5%	20%	22.5%	25%
Dextrose 50%	5ml	10ml	15ml	20ml	25ml	30ml
Dextrose 10%	95ml	90ml	85ml	80ml	75ml	70ml

Note: Due to the inaccuracy of measurement on a burette (10% deficit), safe practice is to measure the amounts required of each fluid into a syringe before adding to the burette

**If concentrations of greater than 12.5% dextrose are required, the fluid must NOT go through a peripheral intravenous line or UAC**

## Preparation using a syringe:

Intravenous fluids are to be prepared and administered aseptically and administered to the patient directly following preparation. **Please double check all calculations**

1. Ensure solution of 50% dextrose vial is clear and free of any particulate matter
2. Withdraw the required volume of 50% dextrose into the syringe then draw up required volume of 10% dextrose to **create a final total volume of 50ml.**

**See table below:**

Dextrose Concentration	12.5%	15%	17.5%	20%	22.5%	25%
Dextrose 50%	2.5ml	5ml	7.5ml	10ml	12.5ml	15ml
Dextrose 10%	47.5ml	45ml	42.5ml	40ml	37.5ml	35ml

**Avoid using repeated boluses** of IV dextrose to avoid rebound hypoglycaemia. Rather increase the rate of IV dextrose administration.

**Continue some oral feeding if possible** e.g. 25mls/kg/day

**If persistent severe hypoglycaemia** or requiring > 10mg/kg/min of IV glucose, investigate further.

The following investigations should be taken during an episode of hypoglycaemia:

- Blood glucose ( venous sample to be sent to lab)
- Blood and urinary ketones ] Ketostix
- pH + lactate ] capillary gas
- Insulin + Free fatty acids ] 2 x EDTA on ice
- Growth hormone ] red top
- Cortisol ] red top
- Carnitine ] Guthrie card circle x 1
- Urine reducing substances, urine amino acids and organic acids ] 1<sup>st</sup> urine passed

Other bloods to be done at some stage:

Ammonia, Thyroid function tests, serum amino acids.

Continue monitoring blood glucose every 30mins until  $\geq 2.6$ mmol. Further monitoring is dependent on the clinical situation.

Once IV fluids have been stopped 3 consecutive blood glucose  $\geq 2.6$  mmol/L are required before monitoring is discontinued.

## 8. HYPERINSULINISM

Infants with hypoglycaemia due to hyperinsulinism (infant of a diabetic mother requiring insulin during pregnancy or some SGA infants) may need >10mg/kg/min of glucose.

- Initially start with 6-8mg/kg/min (the maximum rate is 12mg/kg/min)
- Use **glucagon** early if the infant is needing >10mg/kg/min IV glucose. The dose is
  - 300mcg/kg (0.3mg/kg) IV or IM if not SGA
  - 200mcg/kg (0.2mg/kg) IV or IM if SGA
- If 12mg/kg/min IV glucose is required and glucagon has been given, use hydrocortisone 5mg/kg/day in 4 divided doses

Infants with hyperinsulinism may require transfer to a tertiary unit.

In some babies, diazoxide and somatostatin infusions may be required.

### Implementation and monitoring compliance

- One important measurement to ensure this protocol is adhered to, and for the safety of infants, is to check that all three consecutive pre-feed BSLs are checked, and are  $\geq 2.6$ mmol/L. This could be audited by a notes review looking the recording of three BSLs  $\geq 2.6$ mmol/L.
- The addition of dextrose gel to the neonatal hypoglycaemia protocol may prevent some admissions of infants to SCBU.

### References

1. Kerstjens JM et al. *Neonatal morbidities and developmental delay in moderately preterm-born children*. Pediatrics 2012; 130: 265-72
2. Koh TM et al. *Neural dysfunction during hypoglycaemia*. Archives of disease in childhood 1988; 63: 1353-8.
3. Lucas et al. *Dextrose gel for neonatal hypoglycaemia*. British Medical Journal 1988; 297: 1304- 8.
4. Harris DL, Weston PJ, Harding JE. *Incidence of neonatal hypoglycaemia in babies identified as at risk*. Journal of Pediatrics 2012; 161; 787-91.
5. Harris DL, Weston PJ, Signal M, Chase JG, Harding JE. *Dextrose gel for neonatal hypoglycaemia (the sugar babies study): a randomised, double-blind, placebo-controlled trial*. Lancet 2013; **382**: 2077-83.
6. <http://www.gestation.net/cc/3/172546.htm>
7. Capital and Coast District Health Board pharmacy NICU drug monograph: Dextrose IV. (March 2013). <http://ccdhb.intranet/PoliciesAndProcedures/> accessed June 2016

### **Informed Consent**

The right of a consumer to make an informed choice and give informed consent, including the right to refuse medical treatment, is enshrined in law and in the Code of Health and Disability Consumers' Rights in New Zealand. This means that a woman can choose to decline treatment, referral to another practitioner, or transfer of clinical responsibility. If this occurs follow the process map on page 18 of the Referral Guidelines (Ministry of Health, 2012).

## Appendix 1

### **40% DEXTROSE GEL** **FOR HYPOGLYCAEMIA**

INDICATIONS: Infants with Hypoglycaemia  
(Whole blood glucose <2.6 mmol/L)

- METHOD:
1. Draw up 0.5 mL/kg of 40% Dextrose Gel into 2 ml syringe.
  2. Dry infant's buccal mucosa with gauze swab.
  3. Place 40% Dextrose Gel on your gloved finger and massage into infant's buccal mucosa.
  4. Check blood sugar level 30-60 minutes after administration of 40% Dextrose Gel and feeding, as per flow chart.
  5. Continue to give feeds as charted, as tolerated.
  6. Inform and explain to parents.

CAUTIONS: Infants who are unconscious or experiencing hypoglycaemic seizures should receive an urgent bolus of Dextrose IV or Glucagon IM, as prescribed by medical staff. However, dextrose gel can be administered while venous access is gained.

N.B. - 40% Dextrose Gel may be given immediately by midwifery, nursing or medical staff. It should be recorded on the infant's record sheet and Stat Prescription Sheet.

Under Section 29 of the Medicines Act it is a legal requirement to supply details of administration. It is important to record the administration on the Stat Prescription Sheet (to advise pharmacist for ordering purposes), and on form titled "Medicines Supplied Under Section 29 of the Medicines Act for Named Patient."