

ANNEXURE

1. How to calculate the desired concentration of glucose in intravenous fluid and how to mix various solutions for creating a desired concentration of glucose in IV infusate?

The formula for preparing 100 mL of fluid with a desired concentration of glucose using 5% dextrose and 25% dextrose solutions is given by the formula $5X-25 = Y$ where X is the required percentage of dextrose and Y is the amount of 25% dextrose (in mL) to be made up with 5% dextrose to make a total of 100 mL.

For example, to prepare 100ml of 10% dextrose from 5% dextrose and 25% dextrose, add $5 \times 10 - 25 = 25$ ml of 25% dextrose to the remaining volume, i.e. $100 - 25 = 75$ ml of 5% dextrose.

To prepare 100 ml of 12.5% dextrose, add $5 \times 12.5 - 25 = 37.5$ ml of 25% dextrose to 62.5 ml ($100 - 37.5$) of 5% dextrose.

2. How to calculate the glucose infusion rate (GIR)?

Neonatal blood glucose concentrations correlate closely with glucose infusion rates. Glucose Infusion Rate (GIR) is expressed in terms of milligrams of glucose per kilogram body weight per minute (mg/kg/min). It can be calculated using one of the following formulae³⁹ :

$$(a) \text{ GIR (mg/kg/min)} = \frac{\% \text{ of dextrose being infused} \times \text{rate of infusion (in ml/hr)}}{\text{Body weight (in kg)} \times 6}$$

$$(b) \text{ GIR (mg/kg/min)} = \frac{\text{Rate of IV fluids (in ml/kg/day)} \times \% \text{ of dextrose infused}}{144}$$

$$(c) \text{ GIR} = \text{Rate of IV fluids (in ml/kg/day)} \times \% \text{ of dextrose infused} \times 0.007$$

Method 1 for calculating GIR (same as (b) above)

Decide desired fluid intake of the neonate in mL/kg/day (24 hrs) Convert this to mL/kg/min by dividing the figure by 1440

(Since 24 hours have 1440 minutes)

If 10% dextrose is being used, multiply the figure obtained in (b) above by 100 to find out the Glucose Infusion Rate (GIR) in mg/kg/min.

(Since 10% Dextrose has 100 mg/mL of dextrose. Similarly, 5% dextrose has 50

mg/mL; 7.5% dextrose has 75mg/mL of dextrose and so on)

(d) Based on desired fluid intake and desired GIR, the concentration of dextrose in the IV infusate can be decided.

(e) **Example**

(i) Let the neonate's fluid intake be 80 mL/kg/day

(ii) This is $80/1440 = 0.055$ mL/kg/min

(iii) If 10% dextrose is given, then the GIR is :

$$0.055 \times 100 = 5.5 \text{ mg/kg/min}$$

Method 2 for fluid rate and GIR (Using 10% dextrose only)²⁴

Step1

a) 100 mL of 10% dextrose has 10 gm or 10,000 mg of glucose

b) If this 100 ml is given over 24 hours then GIR is

$$10,000/1440 = 6.95 \text{ mg/min; say } 7.0 \text{ mg/min}$$

(Since 24 hours have 1440 minutes)

c) Therefore 1 mL/day of 10% dextrose will provide a GIR of 0.07 mg/min

d) Based on the above, GIR for a neonate can be calculated as follows: GIR (mg/kg/min) = IV fluid rate (mL/kg/day) x 0.07

Step 2 – Increasing GIR by 1mg/kg/min

(a) **Add 2 mL/kg of 25% dextrose to the volume of fluid to be infused over 8 hrs –see explanation below:**

[i] 25% Dextrose has 250 mg/mL of dextrose; 2 mL/kg has 500 mg/kg

[ii] The 8 hour period has $8 \times 60 = 480$ minutes

[iii] 2 mL/kg of 25% dextrose over 8 hrs will increase the GIR by $500/480$ or roughly 1 mg/kg/min

(b) **Example**

1. Let the neonate's fluid intake be 80 mL/kg/day

2. With 10% dextrose the GIR is $80 \times 0.07 = 5.6$ mg/kg/min

3. If GIR has to be increased by 1 mg/kg/min then add 2 ml/kg of 25% dextrose to the fluid to be infused over 8 hrs

(c) **Caveat:** For this formula to work, the GIR has to be kept at or below a tenth of the total fluid intake in mL/kg/day – e.g. if the total fluid intake is 100 mL/kg/day, you cannot increase GIR beyond 10 mg/kg/min using this formula – to increase GIR beyond this limit, fluid intake has to be increased.

3. How to convert gm/dL to mmol/L & vice versa?

There are two main methods of describing concentrations: by weight, and by molecular count. Weights are in grams, molecular counts in moles.

To convert mmol/L of glucose to mg/dl, multiply by 18. To convert mg/dL of glucose to mmol/L, divide by 18 or multiply by 0.055.

4. How to calculate GIR in an infant on oral feeds along with simultaneous intravenous infusion of glucose? (also see Figures 2 and 3)

Glucose infusion needs to be calculated while giving feeding and can be done by the same formula Glucose infusion rate while on feeding (mg/kg/min) =

$$[\text{IV rate (ml/hr)} \times \text{Dextrose conc (g/dl)} \times .0167 / \text{wt (kg)}] + [\text{Feed rate (ml/hr)} \times \text{Dextrose conc}^* \text{ (g/dl)} \times .0167 / \text{wt (kg)}]$$

Amount of dextrose in milk : Breast milk = 7.1 gm/dL, Term formula = 7.1 gm/dL, Preterm formula = 8.5 gm/dL

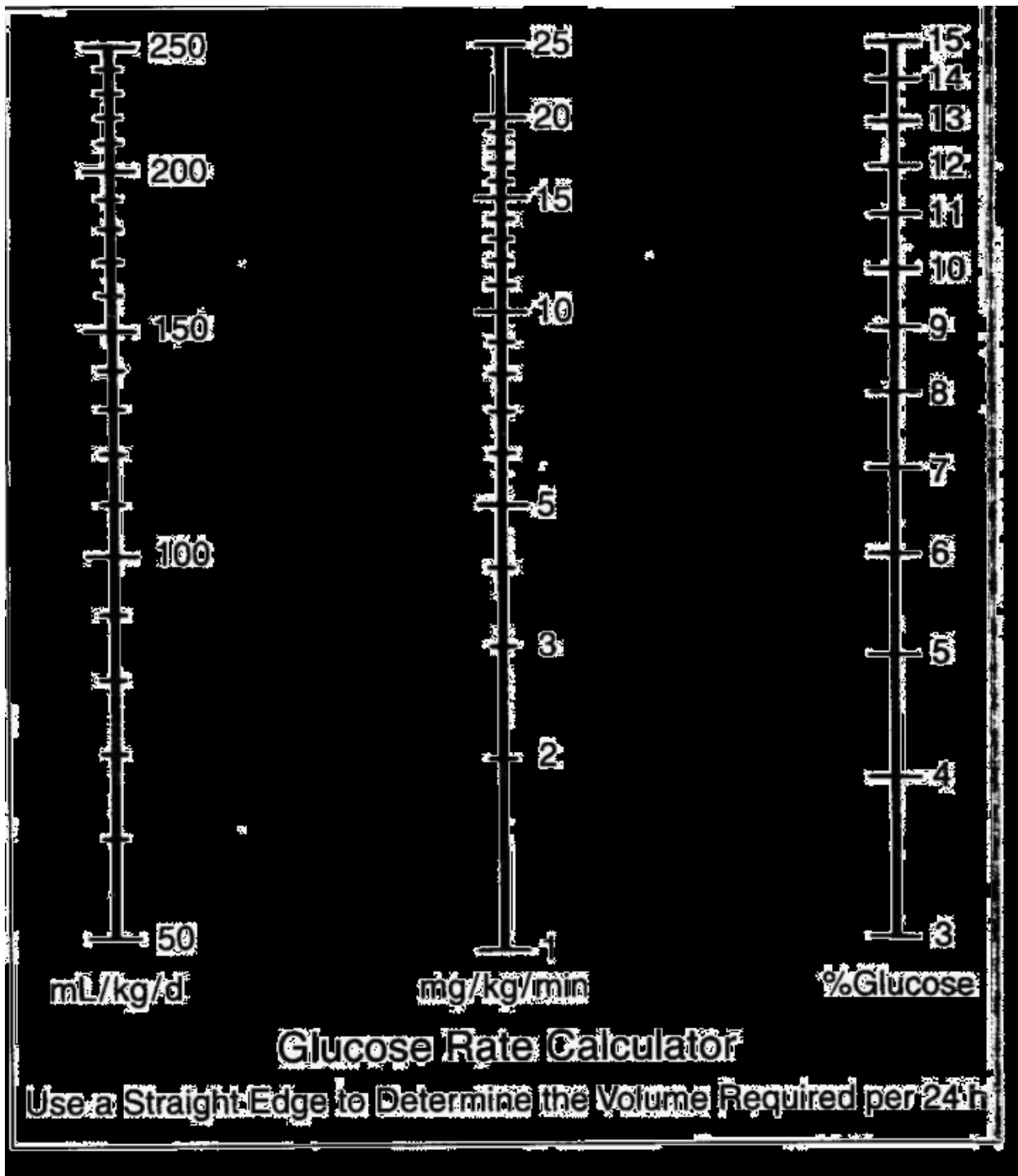
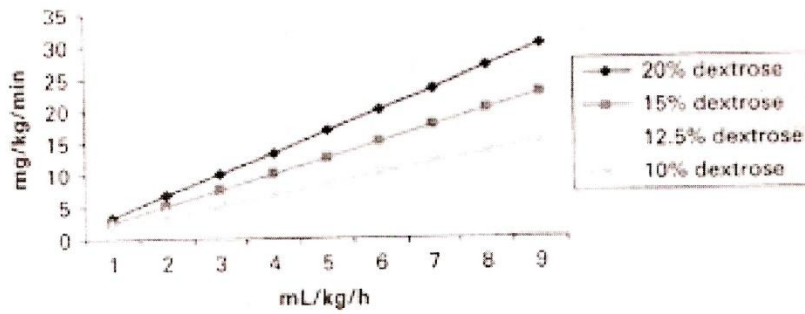
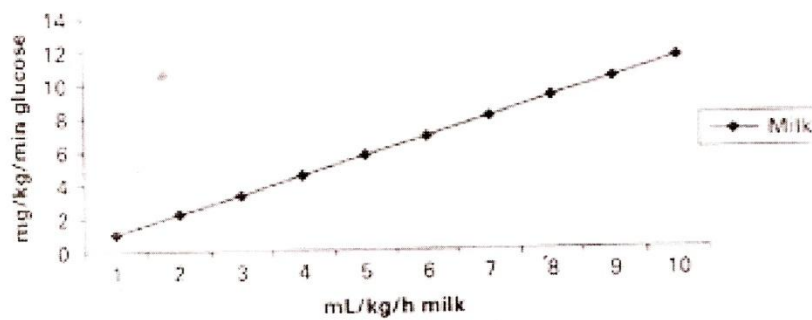


Figure 2: Calculating glucose concentration to be used based on amount of fluid and GIR

Use figures below:



IV dextrose equivalents



Milk feed

Figure 3 Calculation of GIR of baby on fluids and feeds (assuming breast milk or term formula)