Stress the importance of close/frequent glucose monitoring in the sick neonate. However, it is important that you also discuss using good judgment when deciding how often to monitor the blood sugar. If the trend is towards a normal blood sugar, then less frequent monitoring is indicated.

Dextrose-containing solutions should be treated like any other medication; a "dose in milligrams" is given when the IV fluid is administered.

For more advanced students
It is helpful to understand the concept of "glucose infusion rate" (GIR) and how to calculate GIR.

$D_{10}W$ contains 10 grams of glucose per 100 mL of IV solution. This equates to 100 mg of glucose per milliliter.

- A bolus of 2 mL/kg of $D_{10}W$ equals a dose of 200 mg per kg of glucose.
- Practice calculating the glucose infusion rate by using this formula:
  Glucose (mg/kg/min) = (% dextrose in solution x IV rate in mL/hour x 0.167) divided by weight in kg.

Practice Examples

1) 3.5 kg infant is receiving $D_{10}W$ at a rate of 80 mL/kg/day, equals 11.7 mL/hr. The GIR calculation is as follows:

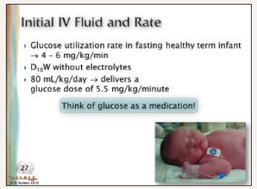
- (10 x 11.7 x 0.167) divided by 3.5 = glucose infusion rate in mg/kg/minute
- 19.539 divided by 3.5 = 5.58 mg/kg/minute

2) 3.5 kg infant is receiving $D_{12.5}W$ at a rate of 80 mL/kg/day, 11.7 ml/hour.

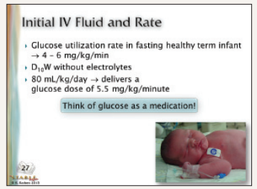
- (12.5 x 11.7 x 0.167) divided by 3.5 = glucose infusion rate in mg/kg/minute
- 24.42 divided by 3.5 = 6.98 mg/kg/minute

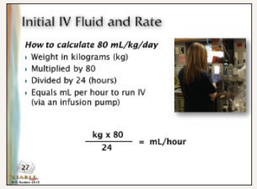
Alter the infant's weight and dextrose concentration if more practice is desired.

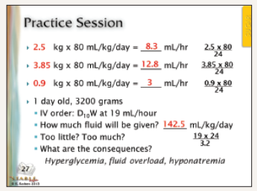
NICU

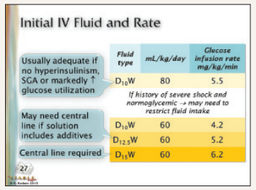


Non NICU









For Non-NICU students
Students will need a calculator to participate in the Practice Session on how to calculate the IV infusion rate.

In addition to learning how to calculate the hourly IV infusion rate, students should also know how to calculate how much total fluid (mL/kg/day) would be administered when an order is written for an hourly infusion rate. In the example, the physician order for 19 mL per hour would provide too much fluid for a one-day old infant. Discuss the potential consequences of administering too much fluid (includes: hyperglycemia, fluid overload, and hyponatremia).

Initial IV Fluid and Rate

Establish intravenous (IV) access and administer a 10% dextrose solution ($D_{10}W$), without electrolytes, at a rate of 80 mL per kilogram per day (80 mL/kg/day). This provides a glucose infusion rate of 5.5 mg/kg/minute, which is similar to the liver glucose production rate in healthy term newborns — 4 to 6 mg/kg/minute.[32,57,97]

Figure 1.6. Initial IV fluid management for the sick infant.

$D_{10}W$ without electrolytes*

80 mL per kilogram per 24 hours (80 mL/kg/day)

Infuse via an infusion pump

**If the infant is older than 24 hours, it may be necessary to add electrolytes to the IV solution.*[114]

In the absence of conditions related to hyperinsulinemia, for infants with limited or no glycogen stores (for example, preterm and small for gestational age infants), or those without significantly increased glucose utilization, a glucose infusion rate of 5.5 mg/kg/minute (80 mL/kg/day of $D_{10}W$), should adequately maintain the blood sugar above 50 mg/dL (2.8 mmol/L). Figures 1.6 and 1.7 summarize the initial IV fluid to provide for sick infants and how to calculate the hourly infusion rate. Table 1.3 shows the glucose infusion rate that is provided with varying fluid infusion rates and varying dextrose concentrations. Treatment of a blood glucose less than 50 mg/dL (2.8 mmol/L) is outlined in Table 1.4.

Dextrose concentration	Infusion volume mL/kg per 24 hours (mL/kg/day)	Glucose infusion rate mg/kg delivered per minute (mg/kg/min)
$D_{10}W$	60	4.2
$D_{10}W$	80 (usual starting rate)	5.5 (usual starting dose)
$D_{10}W$	100	6.9
$D_{12.5}W$	60	5.2
$D_{12.5}W$	80	6.9
$D_{12.5}W$	100	8.7
$D_{15}W$	60	6.3
$D_{15}W$	80	8.3
$D_{15}W$	100	10.4

Table 1.3. Effect of varying dextrose concentrations and infusion rates on the rate of glucose that is delivered in mg/kg/minute.