3.2.6. Dilution of Enteral Formula

Unit IV: Special Concerns in Nutrition

Dilution of Enteral Formula

When the concentration of a tube feeding is changed from 100% to a lower percent, water is added to the formula. Sometimes, the nurse must calculate how much fluid to add to the existing formula to change it to the percent ordered.

Use the following steps to change any 100% solution to the percent ordered.

1. Change the percent ordered to a decimal (85% = 0.85).
2. Divide the total amount of formula used by the decimal.
3. Subtract the original total amount from the amount derived in step 2.
4. Add water to the formula in the amount derived in step 3.

Example:
The physician orders an enteral feeding at 25%. The formula for the feeding is available in 240 ml per can. How much water must be added to the 240 ml to change it to a 25% solution?

1. 25% becomes 0.25
2. 240 ml divided by .25 = 960 ml
3. 240 ml subtracted from 960 ml = 720 ml
4. 720 ml is the amount of water that must be added to the formula

Practice the following calculations to determine the amount of water to add to a 100% solution to change it to the percent ordered.

1. Change 360 ml formula to 75%
2. Change 500 ml formula to 30%
3. Change 240 ml formula to 50%
4. Change 100 ml formula to 25%
**NASOGASTRIC TUBE FEEDING PROBLEMS**

**KEY POINTS:**
- Preparing dilute tube feedings requires calculating the number of mL of water to add to the formula to make the ordered strength.
- Information needed to solve the problem includes the amount of formula in the can and the ordered strength.

**Working With Nasogastric Tube Feeding Problems**

1. The doctor orders a 3/4-strength formula tube feeding for the patient. The formula comes in cans containing 240 mL. How much water will the nurse add to the can of formula to make the ordered 3/4-strength diluted tube feeding?

2. The patient receives a 1/3-strength formula tube feeding. The formula can contains 233 mL. How much water will the nurse add to the can to make the 1/3-strength diluted tube feeding?

3. The order is to prepare a 2/3-strength tube feeding of Nepro® for a patient with a percutaneous endoscopic gastrostomy (PEG) tube. How much water will the nurse add to the 237 mL can of Nepro to make a 2/3-strength tube feeding?
4. The physician orders 200 mL of a 1/4-strength tube feeding q.6h., for a patient with a NG tube. The formula can contains 250 mL. How much water will the nurse add to make the 1/4-strength tube feeding?

5. A patient who has been receiving full-strength Jevity Plus® PEG tube feedings develops diarrhea. The physician orders a diluted tube feeding of 1/2-strength Jevity Plus for the patient. How much water will the nurse add to the 237 mL can of Jevity Plus to make a 1/2-strength tube feeding?

6. The physician orders a 1/4-strength tube feeding of Osmolite® at 40 mL/hr for a patient with a NG tube. The Osmolite can contains 237 mL. How much water will the nurse add to make a 1/4-strength tube feeding?

7. A patient has an order for 1/2-strength Pulmocare® tube feedings, at 50 mL/hr through a PEG tube. The nurse prepares the dilute formula and has a total volume of 475 mL. According to hospital policy, only 4 hours of tube feeding formula can be hung at a time, to minimize bacterial growth. How many mL of the prepared 1/2-strength formula will the nurse use?
8. The physician orders a 250 mL bolus N/G tube feeding of 3/4-strength tube feeding q.8h. The formula can contains 237 mL. How much water will the nurse add to make the 3/4-strength tube feeding?

9. The physician orders a diluted tube feeding of 1/3-strength Jevity Plus for the patient. How much water will the nurse add to the 250 mL can of Jevity Plus to make a 1/3-strength tube feeding?

10. The physician orders a 2/3-strength tube feeding of Suplena® at 25 mL/hr, for a patient with a nasogastric tube. The Suplena can contains 240 mL. How much water will the nurse add to make a 2/3-strength tube feeding?
Working With Nasogastric Tube Feeding Problems
(pp. 29 – 31)

1. 80 mL
2. 466 mL
3. 119 mL
4. 750 mL
5. 237 mL
6. 711 mL
7. 200 mL
8. 79 mL
9. 500 mL
10. 120 mL

Exercise: FOCUS ON SAFETY
Making Clinical Judgments in Working With
Nasogastric Tube Feeding (p. 32)

b. The amount of water added to the formula.

CORRECT: The ordered formula strength is 2/3. The
nurse starts with 200 mL of formula. To make a 2/3-
strength formula, the nurse needs to add 100 mL of water,
not 80 mL.

INCORRECT:
a. The documented N/G tube intake should be 400 mL.
The documented N/G tube intake is correct.
c. The IV intake is incorrect for the ordered rate.
The documented IV intake is correct.
d. The formula strength should be questioned.
The formula strength is ordered by the physician.

Module: READING MEDICATION LABELS

Working With Reading Medication Labels
(pp. 33 – 38)

1. a. Precose
   b. acarbose
   c. 100 mg / tablet
   d. tablet
   e. oral
<table>
<thead>
<tr>
<th>Insulin Type</th>
<th>Appearance</th>
<th>Onset</th>
<th>Peak</th>
<th>Duration of Action</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novolog® 70/30</td>
<td>Clear</td>
<td>30-60 minutes</td>
<td>1-2 hours</td>
<td>6-10 hours</td>
<td>No significant peak, may mix with regular insulin</td>
</tr>
<tr>
<td>Novolog® 100/0</td>
<td>Clear</td>
<td>30-60 minutes</td>
<td>1-2 hours</td>
<td>6-10 hours</td>
<td>No significant peak, may mix with regular insulin</td>
</tr>
<tr>
<td>Humulin® U100</td>
<td>Clear</td>
<td>30-60 minutes</td>
<td>1-2 hours</td>
<td>6-10 hours</td>
<td>No significant peak, may mix with regular insulin</td>
</tr>
<tr>
<td>Regular Insulin</td>
<td>Clear</td>
<td>30-60 minutes</td>
<td>1-2 hours</td>
<td>6-10 hours</td>
<td>No significant peak, may mix with regular insulin</td>
</tr>
<tr>
<td>(Insulin Hap)</td>
<td>Clear</td>
<td>30-60 minutes</td>
<td>1-2 hours</td>
<td>6-10 hours</td>
<td>No significant peak, may mix with regular insulin</td>
</tr>
<tr>
<td>Humalog® 70/30</td>
<td>Clear</td>
<td>30-60 minutes</td>
<td>1-2 hours</td>
<td>6-10 hours</td>
<td>No significant peak, may mix with regular insulin</td>
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<td>6-10 hours</td>
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</tr>
</tbody>
</table>

**Compatibility Note:** Do not mix with other insulin without prior consultation with a health care provider.

**Instruction:** Do not mix with other insulin without proper instruction or consultation with a health care provider.
32. Order: Novolin R Regular U-100 insulin subcut ac per sliding scale and blood sugar (BS) level. The patient’s blood sugar at 1730 hours is 238.

<table>
<thead>
<tr>
<th>Sliding Scale</th>
<th>Insulin Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS: 0–150</td>
<td>0 units</td>
</tr>
<tr>
<td>BS: 151–250</td>
<td>8 units</td>
</tr>
<tr>
<td>BS: 251–350</td>
<td>13 units</td>
</tr>
<tr>
<td>BS: 351–400</td>
<td>18 units</td>
</tr>
<tr>
<td>BS: greater than 400</td>
<td>Call MD</td>
</tr>
</tbody>
</table>

Give: _____ units, which equals _____ mL. (Mark dose on appropriate syringe.)
33. Order: Humulin R Regular U-100 insulin 15 units o Humulin N NPH U-100 insulin 45 units subcut at 0750

You will give a total of ______ units insulin. (Mark dose on appropriate syringe, designating Regular and NPH insulin.)

34. A patient with diabetes is receiving an insulin drip of Humulin R Regular U-100 insulin 300 units in 150 mL NS IV infusing at 10 mL/h. How many units/h of insulin is this patient receiving?

_______ units/h
32) 8; 0.08

33) 60

45 units 15 units  Total = 60 units
NPH Regular (drawn up first)

34) 30 units
DIRECTIONS: The medication order is listed at the beginning of each problem. Calculate the doses. Show your work. Mark the syringe when provided to indicate the correct dose.

1. The physician orders penicillin V 500,000 units per four times a day for your patient with a hysterectomy. Penicillin V pediatric suspension 400,000 units/5 mL is supplied. How many milliliters will you administer? _______ Draw a vertical line through the syringe to indicate the dose.

2. The physician orders Lantus insulin 40 units subcutaneous daily. Draw a vertical line through the syringe to indicate the dose.
3. In preparation for his upcoming hip replacement surgery, Mr. Stone has Epogen 36,000 units subcutaneous injection once 3 weeks before his surgery. Epogen 40,000 units/mL is available. How many milliliters will the nurse administer? 

4. The physician orders Humulin 50/50 insulin 6 units subcutaneous now. Draw a vertical line through the syringe to indicate the dose.

5. The physician orders penicillin G potassium 3,000,000 units IV q6 h for your patient with an ethmoidectomy. What is the medication concentration if 11.5 mL of diluent is added? How many milliliters will you administer?
6. Your patient with insulin-dependent diabetes has orders for Humalog insulin 12 units subcutaneous four times a day. You have Humalog insulin U-100 and a U-100 syringe. Draw a vertical line through the syringe to indicate the dose.

7. Mr. Cory has orders for Pfizerpen 600,000 units IM q6 h for a serious pneumococcal infection. Select the most appropriate dilution. How many milliliters of diluent will you add? ______ How many milliliters will you administer? ______

8. The physician orders Lente insulin 38 units, regular insulin 18 units subcutaneous daily. Lente U-100, regular insulin U-100, and a U-100 syringe are supplied. Draw a vertical line through the syringe to indicate the amount of regular insulin to be given and a second line to indicate the total dose.

9. The physician orders penicillin V 300,000 units po four times a day for your patient with chronic otitis. The drug is supplied in oral solution 200,000 units/5 mL. How many milliliters will you administer? ______
10. The physician orders Pfizerpen 1.2 million units IV in a single dose today. What is the medication concentration if 11.5 mL of diluent is added? _____ How many milliliters will the nurse administer? _____

11. Your patient with a sacral decubitus receives penicillin V 200,000 units po four times a day. You have penicillin V oral solution 400,000 units/5 mL. How many milliliters will you administer? _____

12. Your postoperative patient receives heparin 5000 units subcutaneous q12 h. Heparin 2500 units/mL is available. How many milliliters will you administer? _____

13. Mrs. Tanaka has been admitted with unstable angina. The physician orders Fragmin 8700 international units subcutaneous injection q12 h. How many milliliters will be administered? (Round your final answer to the nearest hundredth.) _____

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14. Mrs. Daisy receives nystatin oral suspension 600,000 units po four times a day. How many milliliters will the nurse administer?

MYCOSTATIN
ORAL SUSPENSION
Nystatin Oral Suspension USP

Each mL contains
100,000 USP Nystatin units in a vehicle containing 50% sucrose.
Not more than 1% alcohol by volume.

USUAL DOSAGE FOR INFANTS: 2 mL (200,000 units) four times daily (1 mL in each side of mouth).

USUAL DOSAGE FOR CHILDREN AND ADULTS:
See package insert.

Store at room temperature; avoid freezing.

Caution: Federal law prohibits dispensing without prescription.

Apothecon
A Bristol-Myers Squibb Company
Princeton, NJ 08540 USA
P8739-00

15. Ms. Sanders has Epogen 2200 units subcutaneous injection three times a week ordered for anemia caused by chronic renal failure. Epogen 3000 units/mL is available. How many milliliters will the patient receive for each dose?

16. The physician orders 40 units Lantus U 100 subcutaneous injection daily at bedtime. Draw a vertical line through the syringe to indicate the dose.

Lantus®
insulin glargine (rDNA origin) injection

100 units/mL
(U-100)

Do not shake vigorously.

Use only the selected dose and syringe.

For subcutaneous injection only.

Use with a 100-U
syringe only.

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17. The physician orders 8 units Novolog U 100 subcutaneous injection daily at bedtime. Draw a vertical line through the syringe to indicate the dose.

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18. The physician orders ampicillin 500 mg IM every 6 hours for a patient with pneumonia. How much diluent will be added to the bottle? _____ What is the concentration after reconstitution? _____ How many milliliters will the nurse administer? _____

19. The physician orders Ancef 500 mg IM every 12 hours for a patient with cellulitis. How much diluent will be added to the bottle? _____ What is the concentration after reconstitution? _____ How many milliliters will the nurse administer? _____
20. Vancocin 1000 mg oral every 6 hours has been ordered for a patient with colitis. How much diluent will be added to the bottle? _____ What is the concentration after reconstitution? _____ How many milliliters will the nurse administer? _____

ANSWERS ON PP. 568–570.
CHAPTER 15 Dosages Measured in Units—Posttest 1, pp. 331–337

Proportion | Formula
---|---
1. 400,000 units : 5 mL :: 500,000 units : x mL  
400,000x = 2,500,000  
x = \frac{2,500,000}{400,000}  
x = 6.25, 6.3 mL

\[ \frac{500,000 \text{ units}}{400,000 \text{ units}} \times 5 \text{ mL} = \frac{25}{4} = 6.25, \ 6.3 \text{ mL} \]

2. Insulin

3. 40,000 units : 1 mL :: 36,000 units : x mL  
40,000x = 36,000  
x = \frac{36,000}{40,000}  
x = 0.9 mL

\[ \frac{36,000 \text{ units}}{40,000 \text{ units}} \times 1 \text{ mL} = 0.9 \text{ mL} \]

4. Lo-Dose

5. 11.5 mL  
1,000,000 units/mL  
1,000,000 units : 1 mL :: 3,000,000 units : x mL  
1,000,000x = 3,000,000  
x = \frac{3,000,000}{1,000,000}  
x = 3 mL

\[ \frac{3,000,000 \text{ units}}{1,000,000 \text{ units}} \times 1 \text{ mL} = 3 \text{ mL} \]

6. Insulin
7. Diluent added = 1.5 mL
   500,000 units : 1 mL :: 600,000 units : x mL
   \[ \frac{500,000 \times x}{500,000} = \frac{600,000}{1} \]
   \[ x = \frac{600,000}{500,000} \]
   \[ x = 1.2 \text{ mL} \]

   Diluent 4 mL, 250,000 units/mL
   250,000 units : 1 mL :: 600,000 units : x mL
   \[ \frac{250,000 \times x}{250,000} = \frac{600,000}{1} \]
   \[ x = \frac{600,000}{250,000} \]
   \[ x = 2.4 \text{ mL} \]

9. 200,000 units : 5 mL :: 300,000 units : x mL
   \[ \frac{200,000 \times x}{200,000} = \frac{300,000}{5} \]
   \[ x = \frac{1,500,000}{200,000} \]
   \[ x = 7.5 \text{ mL} \]

10. Concentration is 1,000,000 units/mL
    1,000,000 units : 1 mL :: 1,200,000 units : x mL
    \[ \frac{1,000,000 \times x}{1,000,000} = \frac{1,200,000}{1} \]
    \[ x = \frac{1,200,000}{1,000,000} \]
    \[ x = 1.2 \text{ mL} \]

11. 400,000 units : 5 mL :: 200,000 units : x mL
    \[ \frac{400,000 \times x}{400,000} = \frac{200,000}{5} \]
    \[ x = \frac{1,000,000}{400,000} \]
    \[ x = 2.5 \text{ mL} \]

12. 2500 units : 1 mL :: 5000 units : x mL
    \[ \frac{2500 \times x}{5000} = \frac{5000}{1} \]
    \[ x = \frac{5000}{2500} \]
    \[ x = 2 \text{ mL} \]
13. 10,000 international units : 1 mL :: 8700 international units : x mL
   \[ 10,000x = 8700 \]
   \[ x = \frac{8700}{10,000} \]
   \[ x = 0.87 \text{ mL} \]

14. 100,000 units : 1 mL :: 600,000 units : x mL
   \[ 100,000x = 600,000 \]
   \[ x = \frac{600,000}{100,000} \]
   \[ x = 6 \text{ mL} \]

15. 3000 units : 1 mL :: 2200 units : x mL
   \[ 3000x = 2200 \]
   \[ x = \frac{2200}{3000} \]
   \[ x = 0.73, 0.7 \text{ mL} \]

16. 

17. 

18. Diluent 3.5 mL, 250 mg/mL
   250 mg : 1 mL :: 500 mg : x mL
   \[ 250x = 500 \]
   \[ x = \frac{500}{250} \]
   \[ x = 2 \text{ mL} \]

19. Diluent 2.5 mL, 330 mg/mL
   330 mg : 1 mL :: 500 mg : x mL
   \[ 330x = 500 \]
   \[ x = \frac{500}{330} \]
   \[ x = 1.51, 1.5 \text{ mL} \]

20. Diluent 20 mL, 250 mg/5 mL
   250 mg : 5 mL :: 1000 mg : x mL
   \[ 250x = 1000 \]
   \[ x = \frac{1000}{250} \]
   \[ x = 20 \text{ mL} \]