

ENTERAL NUTRITION SUPPORT



Course Name: Clinical Nutrition

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DEFINITIONS

- **Nutrition Support:** the delivery of nutrients using a feeding tube or intravenous infusions.
- **Enteral Nutrition:** the provision of nutrients using the GI tract, including the use of tube feedings and oral diets.
- **Parenteral Nutrition:** the intravenous provision of nutrients that bypasses the GI tract.

BACKGROUND- ENTERAL NUTRITION

- Some illnesses may interfere with eating, digestion, or absorption to such a degree that conventional foods cannot supply the necessary nutrients.
- In such cases, **nutrition support—the delivery of nutrients using a feeding tube or intravenous infusions—** can meet a patient's nutritional needs.
- **Enteral nutrition provides nutrients** using the gastrointestinal (GI) tract.
- **Enteral nutrition includes** oral diets or supplements, but the term more often refers to the use of **tube feedings**, which supply nutrients **directly to the stomach or intestine** via a thin, flexible tube.

ELEGIBITLITY:

- **If** gastrointestinal function is **normal** and a poor appetite is the primary nutrition problem, enteral formulas can be provided as oral supplements to the usual diet.
- **If** patients cannot consume enough food or drink enough formula to meet nutrient needs, tube feedings may be used to deliver the required nutrients

TYPES OF ENTERAL FORMULAS

1- Standard Formulas:

- also called **polymeric formulas**, are provided to individuals who can digest and absorb nutrients **without difficulty**.
 - They contain intact proteins extracted from milk or soybeans (called **protein isolates**) or a combination of such proteins.
 - The carbohydrate sources include modified starches, glucose polymers (such as maltodextrin), and sugars.
 - A few formulas, called **blenderized formulas**, are made from whole foods and derive their protein primarily from pureed meat or poultry.
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2- Elemental Formulas:

- Meet the nutrient needs of patients with **limited digestive and absorptive** functions
- Enteral formulas that contain carbohydrates and proteins that are **partially or fully hydrolyzed**; also called *hydrolyzed, chemically defined, or monomeric formulas*.
- The formulas are often low in fat and may contain **medium chain triglycerides (MCT)** to ease digestion and absorption.

TYPES OF ENTERAL FORMULAS - CONTINUED

3- Specialized Formulas:

- Enteral formulas designed to meet the nutrient needs of patients with **specific illnesses**; also called *disease-specific formulas*.
 - Products have been developed for individuals with liver, kidney, and lung diseases; glucose intolerance; and metabolic stress (later chapters provide details).
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4- Modular Formulas:

- Enteral formulas prepared in the hospital from *modules that contain single macronutrients*; used for people with **unique nutrient needs**.
- Can be used to modify other formulas.

TABLE 20-1 Macronutrient Sources in Standard and Elemental Formulas

Type of Formula	Protein Sources	Carbohydrate Sources	Fat Sources
Standard formulas	Intact proteins, such as casein, whey, lactalbumin, and soy protein isolates Milk protein concentrate Egg white	Corn syrup solids Hydrolyzed cornstarch Sucrose Fructose	Vegetable oils (such as corn oil, soybean oil, and canola oil) MCT Palm kernel oil
Elemental formulas	Hydrolyzed casein, whey, lactalbumin, or soy protein Crystalline amino acids	Hydrolyzed cornstarch Maltodextrin Fructose	Vegetable oils (such as corn oil, soybean oil, and canola oil) MCT

NOTE: MCT = medium-chain triglycerides.

FORMULA CHARACTERISTICS

- 1- Macronutrient Composition**
- 2- Energy Density**
- 3- Fiber Content**
- 4- Osmolality**

1- Macronutrient Composition

- The amounts of protein, carbohydrate, and fat in enteral formulas **vary substantially**.
- **The protein content** of most formulas ranges from 12 to 20 percent of total kcalories
 - Note that *PROTEIN* needs are **high** in patients with severe metabolic stress, whereas protein **restrictions** are necessary for patients with chronic kidney disease.
- **Carbohydrate and fat provide most of the energy** in enteral formulas; standard formulas generally provide 40 to 60 percent of kcalories from **carbohydrate** and 30 to 40 percent of kcalories from **fat**.

2- Energy Density

- The energy density of enteral formulas ranges from 0.5 to 2.0 kcalories **per milliliter of fluid**.
- **Standard** formulas provide 1.0 to 1.2 kcalories per milliliter and are appropriate for patients with average fluid requirements.
- **Formulas that have higher energy densities** can meet energy and nutrient needs in a smaller volume of fluid and therefore benefit patients who have high nutrient needs or fluid restrictions.
- Individuals with **high fluid needs** can be given a formula with low energy density or be supplied with additional water via the feeding tube or intravenously.

3- Fiber Content

- Fiber-containing formulas can be helpful for improving **fecal bulk and colonic function**, treating diarrhea or constipation, and maintaining blood glucose control.
- Conversely, fiber-containing formulas are **avoided** in patients with acute intestinal conditions or pancreatitis, and before or after some intestinal examinations and surgeries.

4- Osmolality

- Osmolality refers to the moles of osmotically **active** solutes (or *osmoles*) per *kilogram of solvent*.
- An enteral formula with an osmolality similar to that of blood serum (about **300** milliosmoles per kilogram) is an **isotonic formula**, whereas a **hypertonic formula** has an osmolality greater than that of blood serum.
- Most enteral formulas have osmolalities between 300 and 700 milliosmoles per kilogram; generally, **elemental formulas and nutrient-dense formulas** have **HIGHER** osmolalities than standard formulas.
- **Most** people are able to tolerate both isotonic and hypertonic feedings **without** difficulty.
- When **medications** are infused along with enteral feedings, however, the **osmotic load increases substantially and may contribute to the diarrhea** experienced by many tube-fed patients.

FORMULA SELECTION

1. *Nutrient and energy needs*

→ An adjustment in macronutrient and energy intakes may be necessary for tube-fed patients. For example, patients with diabetes may need to control carbohydrate intake, critical-care patients may have high protein and energy requirements, and patients with chronic kidney disease may need to limit their intakes of protein and several minerals.

2. *Fluid requirements.*

→ *High nutrient needs must be met using the volume of formula a patient can tolerate.*

3. *The need for fiber modifications.*

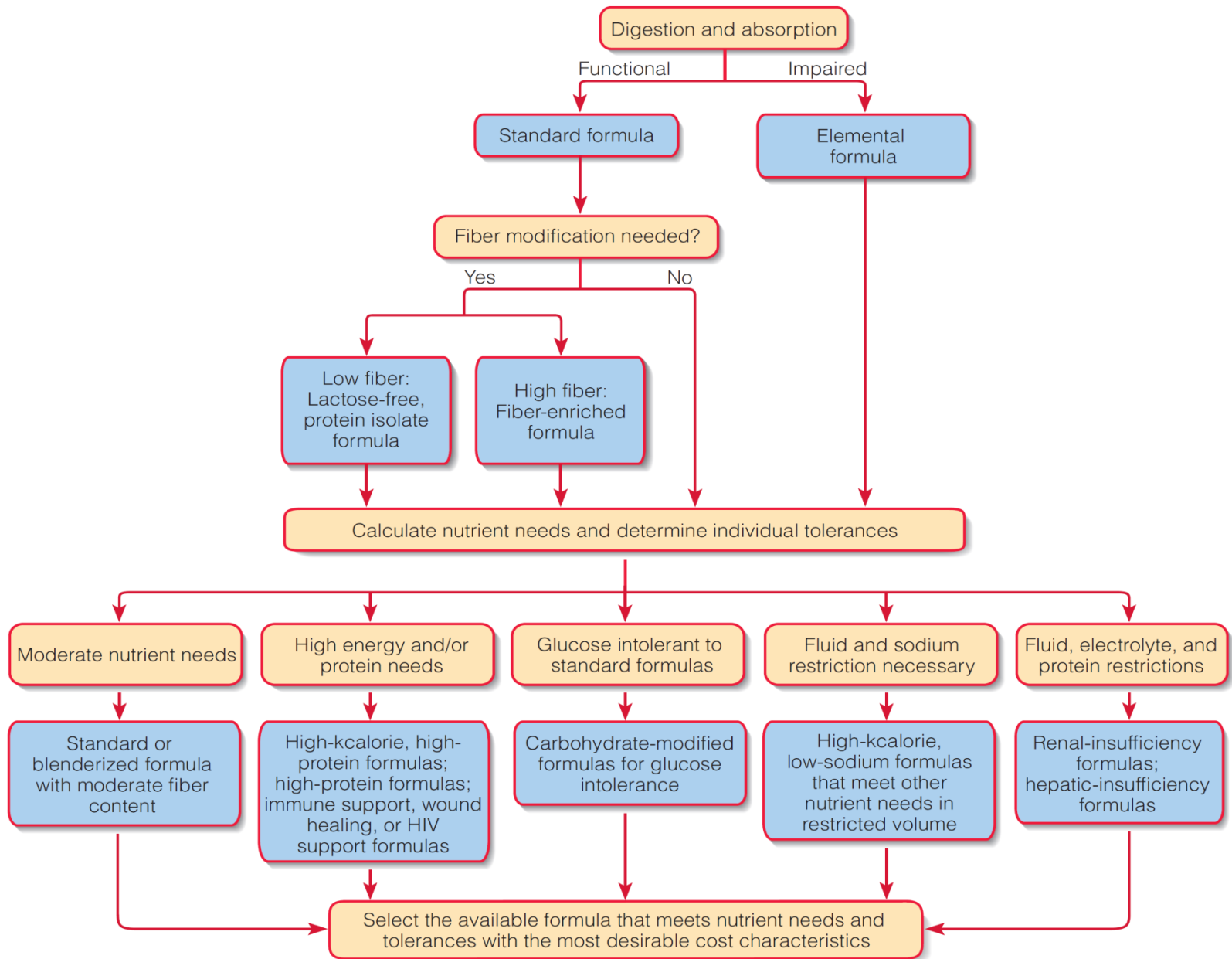
→ *The choice of formulas is narrower if fiber intake needs to be high or low.*

4. *Individual tolerances (food allergies and sensitivities).*

→ Most formulas are **lactose-free**, because many patients who need enteral formulas have some degree of lactose intolerance.

→ Many formulas are also **gluten-free** and can accommodate the needs of individuals with celiac disease (gluten sensitivity).

FIGURE 20-1 Selecting a Formula



Enteral Nutrition in Medical Care

INDICATIONS FOR TUBE FEEDINGS

1. Severe **swallowing** disorders.
2. Impaired motility in the **upper** GI tract.
3. Gastrointestinal **obstructions** and fistulas that can be bypassed with a feeding tube.
4. Certain types of intestinal **surgeries**.
5. Mechanical **ventilation**.
6. **Extremely** high nutrient requirements.
7. Little or no appetite for extended periods, especially if the patient is **malnourished**.
8. **Mental incapacitation** due to confusion, neurological disorders, or coma.

Enteral Nutrition in Medical Care

CONTRAINDICATIONS FOR TUBE FEEDINGS

1. Severe GI **bleeding**, high-output fistulas.
2. Intractable **vomiting or diarrhea**.
3. Complete intestinal **obstruction**.
4. Severe **malabsorption**.

In addition, various clinical studies have suggested that tube feedings are **not always effective** in some of the patient populations in which they are routinely used; thus, the **decision** to use tube feedings should be considered in light of the most recent research evidence

FEEDING ROUTES

- Gastrointestinal access when a patient is expected to be tube-fed for less than four weeks, a route is generally chosen. **nasogastric or nasoenteric**

PLACEMENT:

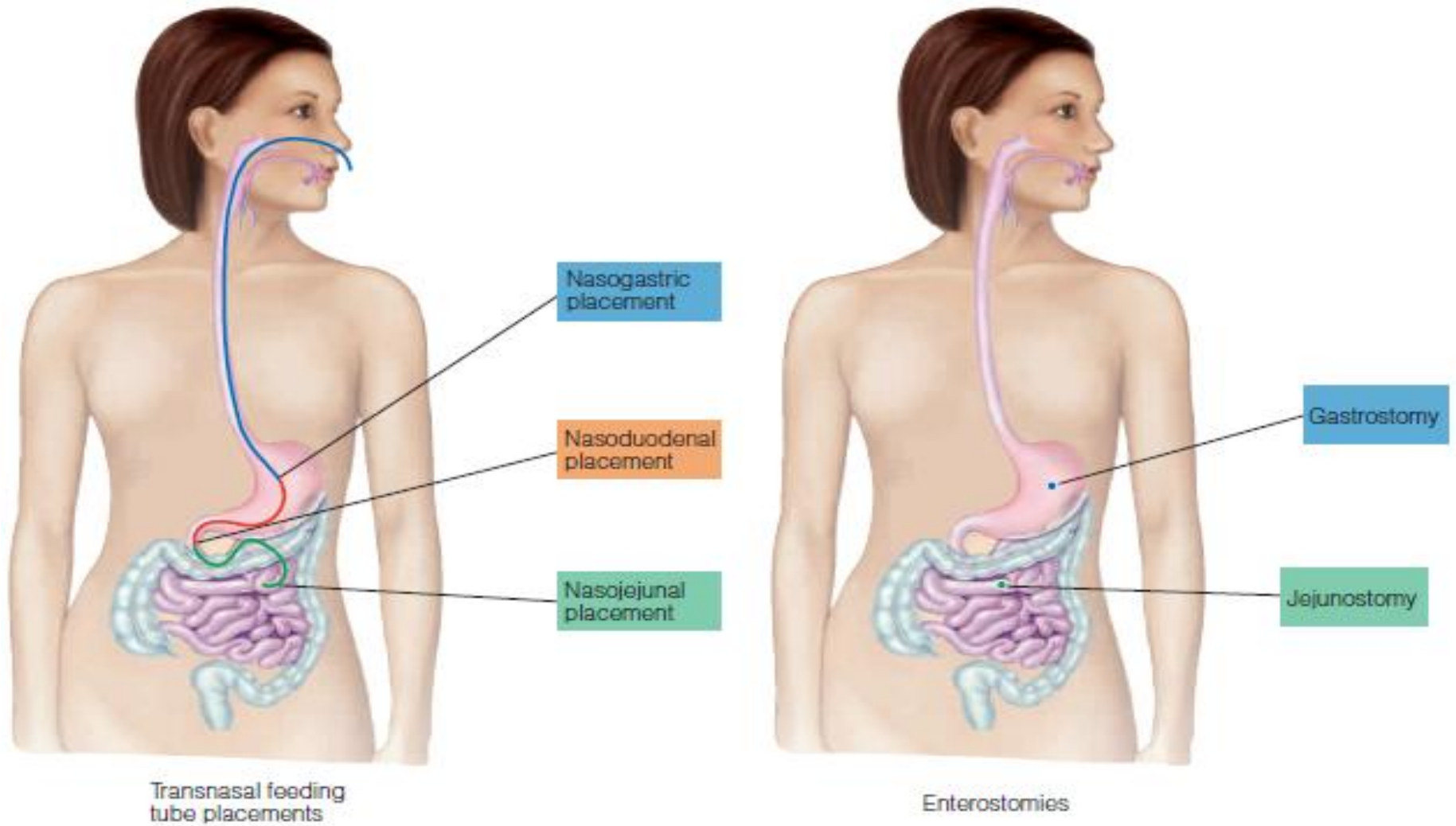
- For these routes, the feeding tube is passed into the GI tract via the nose. **The patient is frequently awake** during transnasal (through-the-nose) placement of a feeding tube.
- While the patient is in a slightly upright position with head tilted, the tube is inserted into a nostril and passed into the stomach (nasogastric placement), duodenum (nasoduodenal placement), or jejunum (nasojejunal placement).
- If the patient is awake and alert, he or she can swallow water to ease the tube's passage.
- The final position of the feeding tube tip is verified by abdominal X-ray or other means.

FEEDING ROUTES (continued)

- **In infants**, **orogastric placement**, in which the feeding tube is passed into the stomach via the mouth, is sometimes preferred over transnasal routes; this placement allows the infant to breathe more normally during feedings.
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- When a patient will be tube-fed **for longer than four weeks** or if the nasoenteric route is **inaccessible** due to an obstruction or other medical reasons, **A DIRECT ROUTE TO THE STOMACH OR INTESTINE** may be created by passing the tube through an **enterostomy**, an opening in the abdominal wall that leads to the stomach (**gastrostomy**) or jejunum (**jejunostomy**).
- An enterostomy can be made by either surgical incision or needle puncture.

FIGURE 20-2 Tube Feeding Routes





A transnasal feeding tube accesses the GI tract via the nose.

Dr. P. Marazzi/Photo Researchers, Inc.



In a gastrostomy, the feeding tube accesses the GI tract through the abdominal wall.

IN SUMMARY

- Enteral formulas are provided to patients with functional GI tracts who cannot meet nutritional needs with conventional foods alone.
- A **nasoenteric** feeding route is preferred for **short-term** tube feedings, whereas **enterostomies** are usually used for **longer-term feedings**.
- Because the stomach delivers nutrients into the intestine at a controlled rate, gastric feedings are typically preferred, although they are frequently avoided in patients at risk of aspiration.
- The selection of feeding tubes is based on **patient age and size, the feeding route, and formula viscosity**.

ADMINISTRATION OF TUBE FEEDINGS

- Enteral formulas should be prepared and administered using **food safety protocols** that reduce the risk of **contamination**.
- Tube placement must be verified and monitored to reduce the **risks of aspiration** and inadvertent placement into the respiratory tract.
- Depending on the patient's medical condition and the feeding route, the formula can be delivered in **bolus** feedings, **intermittently**, or **continuously**.
- Although enteral formulas meet a substantial portion of the water requirements, **additional water** can be provided by flushing water through the feeding tube.
- **Medications should be given separately** and accompanied by water flushes to prevent tube clogging.
- **Complications of tube feedings** can be gastrointestinal, mechanical, or metabolic in nature.
- Tube feedings are tapered off when the patient begins consuming an oral diet.

