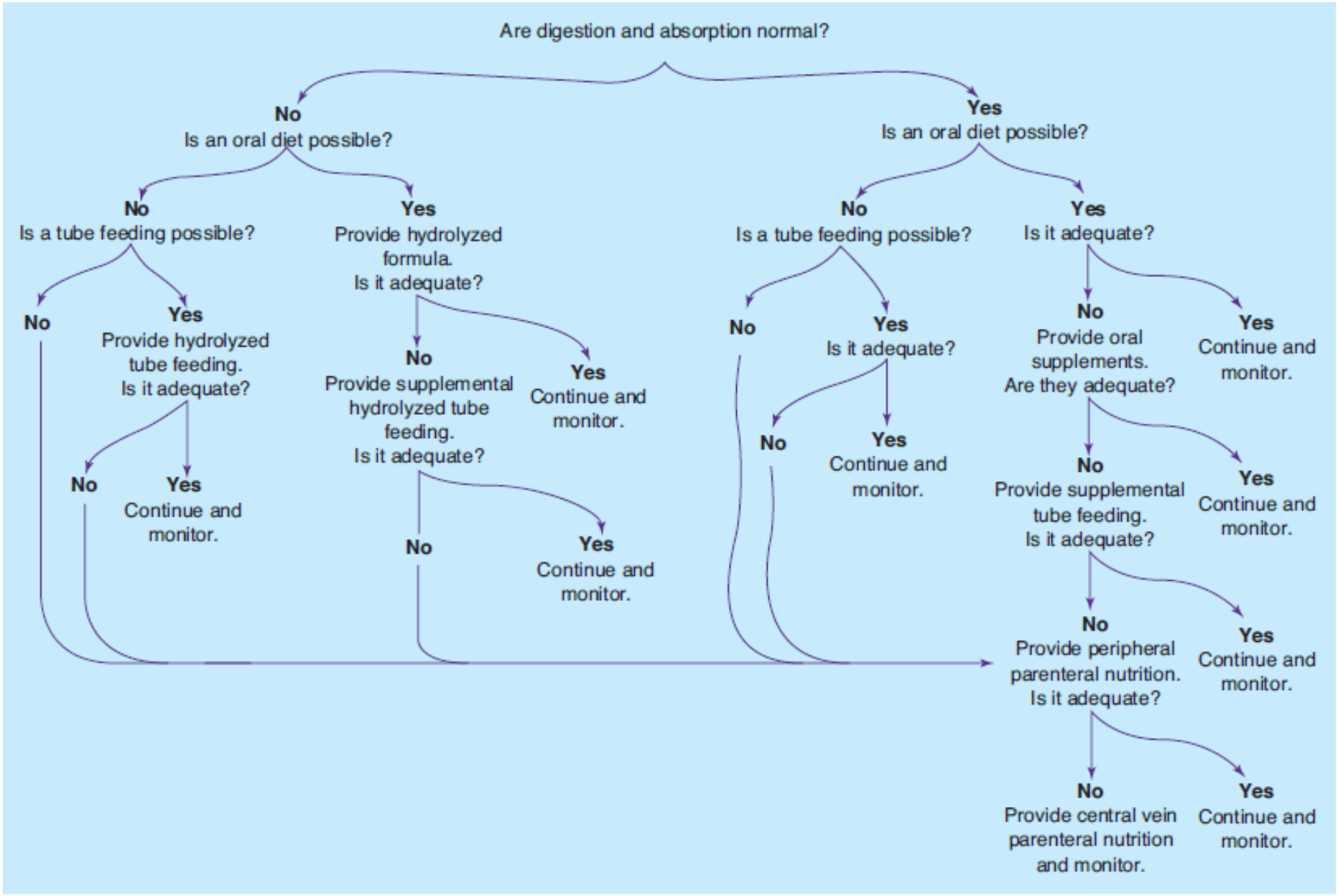
Chapter 15 : Oral diets , Enteral feeding, and Parenteral feeding

Feeding Patients

- Up to 25% to 40% of hospitalized patients have malnutrition, which is associated with:
  - postoperative complications
  - increased length of hospital stay
  - Death
- hospitalization may increase a person's risk of malnutrition
  - Appetite may be impaired by fear, pain, or anxiety
  - Hospital food may be refused
  - Meals may be withheld or missed because of diagnostic procedures or medical treatments.

Feeding Patients

Giving the right food to the patient is one thing; getting the patient to eat (most of it) is another.



ORAL DIETS

1. Regular diet.
2. Modified consistency diet.
3. Therapeutic diet.

or combination diets like:

high protein, soft diet

Ground low sodium

Normal, Regular, and House Diets

- For patients who do not have altered nutritional needs
- No foods are excluded
- Portion sizes are not limited

Modified Consistency Diets

1. Clear liquid diet

- After surgery , in preparation for bowel surgery ,or when oral intake resumes after a prolonged period
- ordered and progressed to a full liquid, soft, regular, or therapeutic diet as tolerated

Diet Characteristics	Foods Allowed	Indications	Contraindications
Clear Liquid			
A short-term, highly restrictive diet composed only of clear fluids or foods that become fluid at body temperature (e.g., gelatin). It requires minimal digestion and leaves a minimum of residue. Inadequate in calories and all nutrients except vitamin C if vitamin C–fortified juices are used.	Clear broth or bouillon Coffee, tea, and carbonated beverages, as allowed and as tolerated Fruit juices; clear (apple, cranberry, grape) and strained (orange, lemonade, grapefruit) Fruit ice made from clear fruit juice Gelatin Popsicles Sugar, honey, hard candy Commercially prepared clear liquid supplements	In preparation for bowel surgery or colonoscopy; acute GI disorders; transitional feeding after parenteral nutrition. Practice of using clear liquids as initial feeding after surgery may not be warranted.	Long-term use

- Minimal digestion, minimal residue
- Inadequate in calories and nutrients

Modified Consistency Diets

- **2. pureed diet**
  - (blenderized liquid diet)

Blenderized Liquid Diet (Also Known As Pureed Diet)

A diet composed of liquids and foods blenderized to liquid form. Thickness/viscosity depends on patient tolerance.

Most foods can be liquefied by combining equal parts of solids and liquids; fruits and vegetables need less liquid.

Broth, gravy, cream soups, cheese, tomato sauce, milk, and fruit juice are preferable to water for blenderizing due to their higher calorie and nutritional value.

All foods are allowed, but consistency is changed to liquid

Used after oral or facial surgery; for wired jaws; chewing and swallowing problems

Modified Consistency Diets

3. Mechanically altered diet

- for patients who have difficulty chewing or swallowing

- contain foods that are chopped, ground, pureed, or soft

Mechanically Altered Diet

A regular diet modified in texture only. Excludes most raw fruits and vegetables and foods containing seeds, nuts, and dried fruit.

Foods are chopped, ground, mashed or soft; pureed diet contains only pureed foods

Chopped or ground diet: milk, yogurt, pudding, cottage cheese; mashed, soft ripened fruit (peaches, pears, bananas); cooked, mashed soft vegetables (peas, carrots, yams); ground meats, soft casseroles, smooth cooked cereals, soft bite-sized pasta, pureed breads.

Pureed diet: foods pureed or slurried foods

Used for patients who have limited chewin ability, such as patients who are edent lous, have ill-fitting dentures, or have un dergone surgery to t head, neck, or mouth

Therapeutic Diets

- Differ from a regular diet in the amount of one or more nutrients or food components for the purpose of preventing or treating disease or illness

- Table 15.2

TABLE 15.2 Selected Therapeutic Diets: Characteristics and Indications

Type of Diet	Characteristics	Indications
"Diabetic" diet or consistent-carbohydrate diet diabetic diet fat-restricted high fiber low fiber high calorie calcium rich diet iron rich diet	Total daily carbohydrate content is consistent with emphasis on general nutritional balance. Calories are based on attaining and maintaining healthy weight. A high fiber intake is encouraged, sodium may be limited, and heart healthy fats are encouraged over saturated fat.	Type 1 and type 2 diabetes, gestational diabetes; impaired glucose tolerance; impaired fasting glucose
Fat-restricted	Fat limited to <50 g or <25 g of fat per day	Malabsorption syndromes, liver disease, pancreatic disease, chronic cholecystitis, gastroesophageal reflux
High-fiber	A general diet with low-fiber foods replaced by foods high in fiber	To prevent or treat constipation, diabetes, irritable bowel syndrome, hypercholesterolemia, obesity
Low-fiber	Fiber limited to <10 g/day	Before surgery to minimize fecal residue; during acute phases of intestinal disorders such as ulcerative colitis, Crohn's disease, and diverticulitis
High-calorie, high-protein	A diet rich in calorie-dense and/or protein-dense foods	To meet increased nutritional requirements; also used in patients with poor intakes
Calcium-rich diet	Calcium-rich foods are emphasized in a regular diet	Used for patients with low calcium intake and those at risk for osteoporosis
Iron-rich diet	Iron-rich foods are emphasized in a regular diet	Used for patients with low iron intake and those with high iron requirements, such as pregnant women and endurance athletes

TABLE 15.2 Selected Therapeutic Diets: Characteristics and Indications

Type of Diet	Characteristics	Indications
		endurance athletes
Potassium-modified potassium sodium restrectied gluten free lactose restrected	Potassium may be increased or restricted by manipulating potassium-rich foods, such as fruits, vegetables, whole grains, milk, and meats	Low-potassium diets may be used in the treatment of certain renal diseases, in conjunction with certain medications or in adrenal insufficiency; high potassium may be used in conjunction with certain medications and with certain renal diseases
Sodium-restricted	Sodium limit may be set at 500 mg/day, 1000 mg/day, 2000 mg/day, or 3000 mg/day	Hypertension, congestive heart failure, acute and chronic renal disease, liver disease
Gluten-free	Sources of gluten (a protein in wheat, rye, oats, and barley) are eliminated from the diet; gluten-free grains, such as corn, potato, rice, soy, and quinoa are encouraged as sources of complex carbohydrates	Celiac disease (celiac sprue, nontropical sprue, gluten-sensitive enteropathy) and dermatitis herpetiformis rash
Lactose-restricted	Limits foods with lactose ("milk sugar") to the amount tolerated by the individual	Lactose intolerance or lactase insufficiency, which may occur secondary to certain inflammatory GI disorders such as ulcerative colitis and Crohn's disease

Nutritional Supplements

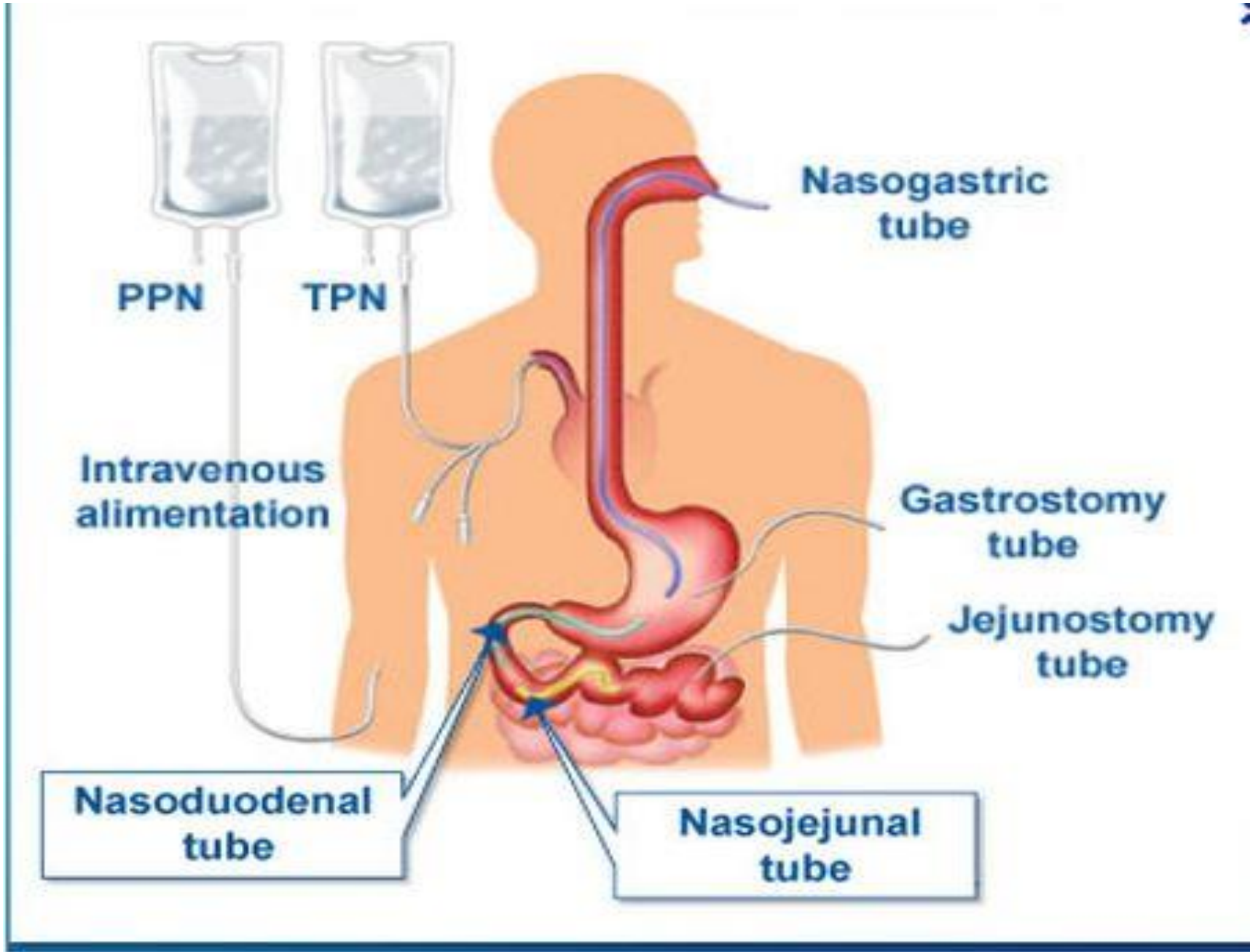
- Some patients are unable or unwilling to eat enough food to meet their requirements
- because intake is poor or because their nutritional needs are so high

- nutritional supplements with or between meals can significantly boost protein and calorie intakes.

TABLE 15.3 Nutritional Supplements

Type	Examples	Characteristics	Comments
Clear Liquid clear liquid milk based commercially prepared liquid supplemental food	Enlive! Forta Drink Resource Fruit Beverage	Come ready-to-use or as a powder to be mixed with water Provide protein or calories, or both for patients on clear liquid diets Extremely low in fat	Although they come in flavors, they are not as well accepted as the other types of supplements
Milk-based	Forta Shake Carnation Instant Breakfast Boost Drink	May be "home made," such as a milkshake; commercially prepared; or in powdered form to be mixed with milk Provide significant amounts of protein and calories; are relatively inexpensive and palatable	Not suitable for patients with lactose intolerance; are not nutritionally complete, so they cannot be used as the sole source of nutrition
Commercially prepared liquid	Ensure: Regular, Protein, Plus, and Fiber varieties Boost: Drink High Protein, Plus, and Fiber varieties	Regular varieties: 8 g protein, 250 cal/8 oz High protein: 12–15 g protein/8 oz Plus: 14 g protein, 360 cal/8 oz Fiber: regular formula with fiber added Are lactose free	Generally sweet and flavored Are quick, easy, varied in flavor, often available in grocery stores Most provide complete nutrition, so they can be used as sole source of nutrition
Commercially prepared supplemental foods	Bars Broth Coffee Coffee creamer Gelatin Pudding	Specially designed to provide a concentrated source of protein and calories	Offer an alternative to sweetened drinks

Enteral Nutrition



Enteral Nutrition (EN)

- Commonly known as **tube feeding**.
- For patients who are unable to consume an adequate oral intake**, but have at least a partially functional (GI) tract.**
- Such as:
  - problems in chewing and swallowing
  - Prolonged lack of appetite
  - obstruction in the upper GI tract
  - coma
  - very high nutrient requirements

Route	Indications	Advantages	Disadvantages
Nasogastric (NG)	Inability to safely and adequately consume oral intake	Easy to place and remove tube Uses stomach as reservoir	Contraindicated for clients at high risk for aspiration Potentially irritating to the nose and esophagus
	Short-term feeding (<6 wk) with functional gastrointestinal tract	Can use intermittent feedings Dumping syndrome less likely than with NI feedings	May be removed by uncooperative or confused patients Not appropriate for long-term use Unaesthetic for patient
Nasointestinal (NI)	Short-term feeding for patients at high risk of aspiration, delayed gastric emptying, or gastroesophageal reflux disease (GERD)	Less risk of aspiration, especially important for patients who have impaired gag or cough reflex, decreased consciousness, ventilator dependence, or a history of aspiration pneumonia	Increased risk of dumping syndrome Not appropriate for intermittent or bolus feedings Not appropriate for long-term use Unaesthetic for patient
Gastrostomy	For long-term use in patients with a functional gastrointestinal tract Frequently used for patients with impaired ability to swallow	Same advantages as NG, but more comfortable and aesthetic for patient Confirmation of tube placement easier Cannot be misplaced into the trachea	PEG insertion contraindicated for clients who cannot have an endoscopy Risk of aspiration pneumonia in clients with GERD Stoma care required Danger of peritonitis Potential for tube dislodgment
Jejunostomy	For long-term use in patients at high risk for aspiration pneumonia and in clients with altered gastrointestinal integrity above the jejunum For short-term use after gastrointestinal surgery	Low risk of aspiration No risk of misplacing tube into the trachea More comfortable and aesthetic for clients than transnasal tubes Because motility resumes more quickly in the intestines than in the stomach after gastrointestinal surgery, feedings can begin sooner than other feedings	Small-diameter tubes easily become clogged Peritonitis can occur from tube dislodgment Cannot be used for intermittent or bolus feedings Stoma care required

nasogastric
nasointestinal
gasrostomy
jejunostomy

Formula Characteristics

Protein content :

1. **Standard formulas :** are made from whole proteins found in foods. (e.g., milk, meat, eggs) or **protein isolates**
   - for patients who have normal digestive and absorptive capacity
2. **Hydrolyzed** protein formulas: contain only free amino acids OR proteins that are broken down into small peptides

   - for patients with impaired digestion or absorption

   - inflammatory bowel disease, short-gut syndrome, cystic fibrosis, and pancreatic disorders.

Calorie and Nutrient Density

- Routine formulas provide 1.0 to 1.2 cal/mL
- High-calorie formulas provide 1.5 to 2.0 cal/mL
  - 2000 Kcal diet can be met with ____ ml of standard formula
  - If fluid restricted we can give ___ ml of high calorie formula

Selected Enteral Products

Product	cal/mL	Protein (g/L)	CHO (g/L)	Fat (g/L)	Volume Needed to Meet 100% RDI* (mL)
Standard, Intact Formulas (lactose-free)					
Isocal	1.06	34	135	44	1890
Isosource	1.2	43	170	39	1165
Osmolite	1.06	37	151	35	2000
High Protein, Intact Formulas					
Isocal HN	1.06	44	124	45	1180
Promote	1.0	63	130	26	1000
Ultracal HN Plus	1.2	54	156	40	1000
High Calorie, Intact Formulas					
Comply	1.5	60	180	61	830
Deliver 2.0	2.0	75	200	101	1000
Nutren 1.5	1.5	60	169	68	1000
Fiber Enriched Intact Formulas (each of the formulas below provide 14 g fiber per L)					
Jevity	1.06	44	155	35	1321
Nutren Fiber	1.0	40	127	38	1500
Promote with Fiber	1.0	63	138	28	1000
Specialty Intact Formulas					
For diabetes: Glucerna	1.0	42	96	54	1420
For immune system support: Impact	1.0	56	130	28	1500
For renal failure (after dialysis has been instituted): Magnacal Renal	2.0	75	200	101	1000
For respiratory insufficiency: Pulmocare	1.5	63	106	93	1420

CALCULATING CALORIES

To calculate calories needed to maintain body weight, a range of 25 to 30 cal/kg actual weight is used. Normal protein RDA is 0.8 g/kg; patients who have increased needs for healing need more, based on the extent of injury or surgery.

Example: Calculate the calorie and protein needs of a patient who weighs his or her healthy body weight of 165 pounds and has normal protein requirements.

1. 165 pounds ÷ 2.2 pounds/kg = 75 kg

2. 75 kg × 25 cal/kg = 1875 calories
   75 × 30 cal/kg = 2250 calories

Estimated calorie needs: 1875 – 2250

3. 75 kg × 0.8 g/kg = 60 g protein

If the patient's ability to digest and absorb nutrients is not impaired, a reasonable choice for an enteral formula (for short-term use) would be Isocal. It would supply adequate calories, protein, and vitamins and minerals when infused over 22 hours/day. Instead of 24 hours/day, 22 hours/day is used to allow "off" time to administer medications. Isocal is low in fiber so if the patient is to receive enteral nutrition for a prolonged period, a fiber-enriched formula may be more suitable.

A goal rate of 90 mL/hour × 22 hours = 1980 mL/day

1980 mL × 10.6 cal/mL = 2099 cal/day

1.980 L × 34 g protein/L = 67 g protein/day

Because the volume of Isocal needed to meet RDI for vitamins and minerals is 1890 mL, the patient's estimated nutritional needs would be met with this regimen.

Water Content

- The water content of tube feedings varies with the **caloric concentration**
  - Formulas that provide 1.0 cal/mL provide 850 mL of water per liter.
  - The water content of high calorie formulas is lower at 690 to 720 mL/L.
- Adults generally need 30 to 40 mL/kg/day, so most patients who received EN need additional free water to meet fluid requirements.

Fiber and Residue Content

- Fiber combines with undigested food, intestinal secretions, and other cells to make **residue**
- Hydrolyzed formulas are essentially residue-free because they are completely absorbed.
- Most standard formulas are low in residue because low-residue formulas are not likely to cause gas or abdominal distention

Fiber and Residue Content

- **Blenderized formulas** are a natural source of fiber because they are made **from whole foods**. They generally provide approximately 4 g of fiber per liter.

- The fiber content of fiber-enriched formulas is generally 10 to 14 g/L

- Because fiber helps to maintain **GI integrity**, formulas with added fiber should be considered when EN is to be used for a **long period.**

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Tube Feeding Complications

- Aspiration
- Diarrhea
- Nausea
- Distention and bloating
- Dehydration
- Fluid overload
- Constipation
- Gastric rupture
- Clogged tube
- Anxiety
- Dry mouth

Tube Feeding Complications

TABLE 15.7 Trouble-Shooting Nutrition-Related Problems in Tube-Fed Patients

Potential Problem	Rationale	Nursing Interventions and Considerations
Aspiration	Feeding infused into the lung	Confirm proper placement of the feeding tube by radiograph prior to initiating a feeding.
	Gastroesophageal reflux	Elevate the bed's headboard 30–45 degrees during feeding and for approximately 1 hour afterward
	Impaired cough reflex	Consider a nasointestinal or jejunostomy feeding
	Delayed gastric emptying	Monitor gastric residuals Switch to a continuous drip delivery method
Diarrhea	Infusion of a formula that is too cold	Give canned formulas at room temperature Warm refrigerated formulas to room temperature in a basin of warm water
	Bacterially contaminated formula	Follow handwashing and sanitation protocol Refrigerate unused formula promptly Discard opened cans within 24 hours Flush the tubing as per protocol Hang formulas less than 6 hours Change extension tubing every 24 hours Initiate and advance feedings as per protocol
	Feeding rate too rapid	For existing feedings, decrease the rate to the level tolerated then advance at half the original increment (e.g., 12 mL/hour instead of 25 mL/hour) Feed smaller volumes more frequently or

	Volume of formula too great	Consider a high-calorie formula if problem persists
	Side effect of antibiotics or other medications	Investigate drugs used for possible causes/possible alternatives Administer antidiarrheals as ordered
	Malplacement of feeding tube	Check the position of the tube
	Feeding rate too rapid	Slow the rate of feeding; switch to a continuous drip method of delivery
Nausea (Discontinue the feeding. Administer antiemetics if ordered by the physician.)	Volume of formula too great → delayed gastric emptying	Check gastric residual and notify the physician if >100 mL Reduce the volume, then increase gradually If distention is contributing to nausea, encourage ambulation
	Feeding too soon after intubation	Explain the procedures to the client and encourage questions
	Anxiety	Allow approximately 1 hour between intubation and the first feeding Allow client to verbalize his/her feelings; provide emotional support
	Intolerance to a specific formula, especially high-fat formulas	Switch to a different formula

(table continues on page 372)

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Transition to an Oral Diet

- To begin the transition process, the tube feeding should be stopped for 1 hour before each meal.
-
- Gradually increase meal frequency until six small oral feedings are accepted

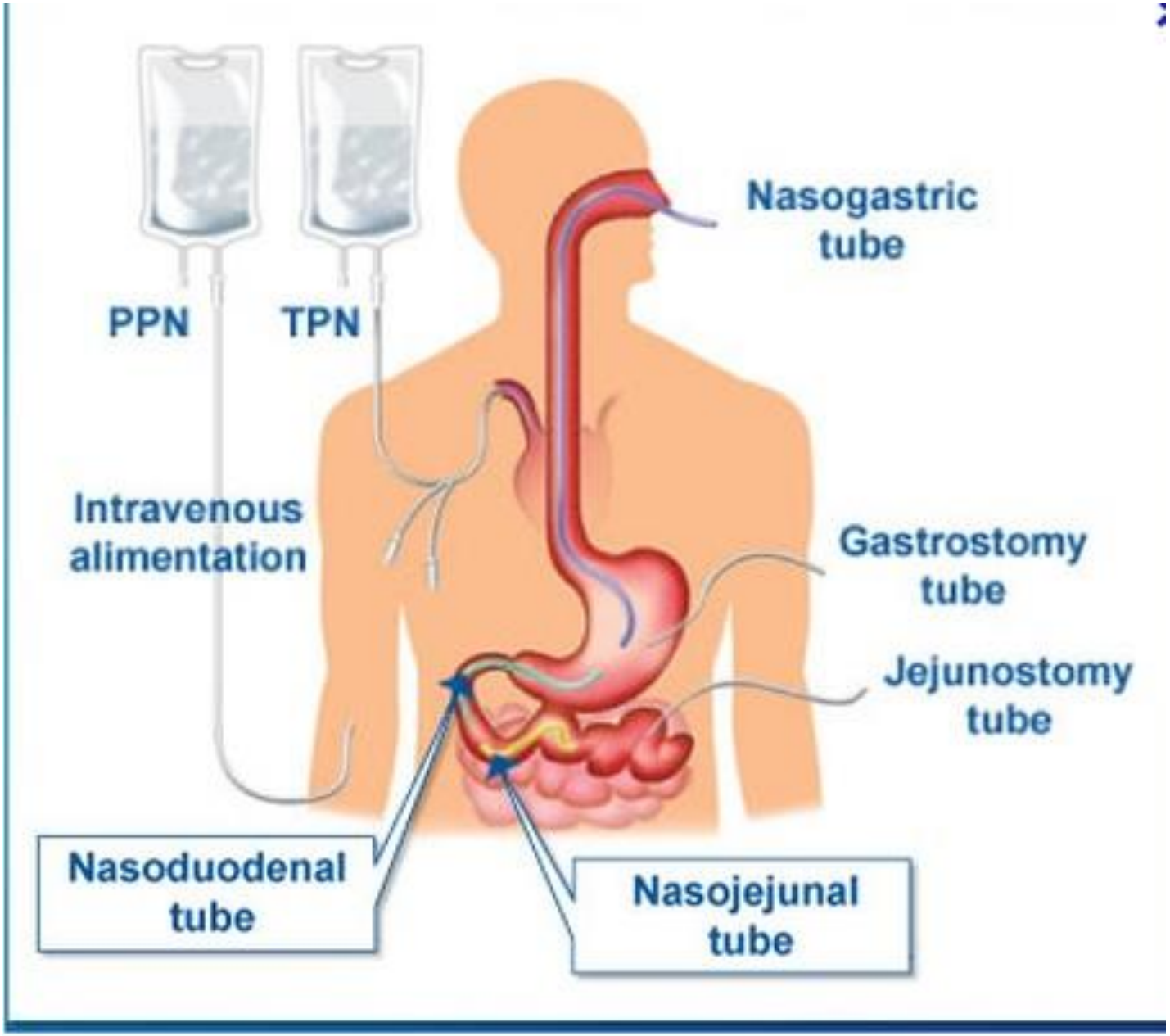
- When the patient consistently consumes two thirds of protein and calorie needs orally for 3 to 5 days, the tube feeding may be totally discontinued

Parenteral Nutrition

Parenteral Nutrition (PN)

- Was developed in 1960s

- When researchers discovered how to deliver nutrients into the bloodstream via central venous access, thereby **bypassing the GI tract**



Parenteral Nutrition (PN)

- It should be used only when:
  - **Enteral intake** is inadequate or contraindicated
  - When prolonged nutritional support is needed.
  - **Nonfunctional GI tract**

Parenteral Nutrition (PN)

- PN is a life-saving therapy in patients who have a **nonfunctional GI tract**, such as:
  - in the case of obstruction
  - intractable vomiting or diarrhea
  - short bowel syndrome
  - Paralytic ileus

Composition of PN

- Solutions provide protein, carbohydrate, fat, electrolytes, vitamins, and trace elements in sterile water.

Protein

- Protein is provided as a solution of crystalline essential and nonessential amino acids ranging in concentration from 3.5% to 20% of the solution

- Usually they receive 1 to 2 g protein/kg of body weight
  - Highly stressed patients may require more

- A nitrogen balance study (see Chapter 3) can be used to determine adequacy of protein intake.

Carbohydrate

- is dextrose monohydrate, which provides 3.4 cal/g.

- The minimal amount of carbohydrate needed to spare protein, that is to prevent protein from being used for energy

Carbohydrate

- Consequences of excess CHO administration:
  - Hyperglycemia
  - Glucosuria leading to → osmotic diuresis
  - Synthesis and storage of fat
  - Hepatic steatosis
  - Increased carbon dioxide production which may complicate weaning from mechanical ventilation

Refeeding Syndrome

- In past, “if some is good, more is better” and overfeeding was common practice

- It is now recognized that overfeeding, particularly overfeeding carbohydrates, can lead to a life threatening complication known as the **refeeding syndrome**

Refeeding Syndrome

potentially fatal complication that occur from an abrupt change from a catabolic state to an anabolic state and an increase in insulin caused by a dramatic increase in calories.

Refeeding syndrome

underfeeding

BOX 16.2 PROPOSED MECHANISMS BY WHICH UNDERFEEDING BENEFITS PATIENTS

- Lower intake of omega-6 fatty acids means less synthesis of the cytokines that promote inflammation
- Lower carbohydrate intake may decrease hyperglycemia
- Lower intakes of calcium, iron, and zinc may lower inflammatory response and cell injury
- Fewer free radicals generated from nutrient metabolism
- Less CO_2 production from less hypermetabolism

Fat

- Lipid emulsions, made from soybean oil or safflower plus soybean oil with egg phospholipid as an emulsifier

- Lipids are a significant source of calories
  - useful when volume must be restricted or when dextrose must be lowered because of persistent hyperglycemia
- to correct or prevent fatty acid deficiency.

Electrolytes, Vitamins, and Trace Elements

- The quantity of electrolytes provided is based on the patient's blood chemistry values
- Parenteral multivitamin preparations usually contain 12 to 13 essential vitamins.

Electrolytes, Vitamins, and Trace Elements

- Additional zinc (5-10 mg daily) should be considered during periods of excessive GI output (diarrhea or fistula) or for severe wounds / burns.

  - vital micronutrient essential for protein synthesis, cell growth and differentiation, immune function, and **intestinal transport of water and electrolytes**

BOX 15.5 POTENTIAL COMPLICATIONS OF TOTAL PARENTERAL NUTRITION

Infection and Sepsis Related to
Catheter contamination during insertion
Long-term indwelling catheter
Catheter seeding from bloodborne or distant infection
Contaminated solution

Metabolic Complications
Dehydration; hypovolemia
Bone demineralization
Hyperglycemia
Rebound hypoglycemia
Hyperosmolar, hyperglycemic, nonketotic coma
Azotemia
Electrolyte disturbances
- Hypocalcemia
- Hypophosphatemia, hyperphosphatemia
- Hypokalemia
- Hypomagnesemia

High serum ammonia levels
Deficiencies of
- Essential fatty acids
- Trace elements
- Vitamins and minerals

Altered acid–base balance
Elevated liver enzymes
Fluid overload

Mechanical Complications Related to Catheterization
Catheter misplacement
Hemothorax (blood in the chest)
Pneumothorax (air or gas in the chest)
Hydrothorax (fluid in the chest)
Hemomediastinum (blood in the mediastinal spaces)
Subcutaneous emphysema
Hematoma
Arterial puncture
Myocardial perforation
Catheter embolism
Cardiac dysrhythmia
Air embolism
Endocarditis
Nerve damage at the insertion site
Laceration of lymphatic duct
Chylothorax
Lymphatic fistula
Thrombosis

sepsis
metabolic complication
mechanical catheterization