

Anorexia Nervosa and Bulimia

Nutritional pathology · endocrine, hematologic and systemic complications

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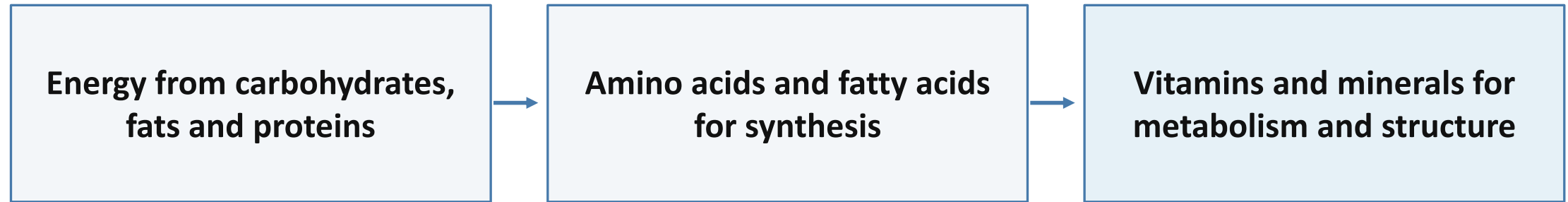
Learning objectives

- Distinguish severe food restriction from binge–purge behavior.
- Explain the endocrine and skeletal consequences of nutritional depletion.
- Recognize gelatinous transformation of bone marrow as a morphologic finding.
- Connect purging-associated hypokalemia to cardiac and visceral complications.

Eating disorders within nutritional pathology

- Malnutrition can arise from inadequate food intake, impaired absorption, excess loss or increased nutrient requirements.
- The Robbins section places anorexia nervosa and bulimia among causes of self-imposed dietary disturbance.
- These disorders require a behavioral assessment as well as evaluation of systemic consequences.

What an adequate diet must supply



Nutritional injury follows failure to meet one or more of these requirements.

Schematic

Primary and secondary malnutrition

Primary insufficiency

- One or more essential dietary components are not ingested in sufficient amounts.
- Self-imposed restriction is included among possible causes.

Secondary insufficiency

- Nutrient intake may be adequate, but absorption, storage or utilization is impaired.
- Excess losses and increased metabolic needs also contribute.

Self-imposed restriction is a distinctive pathway

- Body-image and weight-related concerns can drive harmful eating behaviors.
- Primary nutritional insufficiency can follow these behaviors even without food scarcity.
- Pathologic consequences may extend to endocrine, cardiac, skeletal and hematologic systems.

Anorexia nervosa: Restrictive phenotype

Defining behavior

- Severe restriction of food intake.
- Significant loss of body weight follows.

Pathologic consequence

- Clinical effects resemble those of severe nutritional deprivation.
- Endocrine suppression and marrow abnormalities are prominent.

Bulimia: Binge–purge phenotype

Binge episodes

- Episodes of uncontrolled intake of large quantities of food.
- A predominance of carbohydrate-rich food.

Compensatory behavior

- Self-induced vomiting or misuse of laxatives.
- The aim is to prevent weight gain following bingeing.

Behavioral distinction: Intake and compensation

Dimension	Anorexia nervosa	Bulimia
Dominant pattern	Severe food restriction	Recurrent bingeing followed by purging
Weight course	Marked weight loss	Weight often remains near normal
Medical emphasis	Multisystem starvation effects	Purging-related injuries and electrolyte loss

Body-image concerns are a common context

- Preoccupation with body image and thinness in both syndromes.
- The reported population is predominantly previously healthy young females.
- These descriptors are epidemiologic observations, not restrictions on who can be affected.

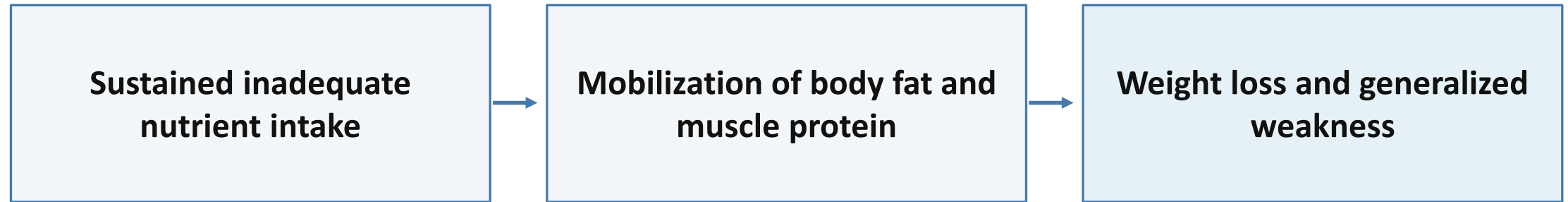
Textbook epidemiology and prognosis

- Bulimia is described as more common than anorexia nervosa and generally having a better prognosis.
- Bulimia in 1–2% of females and 0.1% of males.
- The mean age at onset reported is approximately 20 years.
- The exceptionally high mortality associated with anorexia nervosa.

Neurobiology remains incompletely understood

- The supplied Robbins section does not establish a single causal neural pathway.
- Altered serotonin metabolism is offered as a possible contribution.
- Behavioral phenotype and clinical sequelae are better defined here than molecular etiology.

Nutritional depletion: A pathologic sequence



Context from the nutritional-diseases section of Robbins.

Schematic

Somatic and visceral protein compartments

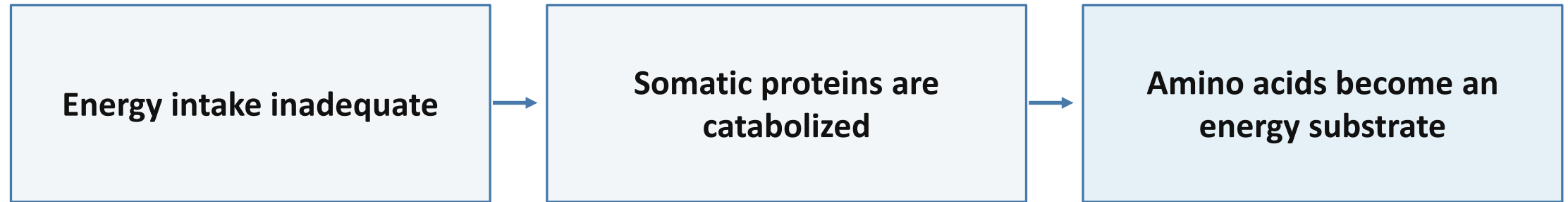
Somatic compartment

- Skeletal muscle is the principal store.
- Catabolism is expressed as reduced muscle mass.

Visceral compartment

- Liver and other visceral organs form this compartment.
- Plasma proteins provide an imperfect clinical reflection.

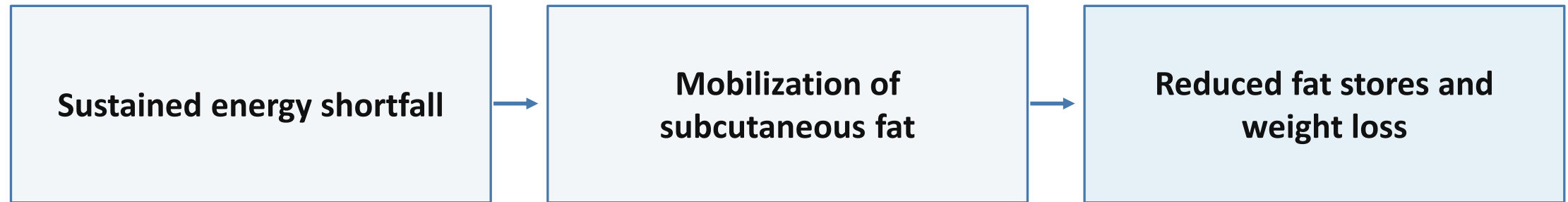
Why skeletal muscle wasting occurs



The mechanism is for severe dietary deficiency.

Schematic

Why subcutaneous fat diminishes



Source-based nutritional physiology; Avoid assuming every patient has identical morphology.

Schematic

Nutritional wasting: Syndrome versus etiology

Morphologic/functional pattern

- Loss of subcutaneous fat, skeletal muscle and weight.
- May be accompanied by anemia and other nutritional abnormalities.

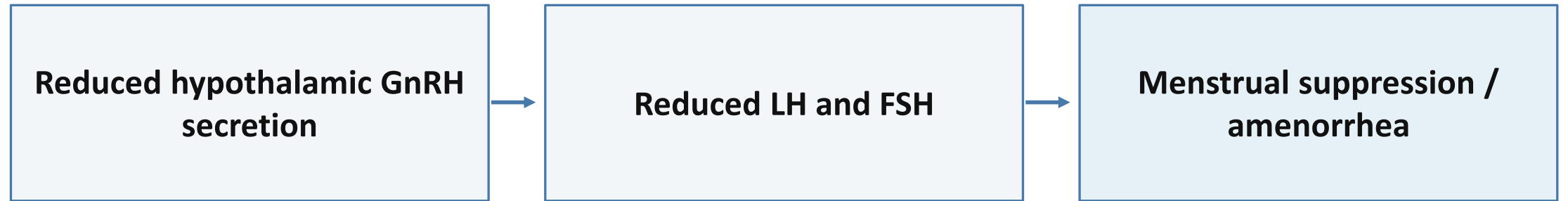
Underlying cause

- Marasmus is a childhood severe-malnutrition syndrome.
- Anorexia nervosa is a behavioral disorder that can produce starvation-related injury.

Anorexia affects multiple organ systems

Reproductive	Amenorrhea; Reduced gonadotropins
Thyroid-related	Cold intolerance; Bradycardia; Constipation
Skeleton	Reduced bone density
Marrow/blood	Anemia; Lymphopenia; Gelatinous change
Fluid/cardiac	Dehydration; Electrolyte changes; Arrhythmia

Reproductive-axis suppression



This endocrine sequence is specifically described for anorexia nervosa.

Schematic

Amenorrhea: The proximate hormonal mechanism

- Reduced GnRH secretion lowers luteinizing hormone and follicle-stimulating hormone.
- Diminished gonadotropin stimulation is associated with loss of normal menstrual cycling.
- Amenorrhea as a frequent clinical feature of anorexia nervosa.

Interpreting amenorrhea in anorexia nervosa

- Its biological relevance is the suppressed hypothalamic–pituitary–gonadal axis.
- The coexistence of marked nutritional depletion supports an energy-related endocrine mechanism.
- Clinical interpretation still requires assessment of the full eating-disorder phenotype.

Menstrual findings in bulimia differ

Robbins observation

- Menstrual irregularities can occur.
- Amenorrhea is described in fewer than half of affected patients.

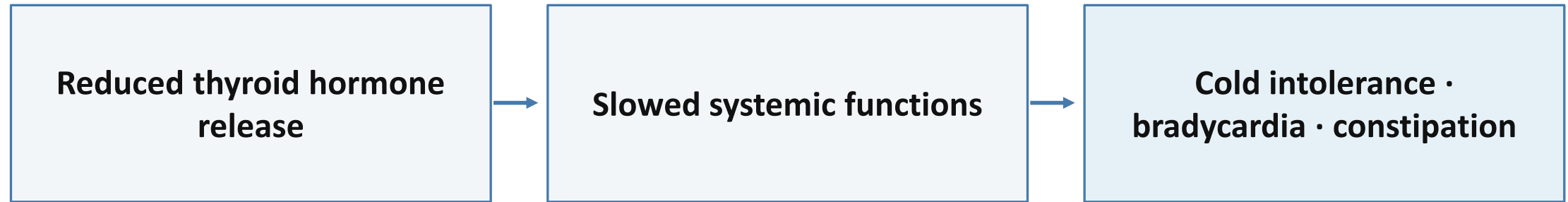
Mechanistic explanation

- Body weight often remains near normal.
- Gonadotropin levels may also stay near normal.

Reproductive endocrinology: Contrasting patterns

Finding	Anorexia nervosa	Bulimia
Nutritional state	Severe weight reduction typical	Weight often near normal
GnRH/gonadotropins	Suppressed reproductive axis	Often closer to normal
Amenorrhea	Very common description	Reported in <50%

Thyroid-associated systemic effects



This cluster to decreased thyroid hormone release.

Schematic

Cold intolerance and bradycardia

Cold intolerance

- Part of the endocrine pattern described in anorexia nervosa.
- In clinical reasoning, it should prompt assessment for broader nutritional effects.

Bradycardia

- Commonly accompanies the same low-thyroid-hormone pattern.
- Cardiac risk also requires attention to electrolyte disturbances.

Constipation as an endocrine-associated manifestation

- Constipation among findings associated with reduced thyroid hormone release.
- This links gastrointestinal symptoms to systemic endocrine disturbance.
- Constipation alone is nonspecific and should be interpreted with nutritional and behavioral history.

Hair and skin changes in nutritional depletion

- Hair changes and dry, scaly skin are noted in anorexia nervosa.
- Robbins groups these findings with the reduced thyroid-hormone-related syndrome.
- Cutaneous findings support the recognition of systemic illness but lack standalone specificity.

Integrated endocrine phenotype

Hypothalamus	Reduced GnRH
Gonadotropins	Reduced LH and FSH
Reproductive system	Amenorrhea
Thyroid-associated effects	Cold intolerance · bradycardia · constipation
Skeleton	Reduced estrogen contributes to bone loss

Anorexia nervosa and reduced bone density



The bone-loss effect to postmenopausal osteoporosis.

Schematic

Why estrogen loss matters for bone

- Estrogen deficiency is the mechanism proposed for reduced bone density.
- The analogy is acceleration of bone loss after menopause.
- Low bone density is an important consequence even when the presenting complaint is behavioral or menstrual.

Dehydration accompanies restrictive illness

- Dehydration is frequently present in anorexia nervosa.
- This can coexist with electrolyte abnormalities and multisystem nutritional consequences.
- The clinical pattern cannot be inferred from body weight alone.

Hypokalemia creates electrical instability



The arrhythmic hazard is shared by anorexia nervosa and bulimia.

Schematic

Sudden cardiac death is a major concern

- Robbins explicitly identifies arrhythmias and sudden death among major complications.
- Hypokalemia is identified as the key electrolyte disturbance passage.
- The risk is clinically consequential in either eating-disorder phenotype.

Two cardiac findings, different contexts

Bradycardia

- Included among reduced-thyroid-hormone-related findings in anorexia.
- Describes heart-rate reduction.

Arrhythmia susceptibility

- Linked to hypokalemia in anorexia and bulimia.
- May culminate in sudden death.

Anemia may accompany anorexia nervosa

- Anemia is among the hematologic abnormalities.
- The source also reports reduced marrow hematopoiesis.
- Anemia should be interpreted within the full nutritional and marrow context.

Lymphopenia signals hematologic involvement

- Lymphopenia among possible laboratory abnormalities.
- It occurs in the setting of systemic nutritional illness and altered marrow function.
- Its absence does not exclude anorexia nervosa.

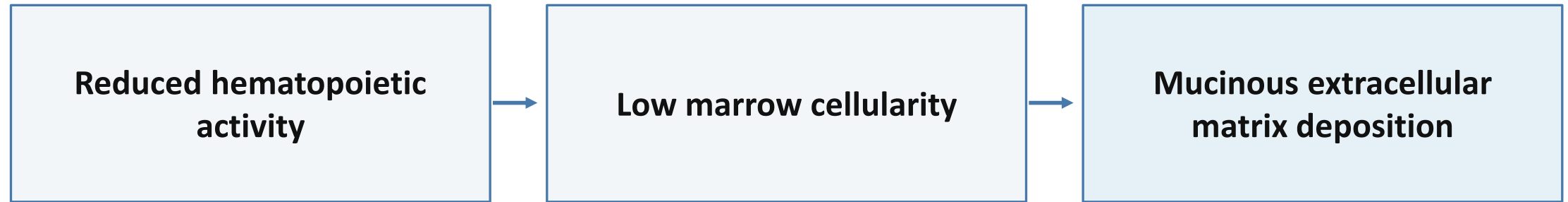
Hypoalbuminemia: Interpret in context

- Hypoalbuminemia as a possible finding in anorexia nervosa.
- Albumin reflects the visceral-protein dimension of malnutrition described in the parent section.
- Not every patient with severe depletion has the same serum-protein pattern.

Hematologic consequences of anorexia nervosa

Peripheral blood	Anemia
White-cell compartment	Lymphopenia
Plasma proteins	Hypoalbuminemia may occur
Bone marrow	Reduced hematopoiesis
Matrix	Gelatinous transformation

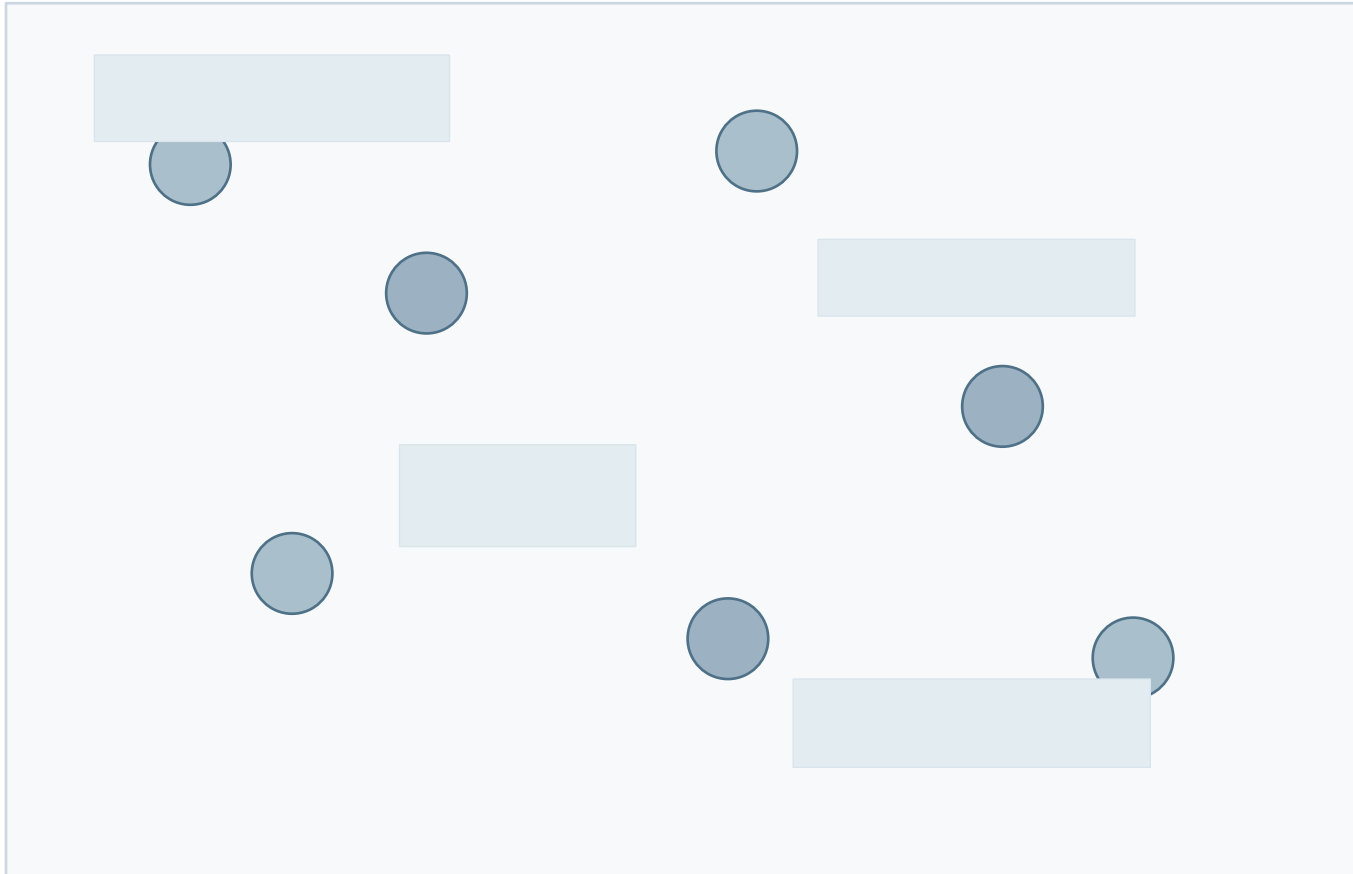
Marrow suppression and gelatinous transformation



This histologic pattern is called gelatinous marrow transformation.

Schematic

Bone marrow: A distinctive morphologic pattern



Schematic — not a histologic specimen

Sparse hematopoietic cells

Reduced marrow cellularity

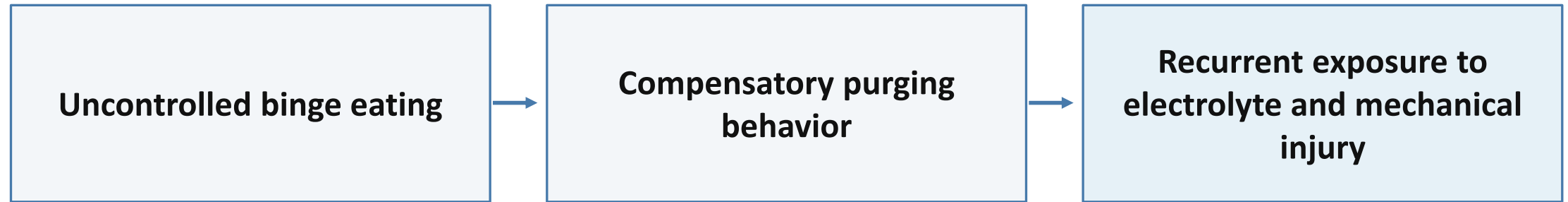
Mucinous extracellular matrix

Gelatinous transformation

Why marrow gelatinization is diagnostically important

- Decreased cellularity with deposition of mucinous matrix.
- The resulting gelatinous transformation is emphasized as a highly characteristic finding.
- The supplied text calls it “virtually pathognomonic”; This wording should not be interpreted as absolute diagnostic exclusivity.

Bulimia: The recurrent behavioral sequence



Vomiting, laxative misuse and diuretic use.

Schematic

Bingeing in bulimia: Key Principles

- Large amounts of food may be consumed during an episode.
- Carbohydrate-rich foods are mentioned as commonly ingested.
- The distinguishing pathologic issue is the compensatory purge and its consequences.

Self-induced vomiting creates multiple hazards

- Vomiting is a prominent purging behavior in the source description.
- Repeated exposure can lead to electrolyte depletion.
- Other described hazards include aspiration of gastric contents and gastrointestinal rupture.

Laxatives and diuretics as purging methods

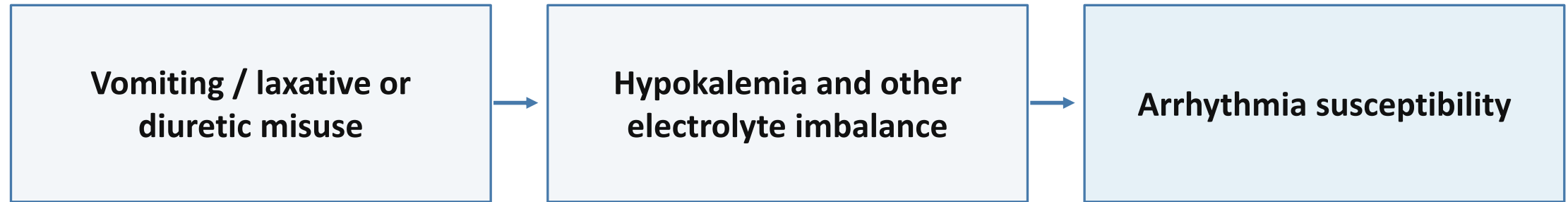
Laxative misuse

- Specifically listed as a purging behavior.
- Contributes to the spectrum of medical complications associated with repeated purging.

Diuretic misuse

- Listed by Robbins as a chronic purging practice.
- A clinically relevant contributor to electrolyte abnormalities.

Bulimia: Electrolyte pathway to cardiac injury



Mechanistic risk is present even without marked underweight.

Schematic

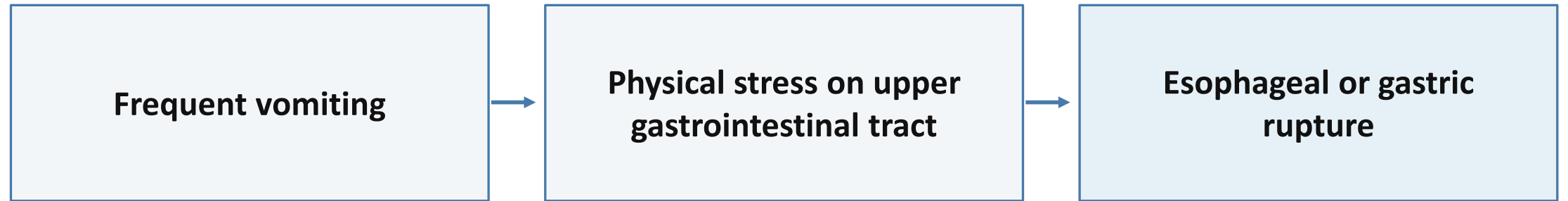
Aspiration during purging



Aspiration as a major complication.

Schematic

Mechanical gastrointestinal injury



The anatomic complications without specifying rates.

Schematic

Purging complications: Three pathways

Mechanism	Pathology or consequence	Clinical relevance
Electrolyte loss	Hypokalemia	Susceptibility to arrhythmia
Airway contamination	Pulmonary aspiration	Respiratory complication
Mechanical stress	Esophageal or gastric rupture	Acute visceral injury

Near-normal body weight does not exclude bulimia

- Body weight and gonadotropin levels may remain near normal.
- Consequently, classic starvation signs may not be prominent.
- The absence of marked weight loss cannot rule out serious purging-related complications.

Why comprehensive psychological assessment is central

- There are no specific signs or symptoms that independently establish bulimia.
- Diagnosis therefore relies on comprehensive psychological assessment.
- Clinical examination remains important for detecting electrolyte and visceral injury.

Anorexia nervosa and bulimia: Pathology comparison

Domain	Anorexia nervosa	Bulimia
Behavior	Severe restriction	Bingeing followed by purging
Weight	Significant loss	Often near normal
Endocrine	GnRH suppression, amenorrhea	Menses often less disrupted
Morphology	Gelatinous marrow transformation	No specific morphologic hallmark cited
Major shared hazard	Hypokalemia → arrhythmia	Hypokalemia → arrhythmia

Two routes to nutritional/cardiac harm

Anorexia nervosa

- Sustained intake restriction causes profound nutritional depletion.
- Endocrine and hematologic abnormalities accompany cardiovascular vulnerability.

Bulimia

- Purging can cause serious electrolyte and tissue injury.
- A near-normal weight can coexist with arrhythmia risk.

Differential context: Malnutrition mechanisms

Cause category	Typical mechanism	Lecture relevance
Dietary insufficiency	Intake fails to meet needs	Anorexia restriction is a key example
Malabsorption / excess loss	Nutrients are not retained or absorbed	Alternative or additional pathology
Inflammatory catabolism	Illness-associated protein breakdown	Contrasts with primary restriction

Clinical application: Restrictive phenotype

A young adult has marked weight loss after severe dietary restriction, menstrual cessation, cold intolerance and bradycardia.

Questions

- Which endocrine pathway explains the menstrual change?
- What skeletal and hematologic complications should be considered?

Reasoning: Reduced GnRH → reduced LH/FSH explains amenorrhea. Low bone density and gelatinous marrow changes are.

Clinical reasoning: Marrow abnormality

A person with severe weight loss has anemia. Bone marrow assessment describes decreased cellularity and abundant mucinous matrix material.

Questions

- Which marrow transformation does this suggest?
- Why should it be interpreted with the history?

Reasoning: Gelatinous transformation of marrow. Its strong association with anorexia does not replace assessment of the full clinicopathologic setting.

Clinical application: Binge–purge phenotype

A young adult with near-normal weight reports recurrent bingeing followed by induced vomiting and experiences an electrolyte abnormality.

Questions

- Which eating-disorder phenotype fits the source description?
- Why is apparent weight preservation not reassuring?

Reasoning: Bulimia is the described behavioral syndrome. Purging may cause hypokalemia and arrhythmia despite near-normal weight.

Clinical reasoning: Complication pathway

A patient with recurrent self-induced vomiting develops acute respiratory symptoms or severe chest/upper-abdominal pain.

Questions

- Which distinct complications are explicitly?
- Why must electrolyte hazards also be considered?

Reasoning: Pulmonary aspiration and esophageal/gastric rupture are possibilities. Concurrent hypokalemia can predispose to arrhythmia.

System-based clinicopathologic assessment

History	Restriction versus bingeing / purging
Nutritional status	Weight loss, fat and muscle depletion
Endocrine	Menstrual, thermal and bowel symptoms
Hematology / marrow	Anemia, lymphopenia, gelatinous change
Immediate harm	Electrolyte / cardiac and visceral complications

High-consequence findings across the syndromes

Anorexia nervosa

- Marked nutritional depletion with endocrine suppression.
- Bone-density reduction and distinctive marrow pathology.
- Hypokalemia-associated arrhythmia risk.

Bulimia

- Recurrent purging with near-normal weight possible.
- Hypokalemia-associated arrhythmias.
- Pulmonary aspiration and gastrointestinal rupture.

Three clinicopathologic conclusions

Anorexia nervosa: Profound food restriction can produce multisystem starvation effects, including endocrine and marrow abnormalities.

Bulimia: The binge–purge pattern produces dangerous electrolyte, pulmonary and gastrointestinal consequences even with near-normal weight.

Both syndromes: Hypokalemia-related arrhythmia and sudden death are essential complications to recognize.

Reference

Robbins, Cotran & Kumar. Pathologic Basis of Disease. 11th ed. (2026).

Assigned reading: “Anorexia Nervosa and Bulimia” and relevant adjacent material in “Nutritional Diseases.”

Detailed source locations and morphology-figure provenance are recorded in the presenter notes.