

Mucosal Atrophy and Intestinal Metaplasia

Gastric mucosal injury, remodeling, and neoplastic risk

Chronic gastritis · oxyntic gland loss · intestinal differentiation · dysplasia

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Learning outcomes

- Define mucosal atrophy, intestinal metaplasia, and epithelial dysplasia without conflating them.
- Connect H. Pylori and autoimmune gastritis to characteristic distributions of gland loss.
- Recognize the morphologic basis of intestinal metaplasia and dysplasia.
- Explain why chronic atrophy and metaplasia matter for gastric neoplasia.

Three distinct epithelial abnormalities

Process	Defining change	Diagnostic implication
Atrophy	Loss of normal gastric glands	Assess location and residual gland types
Metaplasia	Intestinal differentiation within gastric mucosa	Look for goblet cells
Dysplasia	Preinvasive cytologic and architectural atypia	Distinguish from reactive repair

Normal gastric regions are not interchangeable

Body and fundus

- Oxyntic glands contain acid-secreting parietal cells.
- Chief cells provide digestive zymogens.
- Major site of autoimmune-mediated gland loss.

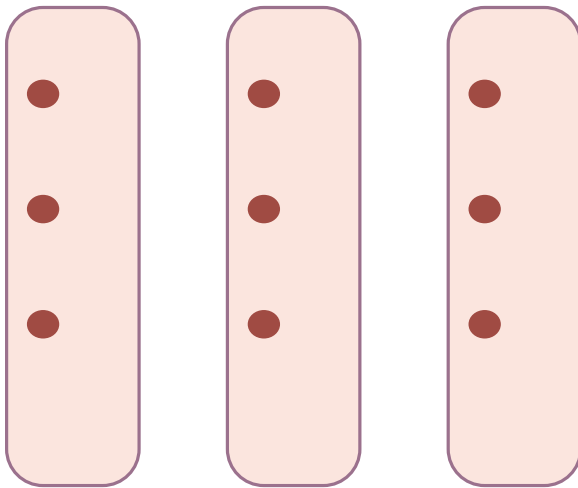
Antrum

- Predominantly mucus-producing pyloric glands.
- G cells regulate gastrin secretion.
- Frequent initial focus of H. Pylori gastritis.

Oxyntic mucosa: The relevant glandular compartment

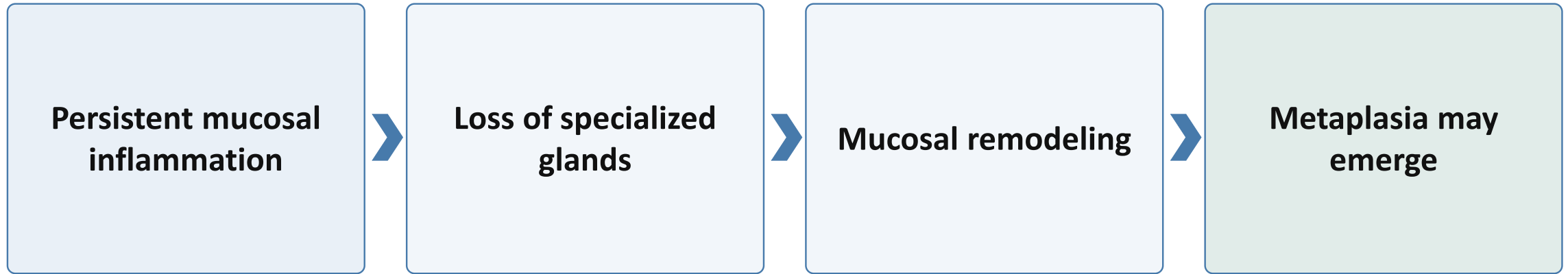
Recognize the normal compartment

- Surface foveolae open into deeper gastric glands.
- Parietal and chief cells account for characteristic oxyntic differentiation.
- Loss of these glands is central to corpus atrophy.



Schematic: Not a histologic specimen

The core lesion begins with chronic gastric injury



The morphologic outcome depends on cause, regional distribution, and persistence of injury.

Atrophy and metaplasia: Related, not synonymous

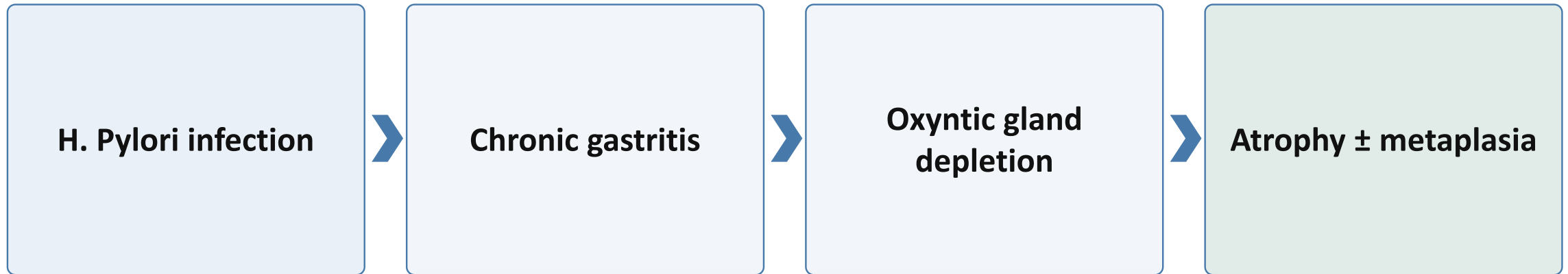
Mucosal atrophy

- Defined by loss of native glands.
- May lower secretory capacity in oxyntic mucosa.
- Can coexist with metaplastic epithelium.

Intestinal metaplasia

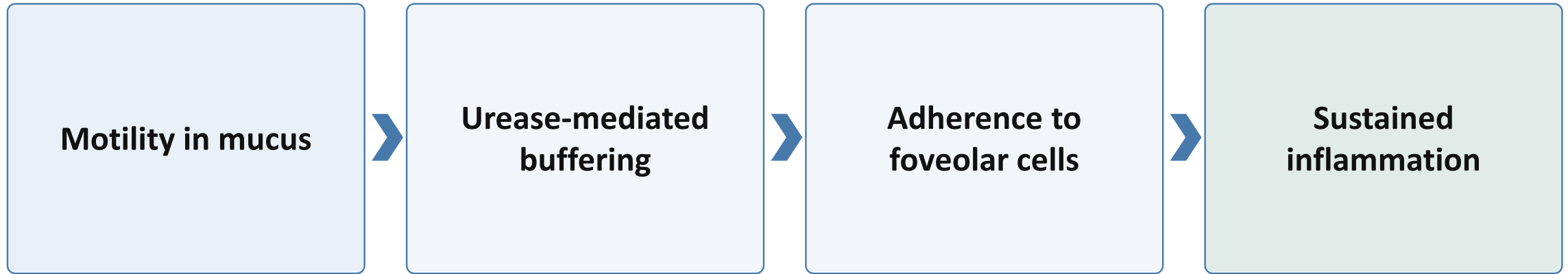
- Defined by intestinal-type differentiation.
- Identified morphologically by goblet cells.
- Can occur in an atrophic inflammatory background.

Two major pathways to atrophic gastritis



Autoimmune-mediated body/fundus injury is a separate initiating pathway; Do not assign both causes automatically.

H. Pylori persists within the gastric mucus niche



Flagella, urease and adhesins support persistence; Host and bacterial factors modify disease.

Antral-predominant H. Pylori gastritis

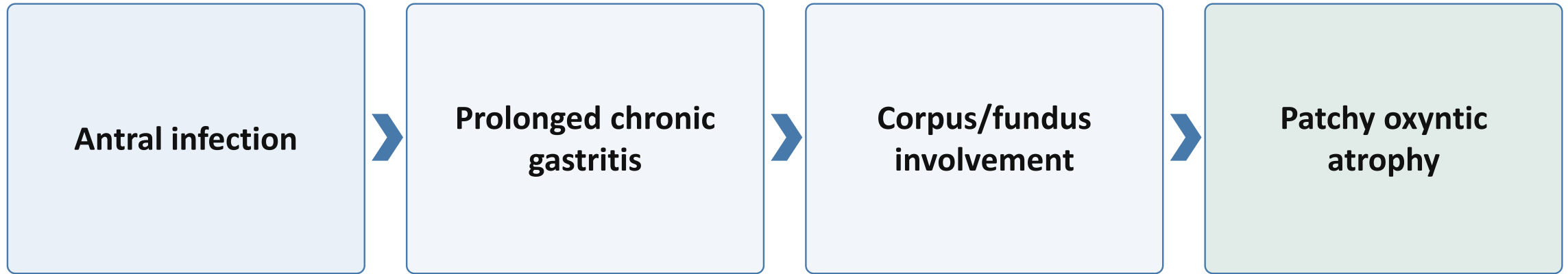
Typical earlier pattern

- Predominant antral inflammation.
- Organisms in superficial mucus and foveolar region.
- Plasma cells, lymphocytes and neutrophils.

Functional tendency

- Gastrin production may increase locally.
- Acid secretion remains normal or rises.
- Peptic ulcer tendency differs from atrophic disease.

Progression can extend into body and fundus



The progression is possible, not obligatory: H. Pylori infection has heterogeneous outcomes.

Patchiness is a diagnostic feature in H. Pylori atrophy

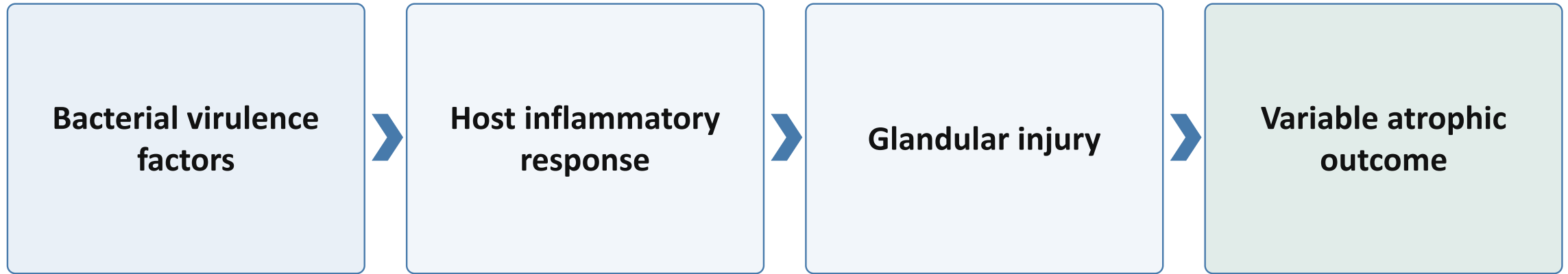
Topographic pattern

- Atrophic foci may be discontinuous.
- Residual oxyntic glands may persist nearby.
- Colonization and inflammation may be irregular.

Interpretation

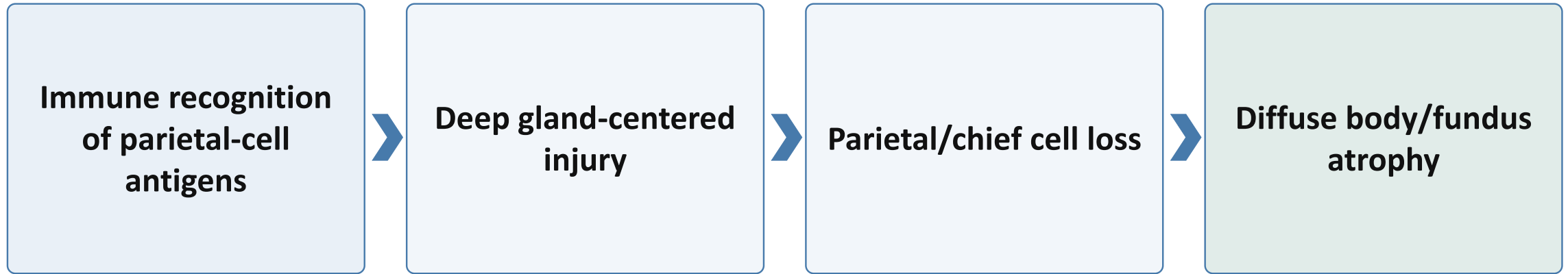
- A small biopsy samples only part of the mucosa.
- Antrum and corpus must not be treated as interchangeable.
- Patchy injury contrasts with typical autoimmune distribution.

Host and bacterial determinants modify progression



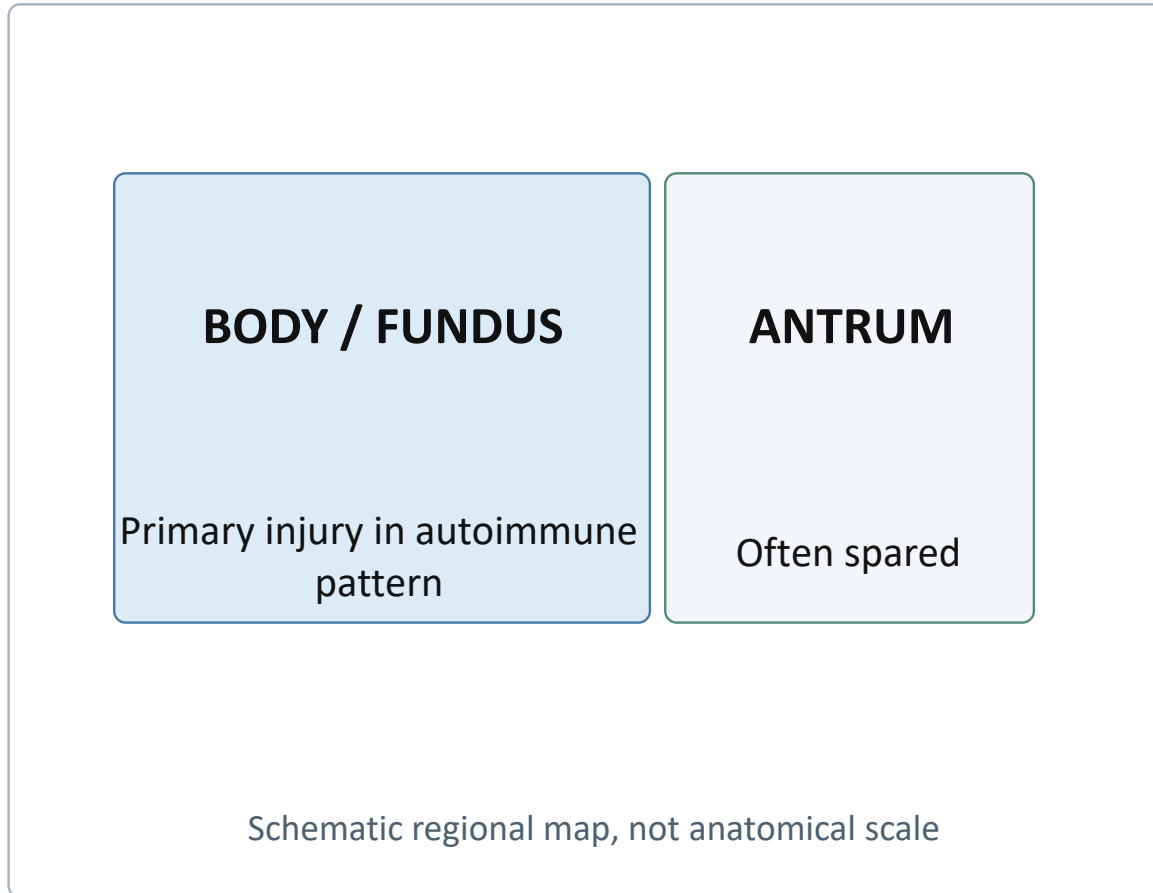
CagA-associated strains and host cytokine responses are discussed by Robbins as modifiers, not deterministic tests.

Autoimmune gastritis targets the oxyntic compartment



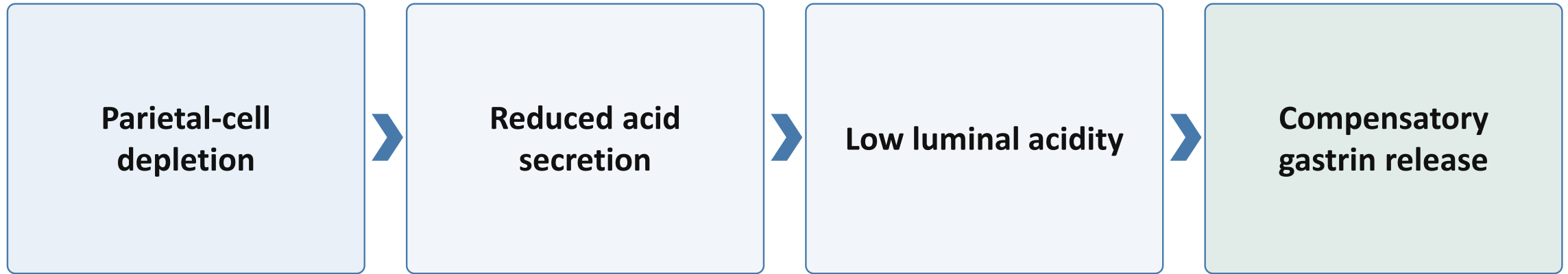
Autoantibodies to H^+/K^+ -ATPase and intrinsic factor support the autoimmune phenotype.

Autoimmune distribution: Body predominant, antrum spared



- Body and fundus: Principal site of glandular damage.
- Antrum: Typically relatively spared.
- Topography helps separate autoimmune from H. Pylori-associated injury.

Oxyntic destruction reduces acid production

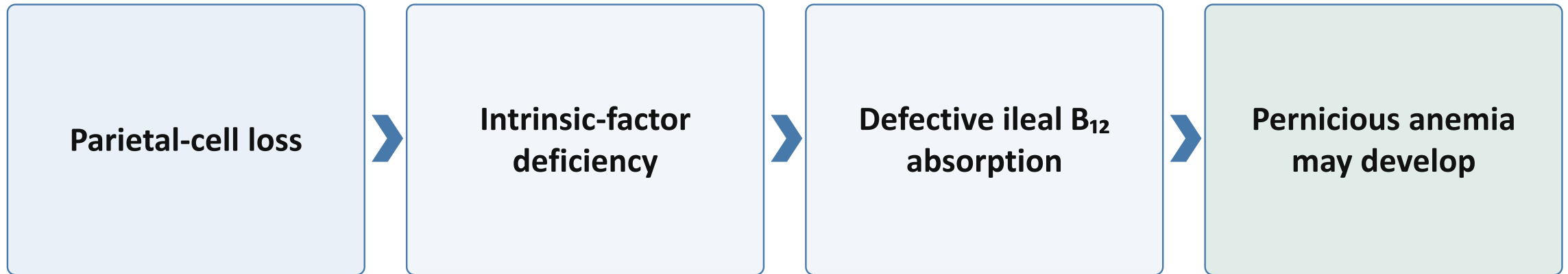


Autoimmune destruction can lead to achlorhydria and marked hypergastrinemia.

Cause and location predict acid physiology

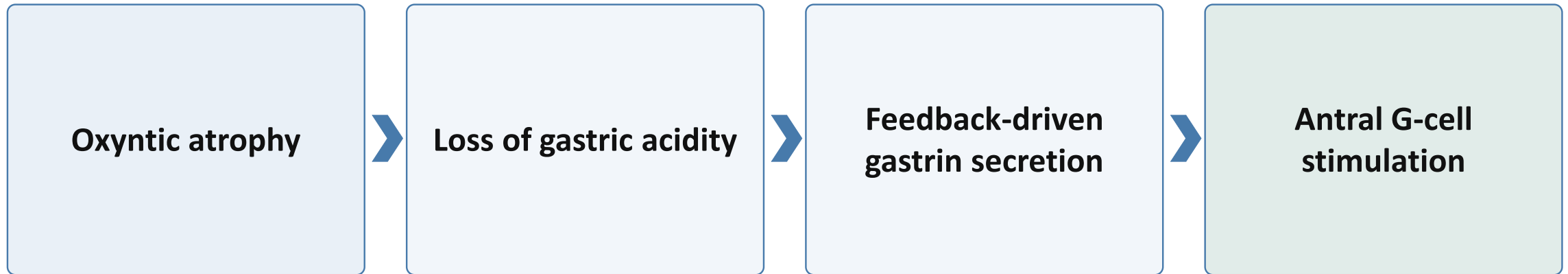
Phenotype	Gland preservation	Acid pattern
Antral-predominant H. pylori	Oxyntic glands relatively preserved	Normal or increased
Atrophic H. pylori	Patchy oxyntic loss	Reduced
Autoimmune body gastritis	Extensive oxyntic loss	Markedly reduced / absent

Parietal cells link gastric injury to vitamin B₁₂ status



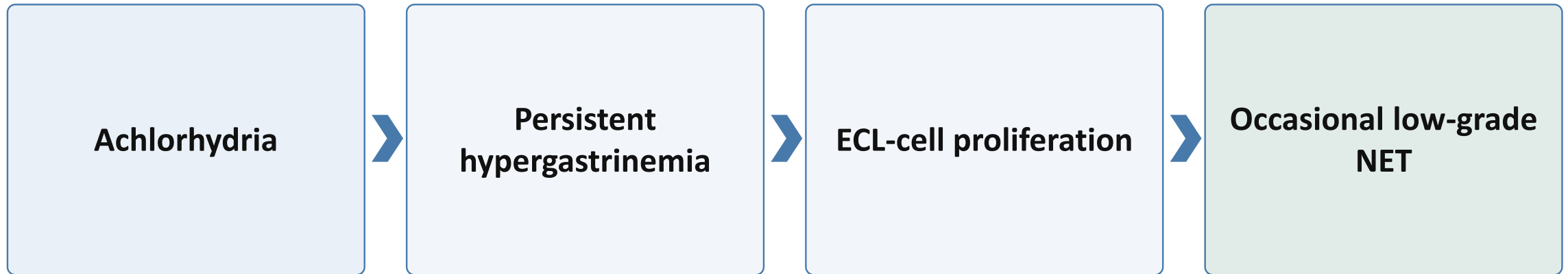
Vitamin B₁₂ deficiency is a downstream clinical effect of autoimmune atrophic gastritis.

Achlorhydria alters gastric feedback



Marked hypergastrinemia is characteristic of autoimmune atrophic gastritis.

Enterochromaffin-like cell hyperplasia can accompany atrophy



Small multicentric gastric-body neuroendocrine tumors as an uncommon downstream event.

Atrophic oxyntic mucosa may become visibly thin

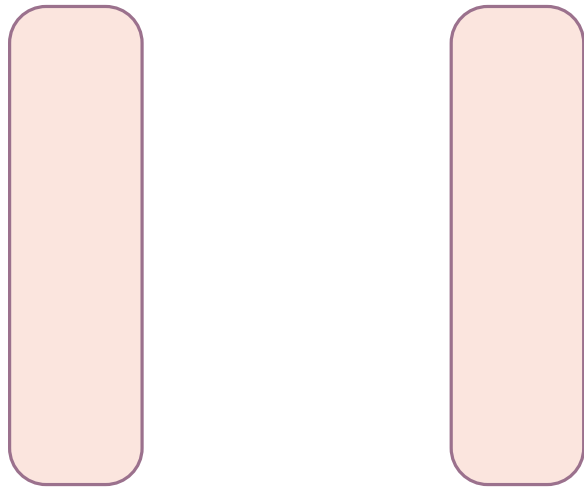
Normal oxyntic mucosa

- Preserved body/fundus gland population.
- Rugal architecture maintained.
- Acid-producing compartment intact.

Advanced autoimmune atrophy

- Marked mucosal thinning.
- Loss of rugal folds.
- Residual gland islands may appear as nodules.

Mucosal atrophy means loss of original glands

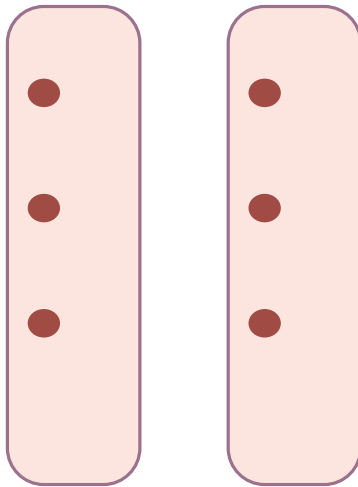


Schematic: Not a histologic specimen

Read the gland count

- Compare gland density and recognizable cell populations.
- Atrophic mucosa has fewer specialized oxyntic glands.
- Do not diagnose atrophy by inflammation alone.

The cellular signature is parietal and chief cell depletion

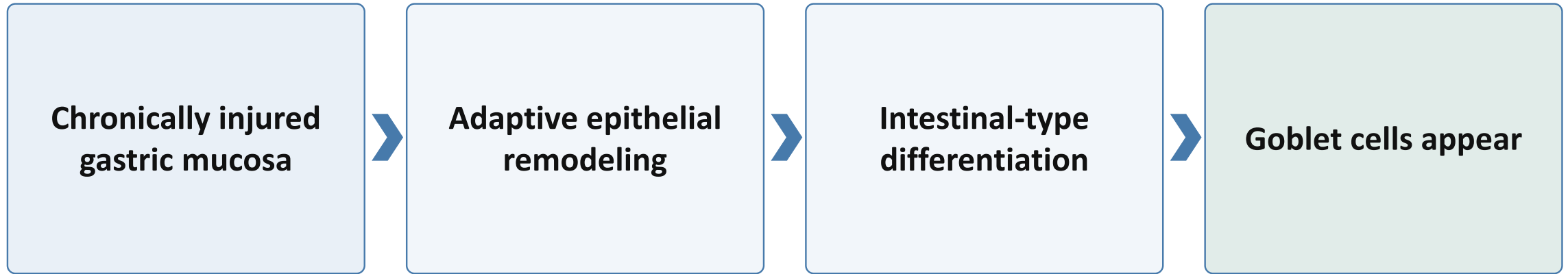


Schematic: Not a histologic specimen

Read the cellular loss

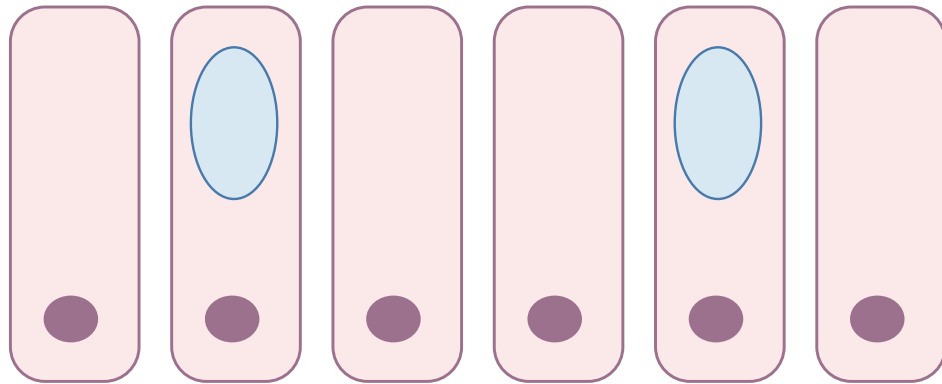
- Parietal cells are the acid- and intrinsic-factor-producing lineage.
- Chief cells are another component of oxyntic glands.
- Conspicuous loss of both supports oxyntic glandular atrophy.

Intestinal metaplasia is epithelial lineage replacement



The appearance of intestinal-type cells defines metaplasia; It is not invasive carcinoma.

Goblet cells establish intestinal differentiation

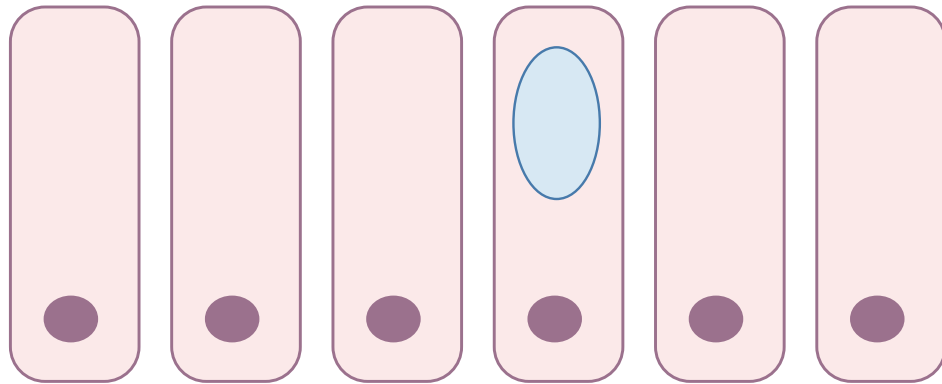


Schematic — simplified epithelial cells

Goblet-cell morphology

- Pale cytoplasmic mucin displaces the nucleus toward the base.
- Goblet cells are identifiable in gastric epithelium.
- Their presence is the key microscopic recognition point.

Intestinal-type epithelium may include absorptive cells

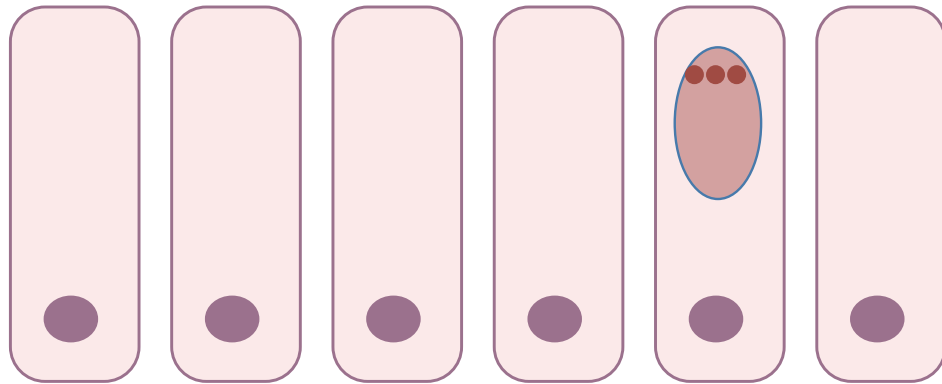


Schematic — simplified epithelial cells

Intestinal-type lineages

- Metaplastic mucosa can contain absorptive-type columnar cells.
- Goblet cells remain the most practical recognition feature.
- Different intestinal-type lineages may coexist in one focus.

Paneth cells may accompany gastric intestinal metaplasia

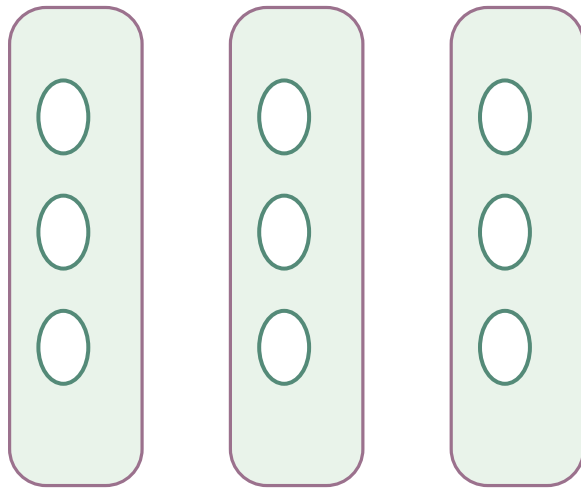


Schematic — simplified epithelial cells

Paneth-cell variation

- Paneth cells are present in some intestinalized gastric glands.
- They are not required for a diagnosis of intestinal metaplasia.
- Their presence reinforces intestinal differentiation.

Gastric-to-intestinal shift is a differentiation change



Schematic: Not a histologic specimen

Read the cell lineage

- Normal gastric mucosa contains native gastric glandular lineages.
- Metaplastic foci contain intestinal-type elements.
- The process is a tissue response associated with chronic injury.

Atrophy and metaplasia often coexist in one biopsy

Atrophic background

- Depletion of native oxyntic glands.
- Chronic inflammatory background may remain.
- Altered endocrine and secretory physiology.

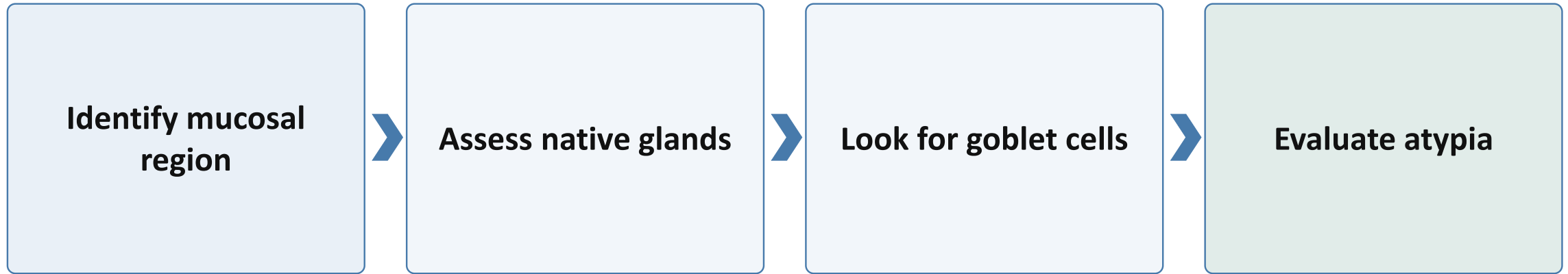
Metaplastic focus

- Goblet cells within gastric epithelium.
- Possible absorptive or Paneth differentiation.
- A separate morphologic observation from atrophy.

Regional context prevents misinterpretation

Biopsy location	Relevant native mucosa	Key concern
Body / fundus	Parietal- and chief-cell-rich oxyntic glands	Oxyntic gland depletion
Antrum	Pyloric-type glands	Chronic inflammation and metaplasia
Mixed / unknown site	Variable mucosal phenotypes	Avoid ungrounded etiologic assignment

Histology reading sequence: Identity before inference



Only then integrate inflammatory pattern and clinical context to infer likely cause.

Inflammatory distribution supports the etiologic distinction

Feature	H. pylori gastritis	Autoimmune gastritis
Preferred site	Antrum; may extend to body	Body / fundus
Inflammatory emphasis	Superficial lamina propria	Deep, gland-centered
Neutrophils	Often prominent	Usually not prominent
Oxyntic loss	Typically patchy if present	Often diffuse

Endoscopic appearance is not a microscopic diagnosis

What endoscopy can suggest

- Thin gastric folds / mucosa.
- Nodularity or small elevations.
- Heterogeneous geographic changes.

What biopsy establishes

- Loss of specific gland types.
- Goblet cells in gastric epithelium.
- Reactive versus dysplastic epithelial maturation.

A case of patchy body atrophy

A body biopsy shows focal parietal-cell depletion and intestinalized epithelium; Adjacent areas retain oxyntic glands.

Consider an atrophic gastritis pattern with patchy remodeling.

- Patchiness is compatible with H. Pylori-associated injury.
- Diagnosis still requires assessment of inflammation and organism status.
- Goblet cells establish the metaplastic component.

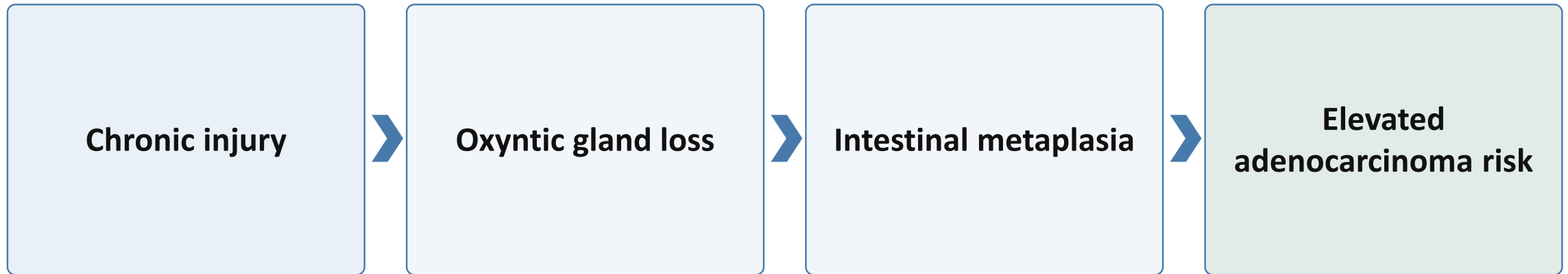
A case of diffuse corpus-predominant atrophy

Gastric body mucosa is markedly thin, with deep gland-centered inflammation, loss of specialized cells, and relative antral sparing.

An autoimmune pattern is favored.

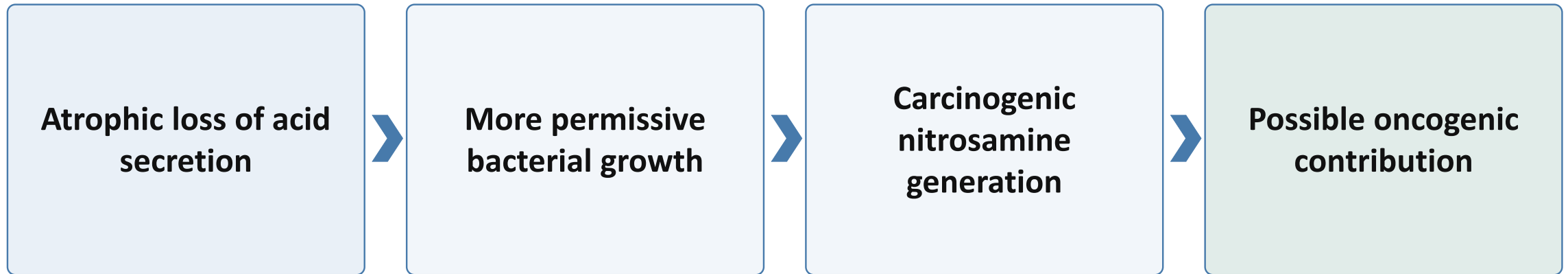
- Topographic restriction points toward corpus-directed injury.
- Reduced acid and intrinsic-factor production are mechanistically plausible.
- Correlate with the autoimmune serologic and clinical phenotype.

Why the lesion matters beyond inflammation



The sequence represents an association with risk; Metaplasia is not synonymous with carcinoma.

Achlorhydria and nitrosamines: A proposed mechanism



This as a possible explanation; It is not a proven single-cause pathway.

Cancer risk is a clinicopathologic association

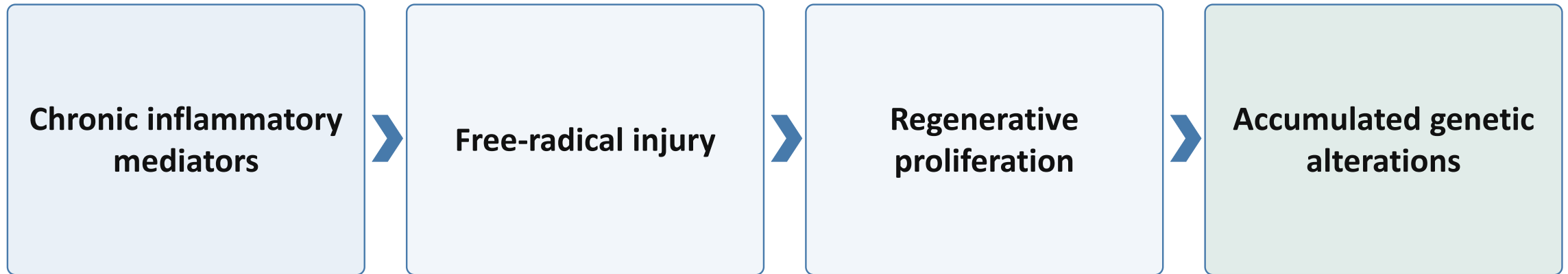
Supported by source

- Atrophy with intestinal metaplasia is linked to increased gastric adenocarcinoma risk.
- The text highlights autoimmune metaplastic atrophic gastritis.
- Chronic injury can precede dysplasia.

Not justified by the lesion alone

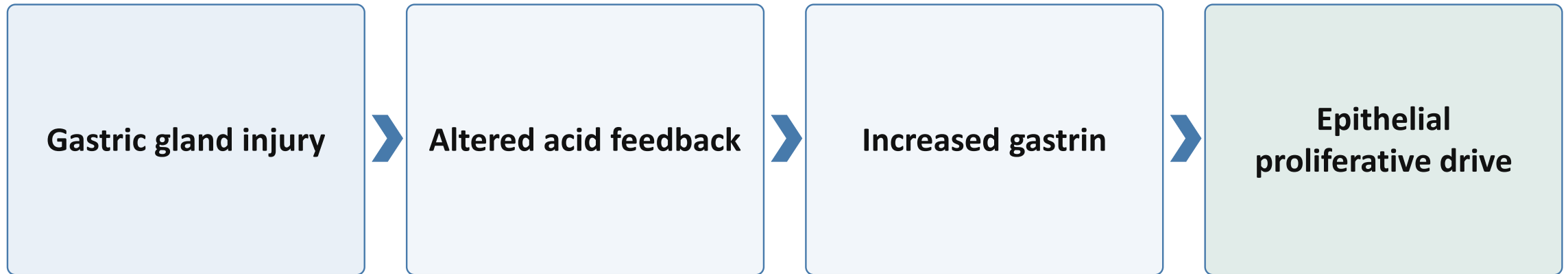
- No individual absolute risk can be assigned from this excerpt.
- No inference that every metaplastic focus will progress.
- No molecular or staging threshold is supplied.

Persistent inflammation can produce genetic damage



The dysplasia section links oxidative injury and repeated growth signals to epithelial evolution.

Gastrin can be part of a proliferative milieu



Gastrin as a gastric epithelial mitogen alongside inflammation-related stimuli.

Dysplasia is a preinvasive epithelial lesion

Metaplasia

- Intestinal-type differentiation.
- Goblet cells may be conspicuous.
- Does not itself establish cytologic malignancy.

Dysplasia

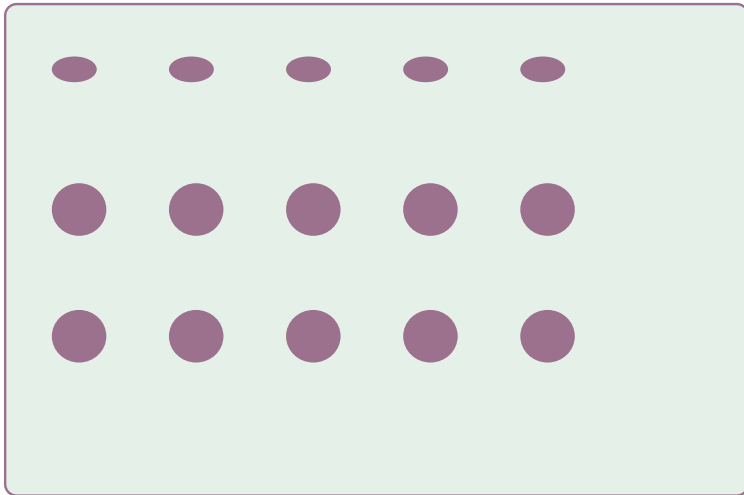
- Altered epithelial size, shape and orientation.
- Nuclear atypia with disordered maturation.
- Considered a preinvasive in situ lesion.

Dysplastic nuclear morphology has specific features

- Nuclear enlargement with hyperchromasia.
- Coarse chromatin texture.
- Variability in epithelial nuclear size and shape.
- Distorted nuclear orientation relative to epithelial architecture.

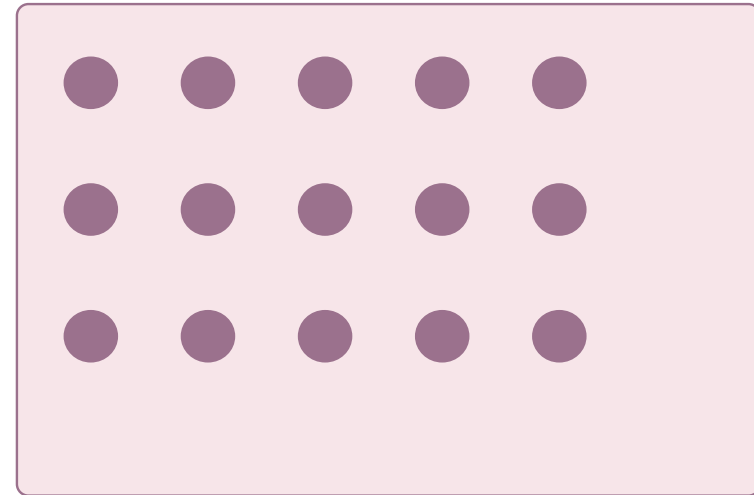
Architecture and polarity contribute to dysplasia

Reactive repair



Surface cells mature

Dysplastic epithelium



Atypia persists to surface

Persistent abnormal cellular orientation strengthens concern for dysplasia.

Regenerative atypia is a central diagnostic pitfall

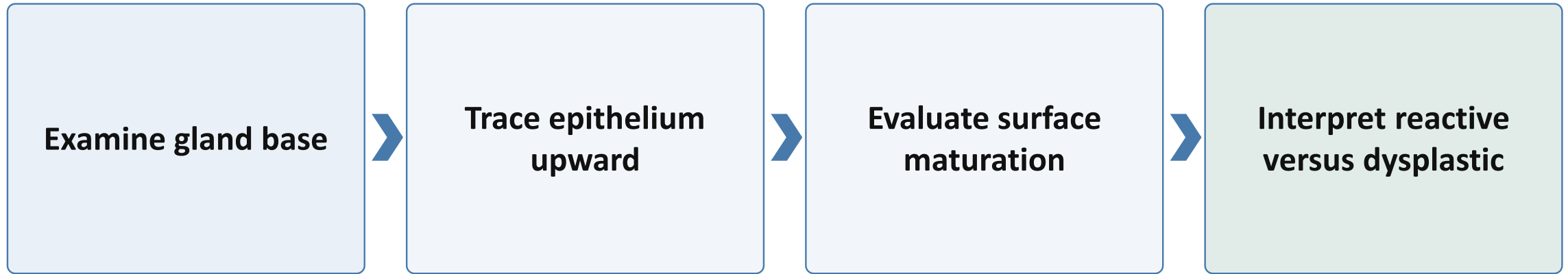
Reactive change

- Occurs with active injury and regeneration.
- Can feature proliferative expansion and mitoses.
- Surface cells tend to mature.

Potential dysplasia

- Atypia exceeds expected reparative changes.
- Disordered size, shape and orientation.
- Cytologic immaturity can persist at the surface.

Surface maturation helps resolve the pitfall

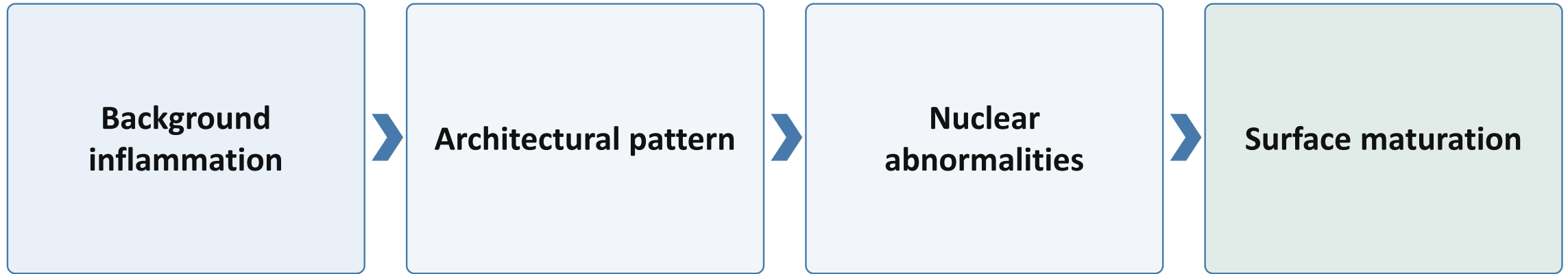


A retained surface maturation gradient favors regeneration; Persistent immaturity favors dysplasia.

Reactive versus dysplastic epithelium

Microscopic feature	Regenerative change	Dysplasia
Mitoses / proliferation	May be increased	May be increased
Nuclear atypia	May be present	Usually persistent and disordered
Surface differentiation	Maturation retained	Immaturity persists
Interpretive approach	Injury context is essential	Integrate nuclear and architectural changes

Interpretation requires multiple morphologic clues



Do not treat a single mitotic figure or an enlarged nucleus as a definitive diagnosis.

A common overcall: Regeneration mistaken for dysplasia

An inflamed gastric biopsy shows prominent regenerative mitoses at gland bases, but the surface epithelium becomes orderly and cytologically mature.

The maturation pattern supports reactive/regenerative atypia.

- Active inflammation can drive vigorous proliferation.
- Mitotic activity alone cannot define dysplasia.
- Surface maturation is the source-provided discriminator.

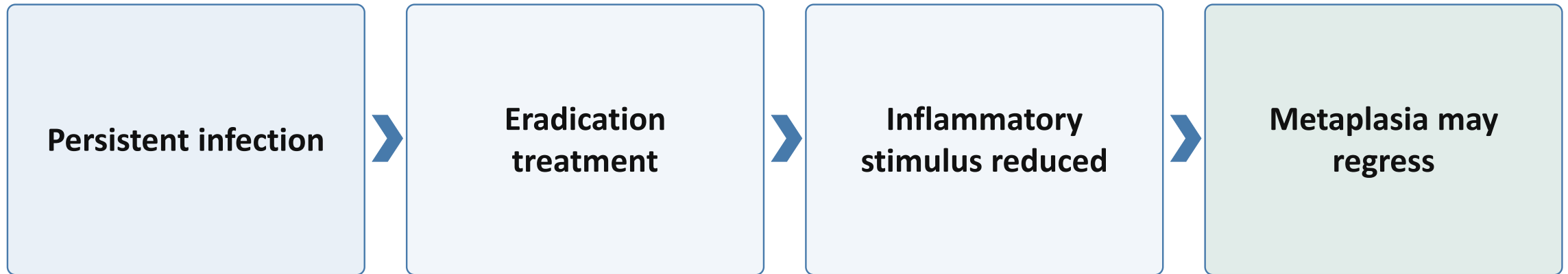
A concerning pattern: Atypia persists to the surface

A gastric biopsy shows coarse nuclear chromatin, enlarged hyperchromatic nuclei, disordered orientation, and no clear surface maturation.

The combination supports concern for dysplasia.

- Atypia spans the gland-to-surface axis.
- Structural and nuclear abnormalities reinforce one another.
- The interpretation is morphologic, not based only on mitotic count.

H. Pylori eradication may permit metaplastic regression



“May regress” is the source wording; Restoration is neither uniform nor assured.

Treatment response does not erase prior morphology

After eradication: Possible

- Reduced active infectious inflammation.
- Clinical improvement in H. Pylori gastritis.
- Regression of some metaplastic change.

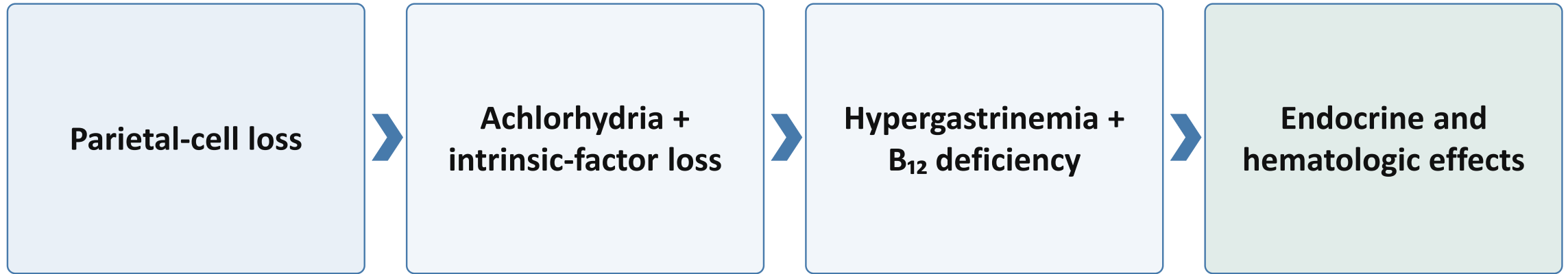
Not guaranteed

- Immediate restoration of lost glands.
- Reversal of all metaplastic foci.
- Elimination of all neoplastic risk from prior injury.

Avoid deterministic causal statements

Claim	Responsible interpretation
Atrophy → carcinoma in every case	Association with elevated risk, not inevitability
Metaplasia proves current H. pylori	Multiple etiologic pathways exist
Autoantibody positivity alone proves gland loss	Correlation with topography and tissue morphology
Eradication always reverses metaplasia	Regression may occur; not guaranteed

Autoimmune atrophy: Clinical consequences



The glandular lesion unifies the gastric and extra-gastric phenotype.

Vitamin B₁₂ deficiency can have systemic manifestations

- Megaloblastic anemia and related hematologic effects.
- Atrophic glossitis with a smooth, erythematous tongue.
- Malabsorptive symptoms may develop.
- Neurologic injury can accompany severe or longstanding deficiency.

Endocrine changes are distinct from adenocarcinoma risk

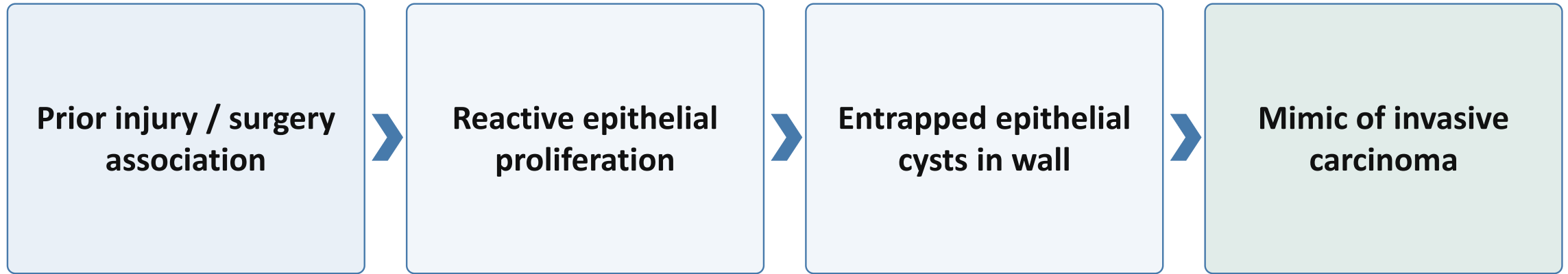
ECL-cell pathway

- Hypergastrinemia drives endocrine-cell hyperplasia.
- Occasional gastric-body low-grade neuroendocrine tumors.
- A consequence highlighted in autoimmune gastritis.

Epithelial adenocarcinoma association

- Chronic atrophy and metaplasia are risk-associated lesions.
- Inflammation and epithelial damage may culminate in dysplasia.
- A different neoplastic lineage and pathobiology.

Gastritis cystica is an important reactive mimic



The cause of deep cyst formation is not fully established.

Entrapped glands are not automatically invasive cancer

Gastritis cystica

- Epithelium-lined cysts may lie beneath mucosa.
- Cystica polyposia: Submucosal level.
- Cystica profunda: Deeper gastric wall.

Diagnostic caution

- Prominent reactive atypia may be present.
- Depth alone is an insufficient cancer diagnosis.
- Avoid mistaking reactive entrapment for invasive carcinoma.

Hypertrophic gastropathy is a different growth pattern

Atrophic remodeling

- Loss of gastric glands.
- Potential thinning of corpus mucosa.
- Chronic inflammatory etiologies.

Hypertrophic gastropathy

- Enlarged cerebriform gastric folds.
- Epithelial hyperplasia rather than gland loss.
- Defined without inflammatory change in the source.

A focused gastric biopsy description

- State gastric region where known and whether the native glands are preserved.
- Describe glandular loss separately from intestinal metaplasia.
- Identify characteristic inflammation and reactive versus dysplastic changes.
- Use etiologic language only when adequately supported by morphology and context.

Integrated comparison of the principal patterns

Feature	H. pylori-associated atrophy	Autoimmune atrophy
Distribution	Often patchy; may involve corpus	Body/fundus predominant
Antibodies	Not characteristic	Parietal-cell / intrinsic-factor
Acid secretion	May decline with oxyntic injury	Often markedly reduced
Other effects	Metaplasia; carcinoma association	B ₁₂ deficiency; ECL hyperplasia

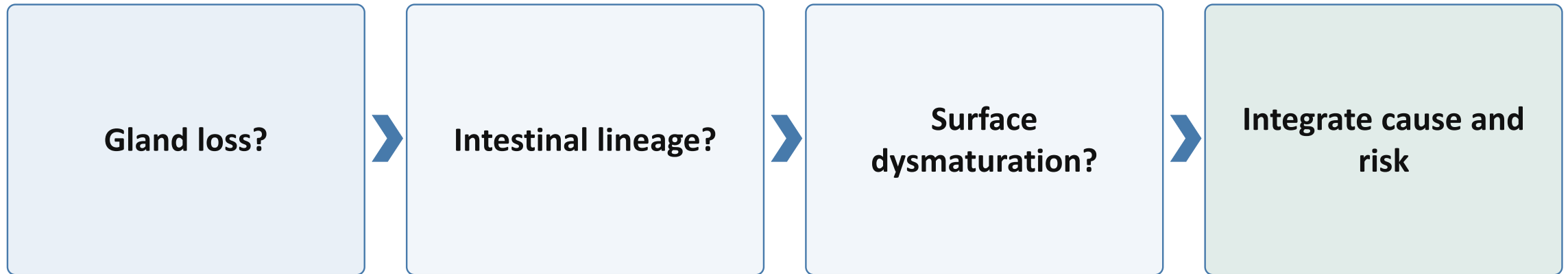
Clinicopathologic exercise: Three biopsy statements

A: Goblet cells are present. B: Oxyntic glands are depleted. C: Hyperchromatic nuclei remain immature at the surface.

Three observations represent three different diagnoses.

- A identifies intestinal metaplasia.
- B establishes oxyntic glandular atrophy.
- C supports a dysplastic epithelial pattern.

Final synthesis: Read gland, lineage, and maturation



Atrophy, metaplasia and dysplasia have separate morphologic meanings.

Source and scope

- Robbins, Cotran & Kumar. Pathologic Basis of Disease. 11th ed. (2026).
- Core discussion: gastric mucosal atrophy, intestinal metaplasia and dysplasia.
- Supporting sections: H. pylori gastritis, autoimmune gastritis and gastritis cystica.
- All epithelial/glandular illustrations are original editable conceptual schematics, not histopathology specimens.