Developing A Step 1 Brain

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Achieving Program Goals

Strengthen Analytic Thinking

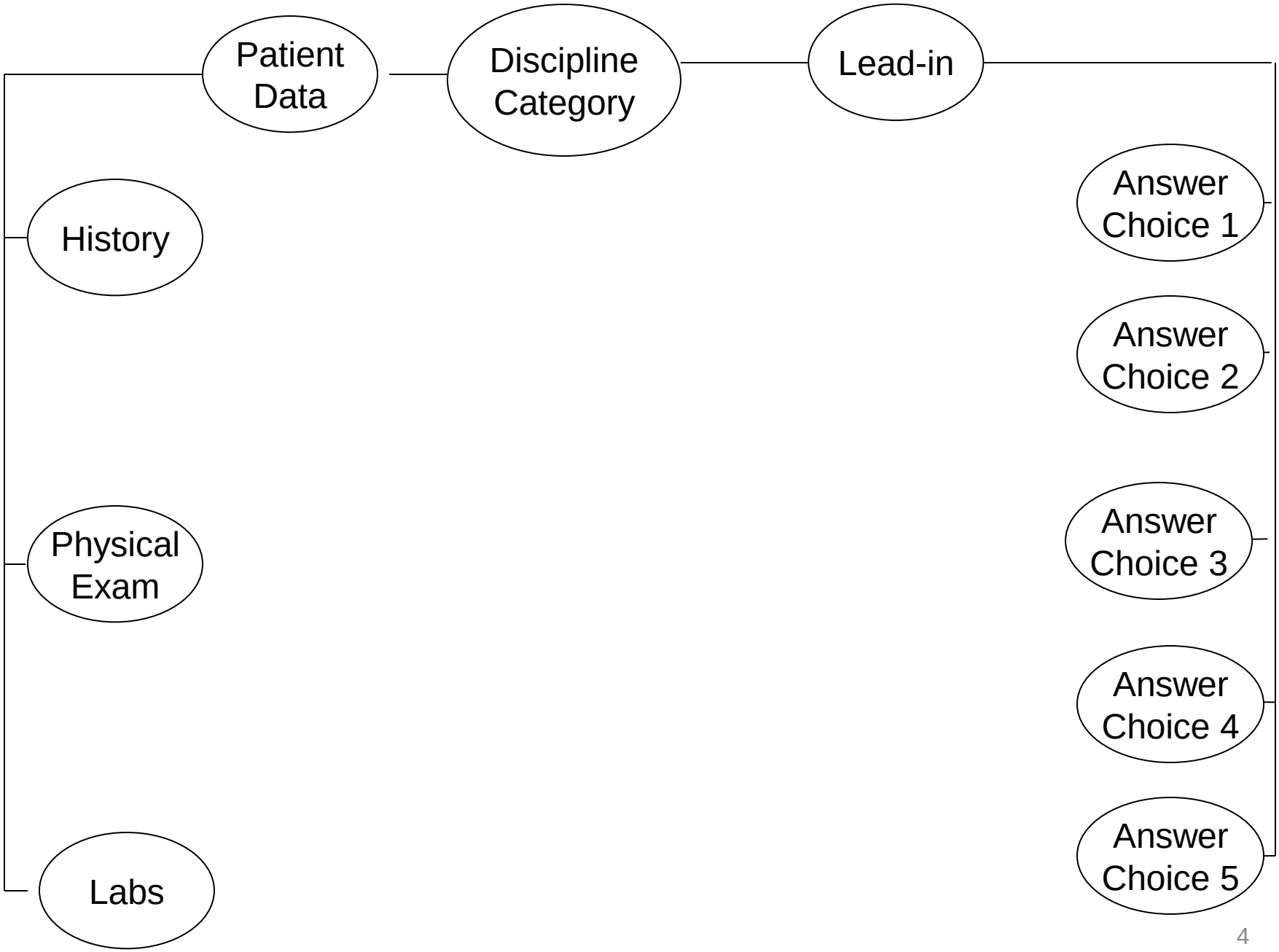
- Better time efficiency from *long term* memory
- Reframing thinking process to *explain patient data*

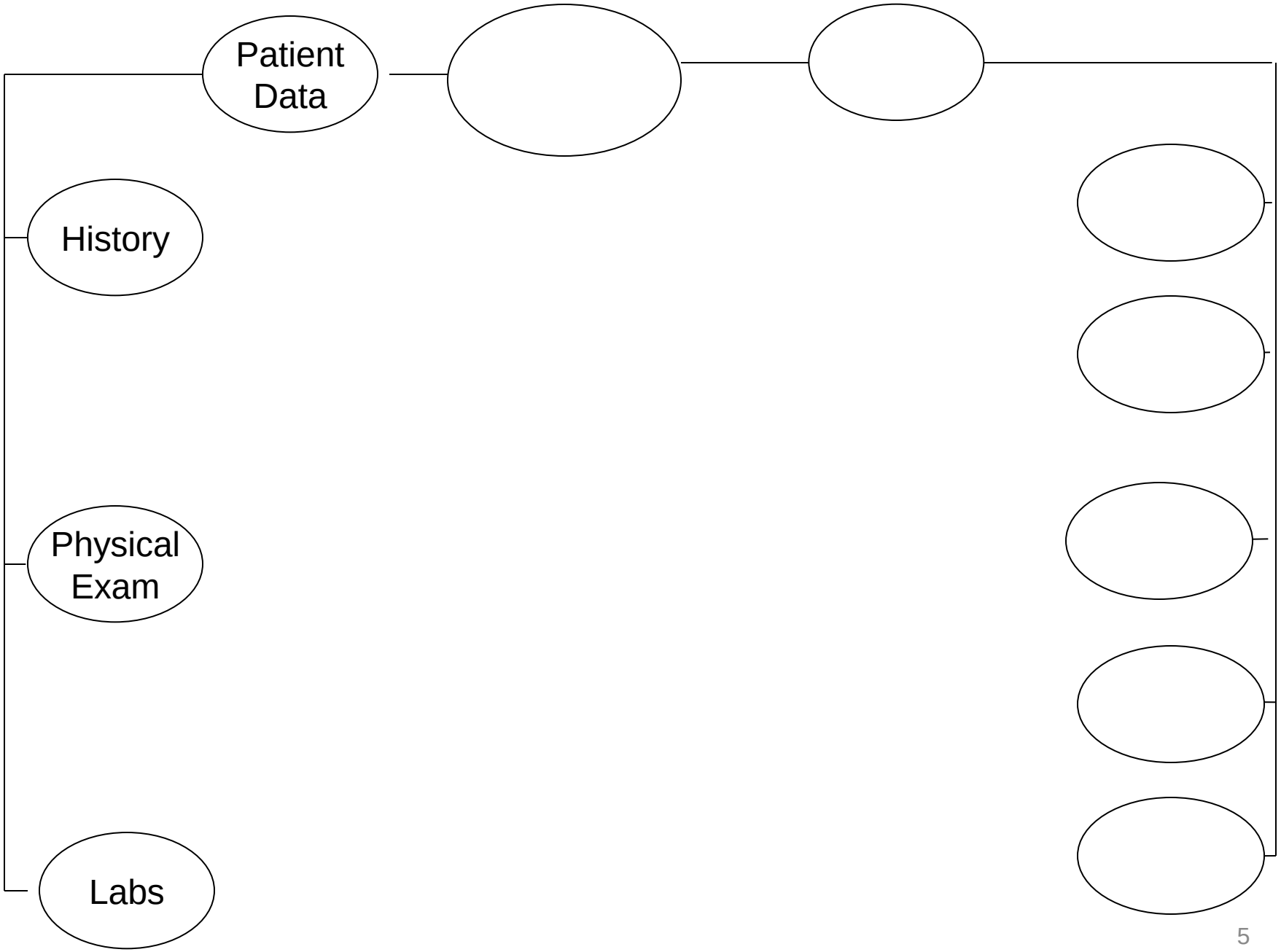
Higher Course Grades

- *Carry-over* of team study thinking to course study
- Analyzing *course-relevant* Step 1 questions

Weekly Question Analysis Sessions

- Based on brain research on learning process
- Correlated with current course content
- Structured protocol; open references
- 10-12 per team
  - Some teams may prefer fewer (5-7)
- Develops “ruling-out” thinking
- Utilizes side-to-side concept map on whiteboard (template, next slide)


Patient Data
Discipline Category
Lead-in
History
Physical Exam
Labs
Answer Choice 1
Answer Choice 2
Answer Choice 3
Answer Choice 4
Answer Choice 5


Patient Data
History
Physical Exam
Labs

What Is "Ruling-Out" Thinking?

- Rationale for ruling out wrong answers
  - Saying "why" develops analytic skills
- Requires full active learning cycle
  - Whole brain learning
  - Learning cycle explained later
- Not guessing, but processing

Five Steps to Step 1 (one-at-a-time)

(illustrated on separate slides)

1. Session leader calls on first student to read lead-in from first question and enters in concept map template.
2. Session leader continues with first student to read stem from first question and to propose patient data to add to concept map.
3. Session leader adds additional patient data to concept map by calling on additional students; other “lead-in relevant” information is added to patient data to.
4. Session leader fills in answer choice information in concept map template
5. Session leader calls on group members to identify “lead-in relevant” information for each answer that contributes to ruling it out.
   - Relevance is frequently debated for consensus.
6. Group proposes pathophysiology crosslinks between answer choices and patient data in question.

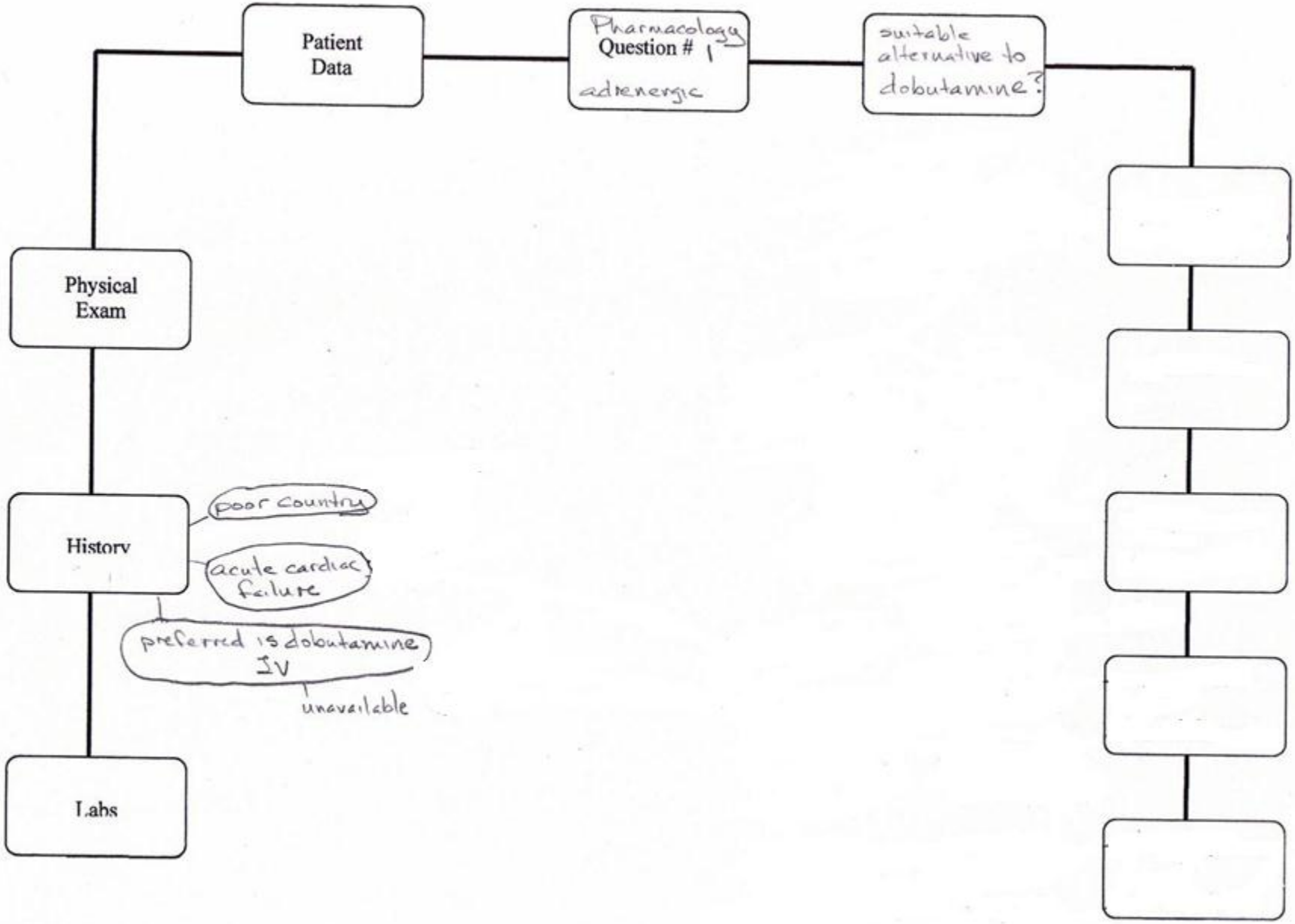
1. Lead-in & Patient Data – Log it in

1. Session leader calls on first student:
   - Reads lead-in from first question; summarized in template
   - Provides a context for discussing question.
   - proposes patient data for concept map.

- Sample question – next slide

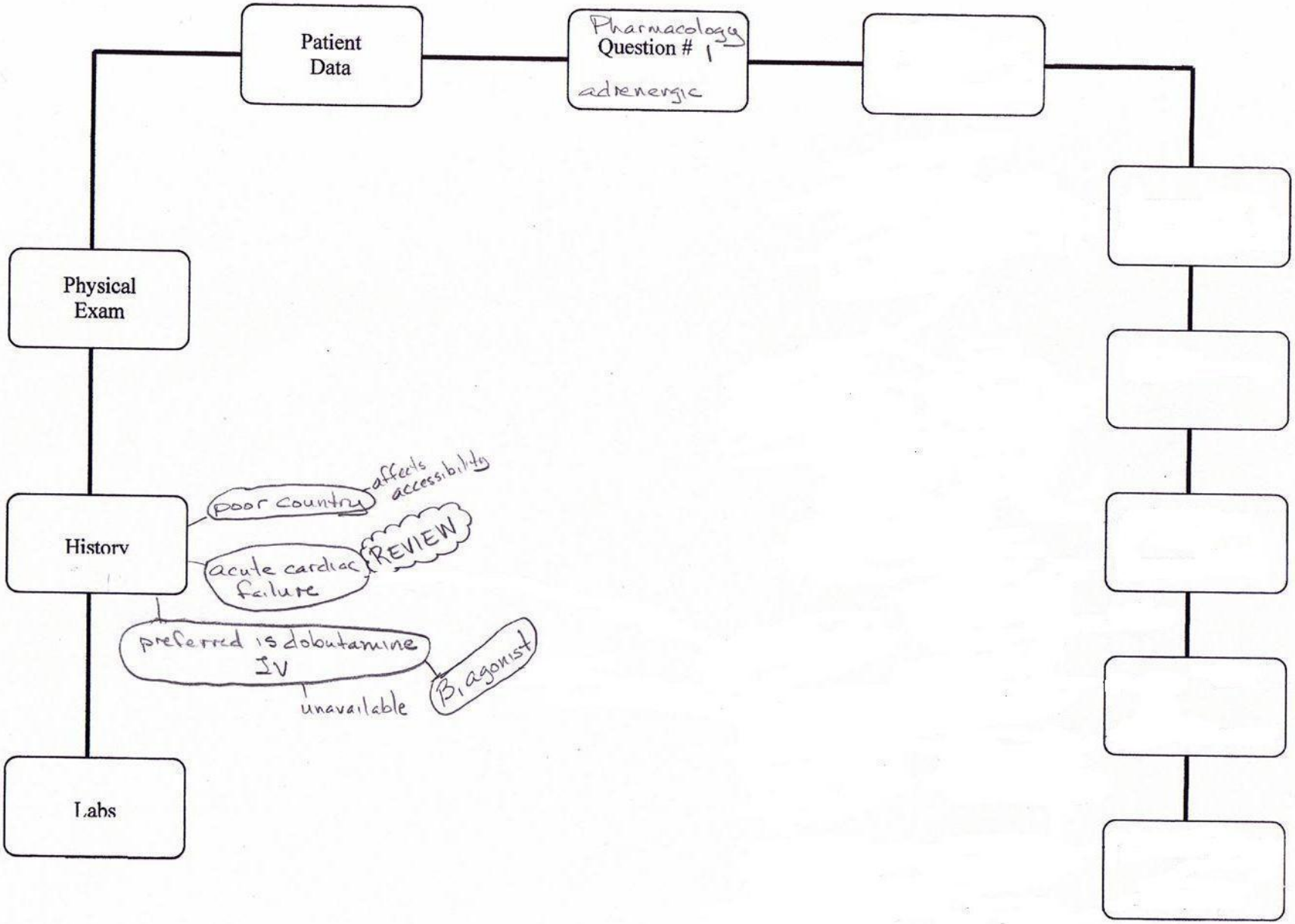
Can You Identify The Appropriate Patient Data?

- A 54-year-old female who lives in an economically underdeveloped country is brought to a village clinic in acute cardiac failure. The preferred therapy is intravenous dobutamine, but this drug is too expensive and is therefore unavailable. Which of the following is the most suitable alternative to dobutamine in treating this patient?


Patient Data
Pharmacology Question # 1
adrenergic
suitable alternative to dobutamine?
Physical Exam
History
poor country
acute cardiac failure
preferred is dobutamine IV
unavailable
Labs

2. Patient Data – add significant information

2. Session leader adds data to concept map by calling on additional students; other significant information is added to patient data


Patient Data
Pharmacology Question # 1
adrenergic
Physical Exam
History
poor country
affects accessibility
acute cardiac failure
REVIEW
preferred is dobutamine IV
unavailable
B1 agonist
Labs

3. Log in answer choices

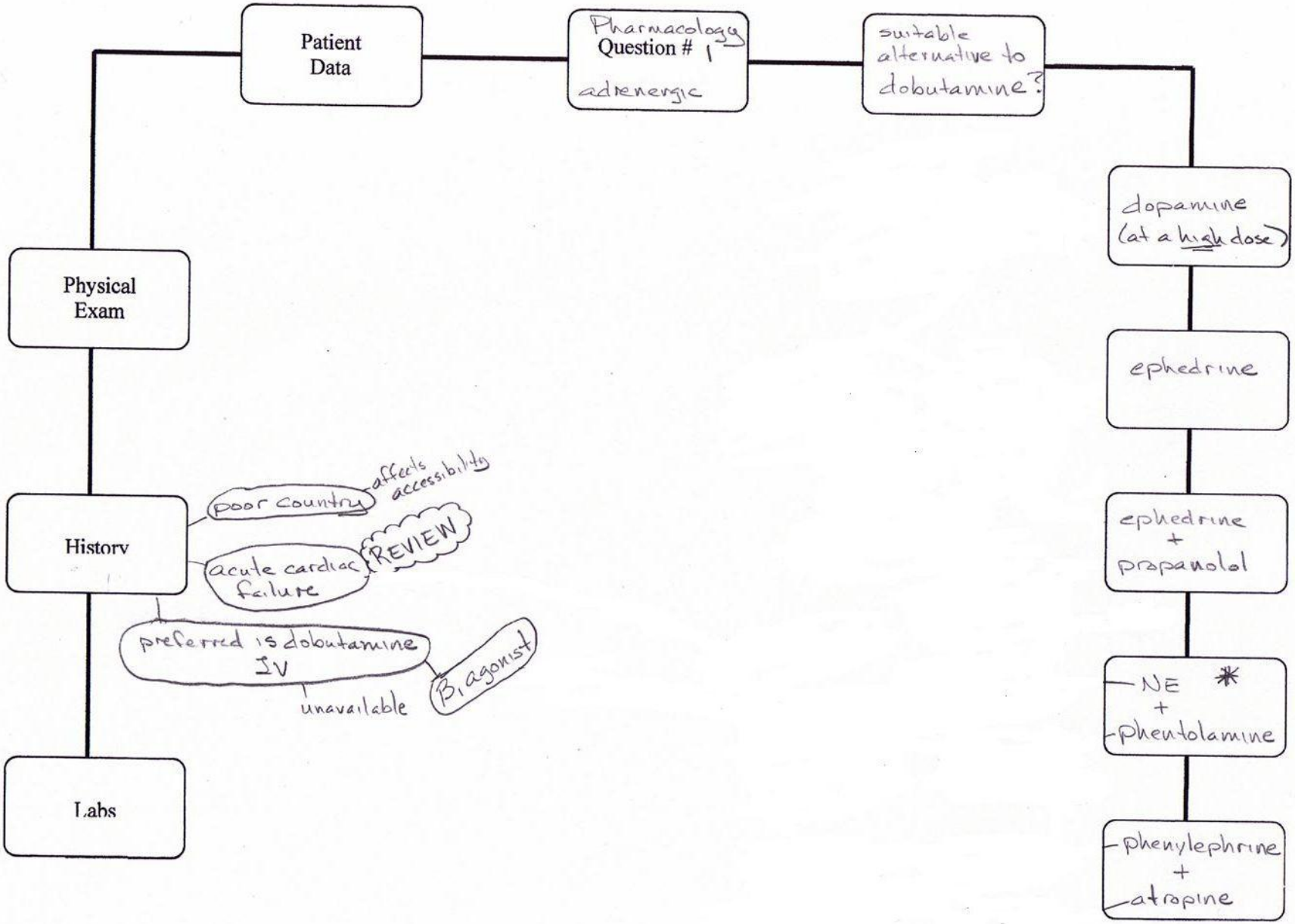
3. Session leader fills answer choice information in concept map template

- Note: The time taken to enter information into map gives “processing” time.

Answer Choices

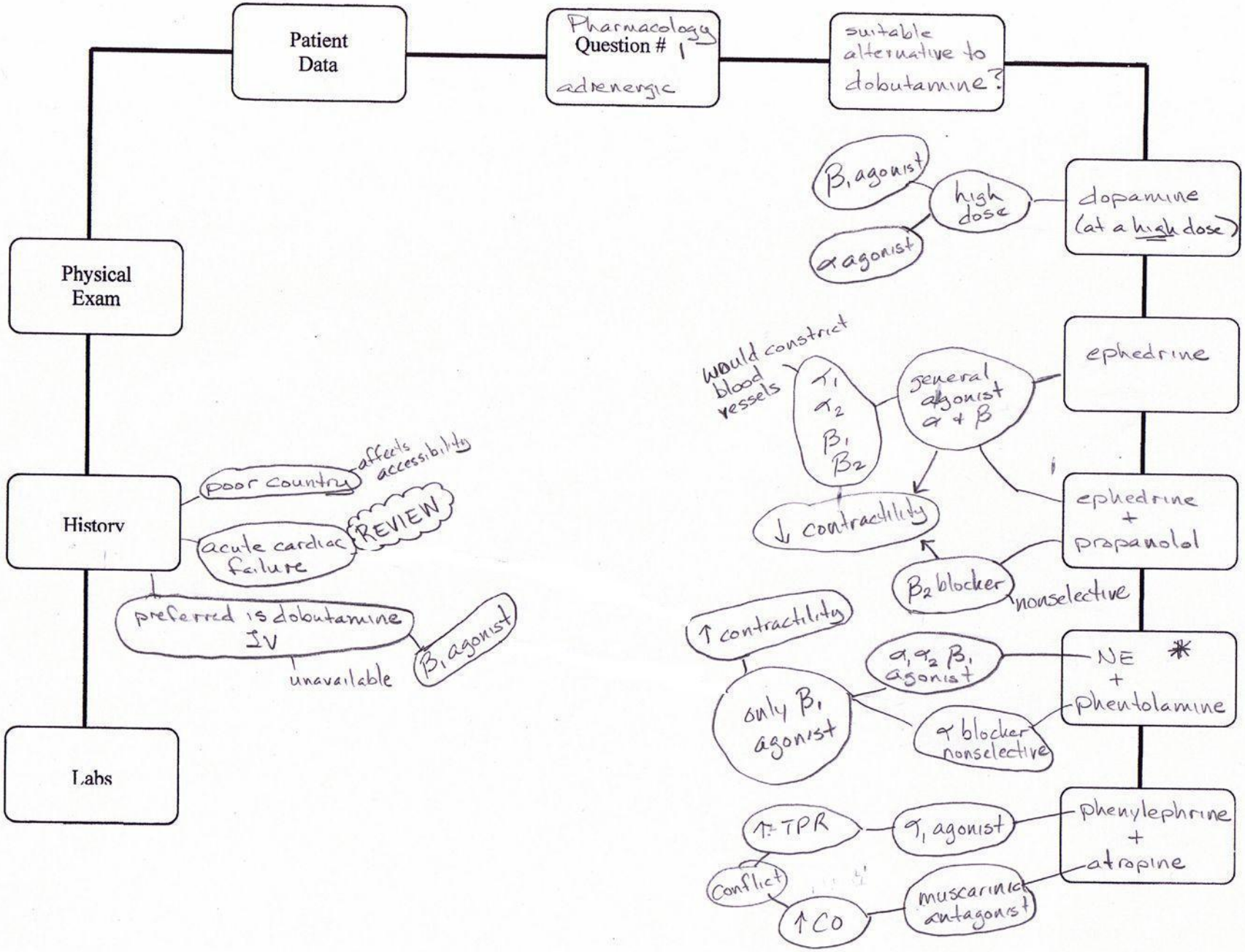
- A 54-year-old female who lives in an economically underdeveloped country is brought to a village clinic in acute cardiac failure. The preferred therapy is intravenous dobutamine, but this drug is too expensive and is unavailable. Which of the following is the most suitable alternative to dobutamine in treating this patient?

A. high dose dopamine
B. ephedrine
C. ephedrine plus propranolol
D. norepinephrine plus phentolamine
E. phenylephrine plus atropine


Patient Data
Pharmacology Question # 1
adrenergic
suitable alternative to dobutamine?
Physical Exam
History
Labs
poor country
affects accessibility
acute cardiac failure
REVIEW
preferred is dobutamine IV
unavailable
B1 agonist
dopamine (at a high dose)
ephedrine
ephedrine + propanolol
NE * + phentolamine
phenylephrine + atropine

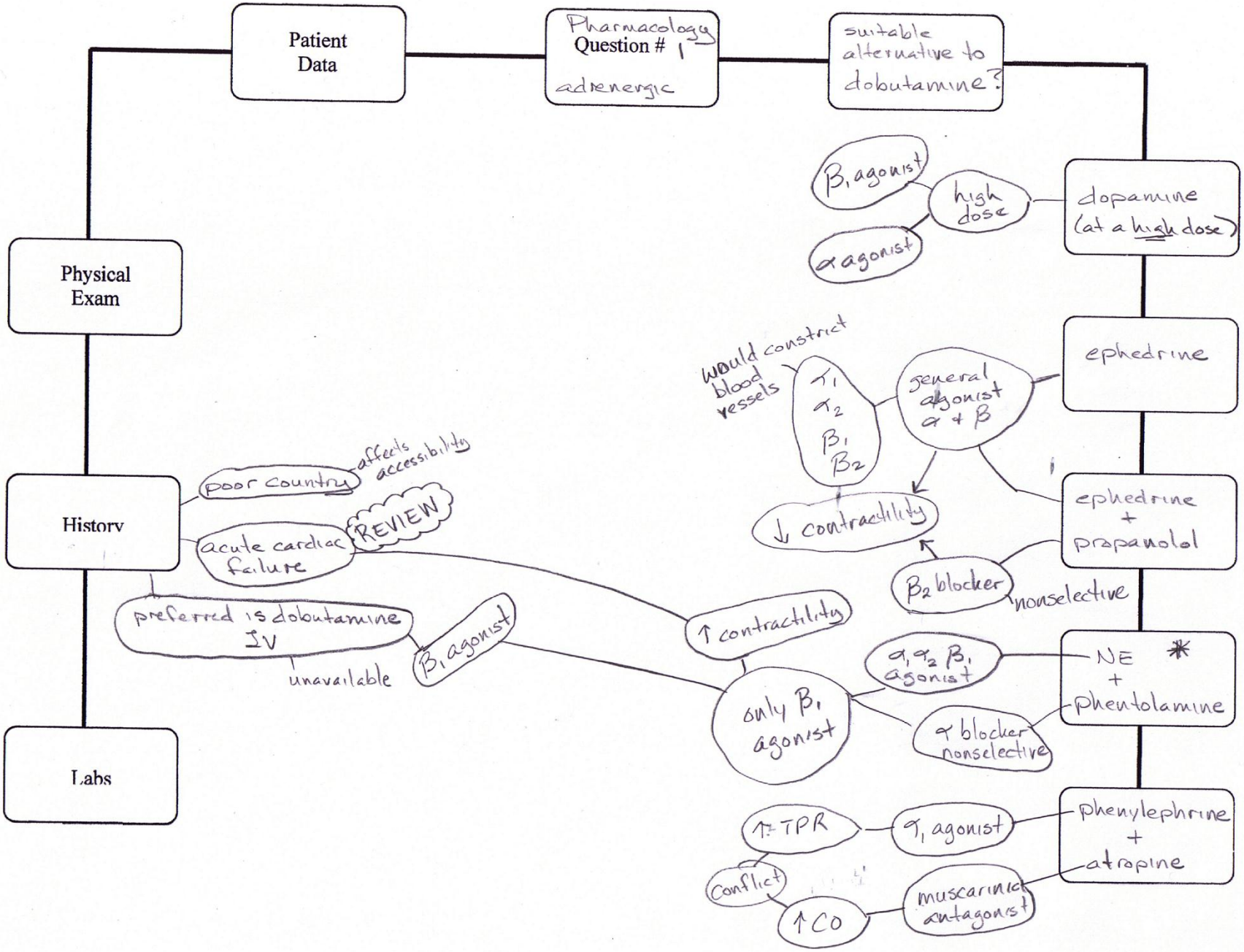
4. Decide on facts needed to rule out wrong answers

4. Session leader calls on group members to identify relevant information for each answer that contributes to ruling it out.


Patient Data
Pharmacology Question # 1
adrenergic
suitable alternative to dobutamine?
Physical Exam
History
Labs
poor country
affects accessibility
acute cardiac failure
REVIEW
preferred is dobutamine IV
unavailable
B1 agonist
B1 agonist
high dose
α agonist
dopamine (at a high dose)
would constrict blood vessels
α1
α2
β1
β2
general agonist α + β
ephedrine
↓ contractility
ephedrine + propanolol
β2 blocker
nonselective
↑ contractility
only β1 agonist
α1, α2 β1 agonist
α blocker nonselective
NE * + phentolamine
↑ TPR
α1 agonist
phenylephrine + atropine
Conflict
↑ CO
muscarinic antagonist

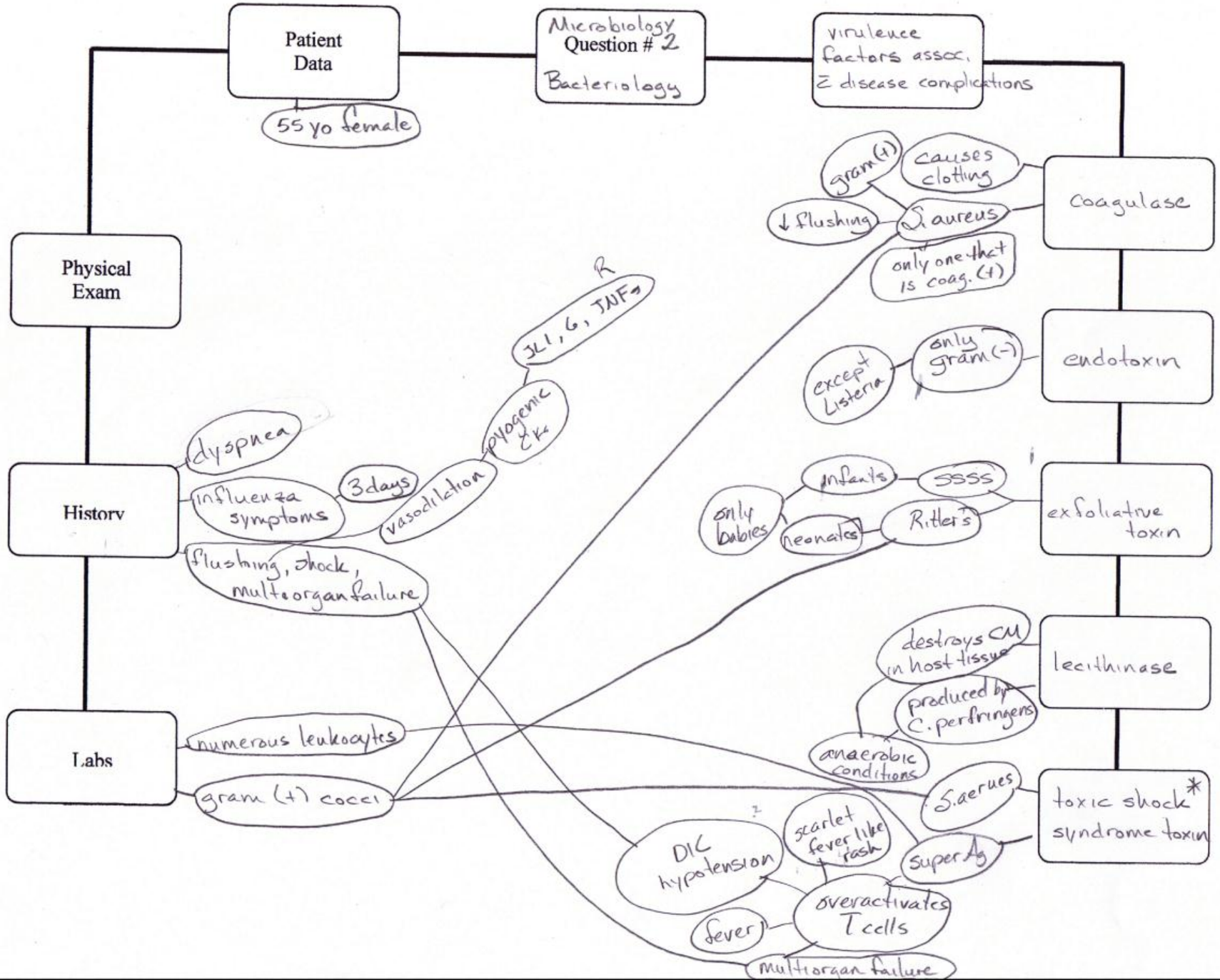
5. Determine correlation cross-links

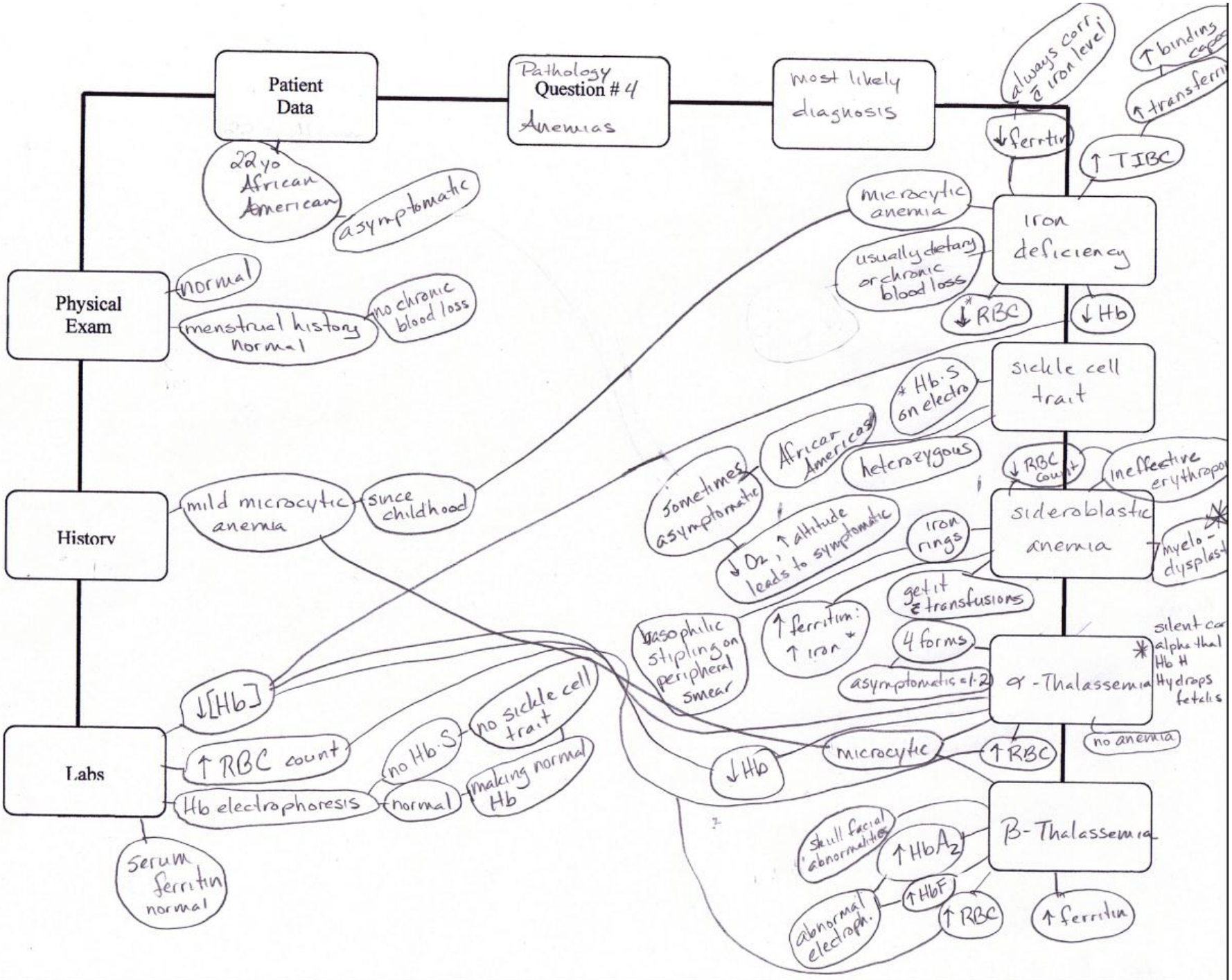
5. Group proposes correlation (pathophysiology) crosslinks between answer choices and patient data in question.


Patient Data
Pharmacology Question # 1
adrenergic
suitable alternative to dobutamine?
Physical Exam
Historv
Labs
poor country
affects accessibility
acute cardiac failure
REVIEW
preferred is dobutamine IV
unavailable
B1 agonist
↑ contractility
only B1 agonist
B1 agonist
high dose
α agonist
dopamine (at a high dose)
would constrict blood vessels
α1 α2 β1 β2
general agonist α + β
ephedrine
↓ contractility
ephedrine + propanolol
β2 blocker
nonselective
α1 α2 β1 agonist
NE * + phentolamine
α blocker nonselective
↑ TPR
α1 agonist
phenylephrine + atropine
Conflict
↑ CO
muscarinic antagonist

Two more examples

- Microbiology – Bacteriology
  - Lead-in “Virulence factors associated with disease complications”
- Pathology – Anemias
  - Lead-in “Most likely diagnosis”


Patient Data
55 yo female
Microbiology Question # 2
Bacteriology
virulence factors assoc. w/ disease complications
Physical Exam
History
Labs
dyspnea
influenza symptoms
3 days
vasodilation
pyogenic & IL
IL1, 6, TNFα
flushing, shock, multi-organ failure
numerous leukocytes
gram (+) cocci
gram (+)
causes clotting
↓ flushing
S. aureus
only one that is coag. (+)
Coagulase
except Listeria
only gram (-)
endotoxin
only babies
infants
neonates
SSSS
Ritter's
exfoliative toxin
destroys CM in host tissue
produced by C. perfringens
anaerobic conditions
lecithinase
S. aerues
Super Ag
toxic shock* syndrome toxin
DIC
hypotension
scarlet fever like rash
fever
overactivates T cells
multi-organ failure


Patient Data
Pathology Question # 4
Anemias
most likely diagnosis
22yo African American
asymptomatic
Physical Exam
normal
menstrual history normal
no chronic blood loss
History
mild microcytic anemia
since childhood
Labs
↓[Hb]
↑ RBC count
Hb electrophoresis
normal
no Hb S
no sickle cell trait
making normal Hb
serum ferritin normal
microcytic anemia
usually dietary or chronic blood loss
iron deficiency
always corr. w/ iron level
↓ferritin
↑ TIBC
↑ binding capac
↑ transferri
↓RBC
↓Hb
sickle cell trait
* Hb S on electro
African Americas
heterozygous
sometimes asymptomatic
↓ O2, ↑ altitude leads to symptomatic
sideroblastic anemia
↓ RBC count
ineffective erythropo
iron rings
myelo-dysplas
basophilic stipling on peripheral smear
↑ ferritin; ↑ iron
get it ∑ transfusions
4 forms
asymptomatic = 1-2
α-Thalassemia
silent ca
alpha thal
Hb H
Hydrops fetalis
no anemia
↓Hb
microcytic
↑RBC
B-Thalassemia
skull facial abnormalities
↑HbA2
↑HbF
abnormal electroph.
↑RBC
↑ferritin

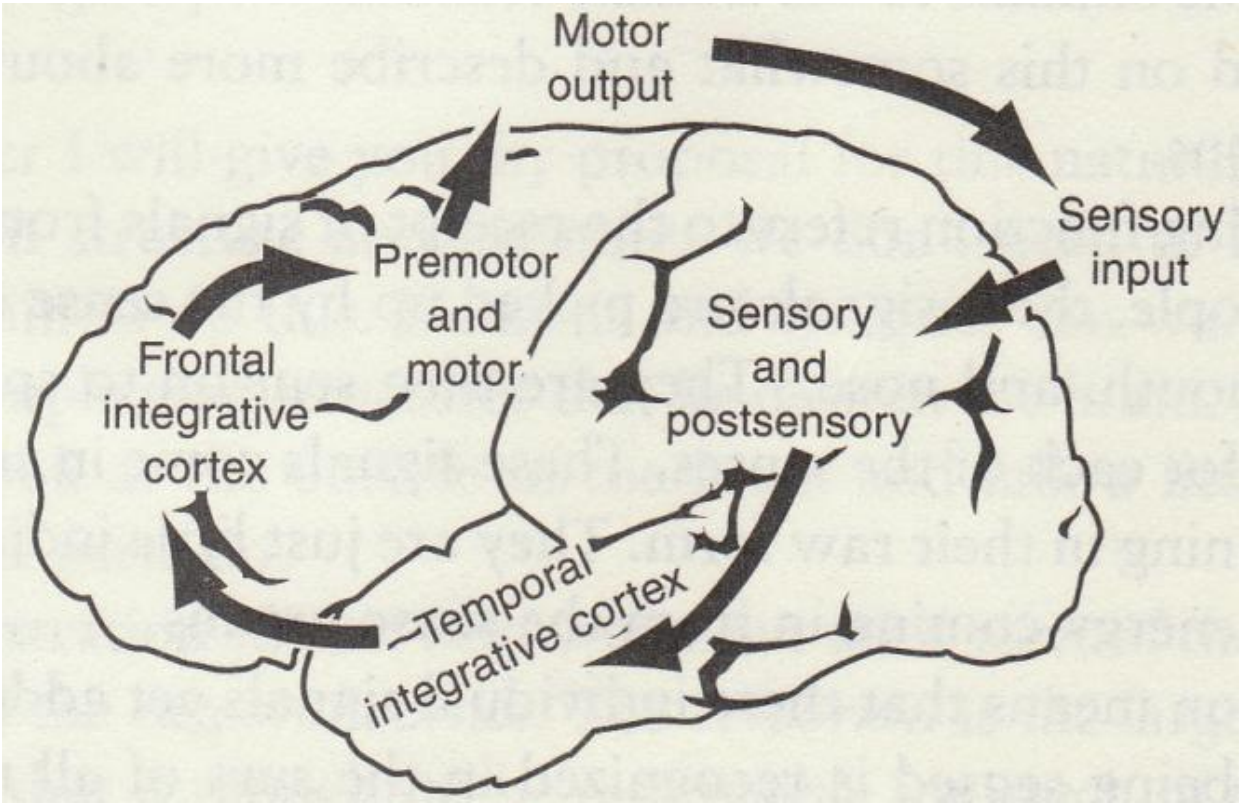
Summary Of Case Vignette Analysis

- *Identify topics* needed to rule out wrong answers
- *Debate relevance of facts* – people remember arguments and agreements
- *Fill in gaps* in learning – different people remember different things; no one remembers everything
- Aggressively seeking relevant information
  - "Always be thinking ahead!"

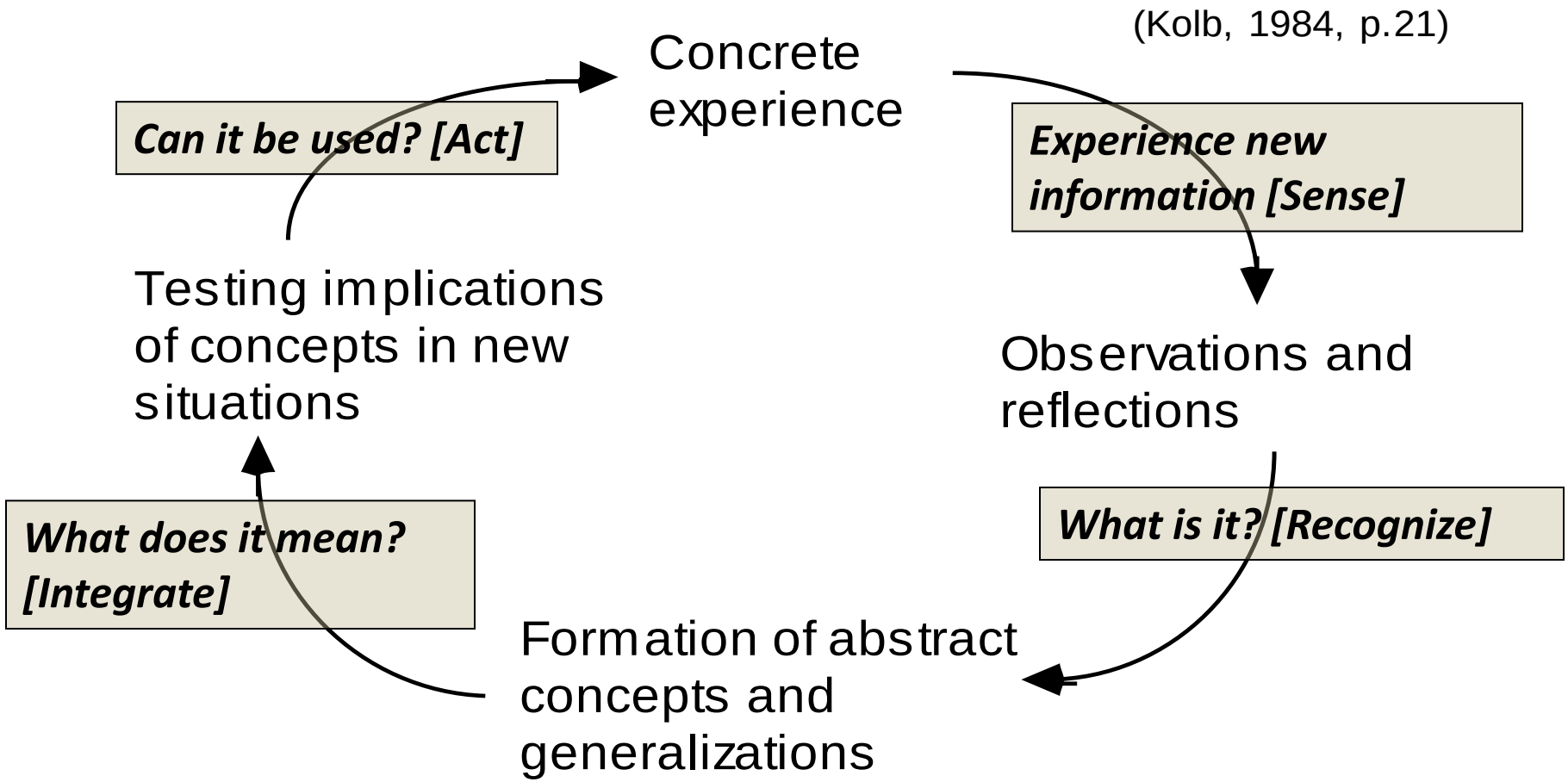
How Do We Prepare For The Sessions?

- Study the way you always do.
- Session leader retrieves 4-8 case vignette questions (fewer at first)
  - Webpath site (free)
  - Klatt Path book
  - Rapid Review series
  - First Aid Q&A
- Session leader emails to group prior to session. Previewing not critical.
  - Can just email questions from Klatt

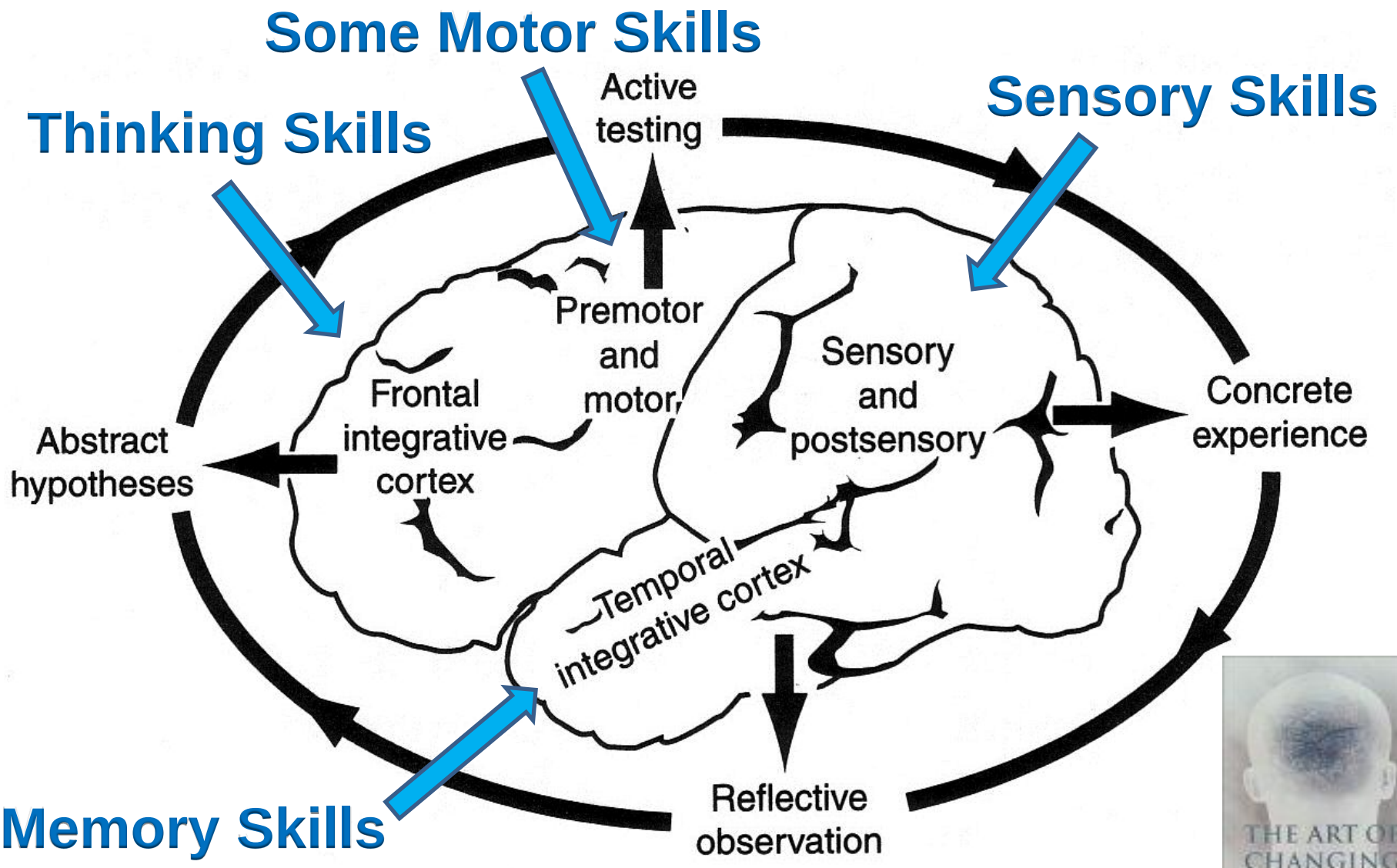
Flow Of Information During Learning

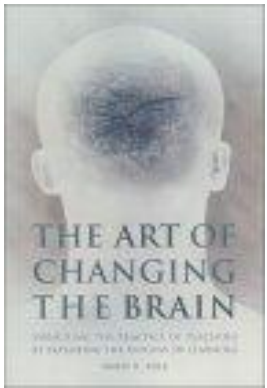


Experiential Learning Cycle
Achieving Long Term Potentiation



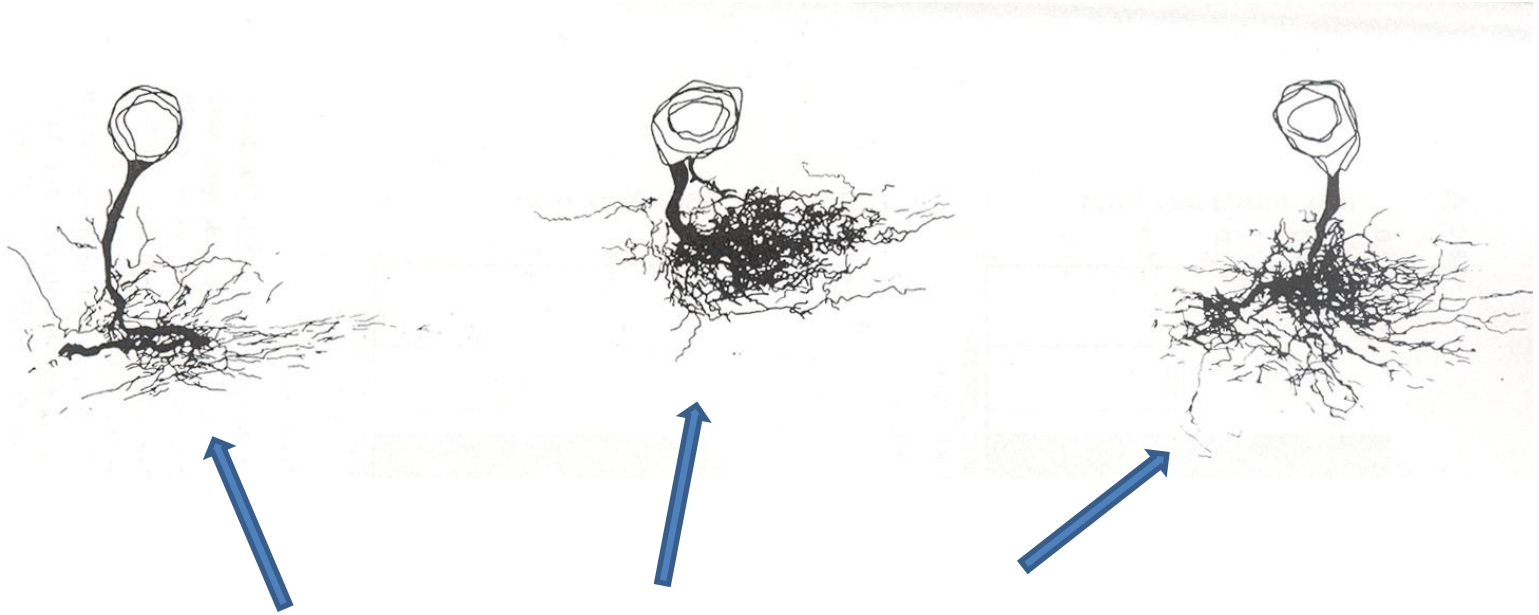
Experiential Learning By The Brain





Adapted from Zull, 2002, The Art of Changing the Brain

Can You Find The Sittin' And Readin' Dendritic Tree?



Sittin' and readin'

1. Complete learning cycle
2. Sleep (5 REM cycles)

- Control left, long-term potentiated (LTP) cells sensitized right
- Tree of LTP markedly increased (hippocampus "rehearsal").
- Dendritic trees are "processing power."
- Prefrontal dendritic growth increases analytic skill.

If you build the front, the back will follow.

- Back = fact memory
- Front = skill memory
- If you develop analytical skills, long-term memory will follow.

How Does A Step 1 Brain Learn?

- Knows how to relate past learning to present learning
- Knows how to determine areas of deficiency and find the missing information
- Prioritizes what is learned by actively organizing new information
- Builds long-term memory through motor activity that creates associations

Test Taking Style

- Linear style
  - Seek answer that matches memorized knowledge
  - Re-read question to stimulate recall
  - Memorization learning requires recognition
- Step 1 Brain (Integrative) style
  - Rule out answer choices
  - Incorrect answers don't fit learned patterns/relationships
  - Big picture learning establishes patterns

How Does A Step 1 Brain Take Tests?

- Can explain significance of each finding in the history, physical exam, or labs
- Can explain why wrong answers are wrong (and what would make them right)
  - "why" = understanding
- Can explain why right answer is right

What Can We Do To Make This Work Best?

1. Set a time limit – 90 min.
2. Seek group consensus
3. Keep multiple references open
   - Be aggressive in finding information!
4. Maximize integration (additional material, comparisons, contrasts, and cause-and-effect)
5. Always be solving a problem

Summary – What and Why?

- What…
  - Is a Step 1 brain?
  - Is side-to-side concept mapping?
  - Is my role in the group?
- Why…
  - Does this work?
  - Is it different from other systems?
  - Should I take the risk? (…and can I afford not to?)