The **Surg-e-Screener HF** Tool:

Improving Heart Failure Recognition in Electronic Health Records

e-Learning Module

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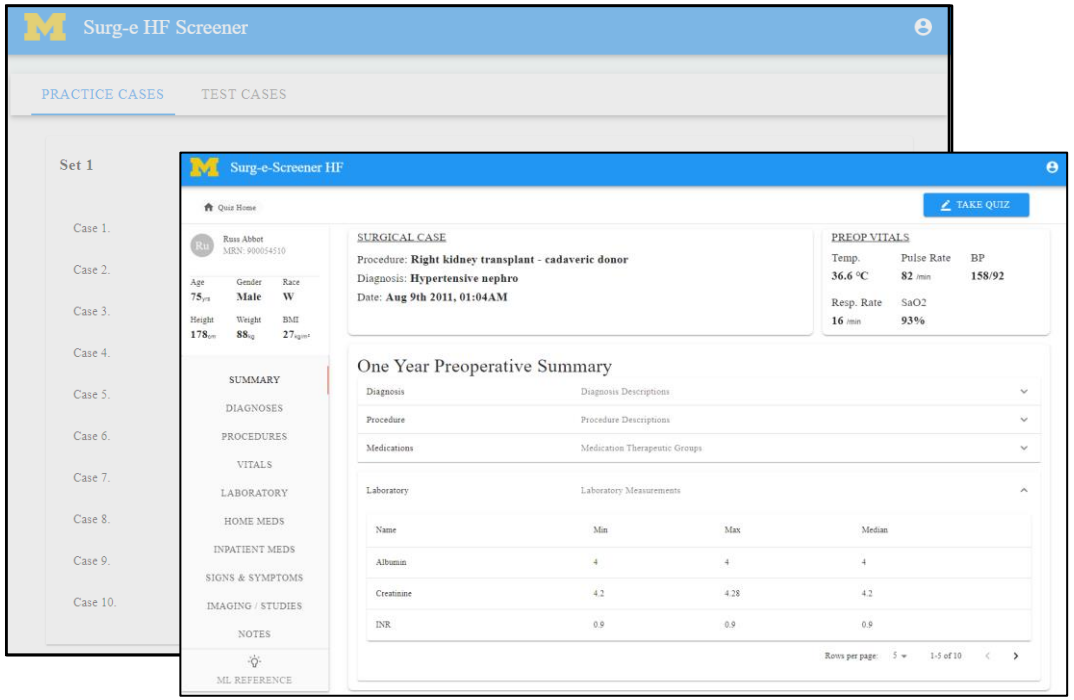
The Problem

Treatments for **heart failure** (HF) proven to extend & improve quality of life are limited by clinicians' ability to diagnose the disease in **early stages**.

The Problem

Unrecognized or untreated heart failure is the single greatest risk factor for cardiovascular complications and mortality after **major surgery**.

The Solution: Surg-e-Screener HF

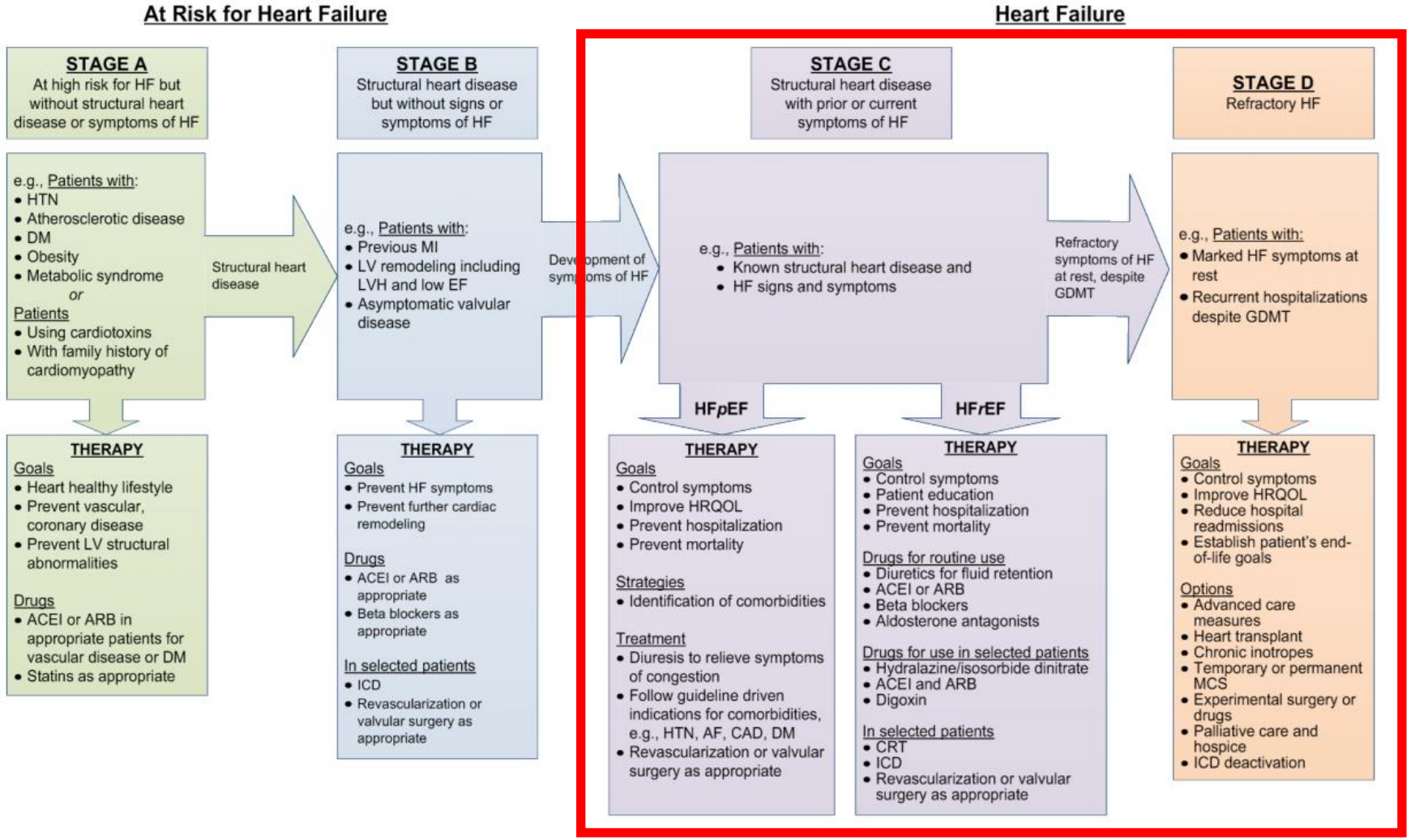


Surg-e-Screener HF:
Automated screening & educational tool

Education & Training –

- It is a quiz-based webapp to **improve HF recognition** with surgical cases in EHR
- It provides a report after completing quizzes to ***compare*** your clinical judgment to **a pane of HF experts**
- It is designed to **augment clinicians' ability** using evidence-based (EB) references

Chronic Heart Failure Definition for this Tool



For purposes of this tool, **Chronic HF** defined as:

- **Chronic**:
  Signs +/- symptoms or underlying pathophysiology persistent for ≥ 3 months (with onset defined as the *start* of this ≥ 3 month period)
- **HF**:
  ACCF/AHA Stage C or D (*prior* or current symptoms + structural heart disease)

Yancy CW, Jessup M, Bozkurt B, et al. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *Journal of the American College of Cardiology.* 2013;62(16):e147-239.

Purpose of this pilot study

To understand how EHR-based *heart failure (HF) recognition* can be improved as aided by the **Surg-e-Screener HF** tool.

Case Review Process

1. Case Reviews

Assume you are *a preop physician* reviewing the patient's medical history prior to surgery in order to identify factors pertaining to presence/absence of HF

- Previous HF diagnoses (simplest way to detect, but occasionally inaccurate)
- Signs & symptoms, labs, studies/imaging, medications, clinical notes.

2. *Pre-test*: HF Recognition Quiz

For the first 10 cases, you use EHR data to decide if a patient had HF (chronic ACC/AHA Stage C or D) before the start of the surgery.

3. EB Reference

After completing the quiz, you have access to the ***Evidence-Based (EB) reference,*** a list of HF risk factors determined by HF guidelines.

4. *Post-test*: HF Recognition Quiz

For the next 10 new cases, you use EHR data **AND** the EB reference to decide if the patient had HF (chronic ACC/AHA Stage C or D) before the start of the surgery.

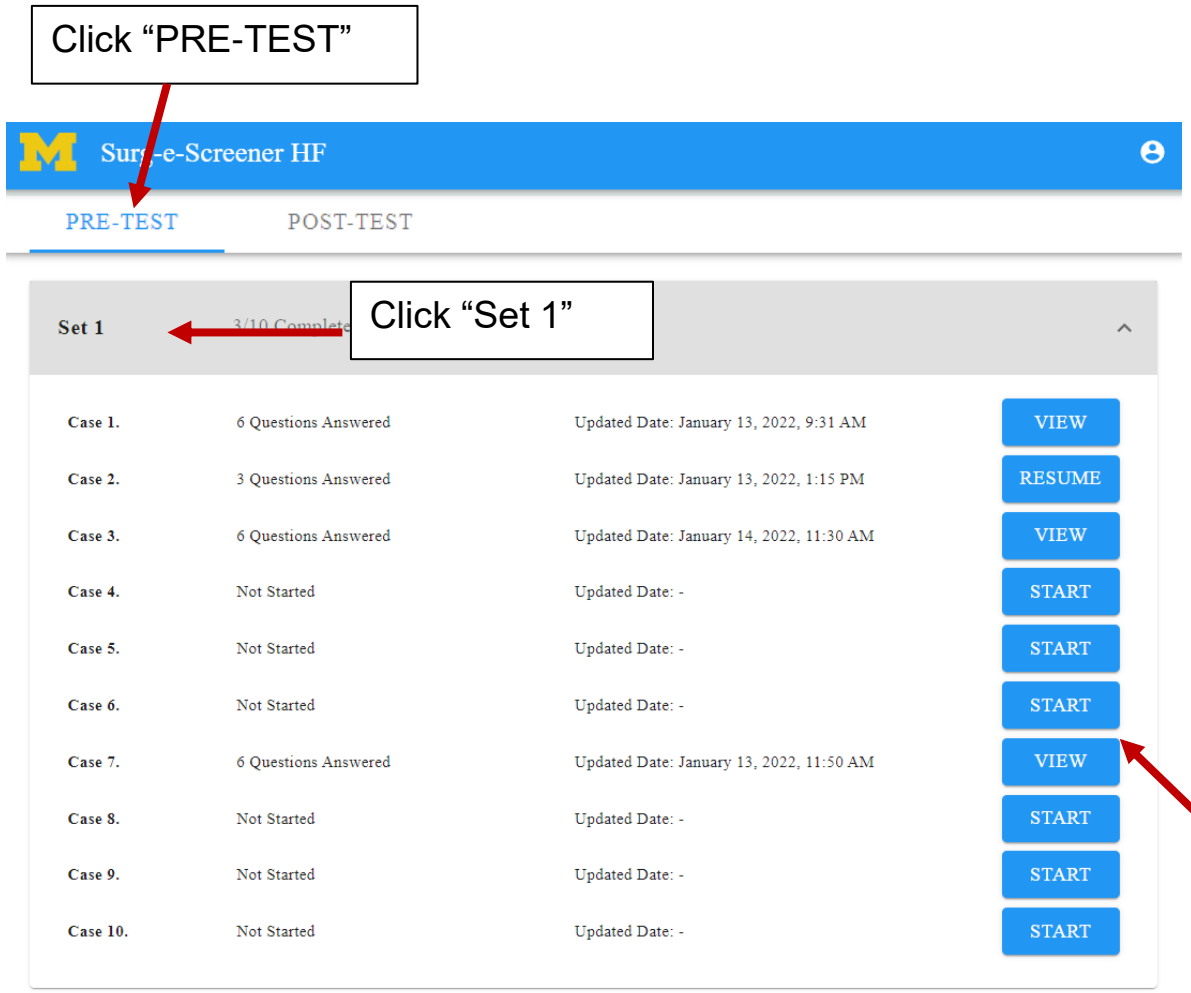
5. Expert Review Comparison

After completing 20 surgical cases, you can access a result report, comparing your HF decision to pre-determined answers and a short case summary by HF experts.

How to use the tool:

Step-by-step Guide

Step 1. Case Reviews



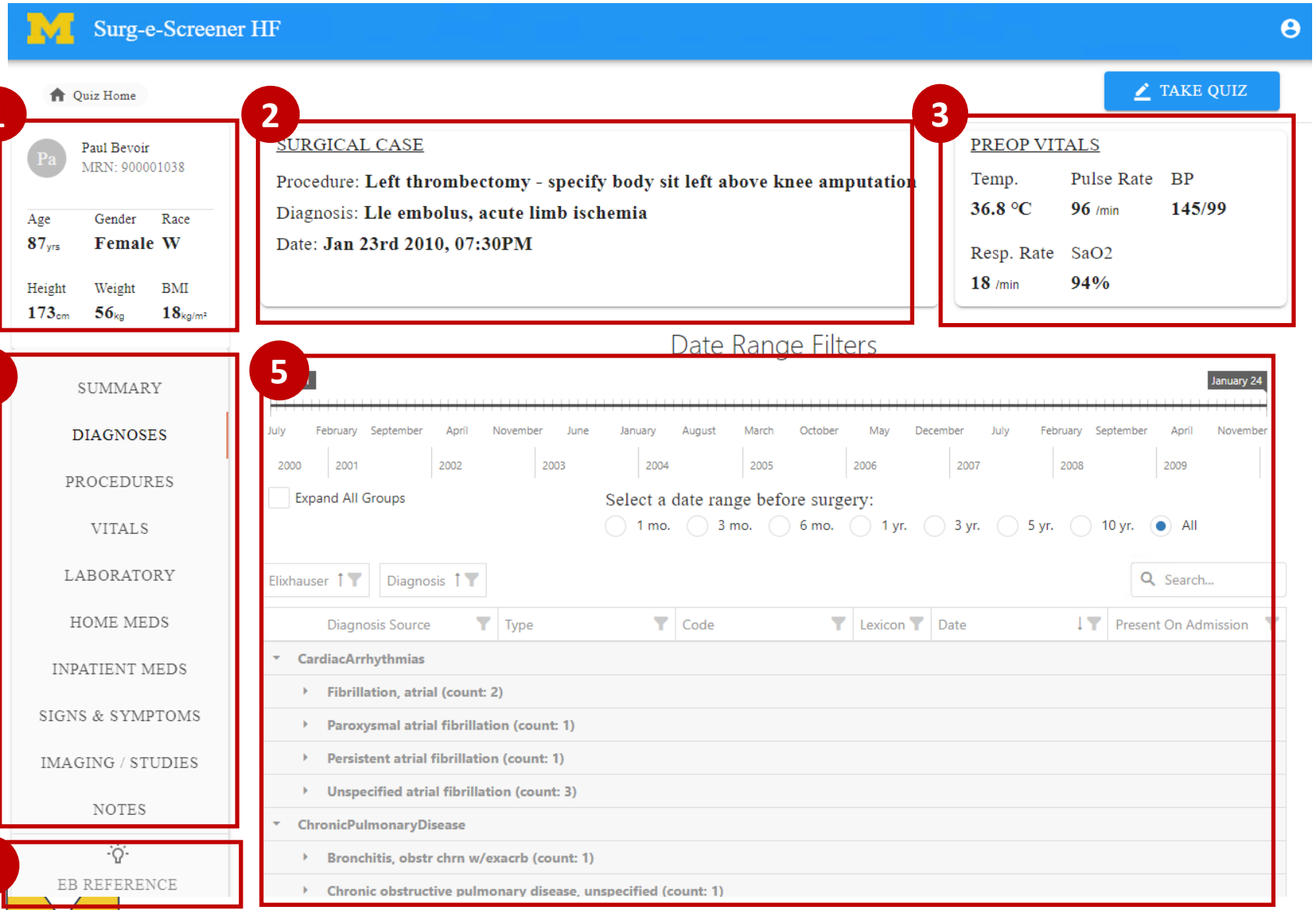
Check your assigned cases

- 10 surgical cases are assigned to ***Pre-Test*** and 10 surgical cases are in ***Post-Test***.
- Click ***Pre-Test*** to review 10 surgical cases.
- Click the ***Start*** button to begin your case review. The button indicates your status.

Status of your progress:

START	No questions completed.
RESUME	Partially answered questions, not yet completed.
VIEW	Completed questions. You can *only* view the case.

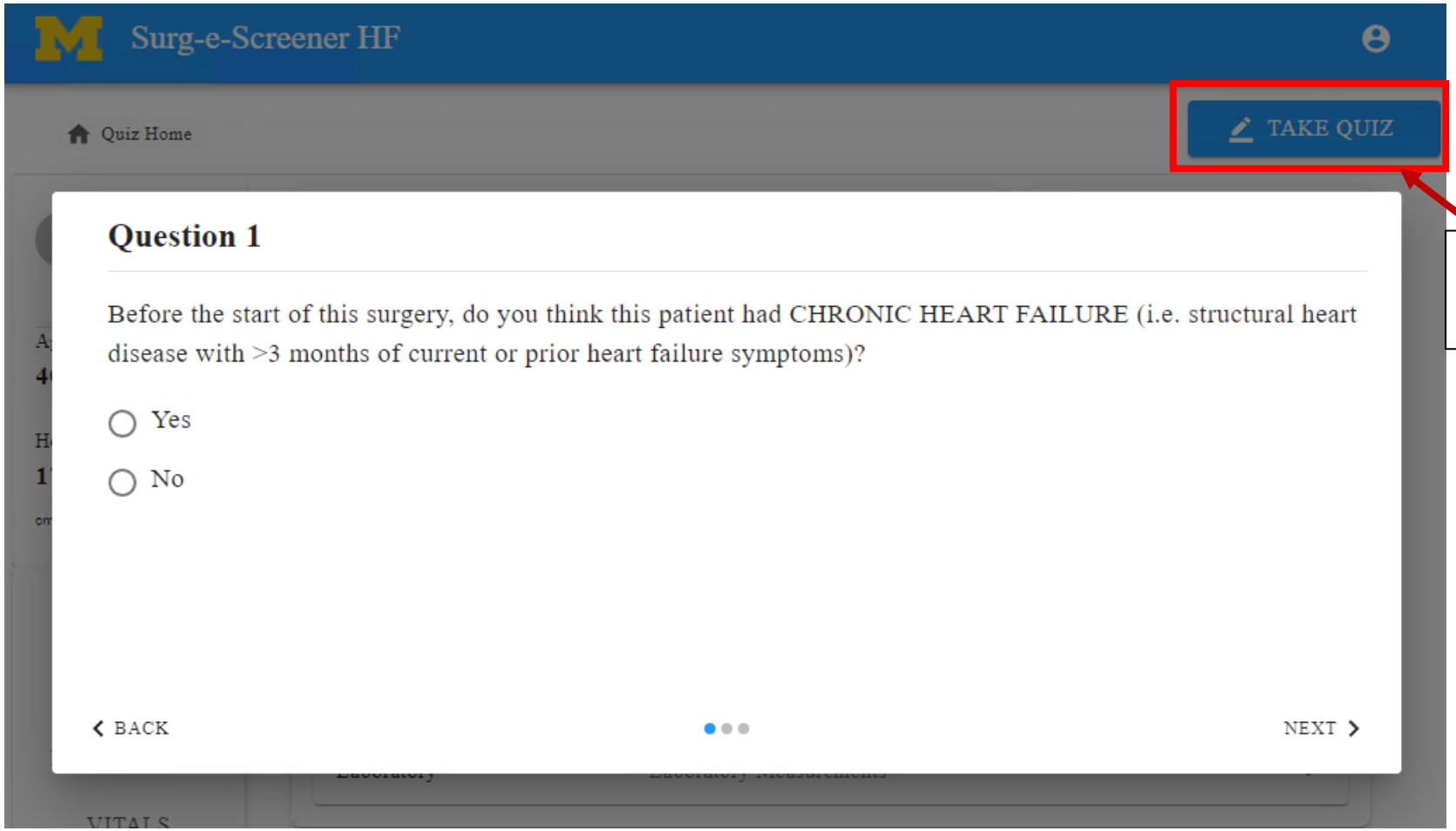
Step 1. Case Reviews: Dashboard



Key components

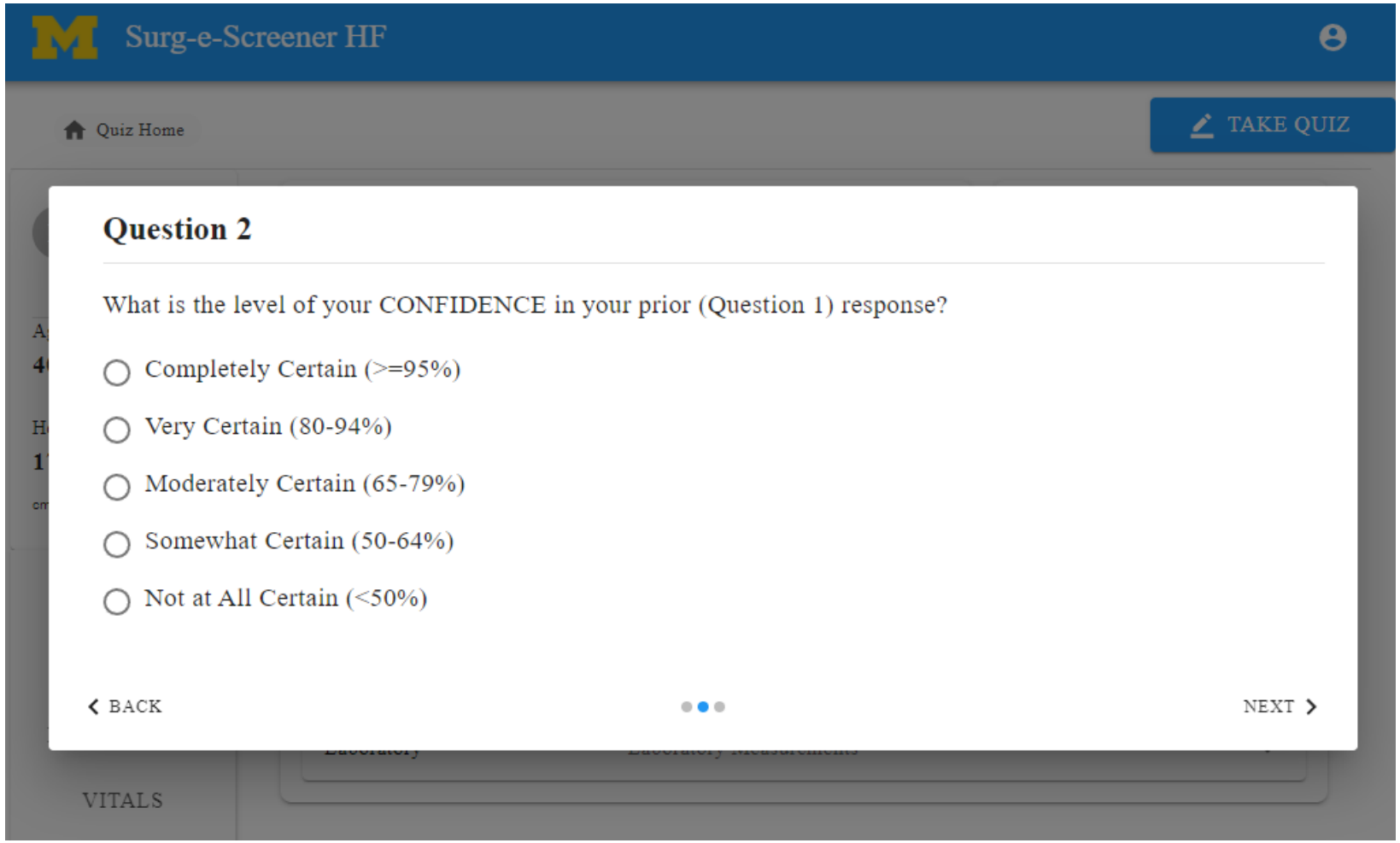
1. Demographics
2. Surgical Case
3. Preoperative Vitals
4. Subject Domains
5. Date Filter & EHR data
6. EB reference

Step 2. *Pre-test*: HF Recognition Quiz

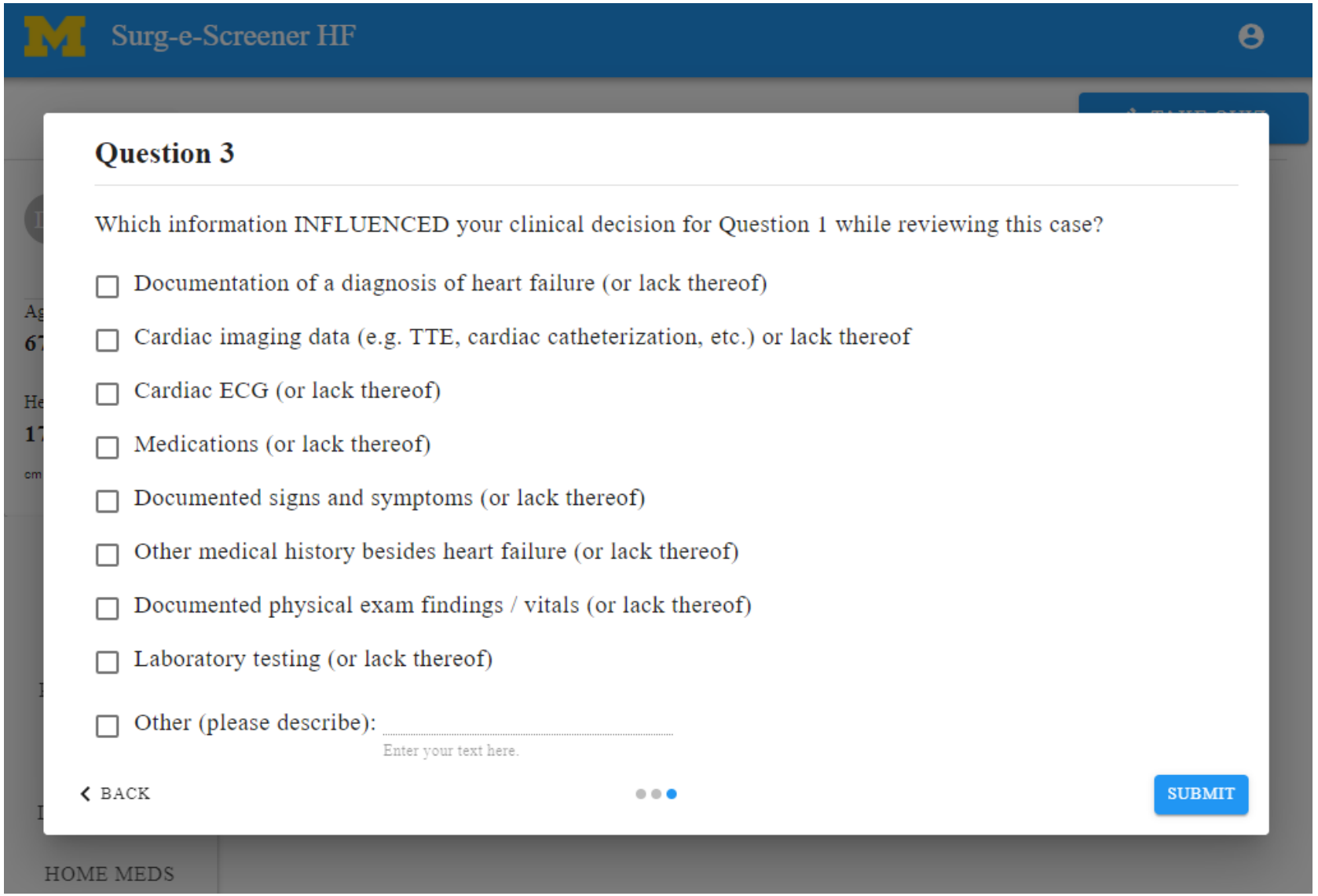


Click “Take Quiz” to answer your decision

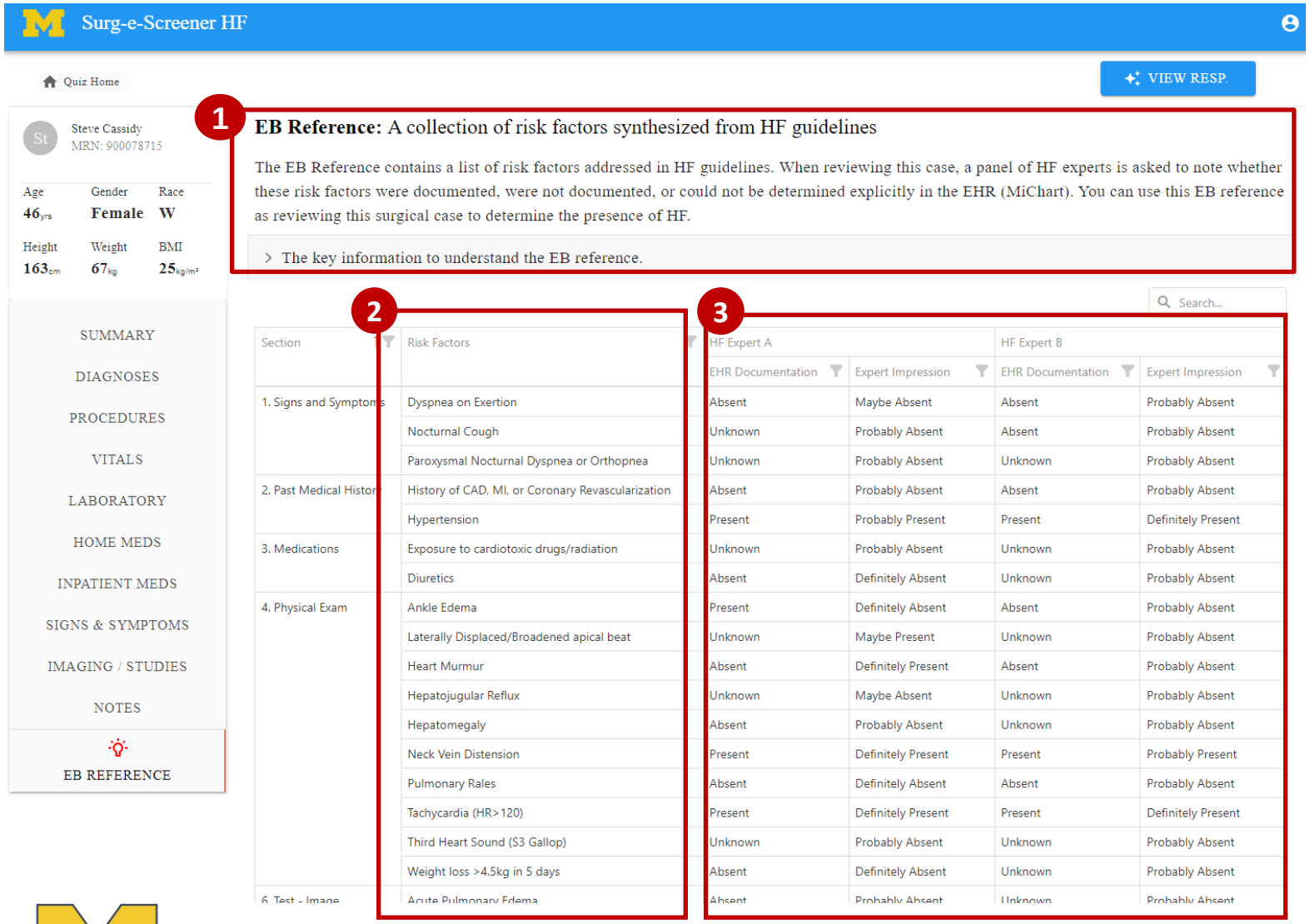
Step 2. *Pre-test*: HF Recognition Quiz



Step 2. *Pre-test*: HF Recognition Quiz



Step 3. Evidence-Based (EB) Reference



Key components

1. The EB reference description
2. Key risk factors from the HF guidelines
3. Two HF expert pre-determined reviews
   - EHR Documentation – Present / Absent / Unknown of risk factors
   - Expert Impression – clinical impression of whether the risk factor present or not.

Factors Contributing to Heart Failure

Framingham Criteria

Major	Minor
Acute pulmonary edema	Ankle edema
Cardiomegaly	Dyspnea on exertion
Hepatojugular reflux	Hepatomegaly
Neck vein distention	Nocturnal cough
Paroxysmal nocturnal dyspnea/orthopnea	Pleural effusion
Pulmonary rales	Tachycardia (HR >120)
Third heart sound (S3 gallop)	
Weight loss >4.5 kg in 5 days in response to treatment	

McKee PA, Castelli WP, McNamara PM, Kannel WB: The natural history of congestive heart failure: the Framingham study. N Engl J Med 1971; 285: 1441-6

Factors Contributing to Heart Failure

European Society of Cardiology Guidelines

Assessment of HF Probability	
Clinical History	History of CAD (MI or revascularization)
	History of arterial hypertension
	Exposure to cardiotoxic drugs/radiation
	Use of diuretics
	Orthopnea / paroxysmal nocturnal dyspnea
Physical Examination	Rales
	Bilateral ankle edema
	Heart Murmur
	Jugular venous distention
	Laterally displaced / broadened apical beat
ECG	Any abnormality

Natriuretic Peptides (HF unlikely if negative)	
NT-proBNP	≥ 125 pg/mL
BNP	≥ 35 pg/mL

Echocardiography
Cardiologist assessment

2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. Eur Heart J. 2016;37(27):2129-2200. doi:10.1093/eurheartj/ehw128

Factors Contributing to Heart Failure

ACCF/AHA Guidelines

Clinical History
Family history of cardiomyopathy
Severity & triggers of dyspnea/fatigue, chest pain, exercise capacity, physical activity, sexual activity
Anorexia, early satiety, weight loss
Rapid weight gain
Palpitations, (pre)syncopal episodes, ICD shocks
Symptoms suggesting transient ischemic attack/thromboembolism
Disordered breathing at night, sleep problems
Diet

Physical Exam
Vital signs, heart rhythm, orthostatic changes
Jugular venous distention / hepatojugular reflux
Peripheral edema / cool lower extremities
Hepatomegaly / ascities
Extra heart sounds, murmurs, enlarged/displaced maximal impulse, RV heave
Rales, pleural effusion

EHR Features
Hospitalizations for HF
Medications for HF

Yancy CW, Jessup M, Bozkurt B, et al. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *Journal of the American College of Cardiology.* 2013;62(16):e147-239.

Using the Evidence-Based (EB) HF Reference

- For each patient, a HF expert panel reviewed the EHR, and documented whether or not **factors contributing to heart failure** were:
  - Present
  - Absent
  - Unable to explicitly determine (Unknown)

- Additionally, the expert panel noted quantitative and qualitative findings describing the **lowest left ventricular ejection fraction** within the EHR prior to surgery

Example Data from HF Expert Panel Review

Based on ***relevant*** clinical records within 365 days of surgery, what specific Major Framingham Criteria for heart failure did the patient exhibit *prior* to surgery?

	Explicitly Determined from Clinical Documentation?		
	Documented as Present	Documented as Absent	Unable to explicitly determine
Acute Pulmonary Edema	◉	○	○
Hepatojugular Reflux	○	◉	○
Neck Vein Distension	◉	○	○
Paroxysmal Nocturnal Dyspnea/Orthopnea	○	◉	○
Pulmonary Rales	○	◉	○
Third Heart Sound (S3 Gallop)	○	○	◉

Based on ***relevant*** clinical records within 365 days of surgery, what specific risk factors for heart failure did the patient exhibit on *prior* to surgery?

	Explicitly Determined from Clinical Documentation?		
	Documented as Present	Documented as Absent	Unable to explicitly determine
History of CAD, MI, or Coronary Revascularization	◉	○	○
History of Hypertension	◉	○	○
Exposure to cardiotoxic drugs/radiation	○	○	◉
Use of diuretics	○	○	◉
Heart Murmur	○	◉	○
Laterally Displaced/Broadened apical beat	○	○	◉

Example Data from HF Expert Panel Review

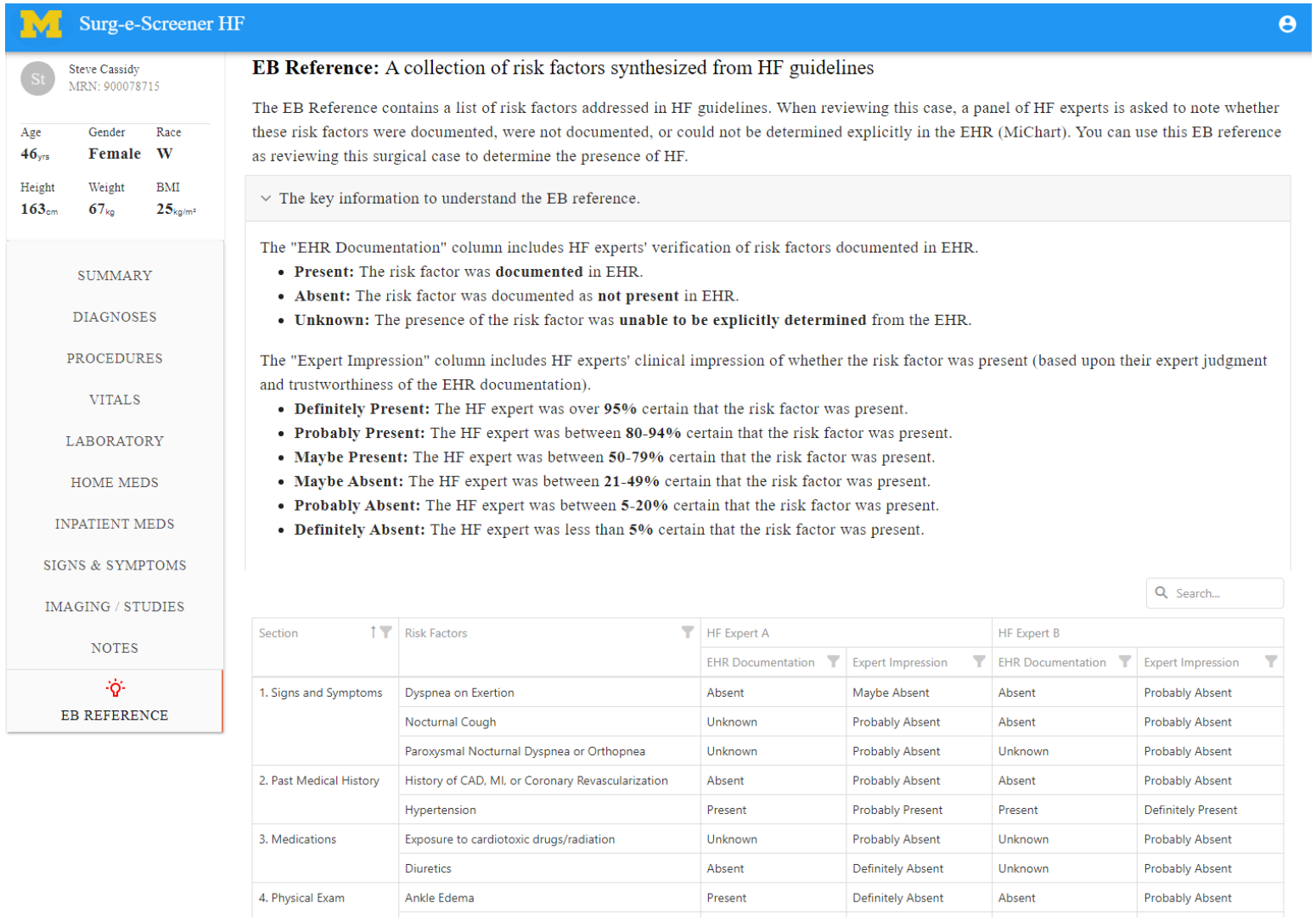
What was the lowest left ventricular ejection fraction (%), or if no ejection fraction available, lowest qualitative report of left ventricular systolic function performed within this time period?

- (●) Specific EF Reported:

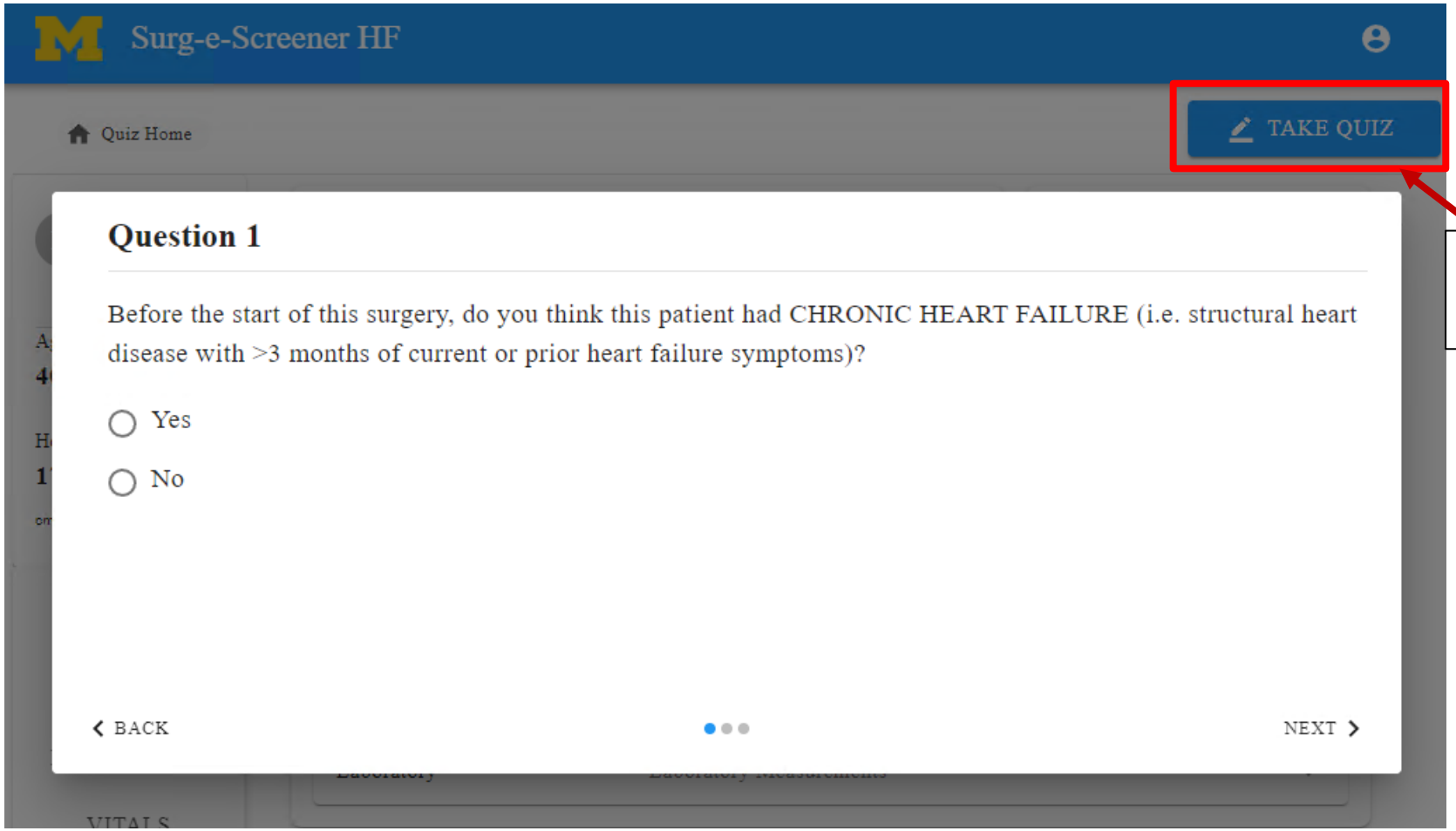
32%

- ( ) No EF Reported, but Hyperdynamic (>=70%) or equivalent qualitative report
- ( ) No EF Reported, but Normal (50-69%) or equivalent qualitative report
- ( ) No EF Reported, but Mild Dysfunction (40-49%) or equivalent qualitative report
- ( ) No EF Reported, but Moderate Dysfunction (30-39%) or equivalent qualitative report
- ( ) No EF Reported, but Severe Dysfunction (<30%) or equivalent qualitative report

Step 3. Evidence-Based (EB) Reference



Step 4. *Post-test*: HF Recognition Quiz



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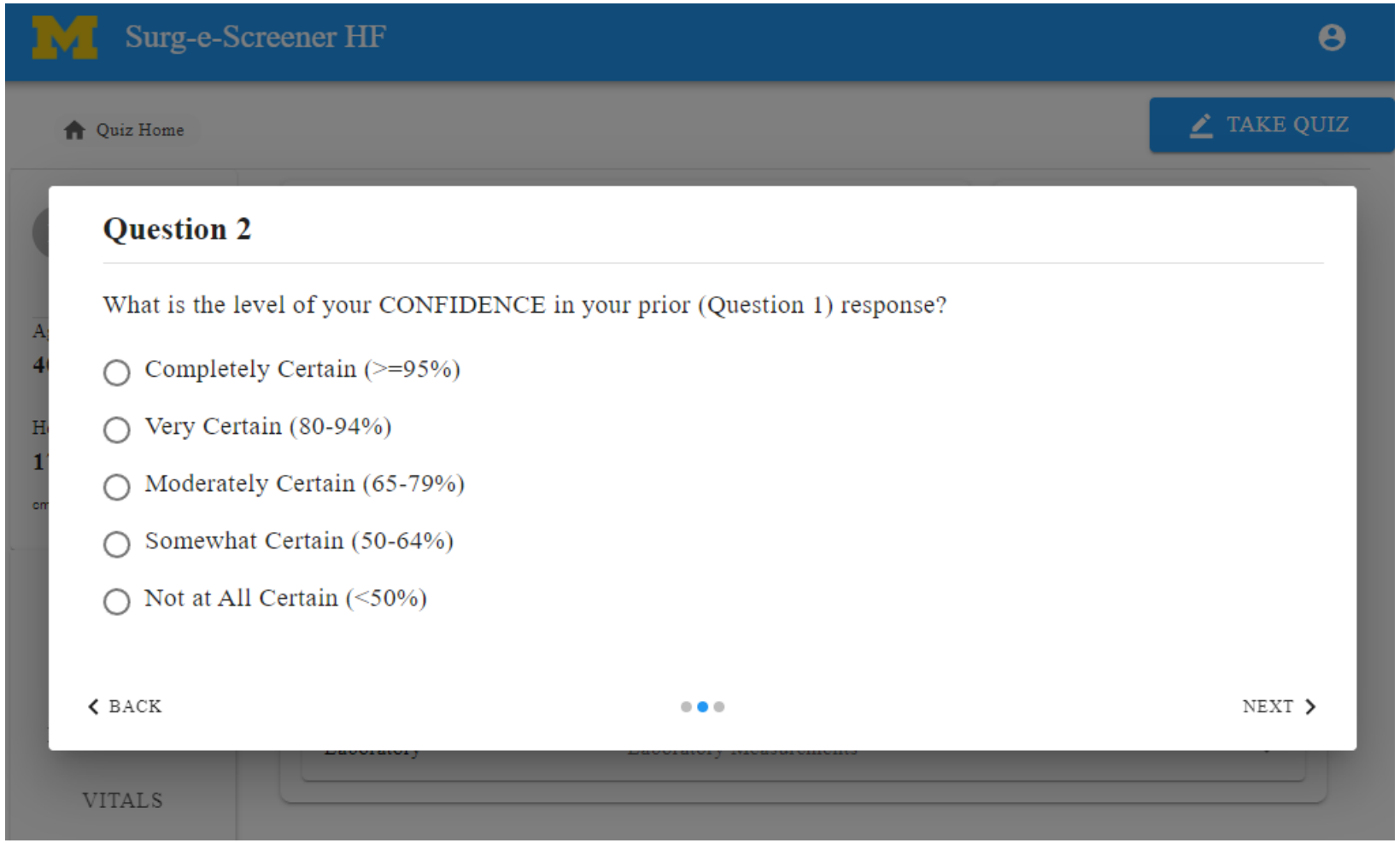

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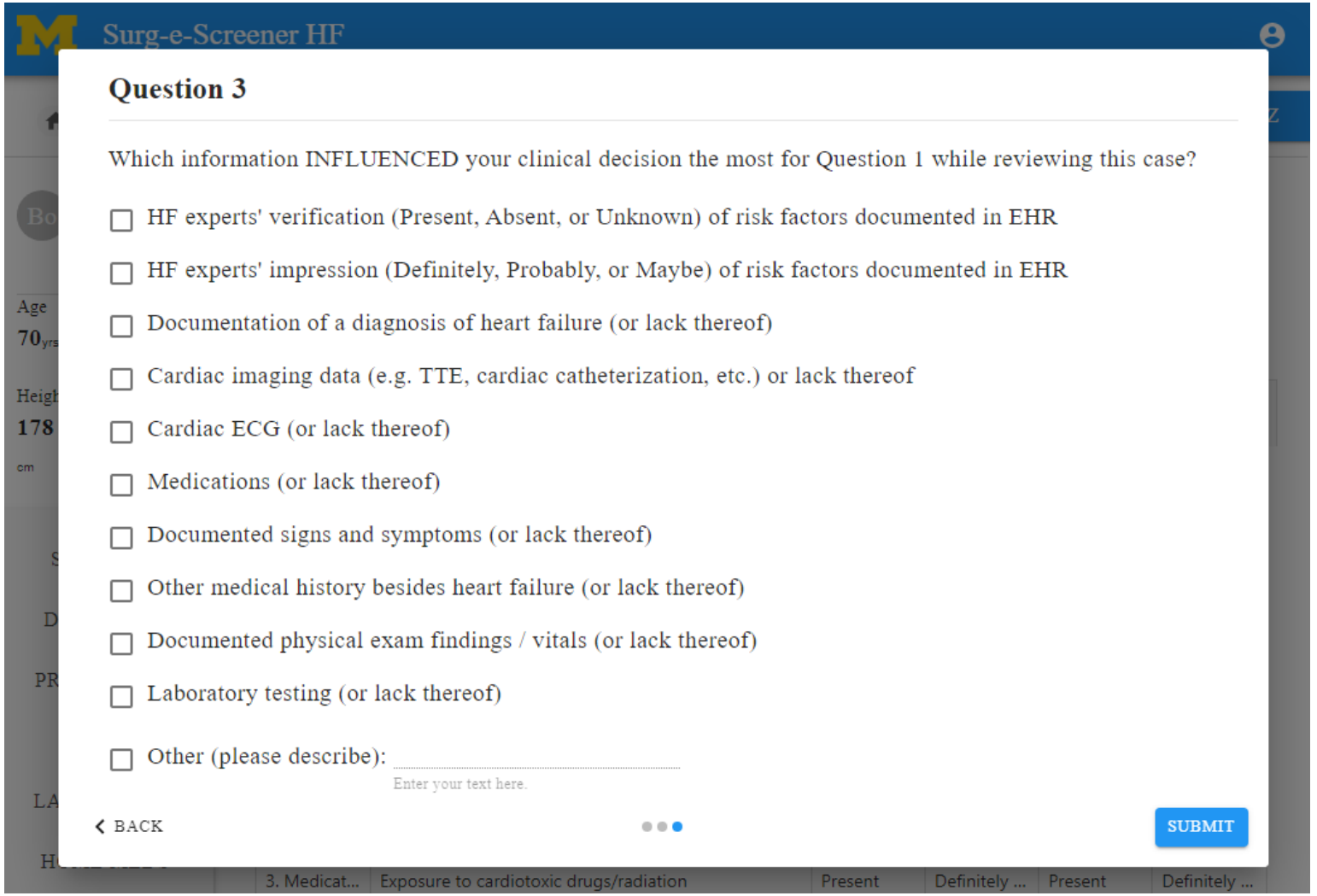
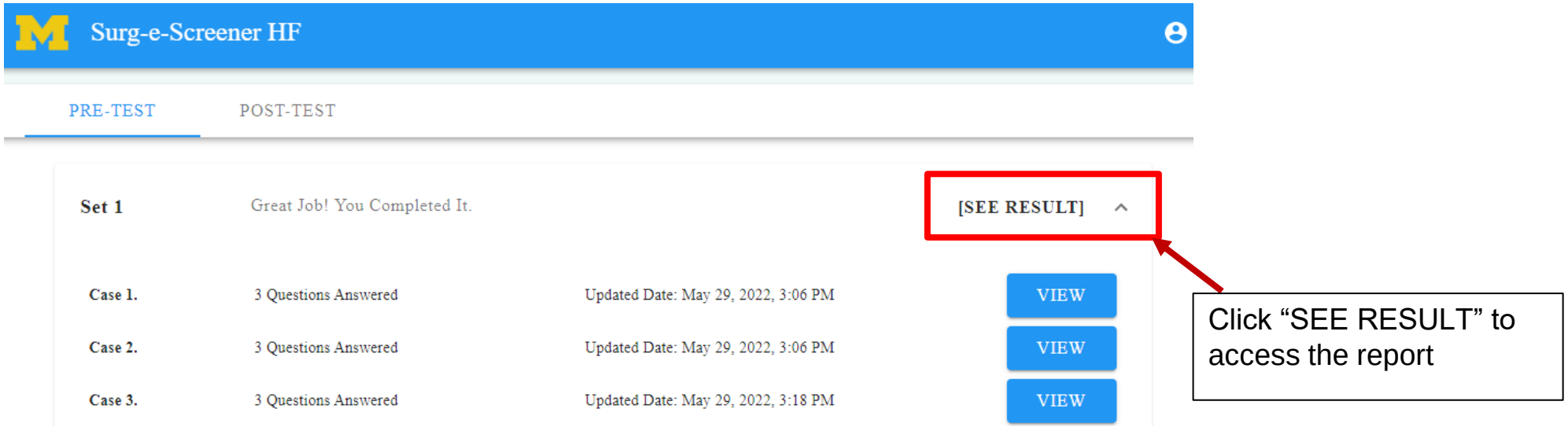


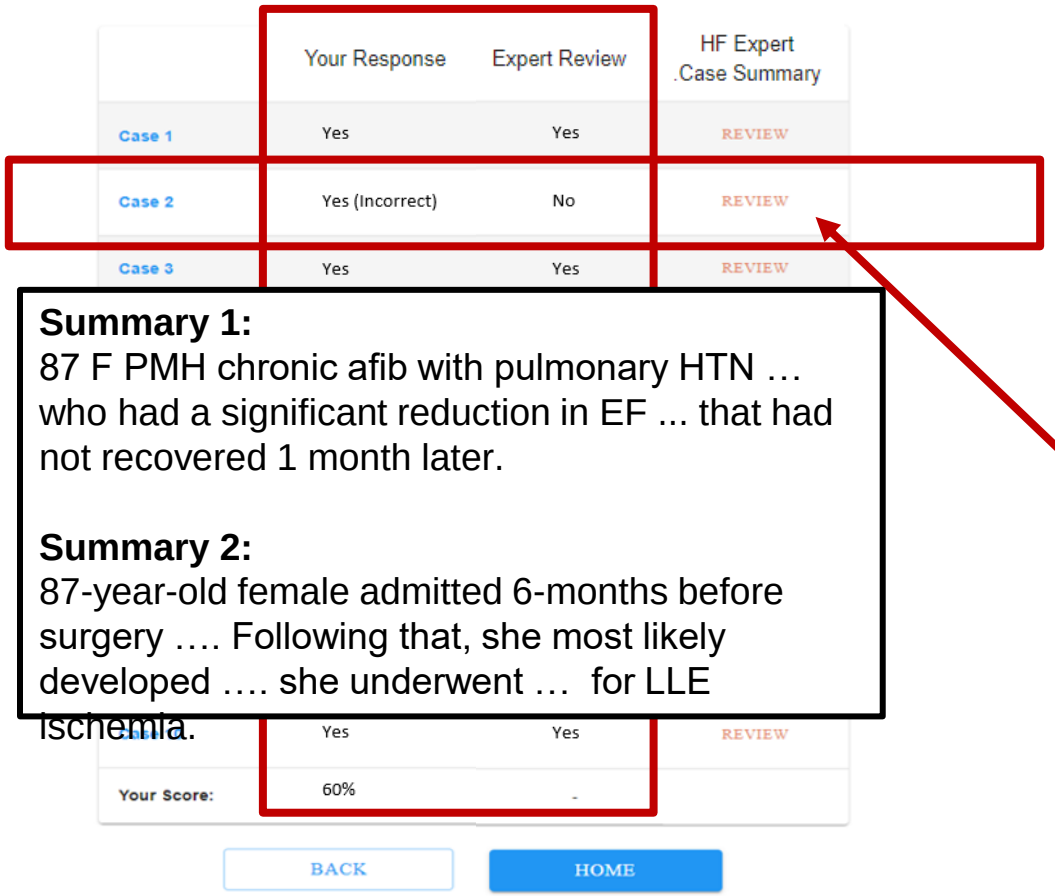
Step 5. Result Report Access



Key components

- SEE RESULT will be available after reviewing 20 surgical cases, 10 case review results in PRE-TEST and 10 case review results in POST-TEST.

Step 5. Expert Review Comparison



Review your result report

- **Compare your HF recognition** with the pre-determined answers by HF experts in each case.
- **Re-examine cases** when you are misaligned with the answers.
- Review **a short description** of the surgical cases summarized by the HF experts.

Summary of e-Learning Module

After watching this e-Learning module, you should be able to:

1. Understand the **process and activities required** to complete the HF recognition study
2. Identify **risk factors contributing to HF** from Framingham Criteria, European Society of Cardiology, and American Heart Association guidelines
3. Describe what combination of **major and minor risk factors** determines HF using the Framingham Criteria.

The short quiz will ask you mainly about Point 2 and Point 3.

Demo

Final Step

- No further actions after completing the test cases. We appreciate your participation.

- Reimbursement:
  - **Follow-up** if any case reviews remain **incomplete**
  - Pending follow-up / completion of all cases, you will receive reimbursement of **$50 as a check** delivered to your mailing address

- Email Hyeon Joo (thejoo@med.umich.edu) if any questions