Clinical Decision Support (CDS) Content and Health Level 7 (HL7)-compliant Knowledge Artifacts (KNARTS)

Cardiology: Chest Pain (CP) / Coronary Artery Disease (CAD) Clinical Content White Paper

Clinical Decision Support (CDS) Content and Health Level 7 (HL7)-compliant Knowledge Artifacts (KNARTS): Cardiology: Chest Pain (CP) / Coronary Artery Disease (CAD) Clinical Content White Paper

Order Set (B5, CLIN0004AA), Documentation Template (B35, CLIN0005AC), Consult Request/Composite (B56, CLIN0006AB)

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Introduction

As the nation increasingly relies upon information technology to support healthcare delivery, compliance with data and vocabulary standards is crucial to enable the promise of interoperability, and its direct impact on improving patient outcomes. Knowledge Based Systems (KBS) is leading VA in their goal to improve the ability of clinicians to provide care for patients while increasing quality, safety, and efficiency. Recognizing the importance of standardizing clinical knowledge in support of this goal, KBS is committed to implementing the HL7 knowledge artifact specification for a wide range of VA clinical use cases.

The Standards and Interoperability (S&I) Framework Health eDecisions Initiative (HeD) is currently evolving the HL7 specification that will enable the structuring and encoding of clinical knowledge. These knowledge artifacts, or KNARTs, have the potential to abstract clinical knowledge from its representation in an underlying platform, thus creating reusable knowledge components which can be readily implemented in any system.

The purpose of this Clinical Content White Paper is to capture the clinical context and clinical intent of KNART use cases in sufficient detail to provide the KNART authoring team with the clinical source material to construct the corresponding knowledge artifacts using the HL7 specification. This paper has been developed using material from a variety of sources: VA artifacts, clinical practice guidelines, evidence in the body of medical literature, and clinical expertise. This material has then been synthesized and harmonized under the guidance of VA subject matter experts to reflect VA's clinical intent for this use case.

Chapter 1. Chest Pain (CP)/Coronary Artery Disease (CAD)

1. Clinical Context

The Cardiology chest pain (CP) and coronary artery disease (CAD) group of KNARTs are intended to assist primary care providers in the management of adult patients with stable chest pain (with or without known CAD); aid in determining when a cardiology consultation is appropriate; provide guidance for initial noninvasive diagnostic orders (stress testing) and provide a structured documentation template for the process. Stable patients with cardiac chest pain require risk stratification, office-based workup, initiation of disease-specific medications, and subspecialty referral to a cardiologist.

This context excludes emergent patients (new/ongoing/unstable pattern CP). Included are those patients with stable CP with or without known CAD, to be considered for evaluation by cardiology. These context domains are summarized below:

- Target User: Provider in a Primary Care Clinic
- Patient: Adult with stable chest pain being considered for cardiology consultation (excluding unstable symptoms and acute coronary syndromes)
- Priority: Routine
- Specialty: Primary Care
- Location: Outpatient

2. Knowledge Artifacts

This section describes the knowledge artifacts that are intended for users caring for adult patients who might present to a Primary Care Clinic with stable chest pain/CAD. The intent of these artifacts is to ensure a minimum workup is initiated prior to a Cardiology Consultation. Specific constraints for these artifacts are that:

- They apply to outpatients with stable chest pain with or without prior documented CAD needing cardiology Consultation
- They exclude emergent patients [new/ongoing/unstable pattern CP suggestive of acute coronary syndrom (ACS)]

There are three knowledge artifacts that define this clinical use case, and are described in detail in the following sections. They are:

- Consult Request
  - High-level, encompassing artifact meant to communicate the request for cardiology consultation
  - Relies upon the documentation template and order set artifacts
- Documentation Template
  - Documents the information provided by the referring provider
  - Includes logic for appropriate display of documentation sections
- Order Set
  - Orderable items associated with the consult request

- Includes logic for appropriate display of the order set

Conventions used within the knowledge artifact descriptions include:

- <obtain>: Indicates a prompt to obtain the information listed
- [...]: Square brackets indicate comments, some action on the part of the user, or an indication of status within the workflow
- Check boxes: Indicates a component of an order set

Chapter 2. Composite

1. Knowledge Narrative

Patients often present in the primary care setting with chest pain that is thought, possibly, to be cardiac in origin. This poses the problem of separating those with non-cardiac chest pain from those with cardiac chest pain and separating unstable from stable patients. Unstable patients with cardiac chest pain (e.g., those suspected with acute coronary syndrome (ACS), ST-segment elevation or non–ST-segment elevation myocardial infarction) require triage to appropriate emergent care, such as to the emergency department. Stable patients with cardiac chest pain require risk stratification, office-based workup, initiation of disease-specific medications, and subspecialty referral to a cardiologist. The care of patients with clearly non-cardiac chest pain (e.g., chest pain secondary to GI, musculoskeletal or pulmonary causes) is a separate clinical problem not addressed herein. Patients should be risk-stratified to estimate their 10-year cardiovascular disease risk ([D'Agostino, 2008]) and guideline-based options for the ordering of diagnostic tests and therapeutic interventions to facilitate efficient resource utilization and subspecialty referral ([Finh, 2014]).

2. Consult Request

[The following list provides the basic components of the consult request. This is the high-level, encompassing artifact, and must be combined with the documentation template and order set to form a fully functional knowledge artifact.]

[Section Selection Prompt: For a cardiology consult to evaluate chest pain in a stable patient with or without known history of CAD, please provide the following information.]

- Reason for Consult: Chest pain evaluation (with or without known history of CAD)
- Consult Specialty: Cardiology

[Routine priority is the default for this consult, though it is recognized that there may be other levels of "routine" identified in the future (e.g., direct phone call for borderline cases, e-consults, etc.)]

- Priority: Routine
- <obtain> Referring Physician
- <obtain> Referring Physician Contact Information

[Activate associated documentation template]

3. Evidence

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Chapter 3. Documentation Template

1. Knowledge Narrative

[See the knowledge narrative for the Composite artifact.]

2. Documentation Template Prerequisites

Clinical Stability Assessment

[Unstable patients with chest pain pattern suggestive of ACS (e.g., those with new onset resting CP, CP with minimal exertion, new unstable angina pattern, ST-segment elevation, non–ST-segment elevation myocardial infarction on ECG, or suspected aortic dissection) require triage to urgent care, such as the emergency department. This documentation template is not applicable for unstable patients. For the following patients, transfer to Emergency Department for evaluation:

1. Ongoing resting chest pain for > 20 minutes with ST elevation or depression on ECG
2. Onset of new resting chest pain episodes within the past week
3. New onset, recurrent chest pain with minimal exertion over the past 2 months
4. Previously stable exertional angina now occurring with minimal activity over the past 2 months.

[Consider the following logic, if required:]

- [Determine if the patient is unstable using the definition above.]
- [For an unstable patient:]
  - [The user will complete this section for a patient determined to be unstable.]
  - <obtain> Rationale for determining that the patient was unstable, noting that the patient was transferred to the nearest emergency department immediately.
  - [Documentation template complete.]
- [For a stable patient:]
  - [The user will continue with the documentation template.]

3. Coronary Artery Disease Risk

[For this documentation template, please assess the patient's cardiovascular disease risk using either clinical judgement or the calculator provided at: http://static.heart.org/riskcalc/app/index.html#!/baseline-risk.]]

- <obtain> Patient's 10-Year Cardiovascular Disease Risk

4. History and Physical

[For this documentation template, the following information should be included, if available.]

- <obtain> History, Brief - describing symptoms, HPI
- <obtain> History of prior cardiac evaluations (e.g., prior hospitalization or evaluations for: chest pain, rule/out MI, angina, heart failure, etc.)
- <obtain> Results of prior cardiac diagnostic procedures performed (resting ECG, echocardiogram, stress testing (echo, nuclear, MRI), CCT or angiography

- <obtain> Physical Exam, Pertinent Positive and Negative Findings

[The user will complete the remaining sections for a patient determined to be stable with known CAD.]

- <obtain> Details of previous invasive diagnostic procedures and resulting interventions (e.g., angiography, PCI/Stents, or CABG)

5. Treatment Provided

[For this documentation template, the following information should be included, if available.]

- <obtain> Pharmacologic Therapy
- <obtain> Other Pertinent Therapy

6. Laboratory Studies

[For this documentation template, the following information should be included (latest value within the past 2 years), if available.]

- <obtain> Basic Metabolic Profile Lab Result
- <obtain> Complete Blood Count Lab Result
- <obtain> Lipid Profile Lab Result
- <obtain> Thyroid Function Testing Lab Result
- <obtain> Troponin Lab Result
- <obtain> Brain Natriuretic Peptide Lab Result
- <obtain> D-dimer Lab Result

7. Imaging and Diagnostic Studies

[For this documentation template, the following information should be included, if available from the prior 1 year.]

[Images should be attached automatically if text is provided for the 12-Lead Electrocardiogram Interpretation field.]

- <obtain> resting 12-Lead Electrocardiogram Interpretation
- [Attach/link Images: 12-Lead Electrocardiogram]

[Results should be attached automatically if text is provided for the Stress Electrocardiography Interpretation field.]

- <obtain> Stress Electrocardiography Interpretation
- [Link Images: Stress Electrocardiography]

[Results should be attached automatically if text is provided for the Resting Echocardiogram/Doppler Interpretation field.]

- <obtain> Resting Echocardiogram/Doppler Interpretation
- [Link Images: Resting Echocardiogram/Doppler Electrocardiography]

[Results should be attached automatically if text is provided for the Stress Echocardiogram Interpretation field. This includes treadmill and dobutamine stress echo.]

- <obtain> Stress Echocardiogram Interpretation
- [Link Images: Stress Echocardiogram]

[Results should be attached automatically if text is provided for the Stress Myocardial Perfusion Imaging (MPI) Interpretation field.]

- <obtain> Stress MPI Interpretation
- [Link Images: Stress MPI]

[Results should be attached automatically if text is provided for the Rest/Stress MRI Interpretation field.]

- <obtain> Rest/Stress MRI Interpretation
- [Link Images: Rest/Stress MRI]

[REsults should be attached automatically if text is provided for the Chest/Coronary/Cardiac CT Angiography (CTA) Interpretation field.]

- <obtain> Chest CT or Coronary/Cardiac CTA Interpretation
- [Link Images: Chest CT or Coronary/Cardiac CTA]

[Results should be attached automatically if text is provided for the X-Ray Chest Interpretation field.]

- <obtain> X-Ray Chest Interpretation
- [Link Images: X-Ray Chest]

[Present associated order set.]

8. Link to Order set

[Present associated order set]

9. Evidence

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Chapter 4. Order Set

1. Knowledge Narrative

[See the knowledge narrative for the Composite artifact]

2. Patient Disposition and Triage

[Users should be directed to immediately assess the patient for clinical stability, based on clinical judgment.]

[For unstable patients (those with signs or symptoms compatible with ACS, acute myocardial ischemia or infarction), this section should be displayed.]

[Section Prompt: Unstable patients should immediately be transferred to the nearest emergency department.]

[Section Selection Behavior: Optional.]

- ☐ Patient sent to emergency department

3. Consults and Referrals

[Section Prompt: Cardiology consult order.]

[Consider other consult modalities which might be available (e.g., e-consult or other rapidly iterative consult method. A simple consult is included here as the overarching clinical intent.]

- ☐ referral to cardiology to evaluate chest pain (routine)

[Section Selection Behavior: Only one may be selected. At least one must be selected.]

[Section Prompt: Reason for cardiology consultation.]

- ☐ typical angina
- ☐ atypical chest pain
- ☐ progressive angina symptoms in a stable patient with known CAD (if the patient is unstable based upon clinical or test results, direct physician-to-physician communication is required)

[If other is selected, the reason must be obtained.]

- ☐ other
-
  - <obtain>Reason for cardiology consultation

[Section Prompt: Goal of cardiology consultation.]

- <obtain> Goal of cardiology consultation

4. Imaging and ECG

[Section Prompt: Consider ordering prior to the cardiology consultation. Resting 12-lead electrocardiogram is required if it has not been obtained within the past two months.]

[Section Selection Behavior: More than one may be selected. Optional]

- ☐ resting 12-lead electrocardiogram to evaluate chest pain (routine)
- ☐x-ray chest to evaluate chest pain(routine)

[Section Selection Behavior: Optional]

[Additionally, consider adding coronary CTA (cCTA) based upon availability at the facility.]

- ☐ coronary CTA chest to evaluate chest pain (routine)

[Section Prompt: Consider for patients with suspected pericarditis, myocarditis, hypertrophic cardiomyopathy, or pulmonary hypertension.]

[Section Selection Behavior: Optional]

- ☐ Resting echocardiogram to evaluate chest pain (routine)

5. Laboratory Tests

[Section Prompt: Consider the following tests to be completed prior to the cardiology consultation.]

[Section Selection Behavior: More than one may be selected. Optional]

- ☐ basic metabolic profile (routine)
- ☐ complete blood count (routine)
- ☐ lipid profile (routine)
- ☐ thyroid function testing (routine)
- ☐ brain natriuretic peptide (routine)

6. Cardiac Risk Stratification

[Section Prompt: For stable patients, these orders may assist in cardiac risk stratification.]

[A link to the ACC/AHA clinical practice guideline for stress testing (Gibbon 2002) should be made available to ordering providers: http://circ.ahajournals.org/content/106/14/1883.long.]

[Section Prompt: Assess for contraindications to stress testing such as: Acute CHF, acute MI or unstable angina, severe aortic stenosis, unstable rhythm, aortic aneurysm/dissection, endocarditis, acute pericarditis, acute pulmonary embolus/infarction, acute systemic illness/infection, severe hypertension, inability to cooperate, Inability to exercise (<5 METs), LBBB, etc.]

Exercise Stress Testing. [Section Prompt: Consider for patients with no known or prior coronary artery disease, low probability for coronary artery disease, ability to exercise, normal electrocardiogram, and heart rate > 60 beats per minute.]

[Section Selection Behavior: Optional.]

- ☐ exercise ECG (routine)

Stress Testing with Echocardiography. [Section Prompt: Consider for patients with no known or prior coronary artery disease, low to intermediate probability for coronary artery disease, ability to exercise, and no evidence of significant regional wall motion abnormalities or conduction abnormalities (IVCD/bundle branch block or pacing) of 12-lead electrocardiogram.]

[Section Selection Behavior: Optional.]

- ☐ exercise echocardiography (routine)

Dobutamine Stress Testing with Myocardial Perfusion Imaging (MPI). [Section Prompt: Consider for patients with no known or prior coronary artery disease, intermediate probability for coronary artery disease, inability to exercise, and normal electrocardiogram.]

[Section Selection Behavior: Optional.]

- ☐ dobutamine stress myocardial perfusion imaging (routine)

Exercise Stress Testing with MPI. [Section Prompt: Consider for patients with known or prior CAD, ability to exercise, and normal ST-T.]

[Section Selection Behavior: Optional.]

- ☐ exercise stress myocardial perfusion imaging (routine)

Vasodilator Stress Testing with MPI. [Section Prompt: Consider for patients with known or prior CAD and abnormal electrocardiogram/PPM. This subsection should also be made available to the provider for patients with known or prior CAD, abnormal electrocardiogram, and history of prior myocardial infarction or regional wall motion abnormalities.]

[Section Selection Behavior: Only one should be selected. Optional.]

- ☐ regadenoson (Lexiscan) stress myocardial perfusion imaging (routine)
- ☐ adenosine stress testing myocardial perfusion imaging (routine)
- ☐ dipyridamole stress testing myocardial perfusion imaging (routine)

Dobutamine Stress Testing with Echocardiography or MPI. [Section Prompt: Consider for patients with known or prior CAD, inability to exercise, normal electrocardiogram, and no prior myocardial infarction. Only one should be selected.]

[Section Selection Behavior: Only one should be selected. Optional.]

- ☐ dobutamine stress testing echocardiography (routine)
- ☐ dobutamine stress testing myocardial perfusion imaging (routine)

Coronary CT Angiogram. [Section Prompt: Consider for patients with no known coronary artery disease, low or intermediate probability for coronary artery disease, especially in presence of a history of prior inconclusive or discrepant diagnostic testing, recurrent symptoms or significant family history of CAD/multiple risk factors in young patients. Additional postprocessing (CT-FFR) or CTA stress perfusion may be ordered where available.]

[Section Selection Behavior: Optional.]

- ☐ coronary CT angiogram (routine)

7. Medications

[Section Prompt: Consider the following medications for stable patients to be initiated prior to the cardiology consultation.]

[Section Selection Behavior: More than one category may be selected. Only one from each category may be selected. Optional.]

- ☐ Antianginal Therapy
-
  - ☐ metoprolol tartrate 25 mg tablet oral twice daily (routine)
  - ☐ metoprolol tartrate 25 mg tablet oral twice daily (routine)

- metoprolol tartrate 50 mg tablet oral twice daily (routine)
- amlodipine 5 mg tablet oral daily (routine)
- nitroglycerin 0.4 mg tablet sub-lingual every 5 minutes as needed for chest pain; maximum 3 tablets (routine)

- Antiplatelet Therapy
-
  - aspirin 81 mg enteric coated tablet oral daily (routine)
- Risk Factor Reduction
-
  - atorvastatin 20 mg tablet oral daily (routine)
  - atorvastatin 40 mg tablet oral daily (routine)
  - simvastatin 20 mg tablet oral daily (routine)
  - simvastatin 40 mg tablet oral daily (routine)
  - rosuvastatin 5 mg tablet oral daily (routine)
  - rosuvastatin 10 mg tablet oral daily (routine)
  - rosuvastatin 20 mg tablet oral daily (routine)

8. Evidence

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Appendix A. Appendix: Existing VA Artifacts

These artifacts consist of screenshots from the Portland VA cardiology, chest pain/coronary artery disease consult set.

Figure A.1. Cardiology - General

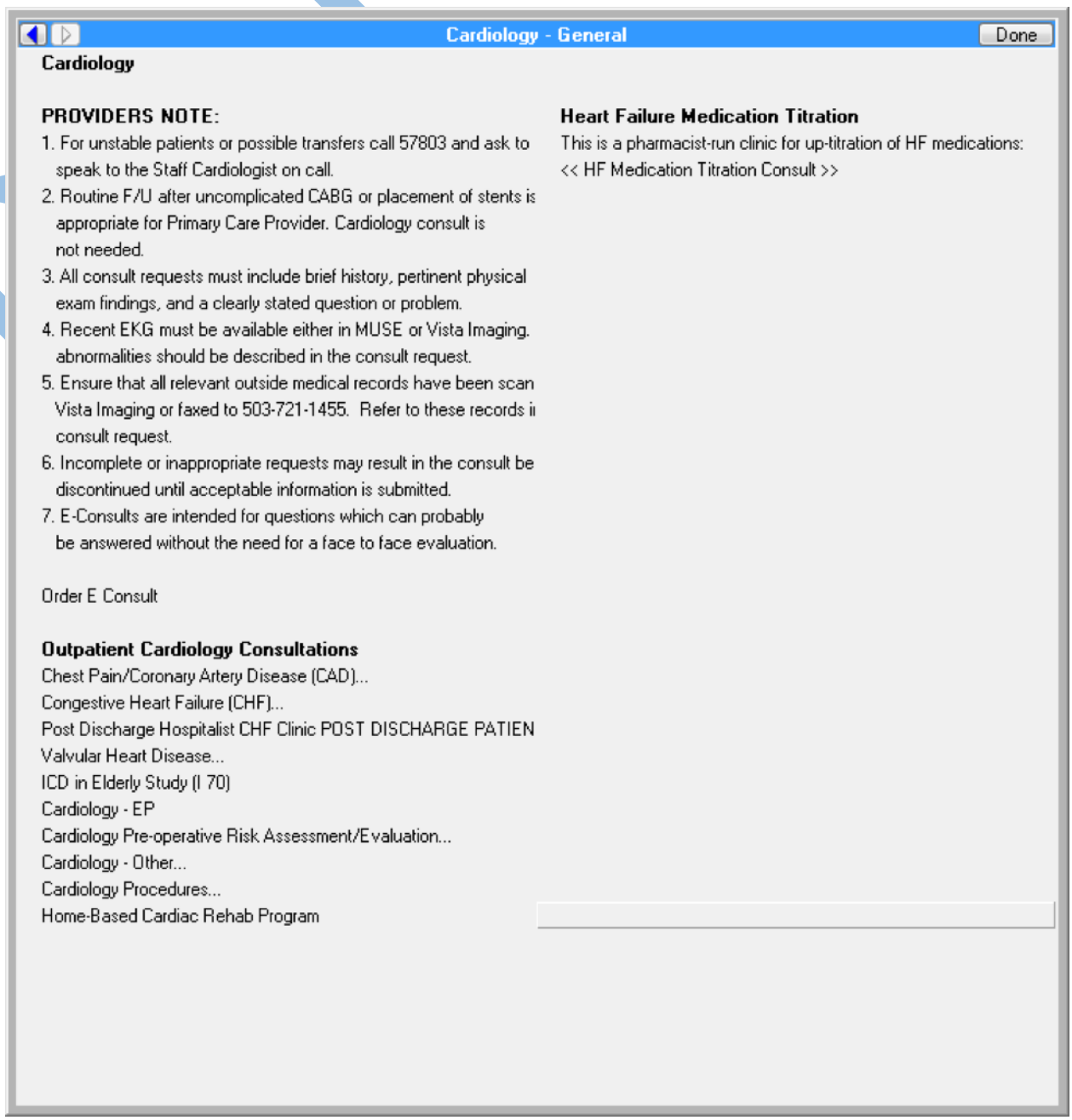

Figure A.2. Chest Pain (CP)/Coronary Artery Disease (CAD) Screenshot

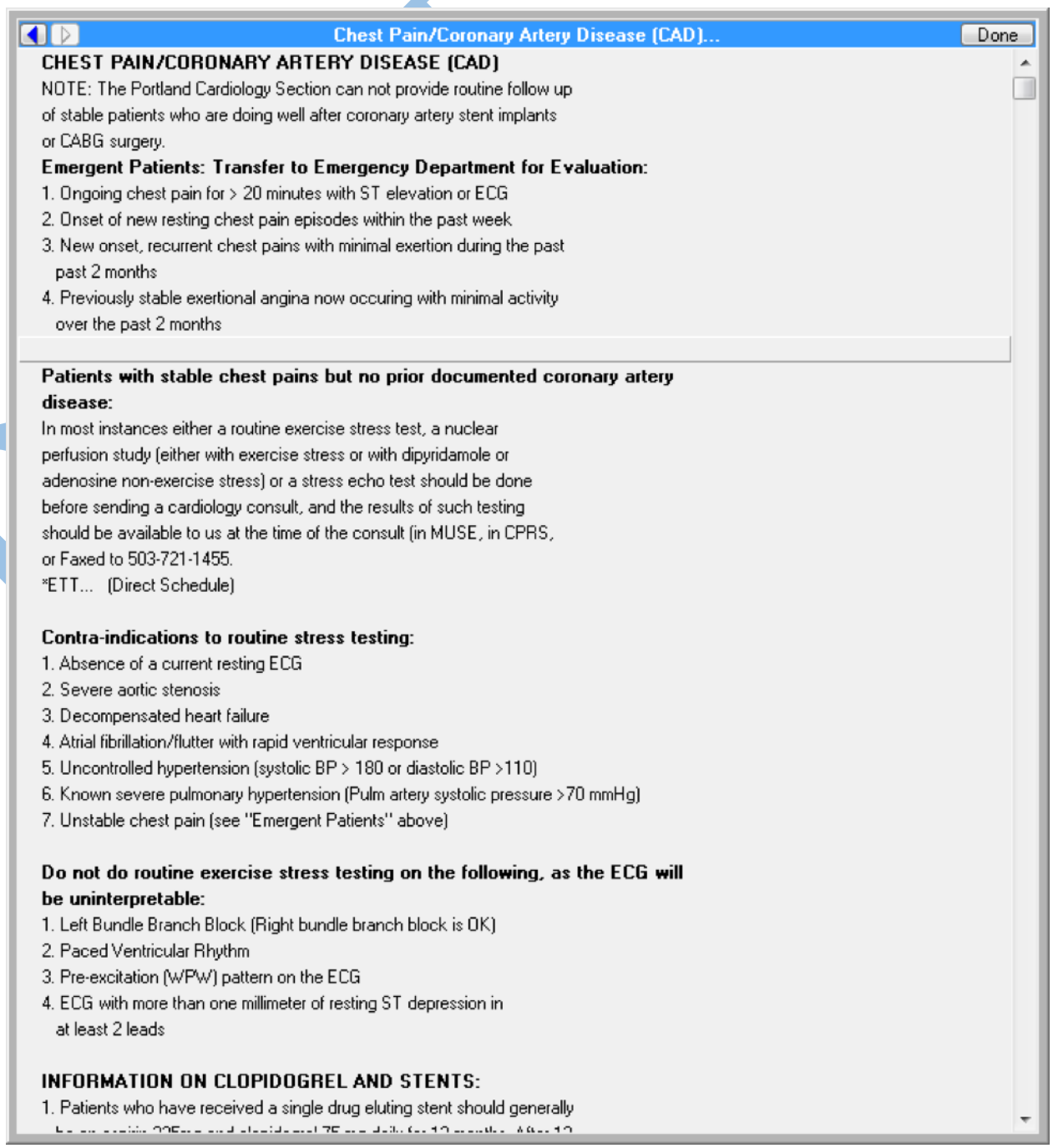

Figure A.3. Chest Pain (CP)/Coronary Artery Disease (CAD) Screenshot with Contraindications

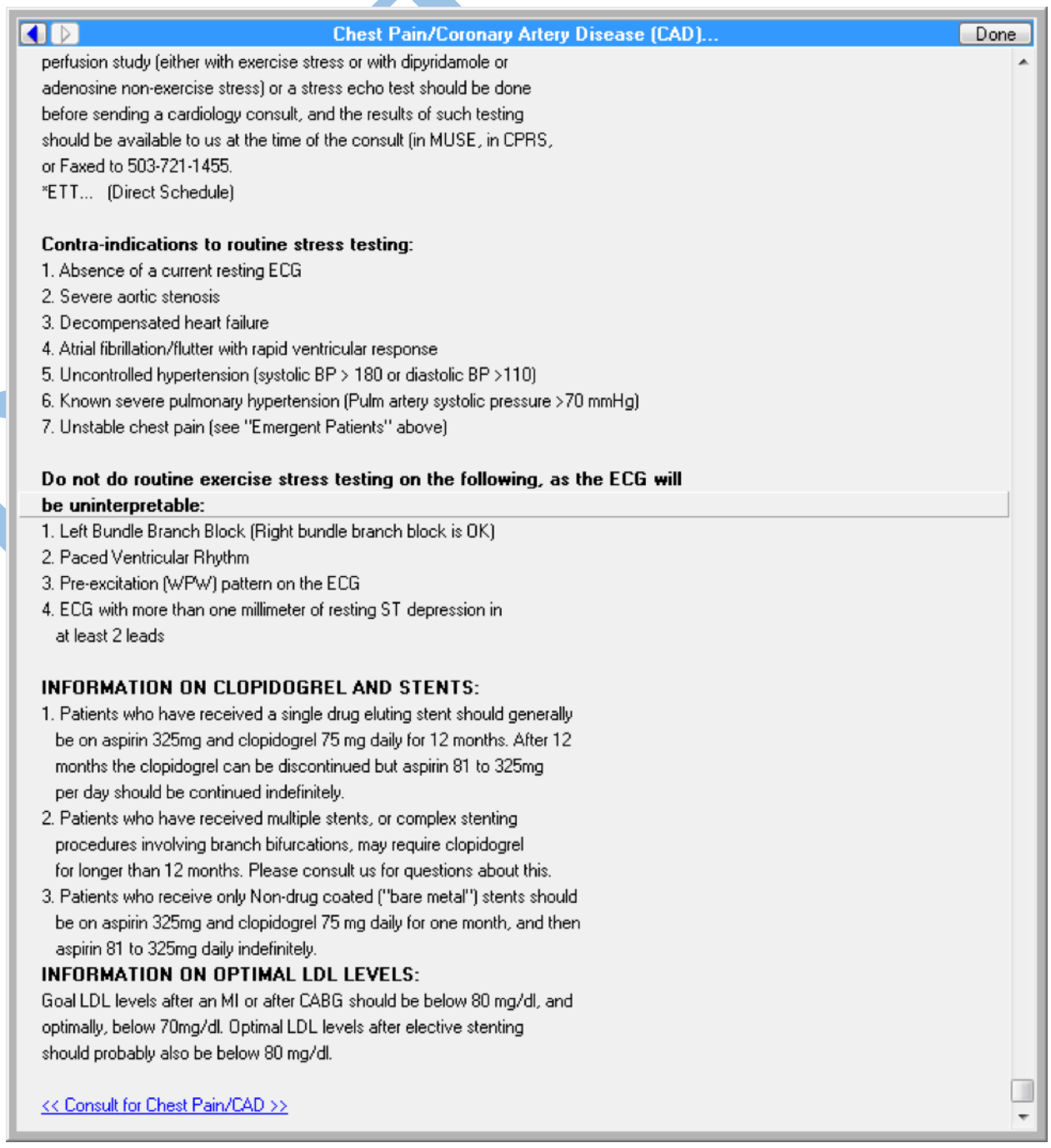

Figure A.4. Cardiology ETT Procedure

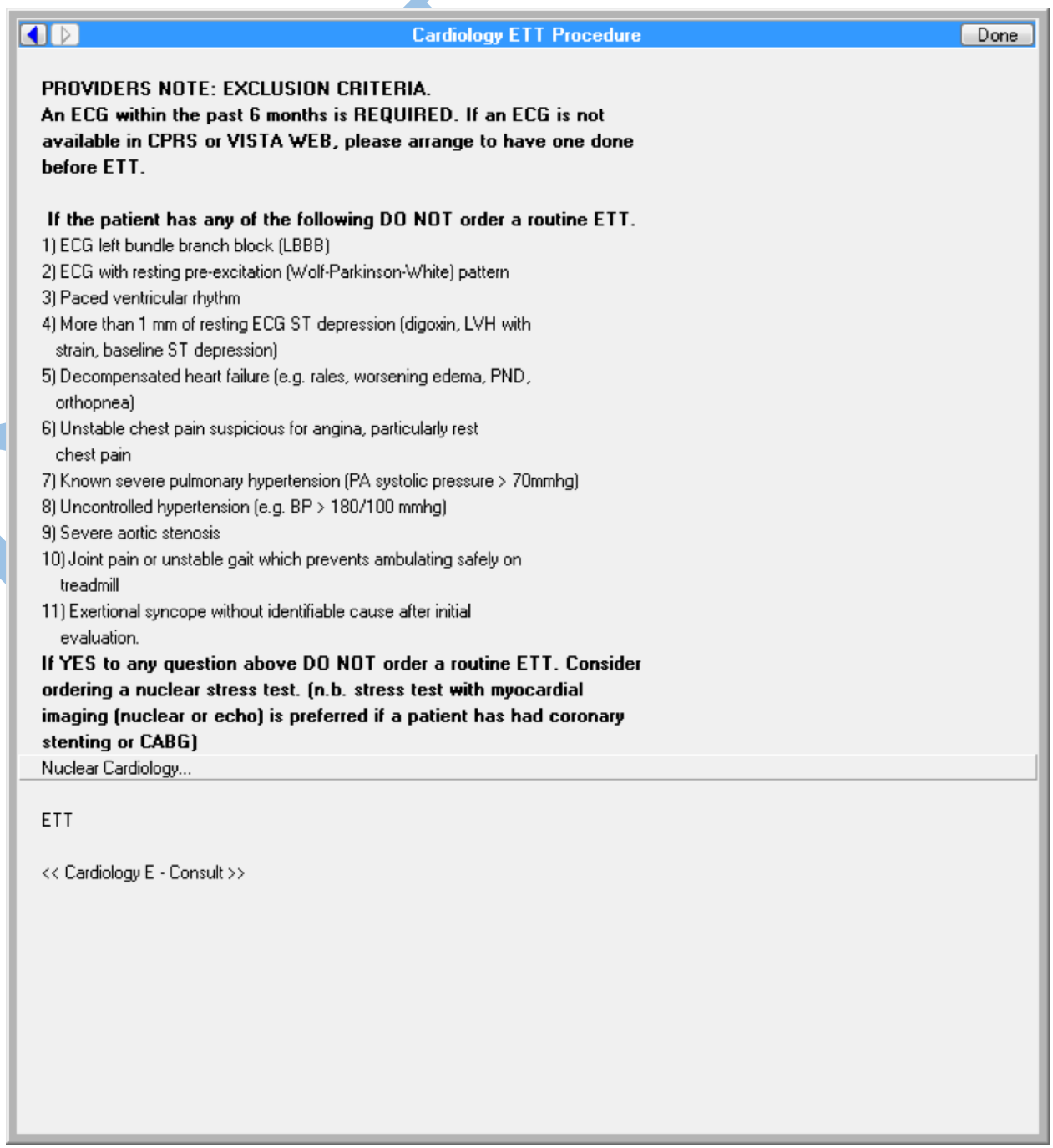

Figure A.5. Order a Procedure

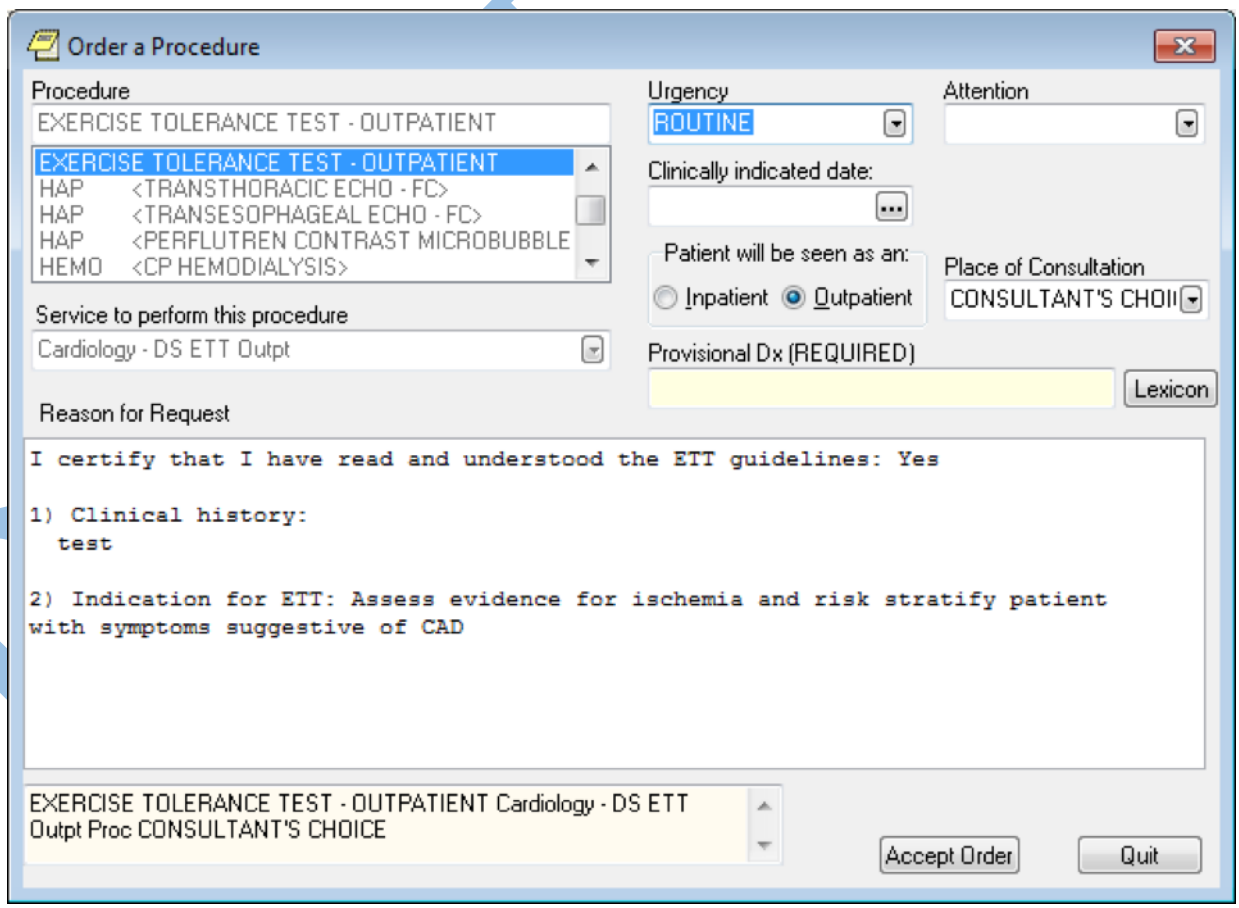

Figure A.6. ETT Request Screenshot

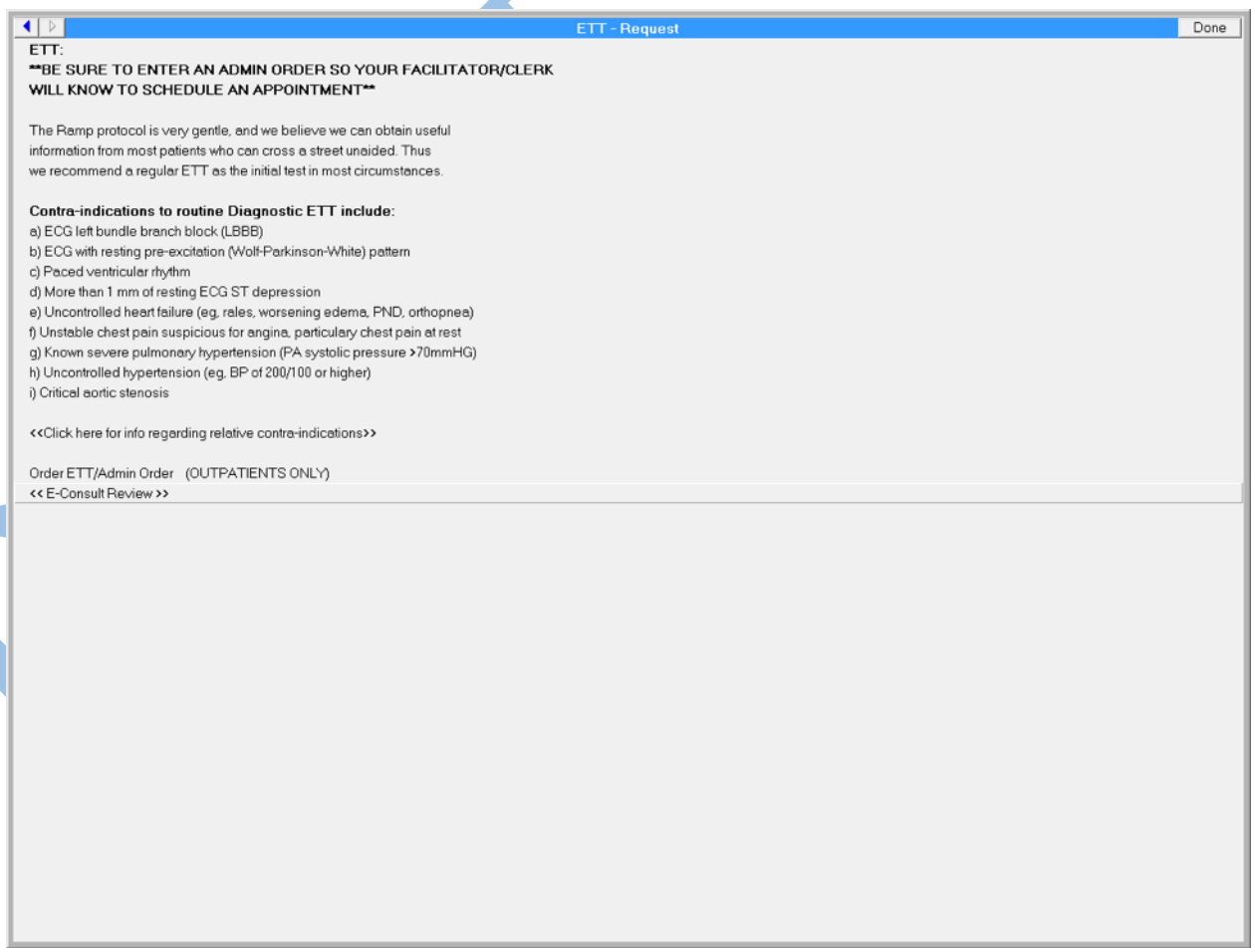

Figure A.7. Reason for Request: Cardiology - General Output

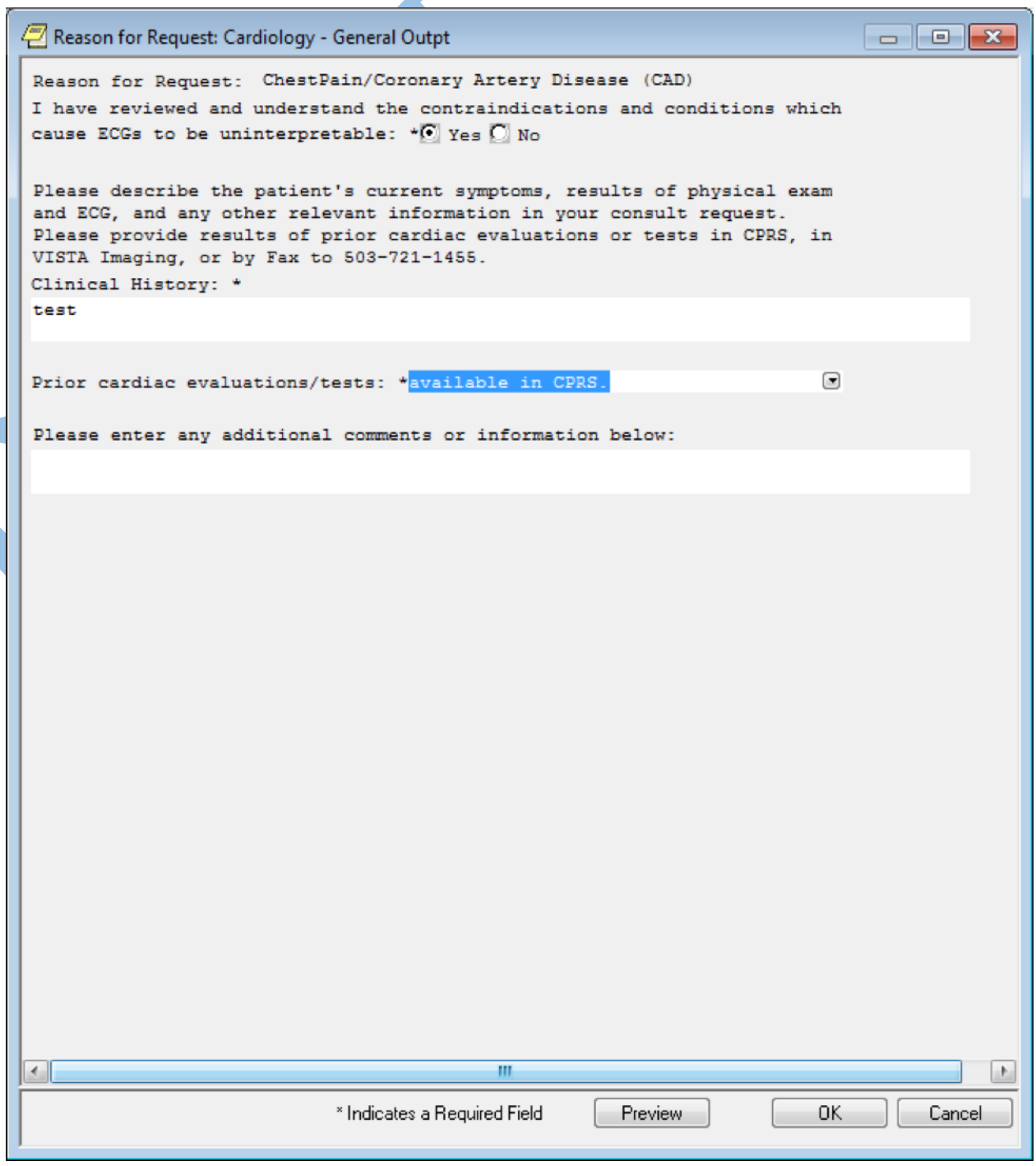

Figure A.8. Order a Consult Screenshot for Cardiology

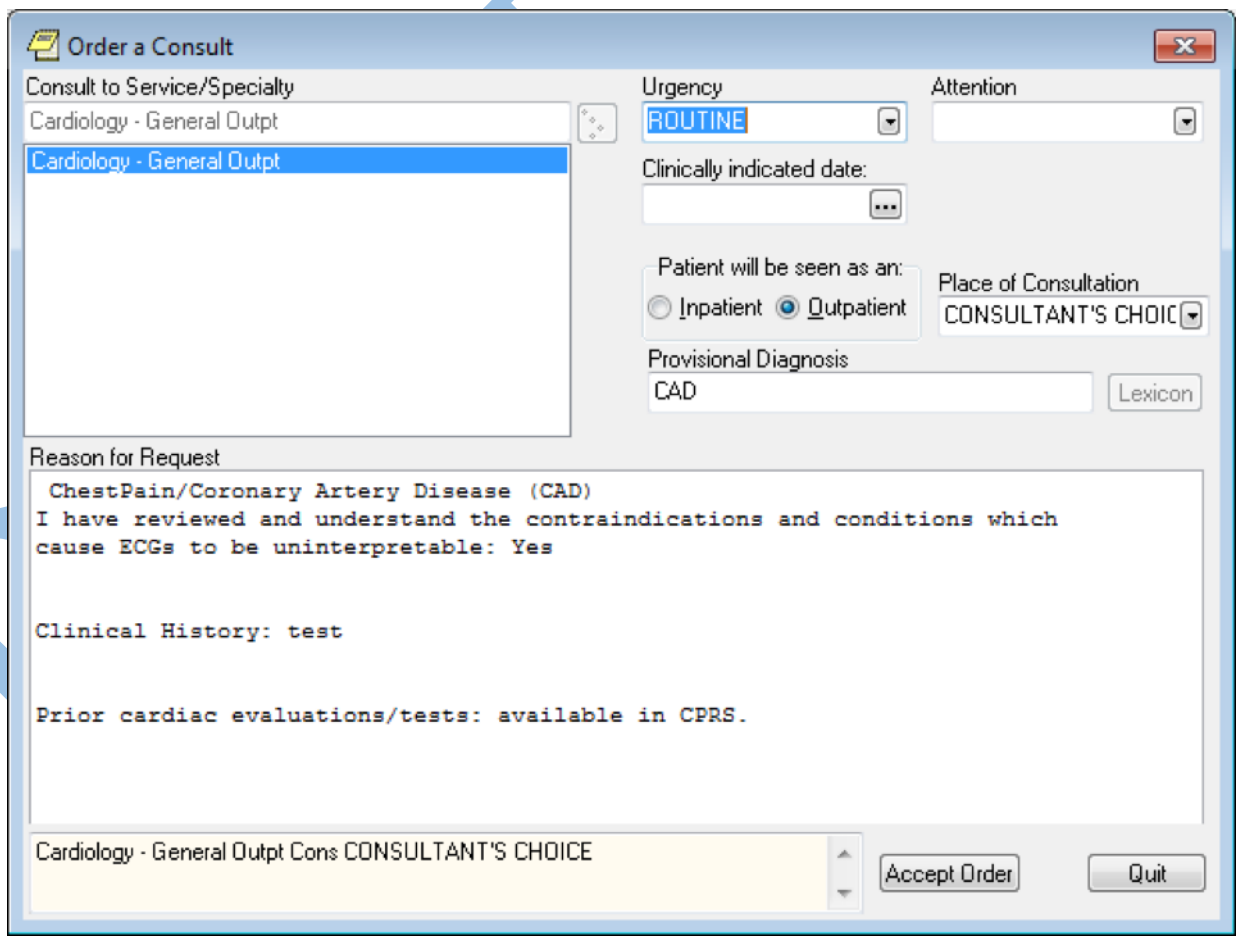

Figure A.9. Consult to Service/Specialty Screen