Cardiology: Cardiac Catheterization Documentation Template

Documentation Template: Conceptual Structure

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by Knowledge Based Systems (KBS), Office of Informatics and Information Governance (OIIG), and Clinical Decision Support (CDS)

Table of Contents

List of Tables

Preface

Table 1. Revision History

Date	Life Cycle Event
June 19, 2018	Published
April 27, 2018	Published
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Table 2. Clinical White Paper Contributors

Name	Role	Affiliation
Bruce Bray, MD	Author	Professor, Cardiovascular Medicine, University of Utah School of Medicine; Staff Cardiologist, Salt Lake City VA Medical Center (VAMC), 500 Foothill Drive, Salt Lake City, Utah 84148
Scott Wall, MD	Author	Assistant Professor, Cardiovascular Medicine, University of Utah; School of Medicine Staff Cardiologist, Electrophysiology, Salt Lake City VAMC, 500 Foothill Drive, Salt Lake City, Utah 84148
Aiden Abidov, MD PhD	Author	Professor of Medicine, Wayne State University; Section Chief, Cardiology, John Dingell VAMC

Table 3. Artifact Identifier

Domain	Artifact ID	Name
urn:va.gov:kbs:knart:artifact:r1	cf545df8-8afe-55b0-b4c0-a72c4dc9e2c6	O30

Artifact Applicability

Table 4. Applicability Foci, Description and Codes

Focus	Description	Code System	Code	Value Set	Value Set Version
TargetUser	Cardiologists			N/A	N/A
ClinicalFocus	Adult Catheterization lab patients			N/A	N/A
ClinicalVenue	Inpatient			N/A	N/A
ClinicalVenue	Cardiology Service			N/A	N/A
PatientAgeGroup	Adult patients with suspected cardiac disease requiring invavise diagnosis and/or treatment	SNOMED CT	133936004 |Adult (person)|	N/A	N/A
PatientGender	All			N/A	N/A
WorkflowTask	Cardiac Catheterization			N/A	N/A

Models

Table 5. Model References

Referenced Model	Description
urn:solor.io:anf-model:1.0	VA Analysis Normal Form Model

Chapter 1. External Data Definitions

Definitions

Table 1.1. Comprehensive Metabolic Profile Lab Result

Expression: type=elm:Query

Annotation:

Codes: elm:value[elm:Code]: [398166005 |Performed (qualifier value)|]elm:value[elm:Code]: [1411000205104 |Comprehensive metabolic panel (procedure)|]

Table 1.2. Complete Blood Count Lab Result

Expression: type=elm:Query

Annotation:

Codes: elm:value[elm:Code]: [398166005 |Performed (qualifier value)|]elm:value[elm:Code]: [26604007 |Complete blood count (procedure)|]

Table 1.3. Brain Natriuretic Peptide Lab Result

Expression: type=elm:Query

Annotation:

Codes: elm:value[elm:Code]: [398166005 |Performed (qualifier value)|]elm:value[elm:Code]: [390917008 |Brain natriuretic peptide measurement (procedure)|]

Table 1.4. Troponin Lab Result

Expression: type=elm:Query

Annotation:

Codes: elm:value[elm:Code]: [398166005 |Performed (qualifier value)|]elm:value[elm:Code]: [105000003 |Troponin measurement (procedure)|]

Table 1.5. Magnesium Result

Expression: type=elm:Query

Annotation:

Codes: elm:value[elm:Code]: [398166005 |Performed (qualifier value)|]elm:value[elm:Code]: [38151008 |Magnesium measurement (procedure)|]

Table 1.6. Activated Partial Thromboplastin Time (aPTT) Result

Expression: type=elm:Query

Annotation:

Codes: elm:value[elm:Code]: [398166005 |Performed (qualifier value)|]elm:value[elm:Code]: [42525009 |Partial thromboplastin time, activated (procedure)|]

Table 1.7. Human Chorionic Gonadotropin Result

Expression: type=elm:Query

Annotation:

Codes: elm:value[elm:Code]: [398166005 |Performed (qualifier value)|]elm:value[elm:Code]: [67900009 |Human chorionic gonadotropin measurement (procedure)|]

Table 1.8. Fingerstick Glucose Result

Expression: type=elm:Query

Annotation:

Codes: elm:value[elm:Code]: [398166005 |Performed (qualifier value)|]elm:value[elm:Code]: [302789003 |Capillary blood glucose measurement (procedure)|]

Table 1.9. 12-Lead ECG

Expression: type=elm:Query

Annotation:

Codes: elm:value[elm:Code]: [398166005 |Performed (qualifier value)|]elm:value[elm:Code]: [268400002 |12 lead electrocardiogram (procedure)|]

Table 1.10. 12-Lead ECG Interpretation

Expression: type=elm:Query

Annotation:

Codes: elm:value[elm:Code]: [398166005 |Performed (qualifier value)|]elm:value[elm:Code]: [[370851004 |Evaluation of diagnostic study results (procedure)] ->(363702006 |Has focus (attribute))->[268400002 |12 lead electrocardiogram (procedure)|]]

Table 1.11. Chest X-Ray

Expression: type=elm:Query

Annotation:

Codes: elm:value[elm:Code]: [398166005 |Performed (qualifier value)|]elm:value[elm:Code]: [399208008 |Plain chest X-ray (procedure)|]

Table 1.12. Chest X-Ray Interpretation

Expression: type=elm:Query

Annotation:

Codes: elm:value[elm:Code]: [398166005 |Performed (qualifier value)|]elm:value[elm:Code]: [[370851004 |Evaluation of diagnostic study results (procedure)] ->(363702006 |Has focus (attribute))->[399208008 |Plain chest X-ray (procedure)|]]

Table 1.13. Echocardiogram

Expression: type=elm:Query

Annotation:

Codes: elm:value[elm:Code]: [398166005 |Performed (qualifier value)|]elm:value[elm:Code]: [40701008 |Echocardiography (procedure)|]

Table 1.14. Echocardiogram Interpretation

Expression: type=elm:Query

Annotation:

Codes: elm:value[elm:Code]: [398166005 |Performed (qualifier value)|]elm:value[elm:Code]: [[370851004 |Evaluation of diagnostic study results (procedure)] ->(363702006 |Has focus (attribute))->[40701008 |Echocardiography (procedure)]]

Triggers

No trigger definitions are present.

Chapter 2. Expression Definitions

No expression definitions are present.

Chapter 3. Cardiac Catheterization Indications

Indications for cardiac catheterization.

	# Suspected Acute Coronary Syndrome
prompt:	
item-Code:	[a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006	Has focus (attribute))->[394659003 |Acute coronary syndrome (disorder)]
re-sponse:	Boolean (Single)
	# Suspected Coronary Artery Disease (CAD)
prompt:	
item-Code:	[a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006	Has focus (attribute))->[53741008 |Coronary arteriosclerosis (disorder)]
re-sponse:	Boolean (Single)

#	Suspected CAD Detail
# prompt:	ST-segment Elevation Myocardial Infarction (STEMI)
response:	Boolean (Single)
# prompt:	Stress Test Findings
response:	EntityName (Multiple)
response range:	EnumerationConstraint (List)
item:	High-Risk Findings on Electrocardiogram (ECG) Stress Test (e.g., Duke Treadmill Score <-12, Ventricular Tachycardia, Prolonged ST-Segment Depression, or Exercise-Induced Hypotension)(TSR-NoCode)
item:	High-Risk Findings on Imaging Stress Test (e.g., >10% Ischemic Myocardium on Nuclear Perfusion Imaging, Stress-Induced Wall Motion Abnormality in >= 2 Segments on Echocardiography, Transient Ischemic Dilation, or Stress-Induced Left Ventricular Dysfunction)(TSR-NoCode)
item:	Resting Left Ventricular Ejection Fraction (LVEF) <41% and Viable Myocardium in Dysfunctional Segment (Reversible Ischemia) on Imaging Stress Test(000ca427-81f2-4af6-829e-06fa21957039 |Cardiovascular stress diagnostic imaging procedure (procedure) ->(363714003 |Interprets (attribute))->[250908004 |Left ventricular ejection fraction (observable entity)])
# prompt:	Symptoms
response:	EntityName (Multiple)
response range:	EnumerationConstraint (List)
item:	Symptomatic Patient with High Pretest Probability of coronary artery disease and No Prior Noninvasive Stress Imaging(TSR-NoCode)
item:	Symptomatic Patient with Intermediate-Risk Findings on Imaging Stress Test (5% to 10% Ischemic Myocardium on Nuclear Perfusion Imaging

or Stress-Induced Wall Motion Abnormality in 1 Segment on Echocardiography)(TSR-NoCode)

item: Symptomatic Patient with Discordant or Equivocal/Uninterpretable Findings on Imaging Stress Test(TSR-NoCode)

item: Symptomatic Patient with New Left Ventricular Systolic Dysfunction (LVEF =;<40%) of Unknown Etiology on Transthoracic Echocardiography(TSR-NoCode)

item: Symptomatic Patient with Suspected Significant Ischemic Complication of CAD on Transthoracic or Transesophageal Echocardiography (e.g., Mitral Regurgitation or Ventricular Septal Defect)(TSR-NoCode)

item: Symptomatic Patient with Any Lesion >= 50% on Coronary Computed Tomography (CT) Angiography(TSR-NoCode)

item: Symptomatic Patient with Possibly Obstructive Lesion of Unclear Severity on Coronary CT Angiography(TSR-NoCode)

prompt: Known Coronary Artery Disease (CAD)

itemCode: [a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[53741008 |Coronary arteriosclerosis (disorder)]

response: EntityName (Multiple)

response range: EnumerationConstraint (List)

item: Medically Managed Patient with Limiting or Worsening Symptoms and Noninvasive Findings of Intermediate Risk that have worsened(TSR-NoCode)

item: Medically Managed Patient and High-Risk Noninvasive Findings(TSR-NoCode)

item: Post revascularization (PCI or CABG) Patient with Limiting or Worsening Symptoms and Intermediate-Risk Noninvasive Findings(TSR-NoCode)

item: Post revascularization Patient with Limiting or Worsening Symptoms and High-Risk Noninvasive Findings(TSR-NoCode)

prompt: Return of Spontaneous Circulation after Resuscitated Cardiac Arrest of Unclear Etiology

itemCode: TSR-NoCode

response: Boolean (Single)

prompt: Ventricular Fibrillation of Unclear Etiology

itemCode: [a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[71908006 |Ventricular fibrillation (disorder)]

response: Boolean (Single)

prompt: Sustained Ventricular Tachycardia of Unclear Etiology

itemCode: [a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[426525004 |Sustained ventricular tachycardia (disorder)]

response: Boolean (Single)

prompt: Assessment of Valvular Heart Disease

response: EntityName (Multiple)

response range: EnumerationConstraint (List)

item: Mitral Valve([a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[11851006 |Mitral valve disorder (disorder)])

item: Aortic Valve([a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[8722008 |Aortic valve disorder (disorder)])

item: Tricuspid Valve([a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[20721001 |Tricuspid valve disorder (disorder)])

item: Pulmonary Valve([a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[76267008 |Pulmonary valve disorder (disorder)])

prompt: Pulmonary Hypertension Disproportionate to Valvular Disease

itemCode: [a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[70995007 |Pulmonary hypertension (disorder)]

response: Boolean (Single)

prompt: Left Ventricular Dysfunction Disproportionate to Valvular Disease

itemCode: [a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[429589006 |Left ventricular cardiac dysfunction (disorder)]

response: Boolean (Single)

prompt: Conflict between Findings of Noninvasive Imaging for Mitral or Aortic Stenosis or Regurgitation and Clinical Impression of Severity

response: Boolean (Single)

prompt: Suspected Pericardial Tamponade

itemCode: [a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[35304003 |Cardiac tamponade (disorder)]

response: Boolean (Single)

prompt: Suspected or Uncertain Constrictive or Restrictive Pericardial Disease

itemCode: [a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[85598007 |Constrictive pericarditis (disorder)]

response: Boolean (Single)

prompt: Suspected or Known Cardiomyopathy

itemCode: [a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[85898001 |Cardiomyopathy (disorder)]

response: Boolean (Single)

prompt: Reevaluation of Known Cardiomyopathy to Guide Therapy or after Change in Clinical Status or Exam

itemCode: [386053000 |Evaluation procedure (procedure)] ->(363702006 |Has focus (attribute))->[85898001 |Cardiomyopathy (disorder)]

response: Boolean (Single)

prompt: Additional Prior Indication Detail

response: String (Single)

Chapter 4. Prior Cardiac Procedures

Prior Cardiac Procedures.

#	Most Recent Angiography
	Represented Concepts: 33367005 |Coronary angiography (procedure)|

> # prompt: Date
> response: Timestamp (Single)
> # prompt: Findings
> response: String (Single)

#	Most Recent Percutaneous Coronary Intervention
	Represented Concepts: 415070008 |Percutaneous coronary intervention (procedure)|

> # prompt: Date
> response: Timestamp (Single)
> # prompt: Findings
> response: String (Single)

#	Prior Cardiac Operative Report

> # prompt: Date
> response: Timestamp (Single)
> # prompt: Findings
> response: String (Single)

#	Prior Cardiac Reports

> # prompt: Additional Prior Cardiac Reports?
> response: String (Single)
> response range: EnumerationConstraint (List)
> > item: Yes
> > item: No

# ❖	Prior Cardiac Operative Report

> > # prompt: Date
> > response: Timestamp (Single)
> > # prompt: Findings
> > response: String (Single)

Additional Prior Cardiac Procedure Detail

prompt:

re- String (Single)
sponse:

Chapter 5. Plan

#	Planned Procedure?

	# prompt:	Left Heart Catheterization
	itemCode:	67629009 |Catheterization of left heart (procedure)|
	response:	Boolean (Single)

	#		
		# prompt:	Coronary Angiography
		itemCode:	33367005 |Coronary angiography (procedure)|
		response:	Boolean (Single)
		# prompt:	Left Ventriculography
		itemCode:	265484009 |Left ventriculogram (procedure)|
		response:	Boolean (Single)

	# prompt:	Right Heart Catheterization
	itemCode:	40403005 |Catheterization of right heart (procedure)|
	response:	Boolean (Single)
	# prompt:	Pericardiocentesis
	itemCode:	309849004 |Pericardiocentesis (procedure)|
	response:	Boolean (Single)
	# prompt:	Possible Percutaneous Coronary Intervention, Angioplasty, and Stent
	itemCode:	415070008 |Percutaneous coronary intervention (procedure)|
	itemCode:	41339005 |Coronary angioplasty (procedure)|
	itemCode:	36969009 |Placement of stent in coronary artery (procedure)|
	response:	Boolean (Single)
	# prompt:	Endomyocardial Biopsy
	itemCode:	387829002 |Endomyocardial biopsy (procedure)|
	response:	Boolean (Single)
	# prompt:	Other procedures?
	response:	Boolean (Single)

	#		
		# prompt:	Specify other planned procedure
		response:	String (Single)

#	Planned Access Site?

	# prompt:	Specify Site
	response:	Code (Single)
	response range:	EnumerationConstraint (List)
	item:	Left Femoral Vein([83419000 |Femoral vein structure (body structure)] ->(272741003 |Laterality (attribute))->[7771000 |Left (qualifier value)])
	item:	Right Femoral Vein([83419000 |Femoral vein structure (body structure)] ->(272741003 |Laterality (attribute))->[24028007 |Right (qualifier value)])

item: Left Radial Artery([45631007 |Structure of radial artery (body structure)] ->(272741003 |Laterality (attribute))->[7771000 |Left (qualifier value)])

item: Right Radial Artery([45631007 |Structure of radial artery (body structure)] ->(272741003 |Laterality (attribute))->[24028007 |Right (qualifier value)])

item: Left Internal Jugular Vein([12123001 |Internal jugular vein structure (body structure)] ->(272741003 |Laterality (attribute))->[7771000 |Left (qualifier value)])

item: Right Internal Jugular Vein([12123001 |Internal jugular vein structure (body structure)] ->(272741003 |Laterality (attribute))->[24028007 |Right (qualifier value)])

item: Left Subclavian Vein([9454009 |Structure of subclavian vein (body structure)] ->(272741003 |Laterality (attribute))->[7771000 |Left (qualifier value)])

item: Right Subclavian Vein([9454009 |Structure of subclavian vein (body structure)] ->(272741003 |Laterality (attribute))->[24028007 |Right (qualifier value)])

item: Other

prompt: Details of alternative site and approach

response: String (Single)

Chapter 6. Consent

# prompt:	Consent Obtained?
response:	Boolean (Single)

Chapter 7. Special Considerations

#	Radiocontrast Allergy	
	# prompt:	Radiocontrast Allergy?
	itemCode:	[a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[293637006 |Allergy to contrast media (disorder)]
	response:	String (Single)
	response range:	EnumerationConstraint (List)
	item:	Yes
	item:	No
responseBinding:	Property ("Radiocontrast Allergy")	
Condition: elm:IsTrue (elm:Property("Radiocontrast Allergy"))		
	# prompt:	History and Description of Reaction
	response:	String (Single)

#	Diabetes?	
	# prompt:	History of Diabetes Mellitus?
	itemCode:	[a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[73211009 |Diabetes mellitus (disorder)]
	response:	Boolean (Single)
responseBinding:	Property ("History of Diabetes")	

#	**Condition:** elm:IsTrue (elm:Property("History of Diabetes"))	
	Insulin	
	# Hold Insulin	
		prompt: Hold Insulin
		itemCode: [416118004 |Administration (procedure)] ->(260686004 |Method (attribute))->[129445006 |Administration - action (qualifier value)] ->(363701004 |Direct substance (attribute))->[67866001 |Insulin (substance)]
		response: Boolean (Single)
	initalValue: elm:Literal (Boolean) True	
		# prompt: Details
		response: String (Single)

#	**Condition:** elm:IsTrue (elm:Property("History of Diabetes"))	
	Metformin	
	# Hold Metformin	
		prompt: Hold Metformin
		itemCode: [416118004 |Administration (procedure)] ->(260686004 |Method (attribute))->[129445006 |Administration - action (qualifier value)] ->(363701004 |Direct substance (attribute))->[372567009 |Metformin (substance)]

		response: Boolean (Single)
		initalValue: elm:Literal (Boolean) True
		# prompt: Details
		response: String (Single)

#	Anticoagulation?	
	# prompt:	Currently on Anticoagulant Therapy?
	itemCode:	182764009 |Anticoagulant therapy (procedure)|
	response:	Boolean (Single)
	responseBinding:	Property ("Currently on Anticoagulant Therapy")
	#	**Condition:**elm:IsTrue (elm:Property("Currently on Anticoagulant Therapy"))
	Modify Anticoagulant Therapy?	
		# Hold Anticoagulant Therapy
		prompt: Hold Anticoagulant Therapy
		itemCode: [416118004 |Administration (procedure)] ->(260686004 |Method (attribute))->[129445006 |Administration - action (qualifier value)] ->(363701004 |Direct substance (attribute))->[372862008 |Anticoagulant (substance)]
		response: Boolean (Single)
		initalValue: elm:Literal (Boolean) True
		# prompt: Details
		response: String (Single)

#	Renal Disease	
	# prompt:	History of renal disease?
	itemCode:	[a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[90708001 |Kidney disease (disorder)]
	response:	Boolean (Single)
	# prompt:	Stage?
	response:	Code (Single)
	response range:	EnumerationConstraint (List)
	item:	Stage 1 (Glomerular Filtration Rate >= 90 mL/min per 1.73 m^2)([a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[431855005 |Chronic kidney disease stage 1 (disorder)])
	item:	Stage 2 (Glomerular Filtration Rate 60 to 89 mL/min per 1.73 m^2)([a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[431856006 |Chronic kidney disease stage 2 (disorder)])
	item:	Stage 3 (Glomerular Filtration Rate 30 to 59 mL/min per 1.73 m^2)([a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[433144002 |Chronic kidney disease stage 3 (disorder)])
	item:	Stage 4 (Glomerular Filtration Rate 15 to 29 mL/min per 1.73 m^2)([a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] -

>(363702006 |Has focus (attribute))->[431857002 |Chronic kidney disease
stage 4 (disorder)])

item: Stage 5 (Glomerular Filtration Rate < 15 mL/min per 1.73 m^2 or on dialy-
sis)([a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (pro-
cedure)] ->(363702006 |Has focus (attribute))->[433146000 |Chronic kidney
disease stage 5 (disorder)])

Chapter 8. Laboratory Studies

Lab Results	
# prompt: Comprehensive Metabolic Profile Lab Result	
response: Tuple (Single)	
initalValue: Comprehensive Metabolic Profile Lab Result	
# prompt: Complete Blood Count Lab Result	
response: Tuple (Single)	
initalValue: Complete Blood Count Lab Result	
# prompt: Brain Natriuretic Peptide Lab Result	
response: Tuple (Single)	
initalValue: Brain Natriuretic Peptide Lab Result	
# prompt: Troponin Lab Result	
response: Tuple (Single)	
initalValue: Troponin Lab Result	
# prompt: Magnesium Result	
response: Tuple (Single)	
initalValue: Magnesium Result	
# prompt: Activated Partial Thromboplastin Time (aPTT) Result	
response: Tuple (Single)	
initalValue: Activated Partial Thromboplastin Time (aPTT) Result	
# prompt: Human Chorionic Gonadotropin Result	
response: Tuple (Single)	
initalValue: Human Chorionic Gonadotropin Result	

Point of Care Studies	
# prompt: Fingerstick Glucose Result	
response: Tuple (Single)	
initalValue: Fingerstick Glucose Result	

Chapter 9. Imaging and Diagnostic Results

12-Lead ECG	
Link results: 12-Lead ECG interpretation	
# prompt:	12-Lead ECG Interpretation
response:	Tuple (Single)
initalValue: 12-Lead ECG Interpretation	
Link images: 12-Lead ECG	
# prompt:	12-Lead ECG
response:	Tuple (Single)
initalValue: 12-Lead ECG	
Chest X-Ray	
Link results: Chest X-Ray interpretation	
# prompt:	Chest X-Ray Interpretation
response:	String (Single)
initalValue: Chest X-Ray Interpretation	
Link images: X-Ray Chest	
# prompt:	Chest X-Ray
response:	Tuple (Multiple)
initalValue: Chest X-Ray	
Echocardiogram	
Link results: Echocardiogram Interpretation	
# prompt:	Echocardiogram Interpretation
response:	String (Single)
initalValue: Echocardiogram Interpretation	
Link images: Echocardiogram	
# prompt:	Echocardiogram
response:	Tuple (Multiple)
initalValue: Echocardiogram	

Chapter 10. Brief Post-Catheterization Note

#	Brief Post Catheterization Note

	link to: VA Clinical Assessment Reporting and Tracking (CART) Program for cardiac catheterization laboratories (Cart-CL) Report

	# prompt:	CART Report
	response:	Tuple (Single)

#	Procedure Performed

	# prompt:	Left Heart Catheterization
	itemCode:	67629009 |Catheterization of left heart (procedure)|
	response:	Boolean (Single)

	#	
		# prompt: Coronary Angiography
		itemCode: 33367005 |Coronary angiography (procedure)|
		response: Boolean (Single)
		# prompt: Left Ventriculography
		itemCode: 265484009 |Left ventriculogram (procedure)|
		response: Boolean (Single)

	# prompt:	Right Heart Catheterization
	itemCode:	40403005 |Catheterization of right heart (procedure)|
	response:	Boolean (Single)
	# prompt:	Pericardiocentesis
	itemCode:	309849004 |Pericardiocentesis (procedure)|
	response:	Boolean (Single)
	# prompt:	Other procedures?
	response:	Boolean (Single)

	#	
		# prompt: Specify details of other procedure
		response: String (Single)

#	Interventions

	# prompt:	Percutaneous Coronary Intervention
	itemCode:	415070008 |Percutaneous coronary intervention (procedure)|
	response:	Boolean (Single)

	#	
		# prompt: Angioplasty
		itemCode: 41339005 |Coronary angioplasty (procedure)|
		response: Boolean (Single)
		# prompt: Stent

itemCode: 36969009 |Placement of stent in coronary artery (procedure)|

response: Boolean (Single)

prompt: Endomyocardial Biopsy

itemCode: 387829002 |Endomyocardial biopsy (procedure)|

response: Boolean (Single)

#

prompt: Other interventions?

response: Boolean (Single)

prompt: Specify details of other interventions

response: String (Single)

Access Site

prompt: Specify Access Site

response: EntityName (Single)

response range: EnumerationConstraint (List)

item: Left Femoral Vein([83419000 |Femoral vein structure (body structure)] ->(272741003 |Laterality (attribute))->[7771000 |Left (qualifier value)])

item: Right Femoral Vein([83419000 |Femoral vein structure (body structure)] ->(272741003 |Laterality (attribute))->[24028007 |Right (qualifier value)])

item: Left Radial Artery([45631007 |Structure of radial artery (body structure)] ->(272741003 |Laterality (attribute))->[7771000 |Left (qualifier value)])

item: Right Radial Artery([45631007 |Structure of radial artery (body structure)] ->(272741003 |Laterality (attribute))->[24028007 |Right (qualifier value)])

item: Left Internal Jugular Vein([12123001 |Internal jugular vein structure (body structure)] ->(272741003 |Laterality (attribute))->[7771000 |Left (qualifier value)])

item: Right Internal Jugular Vein([12123001 |Internal jugular vein structure (body structure)] ->(272741003 |Laterality (attribute))->[24028007 |Right (qualifier value)])

item: Left Subclavian Vein([9454009 |Structure of subclavian vein (body structure)] ->(272741003 |Laterality (attribute))->[7771000 |Left (qualifier value)])

item: Right Subclavian Vein([9454009 |Structure of subclavian vein (body structure)] ->(272741003 |Laterality (attribute))->[24028007 |Right (qualifier value)])

item: Other

prompt: Details of alternative site and approach

response: String (Single)

prompt: Sheath size (French)

response: Real (Single)

```
        # prompt:  Findings
         response:  String (Single)
        # prompt:  Details of Performed Interventions
         response:  String (Single)
        # prompt:  Complications
         response:  String (Single)
        # prompt:  Automatic Closure Device Employed?
         response:  EntityName (Single)
 response range:  EnumerationConstraint (List)
            item:  YES
            item:  NO
```

Chapter 11. Tabular List

Terminology Service Request (TSR) Mappings

Table 11.1. Terminology Versions

Name	Identifer	Version
SNOMED CT	2.16.840.1.113883.6.96	United States Edition 20180301

Table 11.2. Terminology References

System	Code	Display Text[a]	References[b]
SNOMED CT	000ca427-81f2-4af6-829e-06a3105703f9 |Cardiovascular stress diagnostic imaging procedure (procedure) ->(363714003 |Interprets (attribute))->[250908004 |Left ventricular ejection fraction (observable entity)]	Resting Left Ventricular Ejection Fraction (LVEF) <41% and Viable Myocardium in Dysfunctional Segment (Reversible Ischemia) on Imaging Stress Test	1
SNOMED CT	105000003 |Troponin measurement (procedure)|	Precoordinated Expression	1
SNOMED CT	133936004 |Adult (person)|	Adult patients with suspected cardiac disease requiring invavise diagnosis and/or treatment	1
SNOMED CT	1411000205104 |Comprehensive metabolic panel (procedure)|	Precoordinated Expression	1
SNOMED CT	182764009 |Anticoagulant therapy (procedure)|	Precoordinated Expression	1
SNOMED CT	265484009 |Left ventriculogram (procedure)|	Precoordinated Expression	2
SNOMED CT	26604007 |Complete blood count (procedure)|	Precoordinated Expression	1
SNOMED CT	268400002 |12 lead electrocardiogram (procedure)|	Precoordinated Expression	1
SNOMED CT	302789003 |Capillary blood glucose measurement (procedure)|	Precoordinated Expression	1
SNOMED CT	309849004 |Pericardiocentesis (procedure)|	Precoordinated Expression	2
SNOMED CT	33367005 |Coronary angiography (procedure)|	Precoordinated Expression	3
SNOMED CT	36969009 |Placement of stent in coronary artery (procedure)|	Precoordinated Expression	2

System	Code	Display Text[a]	References[b]
SNOMED CT	38151008 |Magnesium measurement (procedure)|	Precoordinated Expression	1
SNOMED CT	387829002 |Endomyocardial biopsy (procedure)|	Precoordinated Expression	2
SNOMED CT	390917008 |Brain natriuretic peptide measurement (procedure)|	Precoordinated Expression	1
SNOMED CT	398166005 |Performed (qualifier value)|	Precoordinated Expression	14
SNOMED CT	399208008 |Plain chest X-ray (procedure)|	Precoordinated Expression	1
SNOMED CT	40403005 |Catheterization of right heart (procedure)|	Precoordinated Expression	2
SNOMED CT	40701008 |Echocardiography (procedure)|	Precoordinated Expression	1
SNOMED CT	41339005 |Coronary angioplasty (procedure)|	Precoordinated Expression	2
SNOMED CT	415070008 |Percutaneous coronary intervention (procedure)|	Precoordinated Expression	3
SNOMED CT	42525009 |Partial thromboplastin time, activated (procedure)|	Precoordinated Expression	1
SNOMED CT	67629009 |Catheterization of left heart (procedure)|	Precoordinated Expression	2
SNOMED CT	67900009 |Human chorionic gonadotropin measurement (procedure)|	Precoordinated Expression	1
SNOMED CT	TSR-NoCode[c]	High-Risk Findings on Electrocardiogram (ECG) Stress Test (e.g., Duke Treadmill Score <-12, Ventricular Tachycardia, Prolonged ST-Segment Depression, or Exercise-Induced Hypotension)	14
SNOMED CT	[12123001 |Internal jugular vein structure (body structure)] ->(272741003 |Laterality (attribute))->[24028007 | Right (qualifier value)]	Right Internal Jugular Vein	2
SNOMED CT	[12123001 |Internal jugular vein structure (body structure)] ->(272741003 |Laterality (attribute))->[7771000 | Left (qualifier value)]	Left Internal Jugular Vein	2

System	Code	Display Text[a]	References[b]
SNOMED CT	[370851004 |Evaluation of diagnostic study results (procedure)] ->(363702006 |Has focus (attribute))->[268400002	12 lead electrocardiogram (procedure)]	Postcoordinated Expression	1
SNOMED CT	[370851004 |Evaluation of diagnostic study results (procedure)] ->(363702006 |Has focus (attribute))->[399208008 |Plain chest X-ray (procedure)]	Postcoordinated Expression	1
SNOMED CT	[370851004 |Evaluation of diagnostic study results (procedure)] ->(363702006 |Has focus (attribute))->[40701008	Echocardiography (procedure)]	Postcoordinated Expression	1
SNOMED CT	[386053000 |Evaluation procedure (procedure)] ->(363702006 |Has focus (attribute))->[85898001	Cardiomyopathy (disorder)]	Postcoordinated Expression	1
SNOMED CT	[416118004 |Administration (procedure)] ->(260686004 |Method (attribute))->[129445006 |Administration - action (qualifier value)] ->(363701004	Direct substance (attribute))->[372567009	Metformin (substance)]	Postcoordinated Expression	1
SNOMED CT	[416118004 |Administration (procedure)] ->(260686004 |Method (attribute))->[129445006 |Administration - action (qualifier value)] ->(363701004	Direct substance (attribute))->[372862008	Anticoagulant (substance)]	Postcoordinated Expression	1
SNOMED CT	[416118004 |Administration (procedure)] ->(260686004 |Method (at-	Postcoordinated Expression	1

System	Code	Display Text[a]	References[b]
	tribute))->[129445006 |Administration - action (qualifier value)] ->(363701004 | Direct substance (attribute))->[67866001 |Insulin (substance)]		
SNOMED CT	[45631007 |Structure of radial artery (body structure)] ->(272741003 |Laterality (attribute))->[24028007 | Right (qualifier value)]	Right Radial Artery	2
SNOMED CT	[45631007 |Structure of radial artery (body structure)] ->(272741003 |Laterality (attribute))->[7771000 | Left (qualifier value)]	Left Radial Artery	2
SNOMED CT	[83419000 |Femoral vein structure (body structure)] ->(272741003 |Laterality (attribute))->[24028007 | Right (qualifier value)]	Right Femoral Vein	2
SNOMED CT	[83419000 |Femoral vein structure (body structure)] ->(272741003 |Laterality (attribute))->[7771000 | Left (qualifier value)]	Left Femoral Vein	2
SNOMED CT	[9454009 |Structure of subclavian vein (body structure)] ->(272741003 |Laterality (attribute))->[24028007 | Right (qualifier value)]	Right Subclavian Vein	2
SNOMED CT	[9454009 |Structure of subclavian vein (body structure)] ->(272741003 |Laterality (attribute))->[7771000 | Left (qualifier value)]	Left Subclavian Vein	2
SNOMED CT	[a997cc03-3e99-40e-b-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[11851006 | Mitral valve disorder (disorder)]	Mitral Valve	1

System	Code	Display Text[a]	References[b]
SNOMED CT	[a997cc03-3e99-40e-b-833a-6374c7750a3a |Observation proce-dure (procedure)] ->(363702006 |Has focus (attribute))->[20721001 | Tricuspid valve disorder (disorder)]	Tricuspid Valve	1
SNOMED CT	[a997cc03-3e99-40e-b-833a-6374c7750a3a |Observation proce-dure (procedure)] ->(363702006 |Has focus (attribute))->[293637006 | Allergy to contrast media (disorder)]	Postcoordinated Expression	1
SNOMED CT	[a997cc03-3e99-40e-b-833a-6374c7750a3a |Observation proce-dure (procedure)] ->(363702006 |Has focus (attribute))->[35304003 | Cardiac tamponade (disor-der)]	Postcoordinated Expression	1
SNOMED CT	[a997cc03-3e99-40e-b-833a-6374c7750a3a |Observation proce-dure (procedure)] ->(363702006 |Has focus (attribute))->[394659003 | Acute coronary syndrome (disorder)]	Postcoordinated Expression	1
SNOMED CT	[a997cc03-3e99-40e-b-833a-6374c7750a3a |Observation proce-dure (procedure)] ->(363702006 |Has focus (attribute))->[426525004 |Sustained ventricular tachycardia (disorder)]	Postcoordinated Expression	1
SNOMED CT	[a997cc03-3e99-40e-b-833a-6374c7750a3a |Observation proce-dure (procedure)] ->(363702006 |Has focus (attribute))->[429589006 |Left ventricular cardiac dysfunction (disorder)]	Postcoordinated Expression	1
SNOMED CT	[a997cc03-3e99-40e-b-833a-6374c7750a3a	Stage 1 (Glomerular Filtration Rate >= 90 mL/min per 1.73 m^2)	1

System	Code	Display Text[a]	References[b]
	|Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[431855005 |Chronic kidney disease stage 1 (disorder)]		
SNOMED CT	[a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[431856006 |Chronic kidney disease stage 2 (disorder)]	Stage 2 (Glomerular Filtration Rate 60 to 89 mL/min per 1.73 m^2)	1
SNOMED CT	[a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[431857002 |Chronic kidney disease stage 4 (disorder)]	Stage 4 (Glomerular Filtration Rate 15 to 29 mL/min per 1.73 m^2)	1
SNOMED CT	[a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[433144002 |Chronic kidney disease stage 3 (disorder)]	Stage 3 (Glomerular Filtration Rate 30 to 59 mL/min per 1.73 m^2)	1
SNOMED CT	[a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[433146000 |Chronic kidney disease stage 5 (disorder)]	Stage 5 (Glomerular Filtration Rate < 15 mL/min per 1.73 m^2 or on dialysis)	1
SNOMED CT	[a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[53741008 | Coronary arteriosclerosis (disorder)]	Postcoordinated Expression	2
SNOMED CT	[a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)] -	Postcoordinated Expression	1

System	Code	Display Text[a]	References[b]
	>(363702006 |Has focus (attribute))->[70995007	Pulmonary hypertension (disorder)]		
SNOMED CT	[a997cc03-3e99-40e-b-833a-6374c7750a3a |Observation proce-dure (procedure)] ->(363702006 |Has focus (attribute))->[71908006 |Ventricular fibrillation (disorder)]	Postcoordinated Expression	1
SNOMED CT	[a997cc03-3e99-40e-b-833a-6374c7750a3a |Observation proce-dure (procedure)] ->(363702006 |Has focus (attribute))->[73211009	Diabetes mellitus (disor-der)]	Postcoordinated Expression	1
SNOMED CT	[a997cc03-3e99-40e-b-833a-6374c7750a3a |Observation proce-dure (procedure)] ->(363702006 |Has focus (attribute))->[76267008	Pulmonary valve disorder (disorder)]	Pulmonary Valve	1
SNOMED CT	[a997cc03-3e99-40e-b-833a-6374c7750a3a |Observation proce-dure (procedure)] ->(363702006 |Has focus (attribute))->[85598007	Constrictive pericarditis (disorder)]	Postcoordinated Expression	1
SNOMED CT	[a997cc03-3e99-40e-b-833a-6374c7750a3a |Observation proce-dure (procedure)] ->(363702006 |Has focus (attribute))->[85898001	Cardiomyopathy (disor-der)]	Postcoordinated Expression	1
SNOMED CT	[a997cc03-3e99-40e-b-833a-6374c7750a3a |Observation proce-dure (procedure)] ->(363702006 |Has focus (attribute))->[8722008		Aortic Valve	1

System	Code	Display Text[a]	References[b]
	Aortic valve disorder (disorder)]		
SNOMED CT	[a997cc03-3e99-40e-b-833a-6374c7750a3a |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[90708001 | Kidney disease (disorder)]	Postcoordinated Expression	1

[a]If a code is used multiple times in the KNART, only the display text of the first instance is shown.

[b]Count of the number of times the given code system and code pair is used in the KNART.

[c]TSR-NoCode is a placeholder indicating a code was requested, but was not provided.

Chapter 12. Behavior Symbols

Table 12.1. Group Organizational Behavior

Sym-bol	Name	Definition
#	Sentence Group	A group of related alternative actions is a sentence group if the item referenced by the action is the same in all the actions, and each action simply constitutes a different variation on how to specify the details for that item. For example, two actions that could be in a SentenceGroup are "aspirin, 500 mg, 2 times per day" and "aspirin, 300 mg, 3 times per day". In both cases, aspirin is the item referenced by the action, and the two actions represent two different options for how aspirin might be ordered for the patient. Note that a SentenceGroup would almost always have an associated selection behavior of "AtMostOne", unless it's a required action, in which case, it would be "ExactlyOne".
#	Logical Group	A group with this behavior logically groups its sub-elements, and may be shown as a visual group to the end user, but it is not required to do so.
➤	Visual Group	Any group marked with this behavior should be displayed as a visual group to the end user.

Table 12.2. Group Selection Behavior

Sym-bol	Name	Definition
#	Any	Any number of the items in the group may be chosen, from zero to all.
#	All	All the items in the group must be selected as a single unit.
#	AllOrNone	All the items in the group are meant to be chosen as a single unit: either all must be selected by the end user, or none may be selected.
#	ExactlyOne	The end user must choose one and only one of the selectable items in the group. The user may not choose none of the items in the group.
✪	AtMostOne	The end user may choose zero or at most one of the items in the group.
✳	OneOrMore	The end user must choose a minimum of one, and as many additional as desired.

Table 12.3. Required Behavior

Sym-bol	Name	Definition
◆	Must	An action with this behavior must be included in the actions processed by the end user; the end user may not choose not to include this action.

Sym-bol	Name	Definition
✧	Could	An action with this behavior may be included in the set of actions processed by the end user.
➢	MustUnlessDocumented	An action with this behavior must be included in the set of actions processed by the end user, unless the end user provides documentation as to why the action was not included.

Table 12.4. Precheck Behavior

Sym-bol	Name	Definition
▲	Yes	An action with this behavior is one of the most frequent actions that is, or should be, included by an end user, for the particular context in which the action occurs. The system displaying the action to the end user should consider "pre-checking" such an action as a convenience for the user.
#	No	An action with this behavior is one of the less frequent actions included by the end user, for the particular context in which the action occurs. The system displaying the actions to the end user would typically not "pre-check" such an action.

Table 12.5. Cardinality Behavior

Sym-bol	Name	Definition
◆	Single	An action with this behavior may only be completed once.
❖	Multiple	An action with this behavior may be repeated multiple times.

Table 12.6. Item Flags

Sym-bol	Name	Definition
☞	fillIn	This item, in a list entry, allows the user to enter a fill in value that is not present in the set of presented choices.

Table 12.7. Read Only Behavior

Sym-bol	Name	Definition
#	true	For a particular action or action group, specifies whether the elements are read only.

Appendix A. References

This appendix contains the list of related resources and supporting documents used in creating this KNART.

List of References

Related Resources

[CCWP] *Cardiology: Cardiac Catheterization, Pre-Cardiac Catheterization, and Post Catheterization Clinical Content White Paper*

[CSD] *Cardiology: Cardiac Catheterization Documentation Template Conceptual Structure Document*

[KVRpt] *Cardiology: Cardiac Catheterization Documentation Template KNART Validation Report*

Supporting Evidence

[Greenberger 1991] *Greenberger PA, Patterson R. The prevention of immediate generalized reactions to radiocontrast media in high-risk patients. J Allergy Clin Immunol. 1991;87(4):867-872* (link [Journal of Clinical Immunology 1991])

[Maddox 2014] *Maddox TM, Plomondon ME, Petrich M, et al. A national clinical quality program for Veterans Affairs catheterization laboratories (from the Veterans Affairs clinical assessment, reporting, and tracking program). Am J Cardiol. 2014;114(11):1750-1757* (link [https://doi.org/10.1016/j.amjcard.2014.08.045])

[Patel 2012] *Patel MR, Bailey SR, Bonow RO, et al. ACCF/SCAI/AATS/AHA/ASE/ASNC/HFSA/HRS/SCCM/SCCT/SCMR/STS 2012 appropriate use criteria for diagnostic catheterization. Cathet Cardiovasc Intervent. 2012;80(3):E50-E81* (link [https://doi.org/10.1016/j.jtcvs.2012.04.013])

[Dolgen Corp] *U.S. National Library of Medicine. ASPIRIN 81 MG (aspirin) tablet, coated [DOLGENCORP, LLC]. Revised January 2017* (link [http://dailymed.nlm.nih.gov/dailymed/lookup.cfm?setid=b4064039-2345-4227-b83d-54dc13a838d3])

[AstraZeneca] *U.S. National Library of Medicine. BRILINTA- ticagrelor tablet [AstraZeneca Pharmaceuticals LP]. Revised April 2017* (link [https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=f7b3f443-e83d-4bf2-0e96-023448fed9a8.])

[Apotex] *U.S. National Library of Medicine. CLOPIDOGREL- clopidogrel bisulfate tablet, film coated [Apotex Corp.]. Revised November 2016* (link [https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=edae8d-f1-caf9-ff72-1304-5ae8b355f8e7])

[Upjohn and Company] *U.S. National Library of Medicine. DELTASONE- prednisone tablet [Pharmacia and Upjohn and Company]. Revised March 2007* (link [https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=3400d26a-41cb-40e4-99b4-780e1e0ec561])

[Sam's West Inc] *U.S. National Library of Medicine. DIPHENHYDRAMINE- diphenhydramine hcl tablet, coated [Sam's West Inc]. Revised June 2016* (link [https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=70a584ab-9e24-404a-aad7-f9a05c377248])

[APP Pharmaceuticals] *U.S. National Library of Medicine. DIPHENHYDRAMINE- diphenhydramine hydrochloride injection, solution [APP Pharmaceuticals, LLC]. Revised January 2012* (link [https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=fc574e74-1fdc-4a61-a1ed-492ae43faed2])

[Eli Lilly] *U.S. National Library of Medicine. EFFIENT- prasugrel hydrochloride tablet, film coated [Eli Lilly and Company]. Revised July 2016* (link [https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=5fe9c118-c44b-48d7-a142-9668ae3df0c6])

[Pharmacia Upjohn] *U.S. National Library of Medicine. SOLU-CORTEF- hydrocortisone sodium succinate injection, powder, for solution [Pharmacia and Upjohn Company LLC]. Revised October 2016* (link [https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=65eefd58-b166-4d71-ade6-45c8fdf86922])

[Valgimigli 2015] *Valgimigli M, Gagnor A, Calabró P, et al. Radial versus femoral access in patients with acute coronary syndromes undergoing invasive management: a randomised multicentre trial. Lancet. 2015;385(9986):2465-2476* (link [https://doi.org/10.1016/j.amjcard.2014.08.045])