

Cardiology: Electrophysiology (EP) Documentation Template

Documentation Tem- plate: Conceptual Structure

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Department of Veterans Affairs (VA)



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

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

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Preface

Table 1. Revision History

Date	Life Cycle Event
June 14, 2018	Published
May 14, 2018	Published
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April 17, 2018	Reviewed
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March 29, 2018	Reviewed
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December 8, 2017	Created

Table 2. Clinical White Paper Contributors

Name	Role	Affiliation
Bray Bruce, MD	Author	Professor, Cardiovascular Medicine, University of Utah School of Medicine; Staff Cardiologist, Salt Lake City VA Medical Center
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Abidov Aiden, MD	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	b098e1ee-609b-5225-b023-56083333057c	B36

Artifact Applicability

Table 4. Applicability Foci, Description and Codes

Focus	Description	Code System	Code	Value Set	Value Set Version
PatientAgeGroup	Adult outpatient needing Cardiology consult for arrhythmia evaluation	SNOMED CT	133936004 Adult (person)	N/A	N/A
ClinicalVenue	Primary Care Clinic	SNOMED CT	5351000124100 Primary care clinic (environment)	N/A	N/A
TargetUser	Clinical Providers in Primary Care Clinic	SNOMED CT	453231000124104 Primary care provider (occupation)	N/A	N/A
WorkflowSetting	Cardiology Consultation			N/A	N/A
WorkflowTask	Ensure a minimum workup is initiated prior to a Cardiology Consultation for adult patients who present to a Primary Care Clinic for evaluation of atrial fibrillation, atrial flutter			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. basicMetabolicPanelLabResult

Expression: type=elm:Query Annotation: Basic Metabolic Panel Lab Result Codes: elm:operand[elm:Code]: [398166005 Performed (qualifier value)]elm:operand[elm:Code]: [1421000205106 Basic metabolic panel (procedure)]
--

Table 1.2. completeBloodCountLabResult

Expression: type=elm:Query Annotation: Complete Blood Count Lab Result Codes: elm:operand[elm:Code]: [398166005 Performed (qualifier value)]elm:operand[elm:Code]: [26604007 Complete blood count (procedure)]

Table 1.3. lipidPanelLabResult

Expression: type=elm:Query Annotation: Lipid Panel Lab Result Codes: elm:operand[elm:Code]: [398166005 Performed (qualifier value)]elm:operand[elm:Code]: [16254007 Lipid panel (procedure)]

Table 1.4. thyroidFunctionTestingLabResult

Expression: type=elm:Query Annotation: Thyroid Function Testing Lab Result Codes: elm:operand[elm:Code]: [398166005 Performed (qualifier value)]elm:operand[elm:Code]: [35650009 Thyroid panel (procedure)]
--

Table 1.5. troponinLabResult

Expression: type=elm:Query Annotation: Troponin Lab Result Codes: elm:operand[elm:Code]: [398166005 Performed (qualifier value)]elm:operand[elm:Code]: [105000003 Troponin measurement (procedure)]
--

Table 1.6. brainNatriureticPeptideLabResult

Expression: type=elm:Query Annotation: Brain Natriuretic Peptide Lab Result Codes: elm:operand[elm:Code]: [398166005 Performed (qualifier value)]elm:operand[elm:Code]: [407059007 Brain natriuretic peptide (substance)]
--

Table 1.7. d-dimerLabResult

Expression: type=elm:Query

Annotation: D-dimer Lab Result
 Codes: elm:operand[elm:Code]: [398166005 |Performed (qualifier value)|]elm:operand[elm:Code]: [70648006 |D-dimer assay (procedure)|]

Table 1.8. resting12LeadElectrocardiogram

Expression: type=elm:Query
 Annotation: Resting 12-Lead Electrocardiogram Interpretation
 Codes: elm:operand[elm:Code]: [398166005 |Performed (qualifier value)|]elm:operand[elm:Code]: [447113005 |12 lead electrocardiogram at rest (procedure)|]

Table 1.9. resting12LeadElectrocardiogramInterpretation

Expression: type=elm:Query
 Annotation: Resting 12-Lead Electrocardiogram Interpretation
 Codes: elm:operand[elm:Code]: [398166005 |Performed (qualifier value)|]elm:operand[elm:Code]: [[370851004 |Evaluation of diagnostic study results (procedure)| ->(363702006 |Has focus (attribute))->[447113005 |12 lead electrocardiogram at rest (procedure)|]]

Table 1.10. stressElectrocardiography

Expression: type=elm:Query
 Annotation: Stress Electrocardiography
 Codes: elm:operand[elm:Code]: [398166005 |Performed (qualifier value)|]elm:operand[elm:Code]: [46136006 |Electrocardiogram with exercise test (procedure)|]

Table 1.11. stressElectrocardiographyInterpretation

Expression: type=elm:Query
 Annotation: Stress Electrocardiography Interpretation
 Codes: elm:operand[elm:Code]: [398166005 |Performed (qualifier value)|]elm:operand[elm:Code]: [[370851004 |Evaluation of diagnostic study results (procedure)| ->(363702006 |Has focus (attribute))->[46136006 |Electrocardiogram with exercise test (procedure)|]]

Table 1.12. restingEchocardiogram

Expression: type=elm:Query
 Annotation: Resting Echocardiogram/Doppler
 Codes: elm:operand[elm:Code]: [398166005 |Performed (qualifier value)|]elm:operand[elm:Code]: [50871731-ba83-45bb-a582-a14943f1d06d |Echocardiography at rest (procedure)|]

Table 1.13. restingEchocardiogramDopplerInterpretation

Expression: type=elm:Query
 Annotation: Resting Echocardiogram/Doppler Interpretation
 Codes: elm:operand[elm:Code]: [398166005 |Performed (qualifier value)|]elm:operand[elm:Code]: [[370851004 |Evaluation of diagnostic study results (procedure)| ->(363702006 |Has focus (attribute))->[50871731-ba83-45bb-a582-a14943f1d06d |Echocardiography at rest (procedure)|]]

Table 1.14. stressEchocardiogram

Expression: type=elm:Query
Annotation: Stress Echocardiogram
Codes: elm:operand[elm:Code]: [398166005 Performed (qualifier value) elm:operand[elm:Code]: [433233004 Exercise stress echocardiography (procedure)]]

Table 1.15. stressEchocardiogramInterpretation

Expression: type=elm:Query
Annotation: Stress Echocardiogram Interpretation
Codes: elm:operand[elm:Code]: [398166005 Performed (qualifier value) elm:operand[elm:Code]: [[370851004 Evaluation of diagnostic study results (procedure)] ->(363702006 Has focus (attribute))>[433233004 Exercise stress echocardiography (procedure)]]]

Table 1.16. stressMPI

Expression: type=elm:Query
Annotation: Stress Myocardial Perfusion Imaging (MPI)
Codes: elm:operand[elm:Code]: [398166005 Performed (qualifier value) elm:operand[elm:Code]: [16545191000119100 Radionuclide myocardial perfusion stress study (procedure)]]]

Table 1.17. stressMPIInterpretation

Expression: type=elm:Query
Annotation: Stress Myocardial Perfusion Imaging (MPI) Interpretation
Codes: elm:operand[elm:Code]: [398166005 Performed (qualifier value) elm:operand[elm:Code]: [[370851004 Evaluation of diagnostic study results (procedure)] ->(363702006 Has focus (attribute))>[16545191000119100 Radionuclide myocardial perfusion stress study (procedure)]]]

Table 1.18. stressMRI

Expression: type=elm:Query
Annotation: Stress Magnetic Resonance Imaging (MRI)
Codes: elm:operand[elm:Code]: [398166005 Performed (qualifier value) elm:operand[elm:Code]: [737593009 Magnetic resonance imaging of heart under stress (procedure)]]

Table 1.19. stressMRIInterpretation

Expression: type=elm:Query
Annotation: Stress Magnetic Resonance Imaging (MRI) Interpretation
Codes: elm:operand[elm:Code]: [398166005 Performed (qualifier value) elm:operand[elm:Code]: [[370851004 Evaluation of diagnostic study results (procedure)] ->(363702006 Has focus (attribute))>[737593009 Magnetic resonance imaging of heart under stress (procedure)]]]

Table 1.20. chestCT

Expression: type=elm:Query

Annotation: Chest CT
 Codes: elm:operand[elm:Code]: [398166005 |Performed (qualifier value)|]elm:operand[elm:Code]:
 [169069000 |Computed tomography of chest (procedure)]

Table 1.21. chestCTInterpretation

Expression: type=elm:Query
 Annotation: Chest CT Interpretation
 Codes: elm:operand[elm:Code]: [398166005 |Performed (qualifier value)|]elm:operand[elm:Code]:
 [[370851004 |Evaluation of diagnostic study results (procedure)] ->(363702006 |Has focus (at-
 tribute))>[169069000 |Computed tomography of chest (procedure)]]

Table 1.22. chestCTA

Expression: type=elm:Query
 Annotation: Coronary/Cardiac CTA
 Codes: elm:operand[elm:Code]: [398166005 |Performed (qualifier value)|]elm:operand[elm:Code]:
 [419545005 |Computed tomography angiography of coronary arteries (procedure)]

Table 1.23. cCTAInterpretation

Expression: type=elm:Query
 Annotation: Coronary/Cardiac CTA Interpretation
 Codes: elm:operand[elm:Code]: [398166005 |Performed (qualifier value)|]elm:operand[elm:Code]:
 [[370851004 |Evaluation of diagnostic study results (procedure)] ->(363702006 |Has focus (at-
 tribute))>[419545005 |Computed tomography angiography of coronary arteries (procedure)]]

Table 1.24. xRayChest

Expression: type=elm:Query
 Annotation: X-Ray Chest Interpretation
 Codes: elm:operand[elm:Code]: [398166005 |Performed (qualifier value)|]elm:operand[elm:Code]:
 [399208008 |Plain chest X-ray (procedure)]

Table 1.25. xRayChestInterpretation

Expression: type=elm:Query
 Annotation: X-Ray Chest
 Codes: elm:operand[elm:Code]: [398166005 |Performed (qualifier value)|]elm:operand[elm:Code]:
 [[370851004 |Evaluation of diagnostic study results (procedure)] ->(363702006 |Has focus (at-
 tribute))>[399208008 |Plain chest X-ray (procedure)]]

Table 1.26. icdProcedure

Expression: type=elm:Query
 Annotation: Implantable Cardioverter-Defibrillator (ICD) Device Implantation"
 Codes: elm:operand[elm:Code]: [398166005 |Performed (qualifier value)|]elm:operand[elm:Code]:
 [395218007 |Implantation of internal cardiac defibrillator (procedure)]

Table 1.27. crtProcedure

Expression: type=elm:Query
Annotation: Cardiac Resynchronization Therapy"
Codes: elm:operand[elm:Code]: [398166005 Performed (qualifier value)]elm:operand[elm:Code]: [1301000205107 Implantation of cardiac resynchronization therapy implantable pacemaker (procedure)]

Table 1.28. pacemakerProcedure

Expression: type=elm:Query
Annotation: Cardiac Pacemaker Implantation"
Codes: elm:operand[elm:Code]: [398166005 Performed (qualifier value)]elm:operand[elm:Code]: [307280005 Implantation of cardiac pacemaker (procedure)]

Table 1.29. cardiacDiagnosticProcedures

Expression: type=elm:List
Annotation:
Codes:

Triggers

No trigger definitions are present.

Chapter 2. Expression Definitions

No expression definitions are present.

Chapter 3. Clinical Stability

This documentation template is not applicable for use with patients who are unstable based on clinician judgement. Examples of unstable patients include, but are not limited to, patients with chest pain pattern suggestive of Acute Coronary Syndrome (ACS), symptomatic hypotension, or unstable arrhythmia. Consider transferring these unstable patients to the nearest emergency department immediately.

prompt: Acknowledge

response: Boolean (Single)

Chapter 4. History and Physical

History		
# prompt: History, Brief		
response: String (Single)		
# prompt: History of prior cardiac evaluations (e.g., prior hospitalization or evaluations for: chest pain, rule/out MI, angina, heart failure, etc.)		
response: String (Single)		
# prompt: Results of prior cardiac diagnostic procedures performed (resting ECG, echocardiogram, stress testing (echo, nuclear, MRI), Cardiac CT (CCT) and Coronary CT Angiography (CCTA)		
response: Tuple (Single)		
initialValue: cardiacDiagnosticProcedures		
# prompt: Physical Exam, Pertinent Positive and Negative Findings		
response: String (Single)		
# prompt: Family History of		
response: Code (Single)		
response range: EnumerationConstraint (List)		
item: Sudden Unexplained Death(90049009 Unexplained sudden death (event))		
item: Drowning(40947009 Drowning (event))		
# prompt: Prior Radiofrequency Catheter Ablation		
response: Boolean (Single)		
Implanted Device History		
	If a device is selected, then enter Current arrhythmia device programmer interrogation report.	
		# prompt: Select at most one:
		response: Code (Single)
		response range: EnumerationConstraint (List)
		item: Prior Implantable Cardioverter-De-fibrillator (ICD) Device Implan-tation(395218007 Implantation of inter-nal cardiac defibrillator (procedure))
	item: Prior Cardiac Resynchronization Ther-apy plus Implantable Cardioverter-De-fibrillator (CRT-D) Device Implan-tation(1301000205107 Implantation of cardiac resynchronization therapy im-plantable pacemaker (procedure))	
	item: Prior Cardiac Pacemaker Implan-tation(307280005 Implantation of car-diac pacemaker (procedure))	

		<p># prompt: Current arrhythmia device programmer interrogation report</p> <p>response: String (Single)</p>
--	--	---

Chapter 5. Treatment Provided

prompt: Pharmacologic Therapy

response: String (Single)

prompt: Other Pertinent Treatment

response: String (Single)

Chapter 6. Laboratory Studies

prompt: Basic Metabolic Panel Lab Result
response: Tuple (Single)
initalValue: elm:Indexer basicMetabolicPanelLabResult elm:Literal()
prompt: Complete Blood Count Lab Result
response: Tuple (Single)
initalValue: elm:Indexer completeBloodCountLabResult elm:Literal()
prompt: Lipid Panel Lab Result
response: Tuple (Single)
initalValue: elm:Indexer lipidPanelLabResult elm:Literal()
prompt: Thyroid Function Testing Lab Result
response: Tuple (Single)
initalValue: elm:Indexer thyroidFunctionTestingLabResult elm:Literal()
prompt: Troponin Lab Result
response: Tuple (Single)
initalValue: elm:Indexer troponinLabResult elm:Literal()
prompt: Brain Natriuretic Peptide Lab Result
response: Tuple (Single)
initalValue: elm:Indexer brainNatriureticPeptideLabResult elm:Literal()
prompt: D-dimer Lab Result
response: Tuple (Single)
initalValue: elm:Indexer d-dimerLabResult elm:Literal()

Chapter 7. Imaging and Diagnostic Studies

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

Attach or link Results: 12-Lead Electrocardiogram

prompt: Resting 12-Lead Electrocardiogram Interpretation

response: Tuple (Multiple)

initalValue: resting12LeadElectrocardiogramInterpretation

Attach or link Images: 12-Lead Electrocardiogram

prompt: Resting 12-Lead Electrocardiogram

response: Tuple (Multiple)

initalValue: resting12LeadElectrocardiogram

Link results: Stress Electrocardiography

prompt: Stress Electrocardiography Interpretation

response: Tuple (Multiple)

initalValue: stressElectrocardiographyInterpretation

Link images: Stress Electrocardiography

prompt: Stress Electrocardiography

response: Tuple (Multiple)

initalValue: stressElectrocardiography

Link results: Resting Echocardiogram/Doppler

prompt: Resting Echocardiogram/Doppler Interpretation

response: Tuple (Multiple)

initalValue: restingEchocardiogramDopplerInterpretation

Link images: Resting Echocardiogram/Doppler

prompt: Resting Echocardiogram/Doppler

response: Tuple (Multiple)

initalValue: restingEchocardiogram

Link results: Stress Echocardiogram

prompt: Stress Echocardiogram Interpretation

response: Tuple (Multiple)

initalValue: stressEchocardiogramInterpretation

Link images: Stress Echocardiogram

prompt: Stress Echocardiogram

response: Tuple (Multiple)

initalValue: stressEchocardiogram

Link results: Stress MPI Interpretation

prompt: Stress Myocardial Perfusion Imaging (MPI) Interpretation

response: Tuple (Multiple)

initalValue: stressMPIInterpretation

Link images: Stress MPI

prompt: Stress Myocardial Perfusion Imaging (MPI)

response: Tuple (Multiple)

initalValue: stressMPI

Link results: Rest/Stress Magnetic Resonance Imaging (MRI) Interpretation

prompt: Rest/Stress Magenetic Resonance Imaging (MRI) Interpretation

response: Tuple (Multiple)

initalValue: stressMRIInterpretation

Link images: Rest/Stress Magenetic Resonance Imaging (MRI)

prompt: Rest/Stress Magnetic Resonance Imaging (MRI)

response: Tuple (Multiple)

initalValue: stressMRI

Link results: Chest CT

prompt: Chest CT Interpretation

response: Tuple (Multiple)

initalValue: chestCTInterpretation

Link images: Chest CT

prompt: Chest CT

response: Tuple (Multiple)

initalValue: chestCT

Link results: Coronary/Cardiac CTA

prompt: Coronary/Cardiac CTA Interpretation

response: Tuple (Multiple)

initalValue: cCTAInterpretation

Link images: Coronary/Cardiac CTA

prompt: Coronary/Cardiac CTA

response: Tuple (Multiple)

initalValue: chestCTA

Link results: X-Ray Chest

prompt: X-Ray Chest Interpretation

response: Tuple (Multiple)

initalValue: xRayChestInterpretation

Link images: X-Ray Chest

prompt: X-Ray Chest

response: Tuple (Multiple)

initalValue: xRayChest

Chapter 8. Reason for Cardiology Arrhythmia Consult

Select one.

prompt: Reason for consult:

response: Code (Single)

response EnumerationConstraint (List)

range:

item: Atrial Fibrillation Evaluation([1221000205105 |Cardiology consultation and report (procedure)] ->(363702006 |Has focus (attribute))->[49436004 |Atrial fibrillation (disorder)])

item: Atrial Flutter Evaluation([1221000205105 |Cardiology consultation and report (procedure)] ->(363702006 |Has focus (attribute))->[5370000 |Atrial flutter (disorder)])

item: Bradycardia Evaluation([1221000205105 |Cardiology consultation and report (procedure)] ->(363702006 |Has focus (attribute))->[6456007 |Supraventricular tachycardia (disorder)])

item: Supraventricular Tachycardia Evaluation([1221000205105 |Cardiology consultation and report (procedure)] ->(363702006 |Has focus (attribute))->[48867003 |Bradycardia (disorder)])

item: Syncope Evaluation([1221000205105 |Cardiology consultation and report (procedure)] ->(363702006 |Has focus (attribute))->[271594007 |Syncope (disorder)])

item: Presyncope Evaluation([1221000205105 |Cardiology consultation and report (procedure)] ->(363702006 |Has focus (attribute))->[271594007 |Syncope (disorder)])

☞ item: Other Arrhythmia Evaluation

Enter evaluation type

item: Pacemaker followup(1221000205105 |Cardiology consultation and report (procedure))

item: ICD follow-up(1221000205105 |Cardiology consultation and report (procedure))

item: Pacemaker generator change([1221000205105 |Cardiology consultation and report (procedure)] ->(363702006 |Has focus (attribute))->[3515001 |Replacement of electronic heart device, pulse generator (procedure)])

item: ICD generator change([1221000205105 |Cardiology consultation and report (procedure)] ->(363702006 |Has focus (attribute))->[395218007 |Implantation of internal cardiac defibrillator (procedure)])

item: Primary prevention pacemaker([1221000205105 |Cardiology consultation and report (procedure)] ->(363702006 |Has focus (attribute))->[307280005 |Implantation of cardiac pacemaker (procedure)])

item: ICD Implant([1221000205105 |Cardiology consultation and report (procedure)] ->(363702006 |Has focus (attribute))->[395218007 |Implantation of internal cardiac defibrillator (procedure)])

Chapter 9. Stroke and Bleeding Risk

Ask the following questions and check any of the following that apply to the patient.

prompt: Active problem of congestive heart failure or active problem of left ventricular systolic dysfunction?

response: Boolean (Single)

prompt: Active problem of hypertension?

response: Boolean (Single)

prompt: Age \geq 75 years?

response: Boolean (Single)

prompt: Active problem of diabetes mellitus?

response: Boolean (Single)

prompt: History of stroke or of problem of transient ischemic attack or thromboembolism?

response: Boolean (Single)

prompt: Active problem of vascular disease?

response: Boolean (Single)

prompt: Age \geq 65 years and age \leq 74 years?

response: Boolean (Single)

prompt: Female?

response: Boolean (Single)

Chapter 10. Tabular List

Terminology Service Request (TSR) Mappings

Table 10.1. Terminology Versions

Name	Identifier	Version
SNOMED CT	2.16.840.1.113883.6.96	United States Edition 20180301

Table 10.2. Terminology References

System	Code	Display Text ^a	References ^b
SNOMED CT	105000003 Troponin measurement (procedure)	Precoordinated Expression	1
SNOMED CT	1221000205105 Cardiology consultation and report (procedure)	Pacemaker followup	2
SNOMED CT	1301000205107 Implantation of cardiac resynchronization therapy implantable pacemaker (procedure)	Precoordinated Expression	2
SNOMED CT	133936004 Adult (person)	Adult outpatient needing Cardiology consult for arrhythmia evaluation	1
SNOMED CT	1421000205106 Basic metabolic panel (procedure)	Precoordinated Expression	1
SNOMED CT	16254007 Lipid panel (procedure)	Precoordinated Expression	1
SNOMED CT	16545191000119100 Radionuclide myocardial perfusion stress study (procedure)	Precoordinated Expression	1
SNOMED CT	169069000 Computed tomography of chest (procedure)	Precoordinated Expression	1
SNOMED CT	26604007 Complete blood count (procedure)	Precoordinated Expression	1
SNOMED CT	307280005 Implantation of cardiac pacemaker (procedure)	Precoordinated Expression	2
SNOMED CT	35650009 Thyroid panel (procedure)	Precoordinated Expression	1
SNOMED CT	395218007 Implantation of internal cardiac defibrillator (procedure)	Precoordinated Expression	2

System	Code	Display Text ^a	References ^b
SNOMED CT	398166005 Performed (qualifier value)	Precoordinated Expression	28
SNOMED CT	399208008 Plain chest X-ray (procedure)	Precoordinated Expression	1
SNOMED CT	407059007 Brain natriuretic peptide (substance)	Precoordinated Expression	1
SNOMED CT	40947009 Drowning (event)	Drowning	1
SNOMED CT	419545005 Computed tomography angiography of coronary arteries (procedure)	Precoordinated Expression	1
SNOMED CT	433233004 Exercise stress echocardiography (procedure)	Precoordinated Expression	1
SNOMED CT	447113005 12 lead electrocardiogram at rest (procedure)	Precoordinated Expression	1
SNOMED CT	453231000124104 Primary care provider (occupation)	Clinical Providers in Primary Care Clinic	1
SNOMED CT	46136006 Electrocardiogram with exercise test (procedure)	Precoordinated Expression	1
SNOMED CT	50871731-ba83-45bb-a582-a14943f1d06d Echocardiography at rest (procedure)	Precoordinated Expression	1
SNOMED CT	5351000124100 Primary care clinic (environment)	Primary Care Clinic	1
SNOMED CT	70648006 D-dimer assay (procedure)	Precoordinated Expression	1
SNOMED CT	737593009 Magnetic resonance imaging of heart under stress (procedure)	Precoordinated Expression	1
SNOMED CT	90049009 Unexplained sudden death (event)	Sudden Unexplained Death	1
SNOMED CT	[1221000205105 Cardiology consultation and report (procedure)] ->(363702006 Has focus (attribute))->[271594007 Syncope (disorder)]	Syncope Evaluation	2
SNOMED CT	[1221000205105 Cardiology consultation and report (procedure)] -	Primary prevention pacemaker	1

System	Code	Display Text ^a	References ^b
	>(363702006 Has focus (attribute))->[307280005 Implantation of cardiac pacemaker (procedure)]		
SNOMED CT	[1221000205105 Cardiology consultation and report (procedure)] - >(363702006 Has focus (attribute))->[3515001 Replacement of electronic heart device, pulse generator (procedure)]	Pacemaker generator change	1
SNOMED CT	[1221000205105 Cardiology consultation and report (procedure)] - >(363702006 Has focus (attribute))->[395218007 Implantation of internal cardiac defibrillator (procedure)]	ICD generator change	2
SNOMED CT	[1221000205105 Cardiology consultation and report (procedure)] - >(363702006 Has focus (attribute))->[48867003 Bradycardia (disorder)]	Supraventricular Tachycardia Evaluation	1
SNOMED CT	[1221000205105 Cardiology consultation and report (procedure)] - >(363702006 Has focus (attribute))->[49436004 Atrial fibrillation (disorder)]	Atrial Fibrillation Evaluation	1
SNOMED CT	[1221000205105 Cardiology consultation and report (procedure)] - >(363702006 Has focus (attribute))->[5370000 Atrial flutter (disorder)]	Atrial Flutter Evaluation	1
SNOMED CT	[1221000205105 Cardiology consultation and report (procedure)] - >(363702006 Has focus (attribute))->[6456007 Supraventricular tachycardia (disorder)]	Bradycardia Evaluation	1
SNOMED CT	[370851004 Evaluation of diagnostic study results (procedure)] ->(363702006	Postcoordinated Expression	1

System	Code	Display Text ^a	References ^b
	[Has focus (attribute))->[16545191000119100 [Radionuclide myocardial perfusion stress study (procedure)]]		
SNOMED CT	[370851004 Evaluation of diagnostic study results (procedure)] - >(363702006 Has focus (attribute))->[169069000 Computed tomography of chest (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))->[419545005 Computed tomography angiography of coronary arteries (procedure)]	Postcoordinated Expression	1
SNOMED CT	[370851004 Evaluation of diagnostic study results (procedure)] - >(363702006 Has focus (attribute))->[433233004 Exercise stress echocardiography (procedure)]	Postcoordinated Expression	1
SNOMED CT	[370851004 Evaluation of diagnostic study results (procedure)] - >(363702006 Has focus (attribute))->[447113005 12 lead electrocardiogram at rest (procedure)]	Postcoordinated Expression	1
SNOMED CT	[370851004 Evaluation of diagnostic study results (procedure)] - >(363702006 Has focus (attribute))->[46136006 Electrocardiogram with exercise test (procedure)]	Postcoordinated Expression	1

System	Code	Display Text ^a	References ^b
SNOMED CT	[370851004 Evaluation of diagnostic study results (procedure)] ->(363702006 Has focus (attribute))->[50871731-ba83-45bb-a582-a14943f1d06d Echocardiography at rest (procedure)]	Postcoordinated Expression	1
SNOMED CT	[370851004 Evaluation of diagnostic study results (procedure)] ->(363702006 Has focus (attribute))->[737593009 Magnetic resonance imaging of heart under stress (procedure)]	Postcoordinated Expression	1

^aIf a code is used multiple times in the KNART, only the display text of the first instance is shown.

^bCount of the number of times the given code system and code pair is used in the KNART.

Chapter 11. Behavior Symbols

Table 11.1. 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 11.2. 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 11.3. 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 11.4. 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 11.5. 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 11.6. 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 11.7. 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: (EP) Arrhythmias Clinical Content White Paper*

[CSD] *Cardiology: Electrophysiology (EP) Documentation Template Conceptual Structure Document*

[KVRpt] *Cardiology: Electrophysiology (EP) Documentation Template KNART Validation Report*

Supporting Evidence

[Heidenreich 2016] Heidenreich, P., Solis, P., Estes, M., Fonarow, G., Jurgens, C., Marine, J., McManus, D., McNamara, R. 2016 ACC/AHA Clinical Performance and Quality Measures for Adults With Atrial Fibrillation or Atrial Flutter. *Circulation: Cardiovascular Quality and Outcomes*. 2016;9:443-488 Originally published June 27, 2016. doi:10.1161/HCQ.0000000000000018 (link [https://doi.org/10.1161/HCQ.0000000000000018])

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- [NLM 2017a] LABEL: AMIODARONE HCL- amiodarone hydrochloride tablet [Internet].: National Library of Medicine; 2017. Available from: <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=08641e51-abca-4c1c-ba19-d24435332018>. (link [<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=08641e51-abca-4c1c-ba19-d24435332018>])
- [NLM 2017b] LABEL: ASPIRIN 81 MG- aspirin tablet, coated [Internet].: National Library of Medicine; 2017. Available from: <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=b4064039-2345-4227-b83d-54d-c13a838d3>. (link [<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=b4064039-2345-4227-b83d-54d-c13a838d3>])
- [NLM 2016a] LABEL: CARDIZEM- diltiazem hydrochloride tablet, coated [Internet].: National Library of Medicine; 2016. Available from: <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=f3e7ecef-f360-4987-a4f5-933214130ab2>. (link [<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=f3e7ecef-f360-4987-a4f5-933214130ab2>])
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- [NLM 2016b] LABEL: DIGOXIN- digoxin tablet, [Internet].: National Library of Medicine; 2016. Available from: <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=dfac7f13-28be-423d-9389-9089da29da17>. (link [<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=dfac7f13-28be-423d-9389-9089da29da17>])
- [NLM 2016c] LABEL: DILTIAZEM HCL CD- diltiazem hydrochloride capsule, coated, extended release, [Internet].: National Library of Medicine; 2016. Available from: <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=5e39be50-ea17-4077-a2dc-668267049f6a>. (link [<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=5e39be50-ea17-4077-a2dc-668267049f6a>])
- [NLM 2017e] LABEL: ELIQUIS- apixaban tablet, film coated ELIQUIS 30-DAY STARTER PACK- apixaban, [Internet].: National Library of Medicine; 2017. Available from: <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=e9481622-7cc6-418a-acb6-c5450daae9b0>. (link [<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=e9481622-7cc6-418a-acb6-c5450daae9b0>])
- [NLM 2012] LABEL: FLECAINIDE ACETATE- flecainide tablet, [Internet].: National Library of Medicine; 2012. Available from: <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=fa68b35e-9f50-408b-9e70-e84cecf3fd6e>. (link [<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=fa68b35e-9f50-408b-9e70-e84cecf3fd6e>])
- [NLM 2008] LABEL: ISOPTIN SR- verapamil hydrochloride tablet, coated, [Internet].: National Library of Medicine; 2018. Available from: <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=6ae13cb4-0316-40d1-9216-c7d5556aaed3>. (link [<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=6ae13cb4-0316-40d1-9216-c7d5556aaed3>])
- [NLM 2017f] LABEL: LOPRESSOR- metoprolol tartrate tablet, [Internet].: National Library of Medicine; 2017. Available from: <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=0283bc9d-6998-493a-824a-d4c85f704111>. (link [<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=0283bc9d-6998-493a-824a-d4c85f704111>])
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- [NLM 2017h] *LABEL: PROPAFENONE HCL- propafenone hydrochloride tablet, film coated, [Internet].: National Library of Medicine; 2017. Available from: <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=a313c111-e539-47bc-9d57-c3767f74bcca>. (link [<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=a313c111-e539-47bc-9d57-c3767f74bcca>])*
- [NLM 2017i] *LABEL: TOPROL XL- metoprolol succinate tablet, extended release, [Internet].: National Library of Medicine; 2017. Available from: <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=4a5762c6-d7a2-4e4c-10b7-8832b36fa5f4>. (link [<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=4a5762c6-d7a2-4e4c-10b7-8832b36fa5f4>])*
- [NLM 2017j] *LABEL: XARELTO- rivaroxaban tablet, film coated, [Internet].: National Library of Medicine; 2017. Available from: <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=10db92f9-2300-4a80-836b-673e1ae91610>. (link [<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=10db92f9-2300-4a80-836b-673e1ae91610>])*