Cardiology: Pre-Cardiac Catheterization Order Set

Order Set: Conceptual Structure

Contract: VA118-16-D-1008, Task Order (TO): VA-118-16-F-1008-0007, CLIN0008BA

Department of Veterans Affairs (VA)

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

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Cardiology: Pre-Cardiac Catheterization Order Set: Order Set: Conceptual Structure

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

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B3 Group, Inc.

Cognitive Medical Systems, Inc.

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Table 1. Revision History

Date	Life Cycle Event
June 18, 2018	Published
April 27, 2018	Published
April 27, 2018	Reviewed
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Table 2. Clinical White Paper Contributors

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Table 3. Artifact Identifier

Domain	Artifact ID	Name
urn:va.gov:kbs:knart:artifact:r1	9a42ab9d-ee66-57a5-aa54-c3055a9ff1fc	O18

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 invasive 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

No externalData expression definitions and no trigger definitions are present.

Chapter 2. Expression Definitions

No expression definitions are present.

Chapter 3. Medication Orders

Order Pre Cardiac Catheterization Medications

Oral Contrast Allergy Premedication Regimen

✪ Prednisone 50 mg tablet oral 1 time 13 hours before procedure

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Postcoordinated Expression [416118004 |Administration (procedure)] ->(260686004 |Method (attribute))->[129445006 |Administration - action (qualifier value)] ->(363701004 |Direct substance (attribute))->[Rx;198148 predniSONE 50 MG Oral Tablet] ->(410675002 |Route of administration (attribute))->[260548002 |Oral (qualifier value)]

timing.lowerBound:

timing.upperBound:

timing.includeLowerBound: true

timing.inludeUpperBound: true

requestedResult.lowerBound: 1

requestedResult.upperBound: 1

requestedResult.includeLowerBound: true

requestedResult.includeUpperBound: true

requestedResult.measureSemantic: Precoordinated Expression 421026006 |Oral tablet (qualifier value)|

✪ Prednisone 50 mg tablet oral 1 time 7 hours before procedure

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Postcoordinated Expression [416118004 |Administration (procedure)] ->(260686004 |Method (attribute))->[129445006 |Administration - action (qualifier value)] ->(363701004 |Direct substance (attribute))->[Rx;198148 predniSONE 50 MG Oral Tablet] ->(410675002 |Route of administration (attribute))->[260548002 |Oral (qualifier value)]

timing.lowerBound:

timing.upperBound:

timing.includeLowerBound: true

timing.inludeUpperBound: true

requestedResult.lowerBound: 1

requestedResult.upperBound: 1

requestedResult.includeLowerBound: true

requestedResult.includeUpperBound: true

requestedResult.measureSemantic: Precoordinated Expression 421026006 |Oral tablet (qualifier value)|

✪ Prednisone 50 mg tablet oral 1 time 1 hour before procedure

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Postcoordinated Expression [416118004 |Administration (procedure)] ->(260686004 |Method (attribute))->[129445006 |Administration - action (qualifier value)] ->(363701004 |Direct substance (attribute))->[Rx;198148 predniSONE 50 MG Oral Tablet] ->(410675002 |Route of administration (attribute))->[260548002 |Oral (qualifier value)]

timing.lowerBound:

timing.upperBound:

timing.includeLowerBound: true

timing.inludeUpperBound: true

requestedResult.lowerBound: 1

requestedResult.upperBound: 1

requestedResult.includeLowerBound: true

requestedResult.includeUpperBound: true

requestedResult.measureSemantic: Precoordinated Expression 421026006 |Oral tablet (qualifier value)|

✪ Diphenhydramine 50 mg tablet oral 1 time 1 hour before procedure

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Postcoordinated Expression [416118004 |Administration (procedure)] ->(260686004 | Method (attribute))->[129445006 |Administration - action (qualifier value)] ->(363701004 |Direct substance (attribute))->[Rx;1085945 diphenhydrAMINE Hydrochloride 50 MG Oral Tablet] ->(410675002 |Route of administration (attribute))->[260548002 |Oral (qualifier value)]

timing.lowerBound:

timing.upperBound:

timing.includeLowerBound: true

timing.inludeUpperBound: true

requestedResult.lowerBound: 1

requestedResult.upperBound: 1

requestedResult.includeLowerBound: true

requestedResult.includeUpperBound: true

requestedResult.measureSemantic: Precoordinated Expression 421026006 |Oral tablet (qualifier value)|

✪ Cimetidine 300 mg tablet oral 1 time 1 hour before procedure

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Postcoordinated Expression [416118004 |Administration (procedure)] ->(260686004 |Method (attribute))->[129445006 |Administration - action (qualifier value)] ->(363701004 |Direct substance (attribute))->[Rx;197506 Cimetidine 300 MG Oral Tablet] ->(410675002 |Route of administration (attribute))->[260548002 |Oral (qualifier value)]

timing.lowerBound:

timing.upperBound:

timing.includeLowerBound: true

timing.inludeUpperBound: true

requestedResult.lowerBound: 1

requestedResult.upperBound: 1

requestedResult.includeLowerBound: true

requestedResult.includeUpperBound: true

requestedResult.measureSemantic: Precoordinated Expression 421026006 |Oral tablet (qualifier value)|

Intravenous Contrast Allergy Premedication Regimen

✪ Hydrocortisone 200 mg solution intraveneous 1 time 4 hours before procedure

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Postcoordinated Expression [416118004 |Administration (procedure)] ->(260686004 |Method (attribute))->[129445006 |Administration - action (qualifier value)] ->(363701004 |Direct substance (attribute))->[Rx;1164003 Hydrocortisone Injectable Product] ->(410675002 |Route of administration (at-

tribute))->[255560000 |Intravenous (qualifier value)]

timing.lowerBound:

timing.upperBound:

timing.includeLowerBound: true

timing.inludeUpperBound: true

requestedResult.lowerBound: 200

requestedResult.upperBound: 200

requestedResult.includeLowerBound: true

requestedResult.includeUpperBound: true

requestedResult.measureSemantic: Precoordinated Expression 258684004 |milligram (qualifier value)|

✪ Diphenhydromine 50 mg solution intraveneous 1 time 4 hours before procedure

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Postcoordinated Expression [416118004 |Administration (procedure)] ->(260686004 |Method (attribute))->[129445006 |Administration - action (qualifier value)] ->(363701004 |Direct substance (attribute))->[Rx;1158446 diphenhydrAMINE Injectable Product] ->(410675002 |Route of administration (attribute))->[255560000 |Intravenous (qualifier value)]

timing.lowerBound:

timing.upperBound:

timing.includeLowerBound: true

timing.inludeUpperBound: true

requestedResult.lowerBound: 50

requestedResult.upperBound: 50

requestedResult.includeLowerBound: true

requestedResult.includeUpperBound: true

requestedResult.measureSemantic: Precoordinated Expression 258684004 |milligram (qualifier value)|

Hold Medication Orders

This section applies to patients who are on medications which should be held prior to cardiac catheterization.

#	insulin	
	# prompt:	Restart timeframe?
	response:	Integer (Single)

responseBinding: Property ("restartTimeframe")

Hold insulin and resume as directed after cardiac catheterization

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Postcoordinated Expression [304540007 |Recommendation to stop drug treatment (procedure)]- ->363702006 |Has focus (attribute))->[416118004 |Administration (procedure)]- ->(363701004 |Direct substance (attribute))->[67866001 |Insulin (substance)];

timing.lowerBound: restartTimeframe

timing.upperBound: restartTimeframe

timing.includeLowerBound: true

timing.inludeUpperBound: true

metformin

Hold metformin and resume as directed after cardiac catheterization

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Postcoordinated Expression [304540007 |Recommendation to stop drug treatment (procedure)]- ->363702006 |Has focus (attribute))->[416118004 |Administration (procedure)]- ->(363701004 |Direct substance (attribute))->[Rx;6809 metFORMIN];

Restart metformin within specified timeframe

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Postcoordinated Expression [182837001 |Restart of medication (procedure)]- ->363702006 |Has focus (attribute))->[416118004 |Administration (procedure)]- ->(363701004 |Direct substance (attribute))->[Rx;6809 metFORMIN];

anticoagulants

Hold anticoagulants and resume as directed after cardiac catheterization

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Postcoordinated Expression [304540007 |Recommendation to stop drug treatment (procedure)]- ->363702006 |Has focus (attribute))->[416118004 |Administration (pro-

			cedure)]- ->(363701004 |Direct substance (attribute))->[372862008 |Anticoagulant (substance)];
		# prompt:	Restart timeframe?
		response:	String (Single)
	#	aspirin	
	# Hold aspirin and resume as directed after cardiac catheterization		
	actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]		
			statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|
			topic: Postcoordinated Expression [304540007 |Recommendation to stop drug treatment (procedure)]- ->363702006 |Has focus (attribute))->[416118004 |Administration (procedure)]- ->(363701004 |Direct substance (attribute))->[Rx;1191 Aspirin];
		# prompt:	Restart timeframe?
		response:	String (Single)

Chapter 4. Laboratory Tests

Possible laboratory tests and order schedules for patients who will undergo cardiac catheterization.

Comprehensive Metabolic Profile

STAT

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 1411000205104 |Comprehensive metabolic panel (procedure)

Today

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 1411000205104 |Comprehensive metabolic panel (procedure)

Upon admission to the catheterization lab

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 1411000205104 |Comprehensive metabolic panel (procedure

unstructured[0]: Upon admission to the catheterization lab

#

prompt: Time for lab draw?

response: Timestamp (Single)

responseBinding: Property ("timeForLabDraw")

Comprehensive Metabolic Profile at specified time

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 1411000205104 |Comprehensive metabolic panel (procedure

timing.lowerBound: timeForLabDraw

timing.upperBound: timeForLabDraw

timing.includeLowerBound: true

timing.inludeUpperBound: true

Complete Blood Count

STAT

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 26604007 |Complete blood count (procedure)|

Today

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 26604007 |Complete blood count (procedure)|

Upon admission to the catheterization lab

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 26604007 |Complete blood count (procedure)|

unstructured[0]: Upon admission to the catheterization lab

#

prompt: Time for lab draw?

response: Timestamp (Single)

Complete Blood Count at specified time

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 26604007 | Complete blood count (procedure)|

timing.lowerBound: timeForLabDraw

timing.upperBound: timeForLabDraw

timing.includeLowerBound: true

timing.inludeUpperBound: true

Brain natriuretic peptide

STAT

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 390917008 |Brain natriuretic peptide measurement (procedure)|

Today

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 390917008 |Brain natriuretic peptide measurement (procedure)|

Upon admission to the catheterization lab

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 390917008 |Brain natriuretic peptide measurement (procedure)|

#

prompt: Test time?

response: Timestamp (Single)

responseBinding: Property ("testTime")

Brain natriuretic peptide test at specified time

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 390917008 |Brain natriuretic peptide measurement (procedure)|

timing.lowerBound: testTime

timing.upperBound: testTime

timing.includeLowerBound: true

timing.inludeUpperBound: true

International Normalized Ratio (INR)

STAT

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 440685005 |Calculation of international normalized ratio (procedure)|

Today

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 440685005 |Calculation of international normalized ratio (procedure)|

unstructured[0]: Today

Upon admission to the catheterization lab

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 440685005 |Calculation of international normalized ratio (procedure)|

unstructured[0]: Upon admission to the catheterization lab

#

prompt: Time for lab draw?

response: Timestamp (Single)

responseBinding: Property ("timeForLabDraw")

INR test at specified time

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 440685005 |Calculation of international normalized ratio (procedure)|

timing.lowerBound: timeForLabDraw

timing.upperBound: timeForLabDraw

timing.includeLowerBound: true

timing.inludeUpperBound: true

Troponin

STAT

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 105000003 |Troponin measurement (procedure)|

Today

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 105000003 |Troponin measurement (procedure)|

unstructured[0]: Today

Upon admission to the catheterization lab

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 105000003 |Troponin measurement (procedure)|

unstructured[0]: Upon admission to the catheterization lab

#

prompt: Time for lab draw?

response: Timestamp (Single)

Troponin test at specified time

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 105000003 | Troponin measurement (procedure)|

timing.lowerBound: timeForLabDraw

timing.upperBound: timeForLabDraw

timing.includeLowerBound: true

timing.inludeUpperBound: true

Magnesium

STAT

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 38151008 |Magnesium measurement (procedure)|

Today

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 38151008 |Magnesium measurement (procedure)|

unstructured[0]: Today

Upon admission to the catheterization lab

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 38151008 |Magnesium measurement (procedure)|

unstructured[0]: Upon admission to the catheterization lab

#

prompt: Time for lab draw?

response: Timestamp (Single)

Magnesium test specified time

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 38151008 | Magnesium measurement (procedure)|

timing.lowerBound: timeForLabDraw

timing.upperBound: timeForLabDraw

timing.includeLowerBound: true

timing.inludeUpperBound: true

aPTT

STAT

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 42525009 |Partial thromboplastin time, activated (procedure)|

Today

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 42525009 |Partial thromboplastin time, activated (procedure)|

unstructured[0]: Today

Upon admission to the catheterization lab

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 42525009 |Partial thromboplastin time, activated (procedure)|

unstructured[0]: Upon admission to the catheterization lab

#

prompt: Time for lab draw?

response: Timestamp (Single)

aPTT at specified time

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 42525009 |Partial thromboplastin time, activated (procedure)|

timing.lowerBound: timeForLabDraw

timing.upperBound: timeForLabDraw

timing.includeLowerBound: true

timing.inludeUpperBound: true

IF patient is FEMALE AND < 52 years old AND has NOT had a hyterectomy, bilateral oophorectomy, or tubal ligation OR is NOT in menopause OR has NOT been previously designated as medically unable to conceive by their provider

Human chorionic gonadotropin (HCG)

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 67900009 |Human chorionic gonadotropin measurement (procedure)|

Point-of-Care test

Finger-stick Glucose

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Precoordinated Expression 302789003 |Capillary blood glucose measurement (procedure)|

Chapter 5. Imaging and Diagnostic Testing

Choose all that apply to patient

12-Lead ECG preprocedural evaluation for cardiac catheterization

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Postcoordinated Expression [268400002 |12 lead electrocardiogram (procedure)] ->(363702006 |Has focus (attribute))-[dffc9bef-d9a5-4b99-bf6a-a89511bf5410 |Evaluation of preoperative cardiac function (procedure))

Echocardiogram preprocedural evaluation for cardiac catheterization

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Postcoordinated Expression [40701008 |Echocardiography (procedure)] ->(363702006 |Has focus (attribute))-[dffc9bef-d9a5-4b99-bf6a-a89511bf5410 |Evaluation of preoperative cardiac function (procedure))

X-ray chest posterioranterior (PA) and lateral preprocedural evaluation for cardiac catheterization

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Postcoordinated Expression [42869005 |Diagnostic radiography of chest, combined posteroanterior and lateral (procedure)] ->(363702006 |Has focus (attribute))-[dffc9bef-d9a5-4b99-bf6a-a89511bf5410 |Evaluation of preoperative cardiac function (procedure))

X-ray anteroposterior (AP) portable preprocedural evaluation for cardiac catheterization

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]

statementType: Precoordinated Expression 385644000 |Requested (qualifier value)|

topic: Postcoordinated Expression [394421000119103 |Plain x-ray of chest anteroposterior view (procedure)] ->(424226004 |Using device (attribute))->[706348008 |Radiology mobile medical facility (physical object)] ->(363702006 |Has focus (attribute))-[dffc9bef-d9a5-4b99-bf6a-a89511bf5410 |Evaluation of preoperative cardiac function (procedure))

Chapter 6. Tabular List

Terminology Service Request (TSR) Mappings

Table 6.1. Terminology Versions

Name	Identifer	Version
SNOMED CT	2.16.840.1.113883.6.96	United States Edition 20180301
RXNorm	2.16.840.1.113883.6.88	5-Mar-18

Table 6.2. Terminology References

System	Code	Display Text[a]	References[b]
SNOMED CT	105000003 |Troponin measurement (procedure)|	Precoordinated Expression	4
SNOMED CT	133936004 |Adult (person)|	Adult patients with suspected cardiac disease requiring invasive diagnosis and/or treatment	1
SNOMED CT	1411000205104 |Comprehensive metabolic panel (procedure	Precoordinated Expression	2
SNOMED CT	1411000205104 |Comprehensive metabolic panel (procedure)	Precoordinated Expression	2
SNOMED CT	258684004 |milligram (qualifier value)|	Precoordinated Expression	2
SNOMED CT	26604007 |Complete blood count (procedure)|	Precoordinated Expression	4
SNOMED CT	302789003 |Capillary blood glucose measurement (procedure)|	Precoordinated Expression	1
SNOMED CT	38151008 |Magnesium measurement (procedure)|	Precoordinated Expression	4
SNOMED CT	385644000 |Requested (qualifier value)|	Precoordinated Expression	46
SNOMED CT	390917008 |Brain natriuretic peptide measurement (procedure)|	Precoordinated Expression	4
SNOMED CT	421026006 |Oral tablet (qualifier value)|	Precoordinated Expression	5
SNOMED CT	42525009 |Partial thromboplastin time, activated (procedure)|	Precoordinated Expression	4
SNOMED CT	440685005 |Calculation of international normalized ratio (procedure)|	Precoordinated Expression	4

System	Code	Display Text[a]	References[b]
SNOMED CT	67900009 |Human chorionic gonadotropin measurement (procedure)|	Precoordinated Expression	1
SNOMED CT	[182837001 |Restart of medication (procedure)]- ->363702006 |Has focus (attribute))->[416118004 |Administration (procedure)]- ->(363701004 |Direct substance (attribute))->[Rx;6809 metFORMIN];	Postcoordinated Expression	1
SNOMED CT	[268400002 |12 lead electrocardiogram (procedure)] ->(363702006 | Has focus (attribute))-[dffc9bef-d9a5-4b99-bf6aa89511bf5410 |Evaluation of preoperative cardiac function (procedure))	Postcoordinated Expression	1
SNOMED CT	[304540007 |Recommendation to stop drug treatment (procedure)]- ->363702006 |Has focus (attribute))->[416118004 |Administration (procedure)]- ->(363701004 |Direct substance (attribute))->[372862008 |Anticoagulant (substance)];	Postcoordinated Expression	1
SNOMED CT	[304540007 |Recommendation to stop drug treatment (procedure)]- ->363702006 |Has focus (attribute))->[416118004 |Administration (procedure)]- ->(363701004 |Direct substance (attribute))->[67866001 |Insulin (substance)];	Postcoordinated Expression	1
SNOMED CT	[304540007 |Recommendation to stop drug treatment (procedure)]- ->363702006 |Has focus (attribute))->[416118004 |Administration (procedure)]- ->(363701004 |Direct substance (at-	Postcoordinated Expression	1

System	Code	Display Text[a]	References[b]
	tribute))->[Rx;1191 Aspirin];		
SNOMED CT	[304540007 |Recommendation to stop drug treatment (procedure)]- ->363702006 |Has focus (attribute))->[416118004 |Administration (procedure)]- ->(363701004 |Direct substance (attribute))->[Rx;6809 metFORMIN];	Postcoordinated Expression	1
SNOMED CT	[394421000119103 | Plain x-ray of chest anteroposterior view (procedure)] ->(424226004 |Using device (attribute))->[706348008 | Radiology mobile medical facility (physical object)] ->(363702006 |Has focus (attribute))-[dffc9bef-d9a5-4b99-bf6aa89511bf5410 |Evaluation of preoperative cardiac function (procedure))	Postcoordinated Expression	1
SNOMED CT	[40701008 |Echocardiography (procedure)] ->(363702006 |Has focus (attribute))-[dffc9bef-d9a5-4b99-bf6aa89511bf5410 |Evaluation of preoperative cardiac function (procedure))	Postcoordinated Expression	1
SNOMED CT	[416118004 |Administration (procedure)] ->(260686004 |Method (attribute))->[129445006 |Administration - action (qualifier value)] ->(363701004 | Direct substance (attribute))->[Rx;1085945 diphenhydrAMINE Hydrochloride 50 MG Oral Tablet] ->(410675002 | Route of administration (attribute))->[260548002 | Oral (qualifier value)]	Postcoordinated Expression	1

System	Code	Display Text[a]	References[b]
SNOMED CT	[416118004 |Administration (procedure)] ->(260686004 |Method (attribute))->[129445006 |Administration - action (qualifier value)] ->(363701004 | Direct substance (attribute))->[Rx;1158446 diphenhydrAMINE Injectable Product] ->(410675002 |Route of administration (attribute))->[255560000 |Intravenous (qualifier value)]	Postcoordinated Expression	1
SNOMED CT	[416118004 |Administration (procedure)] ->(260686004 |Method (attribute))->[129445006 |Administration - action (qualifier value)] ->(363701004 | Direct substance (attribute))->[Rx;1164003 Hydrocortisone Injectable Product] ->(410675002 | Route of administration (attribute))->[255560000 | Intravenous (qualifier value)]	Postcoordinated Expression	1
SNOMED CT	[416118004 |Administration (procedure)] ->(260686004 |Method (attribute))->[129445006 |Administration - action (qualifier value)] ->(363701004 | Direct substance (attribute))->[Rx;197506 Cimetidine 300 MG Oral Tablet] ->(410675002 | Route of administration (attribute))->[260548002 | Oral (qualifier value)]	Postcoordinated Expression	1
SNOMED CT	[416118004 |Administration (procedure)] ->(260686004 |Method (attribute))->[129445006 |Administration - action (qualifier value)] ->(363701004 |	Postcoordinated Expression	3

System	Code	Display Text[a]	References[b]
	Direct substance (attribute))->[Rx;198148 predniSONE 50 MG Oral Tablet] ->(410675002 | Route of administration (attribute))->[260548002 | Oral (qualifier value)]		
SNOMED CT	[42869005 |Diagnostic radiography of chest, combined posteroanterior and lateral (procedure)] ->(363702006 | Has focus (attribute))-[dffc9bef-d9a5-4b99-bf6aa89511bf5410 |Evaluation of preoperative cardiac function (procedure))	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.

Chapter 7. Behavior Symbols

Table 7.1. Group Organizational Behavior

Symbol	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 7.2. Group Selection Behavior

Symbol	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 7.3. Required Behavior

Symbol	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.

Symbol	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 7.4. Precheck Behavior

Symbol	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 7.5. Cardinality Behavior

Symbol	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 7.6. Item Flags

Symbol	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 7.7. Read Only Behavior

Symbol	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: Pre-Cardiac Catheterization Order Set Conceptual Structure Document*

[KVRpt] *Cardiology: Pre-Cardiac Catheterization Order Set 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=edae8df1-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])