

Women's Health: Diagnostic Breast Imaging Rule

Rule: 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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Women's Health: Diagnostic Breast Imaging Rule: Rule: Conceptual Structure

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 19, 2018	Published
May 18, 2018	Published
May 15, 2018	Reviewed
April 19, 2018	Pre-published
April 19, 2018	Created

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	6f9a7a47-24b5-5f8b-ac38-b4e28ede49b3	O9

Artifact Applicability

Table 4. Applicability Foci, Description and Codes

Focus	Description	Code System	Code	Value Set	Value Set Version
TargetUser	Primary Care Provider	SNOMED CT	453231000124104 Primary care provider (occupation)	N/A	N/A
TargetUser	Gynecologist			N/A	N/A
ClinicalVenue	Outpatient	SNOMED CT	33022008 Hospital-based outpatient department (environment)	N/A	N/A
ClinicalVenue	Primary Care	SNOMED CT	5351000124100 Primary care clinic (environment)	N/A	N/A
ClinicalFocus	Primary Care, Gynecology, Interventional Radiology, Pathology, Oncology, Surgery			N/A	N/A
PatientGender	Female	SNOMED CT	248152002 Female (finding)	N/A	N/A
PatientAgeGroup	Adult	SNOMED CT	133936004 Adult (person)	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. PatientAge

Expression: type=elm:SingletonFrom
Annotation: Determine patient age
Codes: elm:value[elm:Code]: [398166005 Performed (qualifier value)]elm:value[elm:Code]: [[a997cc03-3e99-40eb-833a-6374c7750a3a Observation procedure (procedure)] ->(363702006 Has focus (attribute))>[105726004 Age AND/OR growth finding (finding)]]

Table 1.2. PatientGenderFemale

Expression: type=elm:SingletonFrom
Annotation: Determine patient gender
Codes: elm:element[elm:Code]: [[a997cc03-3e99-40eb-833a-6374c7750a3a Observation procedure (procedure)] ->(363702006 Has focus (attribute))>[248152002 Female (finding)]]

Table 1.3. ScreeningMammogramsCategory

Expression: type=elm:Retrieve , dataType=anf:ClinicalStatement, codeProperty=topic
Annotation: BI-RADS Category 0 (Incomplete/Needs additional imaging and/or comparison films); or BI-RADS Category 3 or higher; or Abnormal result without the BI-RAD Category recorded
Codes: elm:element[elm:Code]: [[a997cc03-3e99-40eb-833a-6374c7750a3a Observation procedure (procedure)] ->(363702006 Has focus (attribute))>[397138000 Mammography assessment (Category 0) - Need additional imaging evaluation (finding)]]elm:element[elm:Code]: [[a997cc03-3e99-40eb-833a-6374c7750a3a Observation procedure (procedure)] - >(363702006 Has focus (attribute))>[397143007 Mammography assessment (Category 3) - Probably benign finding, short interval follow-up (finding)]]elm:element[elm:Code]: [[a997cc03-3e99-40eb-833a-6374c7750a3a Observation procedure (procedure)] ->(363702006 Has focus (attribute))>[397143007 397144001 Mammography assessment (Category 4) - Suspicious abnormality, biopsy should be considered (finding)]]elm:element[elm:Code]: [[a997cc03-3e99-40eb-833a-6374c7750a3a Observation procedure (procedure)] ->(363702006 Has focus (attribute))>[397145000 Mammography assessment (Category 5) - Highly suggestive of malignancy (finding)]]elm:element[elm:Code]: [[a997cc03-3e99-40eb-833a-6374c7750a3a Observation procedure (procedure)] ->(363702006 Has focus (attribute))>[6111000179101 Mammography assessment (Category 6) - known biopsy, proven malignancy (finding)]]elm:element[elm:Code]: [3[a997cc03-3e99-40eb-833a-6374c7750a3a Observation procedure (procedure)] ->(363702006 Has focus (attribute))>[97137005 Mammography assessment finding (finding)]]

Table 1.4. EvaluationOfBreastSymptomsAppointment

Expression: type=elm:Retrieve , dataType=anf:ClinicalStatement, codeProperty=topic
Annotation: This subgroup consists of women who have scheduled an appointment for the evaluation of breast symptoms
Codes: elm:element[elm:Code]: [[386053000 Evaluation procedure (procedure)] ->(363702006 Has focus (attribute))>[198116001 Breast signs and symptoms (finding)]]

Table 1.5. BreastSymptoms

Expression: type=elm:Query
Annotation: This subgroup consists of women whose clinicians record breast symptoms during an exam
Codes: elm:value[elm:Code]: [398166005 Performed (qualifier value)]elm:value[elm:Code]: [[a997cc03-3e99-40eb-833a-6374c7750a3a Observation procedure (procedure)] ->(363702006 Has focus (attribute))->[198116001 Breast signs and symptoms (finding)]]

Table 1.6. AbnormalFindings

Expression: type=elm:Query
Annotation: This subgroup consists of women whose clinicians record abnormal clinical breast findings during an exam
Codes: elm:value[elm:Code]: [398166005 Performed (qualifier value)]elm:value[elm:Code]: [[a997cc03-3e99-40eb-833a-6374c7750a3a Observation procedure (procedure)] ->(363702006 Has focus (attribute))->[116339002 Breast finding (finding)]elm:value[elm:Code]: [263654008 Abnormal (qualifier value)]

Table 1.7. BreastSymptomsOrAbnormalFindings

Expression: type=elm:AnyTrue
Annotation: This subgroup consists of women whose clinicians record breast symptoms and/or abnormal clinical breast findings during an exam
Codes:

Triggers

Table 1.8. MammogramScreeningTrigger

Trigger: type=DataEventTrigger, DataElementAdded
Expression: type=elm:Exists
Annotation: Screening mammogram result with BI-RADS Category 0 or Category 3 or Higher recorded; or Abnormal screening mammogram result without BI-RADS Category recorded.
Codes:

Table 1.9. ScreeningMammogramResult

Trigger: type=DataEventTrigger, DataElementAdded
Expression: type=elm:Exists
Annotation: A screening mammogram result is recorded or Recording of breast symptoms in the patient record or Recording of breast findings in the patient record
Codes:

Table 1.10. OpeningOfPatientRecord

Trigger: type=DataEventTrigger, DataElementAccessed
Expression: type=elm:Retrieve , dataType=anf:ClinicalStatement

Annotation: Opening of female patient electronic health record during visit with clinical provider for the evaluation of breast symptoms.

Codes: elm:element[elm:Code]: [TSR-NoCode]

Table 1.11. BreastSymptomsOrFindingsVisit

Trigger: type=DataEventTrigger, DataElementAccessed

Expression: type=elm:Exists

Annotation: Visit with clinical provider in which breast symptoms and/or abnormal clinical breast findings are recorded

Codes:

Chapter 2. Expression Definitions

No expression definitions are present.

Chapter 3. Actions

Condition: elm:Exists (MammogramScreeningTrigger)
Condition: elm:Exists (ScreeningMammogramsCategory)
Follow-up to Screening Mammogram
<p># Send mammography results to the clinical provider.</p> <p>actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]</p> <p>statementType: Precoordinated Expression 385644000 Requested (qualifier value) </p> <p>topic: Precoordinated Expression TSR-NoCode</p> <p># Notify the patient of need for follow up.</p> <p>actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]</p> <p>statementType: Precoordinated Expression 385644000 Requested (qualifier value) </p> <p>topic: Precoordinated Expression TSR-NoCode</p> <p># Schedule patient for follow-up appointment with clinical provider.</p> <p>actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]</p> <p>statementType: Precoordinated Expression 385644000 Requested (qualifier value) </p> <p>topic: Postcoordinated Expression [410538000 Scheduling (procedure)] ->(363702006 Has focus (attribute))->[180301d7-d1e4-4068-8757-9f438f17f843 Follow-up consultation with healthcare provider (procedure)]</p> <p># Make sure guideline recommendations are available to clinical provider</p> <p>actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]</p> <p>statementType: Precoordinated Expression 385644000 Requested (qualifier value) </p> <p>topic: Precoordinated Expression TSR-NoCode</p> <p># Open Diagnostic Breast Imaging Documentation Template</p> <p>actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]</p> <p>statementType: Precoordinated Expression 385644000 Requested (qualifier value) </p> <p>topic: Precoordinated Expression TSR-NoCode</p>
Condition: elm:Exists (OpeningOfPatientRecord)
Condition: elm:Exists (EvaluationOfBreastSymptomsAppointment)
Breast Symptoms
<p># Make sure guideline recommendations are available to clinical provider.</p> <p>actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]</p> <p>statementType: Precoordinated Expression 385644000 Requested (qualifier value) </p> <p>topic: Precoordinated Expression TSR-NoCode</p> <p># Open Diagnostic Breast Imaging Documentation Template</p>

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]
 statementType: Precoordinated Expression 385644000 |
 Requested (qualifier value)|
 topic: Precoordinated Expression TSR-NoCode

Condition:elm:Exists (BreastSymptomsOrFindingsVisit)

Condition:elm:Exists (BreastSymptomsOrAbnormalFindings)

Clinical Breast Findings

Make sure guideline recommendations are available to clinical provider.

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]
 statementType: Precoordinated Expression 385644000 |
 Requested (qualifier value)|
 topic: Precoordinated Expression TSR-NoCode

Open Diagnostic Breast Imaging Documentation Template

actionSentence[type=elm:Instance, classType=anf:ClinicalStatement]
 statementType: Precoordinated Expression 385644000 |
 Requested (qualifier value)|
 topic: Precoordinated Expression TSR-NoCode

Chapter 4. Tabular List

Terminology Service Request (TSR) Mappings

Table 4.1. Terminology Versions

Name	Identifier	Version
SNOMED CT	2.16.840.1.113883.6.96	United States Edition 20180301

Table 4.2. Terminology References

System	Code	Display Text ^a	References ^b
SNOMED CT	133936004 Adult (person)	Adult	1
SNOMED CT	248152002 Female (finding)	Female	1
SNOMED CT	263654008 Abnormal (qualifier value)	Precoordinated Expression	1
SNOMED CT	33022008 Hospital-based outpatient department (environment)	Outpatient	1
SNOMED CT	385644000 Requested (qualifier value)	Precoordinated Expression	9
SNOMED CT	398166005 Performed (qualifier value)	Precoordinated Expression	3
SNOMED CT	3[a997cc03-3e99-40eb-833a-6374e7750a6d] Observation procedure (procedure)] - >(363702006 Has focus (attribute))>[97137005 Mammography assessment finding (finding)]	Precoordinated Expression	1
SNOMED CT	453231000124104 Primary care provider (occupation)	Primary Care Provider	1
SNOMED CT	5351000124100 Primary care clinic (environment)	Primary Care	1
SNOMED CT	TSR-NoCode ^c	Precoordinated Expression	9
SNOMED CT	[386053000 Evaluation procedure (procedure)] - >(363702006 Has focus (attribute))>[198116001 Breast signs and symptoms (finding)]	Postcoordinated Expression	1
SNOMED CT	[410538000 Scheduling (procedure)] - >(363702006 Has focus (attribute))>[180301d7-	Postcoordinated Expression	1

System	Code	Display Text ^a	References ^b
	d1e4-4068-8757-9f438f17f843	[Follow-up consultation with healthcare provider (procedure)]	
SNOMED CT	[a997cc03-3e99-40eb-833a-0374c775d3a2 Observation procedure (procedure)] ->(363702006 Has focus (attribute))->[105726004 Age AND/OR growth finding (finding)]	Observation procedure (procedure) ->(363702006 Has focus (attribute))->(363702006 Observation procedure (procedure))	1
SNOMED CT	[a997cc03-3e99-40eb-833a-0374c775d3a2 Observation procedure (procedure)] ->(363702006 Has focus (attribute))->[116339002 Breast finding (finding)]	Observation procedure (procedure) ->(363702006 Has focus (attribute))->(363702006 Observation procedure (procedure))	1
SNOMED CT	[a997cc03-3e99-40eb-833a-0374c775d3a2 Observation procedure (procedure)] ->(363702006 Has focus (attribute))->[198116001 Breast signs and symptoms (finding)]	Observation procedure (procedure) ->(363702006 Has focus (attribute))->(363702006 Observation procedure (procedure))	1
SNOMED CT	[a997cc03-3e99-40eb-833a-0374c775d3a2 Observation procedure (procedure)] ->(363702006 Has focus (attribute))->[248152002 Female (finding)]	Observation procedure (procedure) ->(363702006 Has focus (attribute))->(363702006 Observation procedure (procedure))	1
SNOMED CT	[a997cc03-3e99-40eb-833a-0374c775d3a2 Observation procedure (procedure)] ->(363702006 Has focus (attribute))->[397138000 Mammography assessment (Category 0) - Need additional imaging evaluation (finding)]	Observation procedure (procedure) ->(363702006 Has focus (attribute))->(363702006 Observation procedure (procedure))	1
SNOMED CT	[a997cc03-3e99-40eb-833a-0374c775d3a2 Observation procedure (procedure)] ->(363702006 Has focus (attribute))->[397143007 397144001 Mammography assessment (Category 4) - Suspicious abnormality, biopsy should be considered (finding)]	Observation procedure (procedure) ->(363702006 Has focus (attribute))->(363702006 Observation procedure (procedure))	1

System	Code	Display Text ^a	References ^b
SNOMED CT	[a997cc03-3e99-40eb-833a-0374c775f03a Observation procedure (procedure)] ->(363702006 Has focus (attribute))->[397143007 Mammography assessment (Category 3) - Probably benign finding, short interval follow-up (finding)]	Observation procedure (procedure) ->(363702006 Has focus (attribute))->[397143007 Mammography assessment (Category 3) - Probably benign finding, short interval follow-up (finding)]	1
SNOMED CT	[a997cc03-3e99-40eb-833a-0374c775f03a Observation procedure (procedure)] ->(363702006 Has focus (attribute))->[397145000 Mammography assessment (Category 5) - Highly suggestive of malignancy (finding)]	Observation procedure (procedure) ->(363702006 Has focus (attribute))->[397145000 Mammography assessment (Category 5) - Highly suggestive of malignancy (finding)]	1
SNOMED CT	[a997cc03-3e99-40eb-833a-0374c775f03a Observation procedure (procedure)] ->(363702006 Has focus (attribute))->[6111000179101 Mammography assessment (Category 6) - known biopsy, proven malignancy (finding)]	Observation procedure (procedure) ->(363702006 Has focus (attribute))->[6111000179101 Mammography assessment (Category 6) - known biopsy, proven malignancy (finding)]	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.

^cTSR-NoCode is a placeholder indicating a code was requested, but was not provided.

Chapter 5. Behavior Symbols

Table 5.1. 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 5.2. 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 5.3. 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.
◇	Could	An action with this behavior may be included in the set of actions processed by the end user.

Symbol	Name	Definition
➤	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 5.4. 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 5.5. 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 5.6. 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 5.7. 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] *Women's Health: Diagnostic Breast Imaging Clinical Content White Paper*

[CSD] *Women's Health: Diagnostic Breast Imaging Rule Conceptual Structure Document*

[KVRpt] *Women's Health: Diagnostic Breast Imaging Rule KNART Validation Report*

Supporting Evidence

[ACS 2017] *American Cancer Society. Lifetime Probability of Developing and Dying from Cancer, 2011-2013. American Cancer Society, Surveillance Research, 2017. Cancer Facts & Figures 2017 website.* (link [<https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/annual-cancer-facts-and-figures/2017/lifetime-probability-of-developing-and-dying-from-cancer-2011-2013.pdf>])

[ACR 2013] *American College of Radiology, Quality and Safety Resources – Breast Imaging - Reporting and Data Systems (BI-RADS) Atlas. 5th edition. 2013.* (link [<https://www.acr.org/Clinical-Resources/Reporting-and-Data-Systems/Bi-Rads>])

[ACR 5TIER] *Radiopedia - 5-tier American College of Radiology (ACR) system of radiologic breast findings.* (link [<https://radiopaedia.org/articles/5-tier-acr-system-of-radiologic-breast-findings>])

[BIRADS FINAL] *Radiology Assistant - BI-RADS Final Assessment.* (link [<http://www.radiologyassistant.nl/en/p53b4082c92130/bi-rads-for-mammography-and-ultrasound-2013.html#in53b4389d91374>])

[BIRADS Mammography] *American College of Radiology. ACR BI-RADS Atlas 5th Edition – Mammography: Reporting System. American College of Radiology website.* (link [<https://www.acr.org/-/media/ACR/Files/RADS/BI-RADS/Mammography-Reporting.pdf>])

[BIRADS Ultrasound] *American College of Radiology. ACR BI-RADS Atlas 5th Edition – Ultrasound: Reporting System. American College of Radiology website.* (link [<https://www.acr.org/-/media/ACR/Files/RADS/BI-RADS/US-Reporting.pdf>])

[NCCN 2017] *National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines): Breast Cancer Screening and Diagnosis, Version 1.2017. National Comprehensive Cancer Network Guidelines website.* (link [https://www.nccn.org/professionals/physician_gls/pdf/breast-screening.pdf])

[Oeffinger 2015] *KC Oeffinger, ETH Fontham, R Etzioni, and et al. Breast Cancer Screening for Women at Average Risk: 2015 Guideline Update from the American Cancer Society. JAMA. 2015;314(15):1599-1614* (link [<https://doi.org/10.1001/jama.2015.12783>])