Neurology: Traumatic Brain Injury (TBI) Screening Rule

Rule: Conceptual Structure

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Department of Veterans Affairs (VA)

**Knowledge Based Systems (KBS)
Office of Informatics and Information Governance (OIIG)
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Neurology: Traumatic Brain Injury (TBI) Screening 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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Table 1. Revision History

Date	Life Cycle Event
June 20, 2018	Published
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Table 3. Artifact Identifier

Domain	Artifact ID	Name
urn:va.gov:kbs:knart:artifact:r1	2e225a2b-2821-5815-bc68-4cc1f6db9824	B2

Artifact Applicability

Table 4. Applicability Foci, Description and Codes

Focus	Description	Code System	Code	Value Set	Value Set Version
TargetUser	Primary Care	SNOMED CT	453231000124104 |Primary care provider (occupation)|	N/A	N/A
ClinicalFocus	Adult patients with suspected Traumatic Brain Injury			N/A	N/A
ClinicalVenue	Outpatient	SNOMED CT	33022008 | Hospital-based outpatient department (environment)|	N/A	N/A
PatientAgeGroup	Adult patients with suspected Traumatic Brain Injury	SNOMED CT	133936004 |Adult (person)|	N/A	N/A
PatientGender	All			N/A	N/A
WorkflowTask	Request Neurology Consultation			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. Outpatient

Expression: type=elm:Query

Annotation:

Codes: elm:value[elm:Code]: [398166005 |Performed (qualifier value)|]elm:value[elm:Code]: [TSR-NoCode]

Table 1.2. DeploymentDates

Expression: type=elm:Query

Annotation:

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

Table 1.3. MostRecentDeployment

Expression: type=elm:Indexer

Annotation:

Codes:

Table 1.4. InjuredWithHeadTraumaDuringDeployment

Expression: type=elm:Retrieve , dataType=anf:ClinicalStatement, codeProperty=topic, dateProperty=dateTime

Annotation:

Codes: elm:element[elm:Code]: [[a997cc03-3e99-40eb-833a-6374c7750a3a |Observation procedure (procedure)]- ->(363702006 |Has focus (attribute))->[3006004 |Disturbance of consciousness (finding)]- ->(42752001 |Due to (attribute))->[82271004 |Injury of head (disorder)];]

dateRange[elm:List]   low: ()

                           high: ()

Table 1.5. MildTraumaticBrainInjuryReferral

Expression: type=elm:Query

Annotation:

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))->[127295002 |Traumatic brain injury (disorder)]- ->(246112005 |Severity (attribute))->[255604002 |Mild (qualifier value)];]

Table 1.6. TraumaticBrainInjuryScreeningCompleted

Expression: type=elm:Retrieve , dataType=anf:ClinicalStatement, codeProperty=topic, dateProperty=dateTime

Annotation:

Codes: elm:element[elm:Code]: [[225391007 |Injury assessment (procedure)] ->(363702006 |Has focus (attribute))->[127295002 |Traumatic brain injury (disorder)]]

dateRange[elm:ExpressionRef]()

            high: ()

Table 1.7. HasEmergencyEvaluationAndTreatmentConditions

Expression: type=elm:Query

Annotation:

Codes: elm:value[elm:Code]: [398166005 |Performed (qualifier value)|]elm:value[elm:Code]: [TSR-NoCode]

Table 1.8. HasSevereTraumaticBrainInjuryConditions

Expression: type=elm:Query

Annotation:

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))->[127295002 |Traumatic brain injury (disorder)]- ->(246112005 |Severity (attribute))->[24484000 |Severe (severity modifier) (qualifier value)];]

Table 1.9. HasModerateTraumaticBrainInjuryConditions

Expression: type=elm:Query

Annotation:

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))->[127295002 |Traumatic brain injury (disorder)]- ->(246112005 |Severity (attribute))->[6736007 |Moderate (severity modifier) (qualifier value)];]

Table 1.10. PeristentHeadache

Expression: type=elm:Query

Annotation:

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))->[25064002 |Headache (finding)]- ->(263502005 |Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];]

Table 1.11. PersistentDizziness

Expression: type=elm:Query

Annotation:

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))->[404640003 |Dizziness (finding)]- ->(263502005 |Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];]

Table 1.12. PersistentBalanceDisorder

Expression: type=elm:Query

Annotation:

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))->[387603000 |Impairment of balance (finding)]- ->(263502005 |Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];]

Table 1.13. PeristentNausea

Expression: type=elm:Query

Annotation:

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))->[422587007 |Nausea (finding)]- ->(263502005 |Clinical course (attribute))- >[62459000 |Chronic persistent (qualifier value)];]

Table 1.14. PeristentSleepDisturbance

Expression: type=elm:Query

Annotation:

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))->[44186003 |Dyssomnia (disorder)]- ->(263502005 |Clinical course (attribute))- >[62459000 |Chronic persistent (qualifier value)];]

Table 1.15. PeristentVisionChanges

Expression: type=elm:Query

Annotation:

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))->[63102001 |Visual disturbance (disorder)]- ->(263502005 |Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];]

Table 1.16. PeristentLightSensitivity

Expression: type=elm:Query

Annotation:

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))->[246622003 |Eyes sensitive to light (finding)]- ->(263502005 |Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];]

Table 1.17. PeristentTinnitus

Expression: type=elm:Query

Annotation:

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))->[60862001 |Tinnitus (finding)]- ->(263502005 |Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];]

Table 1.18. PeristentNumbness

Expression: type=elm:Query

Annotation:

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))->[44077006 |Numbness (finding)]- ->(263502005 |Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];]

Table 1.19. PeristentTingling

Expression: type=elm:Query

Annotation:

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))->[62507009 |Pins and needles (finding)]- ->(263502005 |Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];]

Table 1.20. PeristentMemoryProblems

Expression: type=elm:Query

Annotation:

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))->[386807006 |Memory impairment (finding)]- ->(263502005 |Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];]

Table 1.21. PeristentCognitiveProblems

Expression: type=elm:Query

Annotation:

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))->[386806002 |Impaired cognition (finding)]- ->(263502005 |Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];]

Table 1.22. PeristentBehavioralChanges

Expression: type=elm:Query

Annotation:

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))->[417350008 |Altered behavior (finding)]- ->(263502005 |Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];]

Triggers

Table 1.23. AccessOfPatientRecord

Trigger: type=DataEventTrigger, DataElementAccessed
Expression: type=elm:Instance
Annotation: Any access of the patient record
Codes: elm:value[elm:Code]: [TSR-NoCode]elm:value[elm:Code]: [TSR-NoCode]

Chapter 2. Expression Definitions

Table 2.1. PatientAge

Expression: type=elm:SingletonFrom
Annotation:
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)]]

Chapter 3. Actions

Conditions
Condition:elm:AnyTrue
Condition:elm:Not (elm:Exists(HasEmergencyEvaluationAndTreatmentConditions))
Condition:elm:Not (elm:Exists(HasSevereTraumaticBrainInjuryConditions))
Condition:elm:Not (elm:Exists(HasModerateTraumaticBrainInjuryConditions))

◆ Identify the patient as a candidate for 'mild traumatic brain injury with current symptomatology' screening

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

      statementType: Precoordinated Expression 398166005 |Performed (qualifier value)|

      topic: Precoordinated Expression TSR-NoCode

◆ Open Documentation Template: Traumatic Brain Injury (TBI) Screening KNART

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

      statementType: Precoordinated Expression TSR-NoCode

      topic: Precoordinated Expression TSR-NoCode

◆ Make sure guideline recommendations are available to care team

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

      statementType: Precoordinated Expression TSR-NoCode

      topic: Precoordinated Expression TSR-NoCode

Chapter 4. Tabular List

Terminology Service Request (TSR) Mappings

Table 4.1. Terminology Versions

Name	Identifer	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 patients with suspected Traumatic Brain Injury	1
SNOMED CT	33022008 |Hospital-based outpatient department (environment)|	Outpatient	1
SNOMED CT	398166005 |Performed (qualifier value)|	Precoordinated Expression	22
SNOMED CT	453231000124104 | Primary care provider (occupation)|	Primary Care	1
SNOMED CT	TSR-NoCode[c]	Precoordinated Expression	9
SNOMED CT	[225391007 |Injury assessment (procedure)] ->(363702006 |Has focus (attribute))->[127295002 |Traumatic brain injury (disorder)]	Postcooridnated Expression	1
SNOMED CT	[a997cc03-3e99-40eb-833a-6374c77150a3 |Observation procedure (procedure)] ->(363702006 |Has focus (attribute))->[105726004 |Age AND/OR growth finding (finding)]	Postcoordinated Expression	1
SNOMED CT	[a997cc03-3e99-40eb-833a-6374c77150a3 |Observation procedure (procedure)]- ->(363702006 |Has focus (attribute))->[127295002 |Traumatic brain injury (disorder)]- ->(246112005 |Severity (attribute))->[24484000 |Severe (severity modifier) (qualifier value)];	Postcoordinated Expression	1
SNOMED CT	[a997cc03-3e99-40eb-833a-6374c77150a3 |Observation procedure	Postcoordinated Expression	1

System	Code	Display Text[a]	References[b]
	(procedure)]- ->(363702006 |Has focus (attribute))->[127295002 |Traumatic brain injury (disorder)]- ->(246112005 |Severity (attribute))->[255604002 |Mild (qualifier value)];		
SNOMED CT	[a997cc03-3e99-40eb-833a-6374c77c50a3 |Observation procedure (procedure)]- ->(363702006 |Has focus (attribute))->[127295002 |Traumatic brain injury (disorder)]- ->(246112005 |Severity (attribute))->[6736007 |Moderate (severity modifier) (qualifier value)];	Post-coordinated Expression	1
SNOMED CT	[a997cc03-3e99-40eb-833a-6374c77c50a3 |Observation procedure (procedure)]- ->(363702006 |Has focus (attribute))->[246622003 |Eyes sensitive to light (finding)]- ->(263502005 | Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];	Post-coordinated Expression	1
SNOMED CT	[a997cc03-3e99-40eb-833a-6374c77c50a3 |Observation procedure (procedure)]- ->(363702006 |Has focus (attribute))->[25064002 |Headache (finding)]- ->(263502005 |Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];	Post-coordinated Expression	1
SNOMED CT	[a997cc03-3e99-40eb-833a-6374c77c50a3 |Observation procedure (procedure)]- ->(363702006 |Has focus (attribute))->[3006004 |Disturbance of consciousness (finding)]- ->(42752001 |Due to	Post-coordinated Expression	1

System	Code	Display Text[a]	References[b]
	(attribute))->[82271004 | Injury of head (disorder)];		
SNOMED CT	[a997cc03-3e99-40eb-833a-67344c7750n3 |Observation procedure (procedure)]- ->(363702006 |Has focus (attribute))->[386806002 |Impaired cognition (finding)]- ->(263502005 | Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];	Precoordinated Expression	1
SNOMED CT	[a997cc03-3e99-40eb-833a-67344c7750n3 |Observation procedure (procedure)]- ->(363702006 |Has focus (attribute))->[386807006 |Memory impairment (finding)]- ->(263502005 | Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];	Precoordinated Expression	1
SNOMED CT	[a997cc03-3e99-40eb-833a-67344c7750n3 |Observation procedure (procedure)]- ->(363702006 |Has focus (attribute))->[387603000 |Impairment of balance (finding)]- ->(263502005 | Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];	Precoordinated Expression	1
SNOMED CT	[a997cc03-3e99-40eb-833a-67344c7750n3 |Observation procedure (procedure)]- ->(363702006 |Has focus (attribute))->[404640003 |Dizziness (finding)]- ->(263502005 |Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];	Precoordinated Expression	1
SNOMED CT	[a997cc03-3e99-40eb-833a-67344c7750n3 |Observation procedure (procedure)]- ->(363702006 |Has focus	Precoordinated Expression	1

System	Code	Display Text[a]	References[b]
	(attribute))->[417350008 |Altered behavior (finding)]- ->(263502005 | Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];		
SNOMED CT	[a997cc03-3e99-40eb-833a-03f4cc7751n3 |Observation procedure (procedure)]- ->(363702006 |Has focus (attribute))->[422587007 |Nausea (finding)]- ->(263502005 |Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];	Post-coordinated Expression	1
SNOMED CT	[a997cc03-3e99-40eb-833a-03f4cc7751n3 |Observation procedure (procedure)]- ->(363702006 |Has focus (attribute))->[44077006 |Numbness (finding)]- ->(263502005 |Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];	Post-coordinated Expression	1
SNOMED CT	[a997cc03-3e99-40eb-833a-03f4cc7751n3 |Observation procedure (procedure)]- ->(363702006 |Has focus (attribute))->[44186003 |Dyssomnia (disorder)]- ->(263502005 |Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];	Post-coordinated Expression	1
SNOMED CT	[a997cc03-3e99-40eb-833a-03f4cc7751n3 |Observation procedure (procedure)]- ->(363702006 |Has focus (attribute))->[60862001 |Tinnitus (finding)]- ->(263502005 |Clinical course (attribute))->[62459000 |Chronic	Post-coordinated Expression	1

System	Code	Display Text[a]	References[b]
	persistent (qualifier value)];		
SNOMED CT	[a997cc03-3e99-40eb-833a-6374c775003 |Observation procedure (procedure)]- ->(363702006 |Has focus (attribute))->[62507009 |Pins and needles (finding)]- ->(263502005 | Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];	Coordinated Expression	1
SNOMED CT	[a997cc03-3e99-40eb-833a-6374c775003 |Observation procedure (procedure)]- ->(363702006 |Has focus (attribute))->[63102001 |Visual disturbance (disorder)]- ->(263502005 |Clinical course (attribute))->[62459000 |Chronic persistent (qualifier value)];	Coordinated Expression	1

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

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

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

Chapter 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] *Neurology: Traumatic Brain Injury Screening Clinical Content White Paper*

[CSD] *Neurology: Traumatic Brain Injury (TBI) Screening Rule Conceptual Structure Document*

[KVRpt] *Neurology: Traumatic Brain Injury (TBI) Screening Rule KNART Validation Report*

Supporting Evidence

[rehabtoolkit] *Mild Traumatic Brain Injury Rehabilitation Toolkit. Army Medical Department Center and School (AMEDDC&S), U.S. Army Health Readiness Center of Excellence (HRCoE) website. Accessed August 28, 2017* (link [https://doi.org/10.1111/j.1745-7599.2011.00658.x])

[VA/DoD] *Management of Concussion-mild Traumatic Brain Injury (mTBI), Version 2.0 – 2016. VA/DoD Clinical Practice Guidelines website. Management of Concussion/mTBI Working Group. Published February 2016* (link [https://www.healthquality.va.gov/guidelines/Rehab/mtbi/mTBICPGFullCPG50821816.pdf])