

Indian Health Service

Hands-on BPMN Process Modeling Workshop

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Session Objectives

This session aims to create an awareness of Business Process Modeling and Notation (BPMN)

Topics covered:

- Demonstrate using a BPMN tool.
- Creating a BPMN model.
- Very light Introduce visual notation.

Learning Objectives

At the end of this session, attendees will:

- A basic understanding of the visual language/standard BPMN
- Hands-on experience building a BPMN model

This is not a BPMN or Modeling tutorial, nor a complete description of the entire language.

A Few Definitions

BPM – Business Process Management

- A discipline that uses various methods to discover, model, analyze, measure, improve and optimize business processes

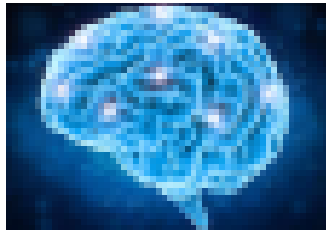
BPMN – Business Process Modeling & Notation

- A specific visual process modeling language, built on open standards published by the Object Management Group (OMG)

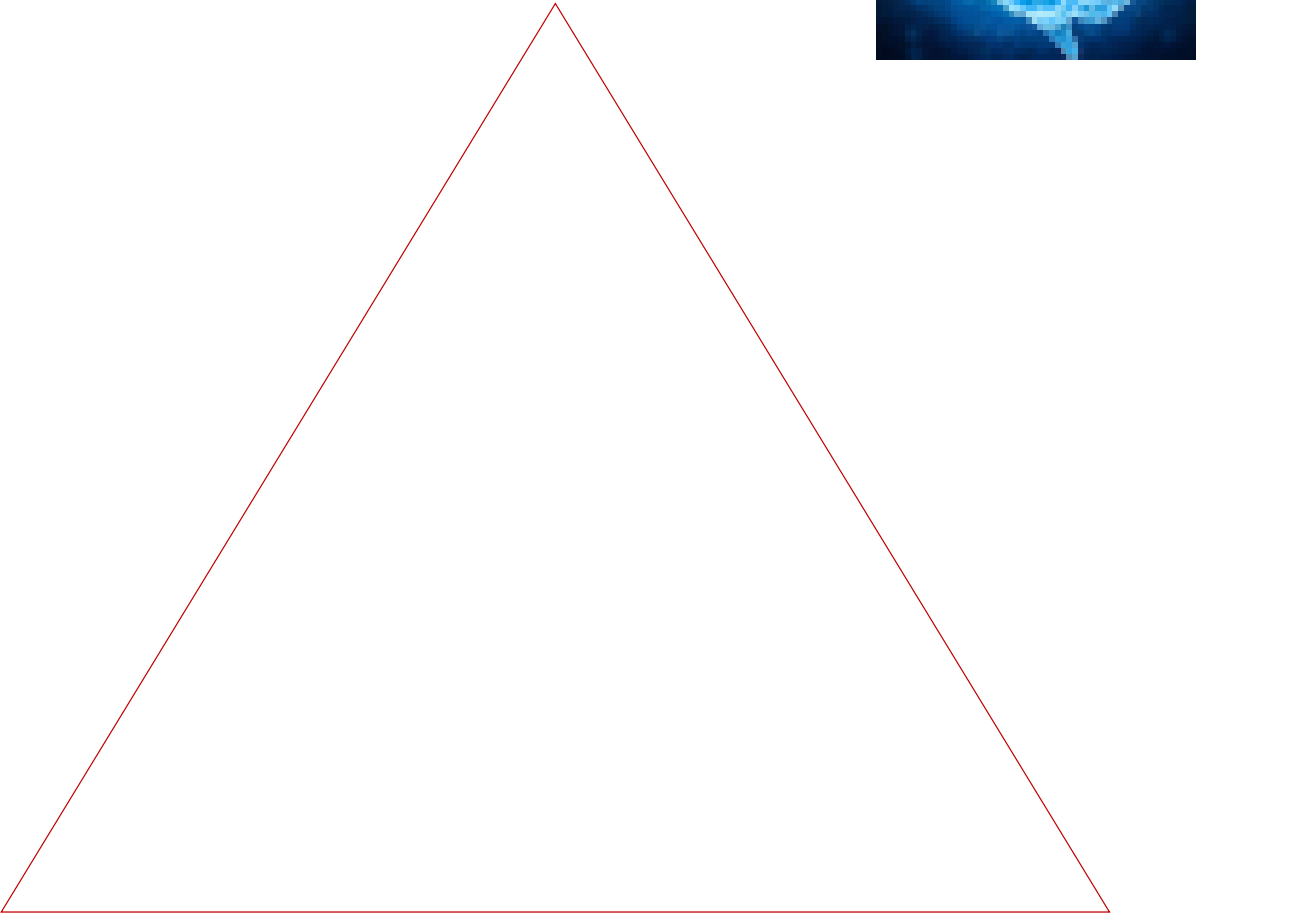
WRAP – Workflow Research and Alignment Plan

- The IHS “brand” for how we are using BPM/BPMN to understand, document, and socialize our shared best practices in clinical and administrative areas in preparation for health IT modernization

Thought or Reference



What is Modeling?



(RED)[®]

Symbol

Referent



C. K. Ogden and I. A. Richards (1923) *The Meaning of Meaning*

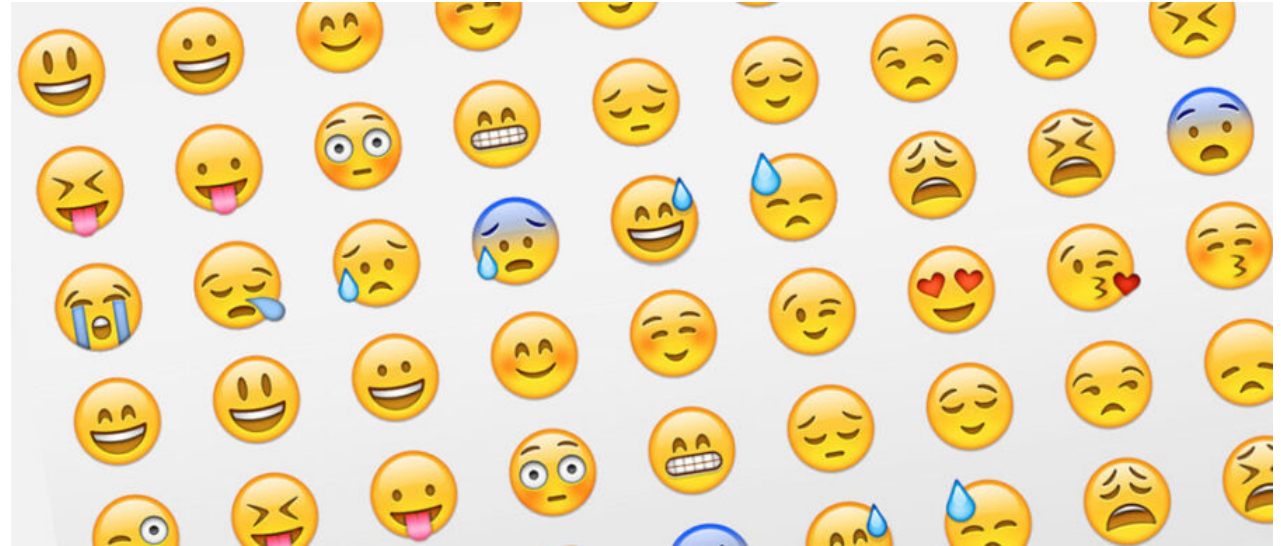
Visual Analog Scale (VAS) pain scores and observational



A Picture is Worth a Thousand Words

Key characteristics

- Immediate Understanding
- Inputs and Outputs
- Cross-functional
- Measurable
- Repeatable and Scalable
- Time and Resource Constraints



What is Modeling and Why do It?

Delivery of Care is Complex

Modeling Helps

To manage **complexity**

To **understand** the problem, expectations & requirement

To detect errors and omissions early in the lifecycle

To **communicate** and **share** with stakeholders

To **evolve** our understanding

To understand the impact of **change**

To ensure that resources are utilized efficiently

Algorithm: Management of CKD

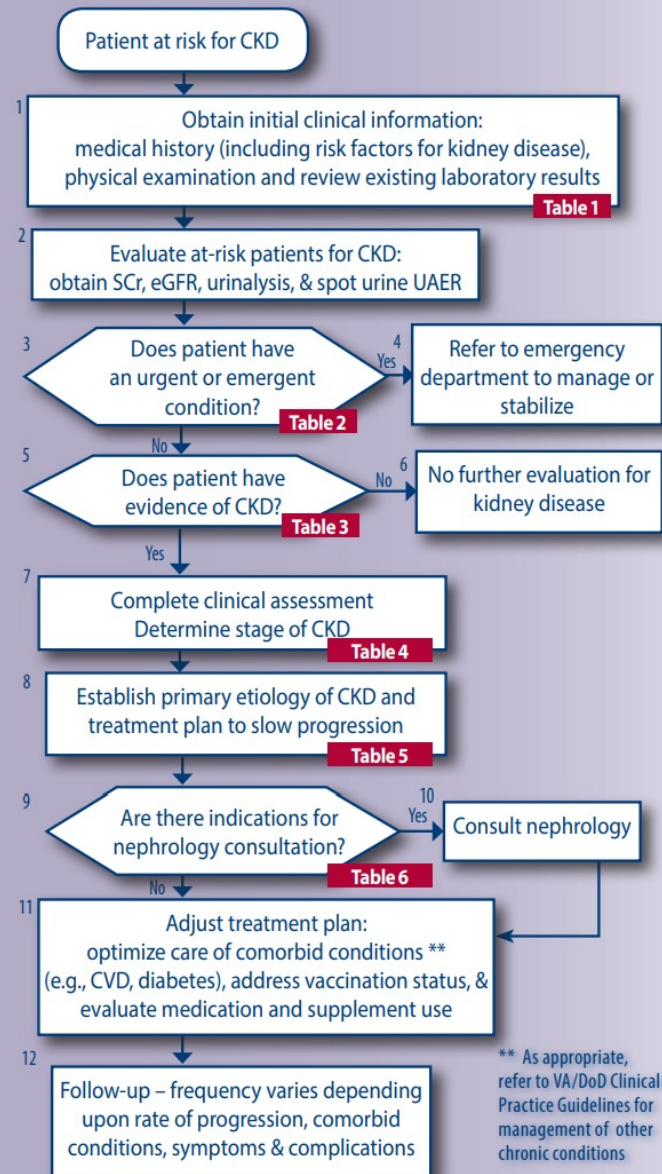


TABLE 1 At-Risk Population

- Diabetes, hypertension, other end organ disease (e.g., CHF), or personal or family history of kidney disease
- Systemic illness (e.g., human immunodeficiency virus (HIV), systemic lupus erythematosus, multiple myeloma)
- History of acute kidney injury (AKI) (e.g., acute tubular necrosis, urinary tract obstruction, interstitial nephritis)
- Elderly patients
- Races and ethnicities associated with increased risk (e.g., African Americans, Hispanics, Native Americans)

TABLE 2 Urgent/Emergent Conditions

- Acute unexplained decline in kidney function
- Heart failure/volume overload
- Hyperkalemia (potassium ≥ 6 mEq/L)
- Signs or symptoms of uremia

TABLE 3 Criteria for Confirmed CKD

CKD is defined as sustained abnormality for > 3 months of **either:**

- eGFR < 60 ml/min/1.73m²

OR any of the following:

- Albuminuria
- Urine sediment abnormality
- Abnormal renal histology
- Structural renal abnormality by imaging
- History of renal transplantation

ACEI=angiotensin-converting enzyme inhibitor, ARB= angiotensin II receptor blocker, CHF=chronic heart failure, CVD=cardiovascular disease, DM=diabetes mellitus, eGFR=estimated glomerular filtration rate, GFR=glomerular filtration rate; RAAS=renin-angiotensin-aldosterone system; RRT=renal replacement therapy, SCr=serum creatinine, UAER=urinary albumin excretion rate

TABLE 4 Stages of CKD

Stages	eGFR (mL/min/1.73 m ²)	Description
G1	≥ 90	Kidney damage with normal or increased GFR
G2	60-89	Kidney damage with mildly decreased GFR
G3a	45-59	Mildly to moderately decreased GFR
G3b	30-44	Moderately to severely decreased GFR
G4	15-29	Severely decreased GFR
G5	<15 or dialysis	Kidney failure

Albuminuria		
Category	Range (mg albumin/g creatinine)	Description
A1	<30 mg/g	Normal to mildly increased
A2	30-300 mg/g	Moderately increased
A3	>300 mg/g	Severely increased

TABLE 5 Strategies to Slow Progression

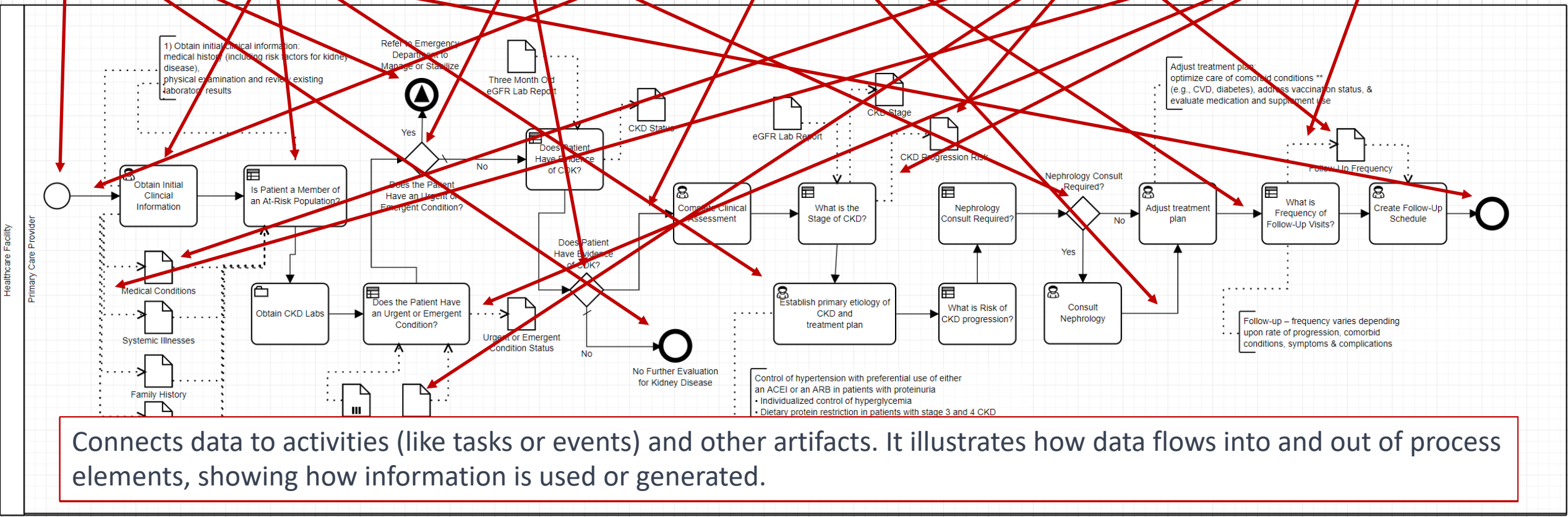
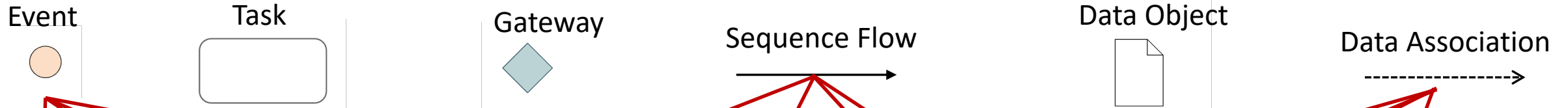
- Control of hypertension with preferential use of either an ACEI or an ARB in patients with proteinuria
- Individualized control of hyperglycemia
- Dietary protein restriction in patients with stage 3 and 4 CKD (consider consultation with nephrologist or renal dietitian)
- Correction of metabolic acidosis
- Avoid nephrotoxic agents

TABLE 6 Indications for Nephrology Consultation * †

- eGFR < 30 ml/min/1.73m²
- Rapid decline of eGFR (>5 ml/min/1.73m² per year)
- Complications of CKD (e.g., anemia, calcium or phosphorus abnormalities)
- Nephrotic range of proteinuria (>3.5 grams/24 hours)
- Underlying cause of CKD or proteinuria is unclear
- Patient's level of disease exceeds the level of comfort of the primary care provider

* Referral should be made following shared decision making with patient that ensures the referral focus is consistent with the patient values & preferences

† This list is not exhaustive, consult the discussion of Recommendation 16 in the full CPG for more information.



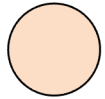
Connects data to activities (like tasks or events) and other artifacts. It illustrates how data flows into and out of process elements, showing how information is used or generated.

Business Process Model and Notation (BPMN) is a Visual Language to Depict Processes

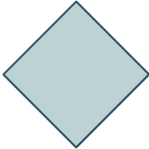
Key characteristics

- **Visual Representation:** BPMN uses symbols, shapes, and arrows to create diagrams that visually represent the flow and logic of a business process.
- **Standardized Notation:** BPMN is an industry-standard notation, meaning it follows specific rules and conventions.
- **Process Elements:** BPMN defines a set of elements or symbols to represent various components of a business process.
- **Process Flow:** BPMN diagrams show the sequence of activities and events in a process, as well as the conditions and decisions that determine how the process progresses.
- **Collaboration:** BPMN can be used to model both individual processes and complex collaborations involving multiple participants or organizations.
- **Process Analysis and Improvement:** BPMN diagrams are valuable tools for analyzing and improving business processes.

Basic Diagram Elements



Event



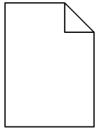
Gateway



Sequence Flow



Data Association



Data Object



BPMN Origins

In 2000, the Business Process Management Institute (BPMI—now merged into the OMG) started developing the Business Process Modeling Language (BPML - an XML process execution language) and recognized the need for a graphical representation.

In August 2001, the Notation Working Group was formed. The group was composed of 35 companies, organizations, or individuals.

BPMN 1.0

- May 2004, the BPMN 1.0 specification was released to the public.
- February 2005, BPMN 1.0 was adopted as an OMG standard.

BPMN 2.0

- January 2011, BPMN 2.0 was adopted as an OMG standard.
- July 2013, BPMN 2.0 was adopted as an ISO standard (ISO/IEC 19510:2013).



Business Process Model and Notation™ provides businesses with the capability of capturing their internal procedures

OMG

1989

founded

249

specifications

325

member
organizations
worldwide

13

specifications
ratified as
ISO standards

One of the largest and longest-standing not-for-profit, open-membership consortia developing and maintaining computer industry specifications.

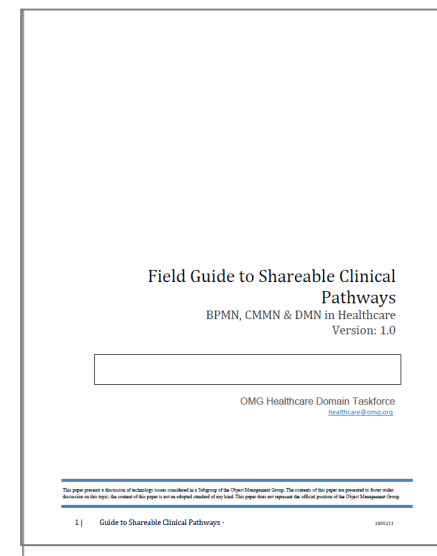
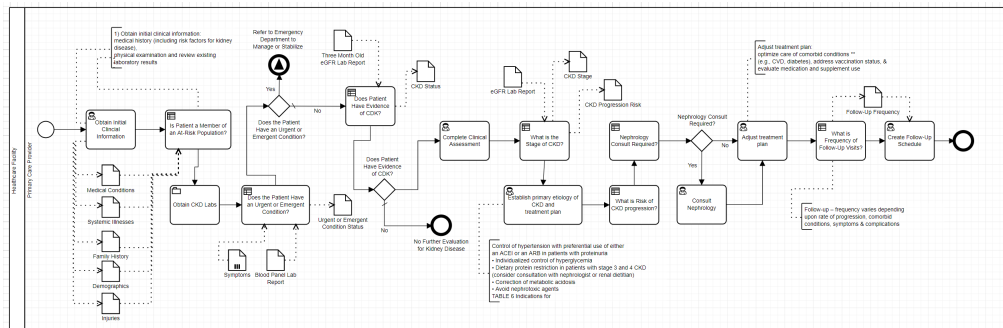
Long-term maintenance of proven standards



Who is the BPM+ Health Community



- Officially launched in September 2019
 - Not-for-Profit non-SDO
 - Membership-based, open community
 - Calls are open
 - Actively collaborating with others, including HL7
-
- Work products are open and available without cost
 - No usage restrictions or limitations
 - Focus on advancing the discipline; best-practices



Who is the BPM+ Health Community



Authoring

- Focus on writing/distributing content
- Healthcare practice patterns

Organizational Adoption & Change Management

- Bringing pathways into institutional use
- Intersect between pathways, HIT, and human resources

Process Automation and Enablement

- Approaches for IT implementation (tooling and execution)
- Ingesting and using externally sourced pathways

Methodology

- Maintain expression formalisms
- Develop/maintain authoritative guidance; feedback to SDOs

Academic and Professional Education

- Develop curriculum for accreditation
- Workforce development

Policy Committee

- Policy implications
- Outreach

Tooling

- Tooling solutions
- Empowering our community

READ THE FIELD GUIDE FOR SHAREABLE CLINICAL PATHWAYS

Field Guide

Access the community's seminal publication, Field Guide for Shareable Clinical Pathways.

The guide applies three Object Management Group® (OMG®) business process standards to represent clinical pathways that define distinct aspects of care workflow and decision-making, including:

- Business Process Model and Notation™ (BPMN™)
- Case Management Model and Notation™ (CMMN™)
- Decision Model and Notation™ (DMN™)



BPM+ Health (BPMN, CMMN, and DMN)



Business Process
Model &
Notation



Case
Management
Model &
Notation



Decision
Model & Notation

- Unambiguous format for modeling processes, cases and decisions
- Can be interchanged between different vendors' products
- Provide common and readily-transferable skills that are learned by analysts

**Provides Open and Repeatable Best Practices for the Expression of
Clinical Knowledge that is Human Readable and Machine Computable**



© 2023 Object Management Group



Based on our experience with developing Shareable Clinical Pathways, we've started the development of three new standards to be included in the BPM+ stack:

- Shared Data Model & Notation (**SDMN**) for the data dictionary
- Knowledge Package Model & Notation (**KPMN**) for packaging a Shareable Clinical Pathway
- Pedigree & Provenance Model and Notation (**PPMN**)

BPM+ Field Guide Project

The OMG Healthcare BPM Project started in Dec 2016.

The main purpose of the project is to develop a Field Guide for healthcare organizations to:

- Develop detailed, re-usable Clinical Pathway models.
- Understand and consume Clinical Pathways developed through the Field Guide.
- Version 1.0 of the Field Guide was published in March 2018.



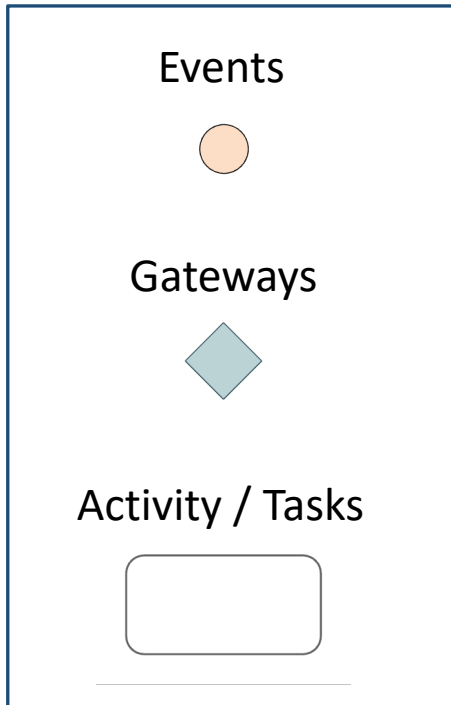
Version 2.0 Released on December 12, 2019.

<https://www.bpm-plus.org/DRAFT-Field-Guide-2.0.pdf>

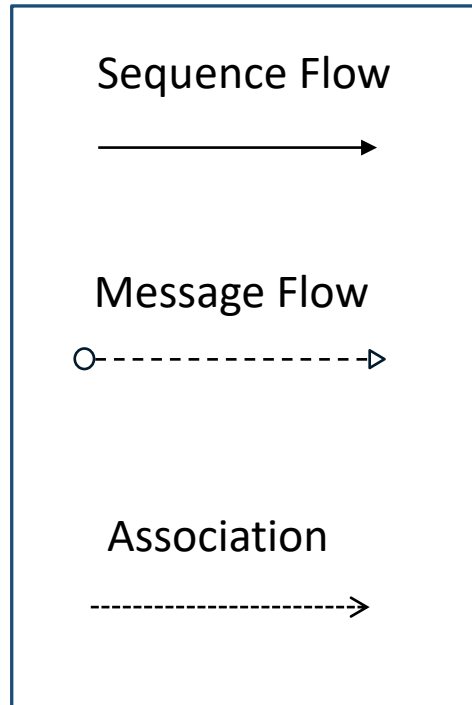


Key BPMN Elements

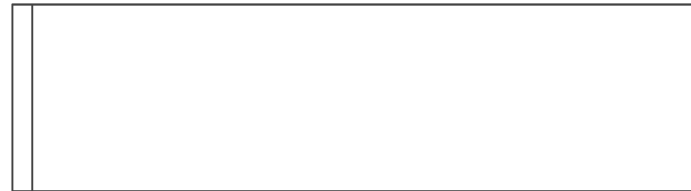
Flow Objects



Connecting



Pool



Lanes with a Pool



Data Object



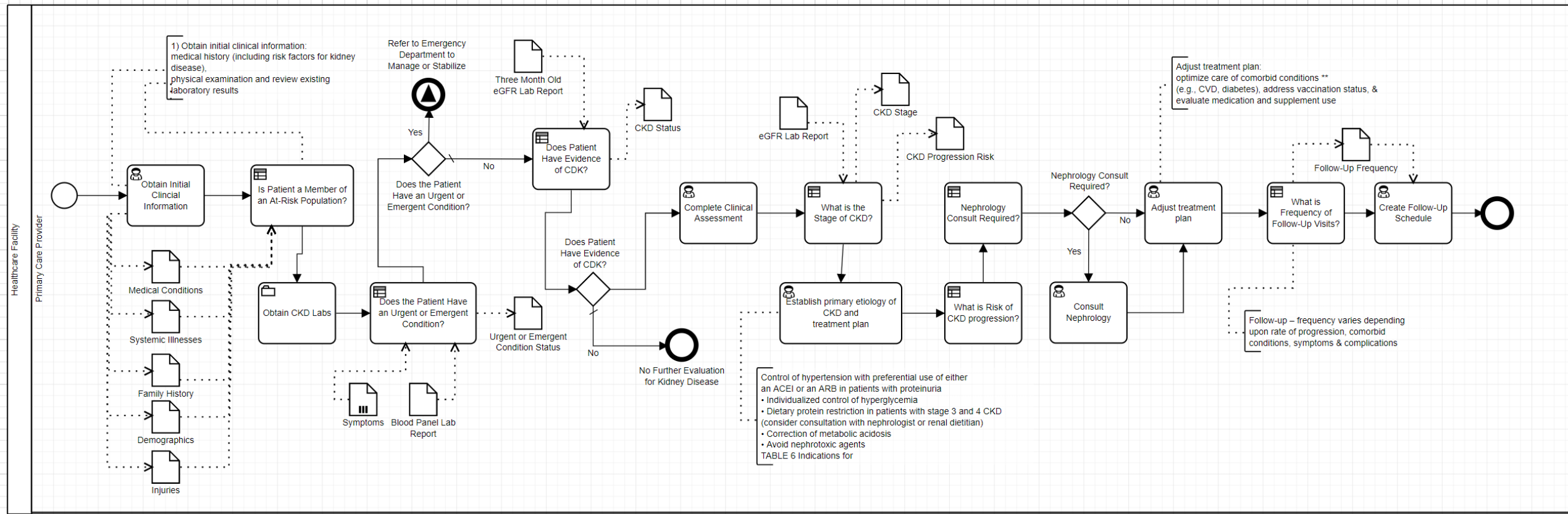
Text Annotation



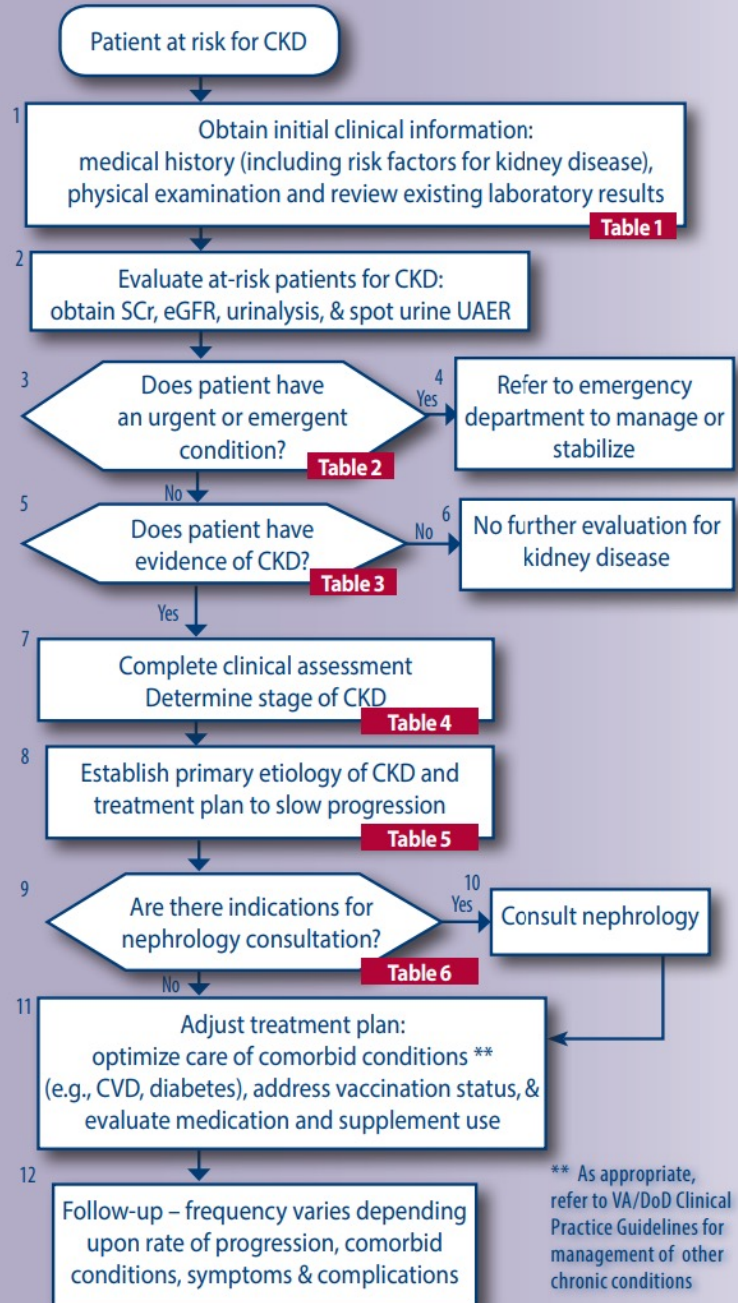
Business Process Model & Notation (BPMN)®

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Algorithm: Management of CKD





Click on the squares to access your products

Places

YOUR NAME HERE

- 0 - BPM + Jumpstart Workshop
- 1 - BPM + Jumpstart Workshop
- 2 - BPM + Jumpstart Workshop
- 3 - BPM + Jumpstart Workshop Complete
- Examples
- EU-Rent
- Trisotech Examples



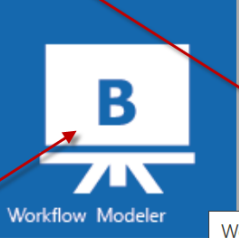
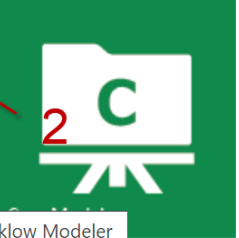

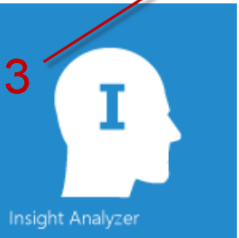






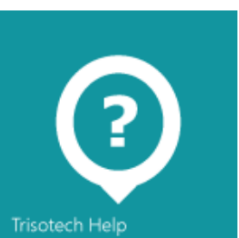
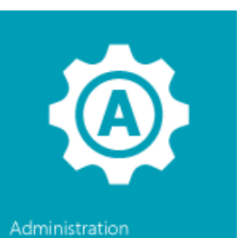



Please select a place.

← → ↻ utah-bmi.trisotech.com 1

Apps PP board - Agile Bo... Save to Mendeley Outlook Web App Welcome to Nimbu... ITOneStop Guidin

UTAH BMI Digital Enterprise Server + New Folder ✎ Rename ✕

 Digital Enterprise Suite	 Discovery Accelerator	 Workflow Modeler	 Workflow Modeler
 Decision Modeler	 Insight Analyzer	 Kommunicator	 Landscaping
 Ideation	 BPMN Quick Guide	 BPMN Rule Book	 EU-Rent
 Trisotech Help	 Administration	 1on1	

2

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3

Workflow Modeler

Undo Redo Paste Copy Cut Delete Fill Line Align Bring Forward Send Backward Same Size Group Horizontal Vertical Select All Select None

- Shapes
- BPMN (Basic)
- BPMN (Advanced)
- Workflow Patterns
- Task
- Sub-Process
- Expanded Sub-Process
- Start Event
- Exclusive Gateway
- Intermediate Event
- End Event
- Sequence Flow
- Message Flow
- Association
- Data Association
- Data Object Reference
- Data Store Reference
- Group
- Annotation
- Image
- Knowledge Source
- Pool











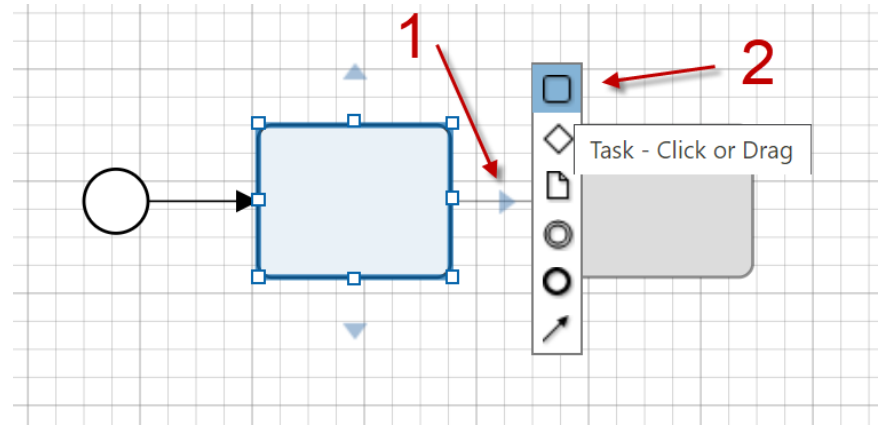
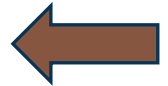
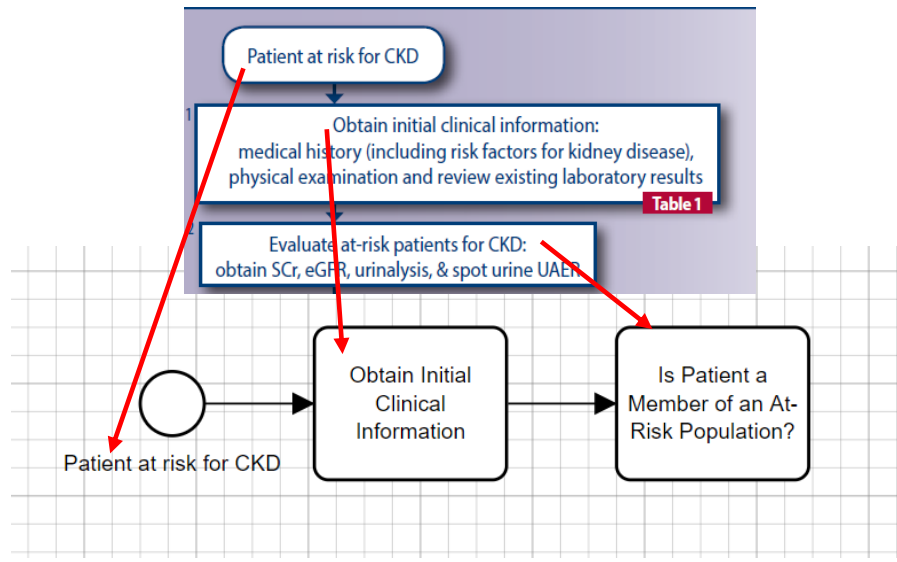
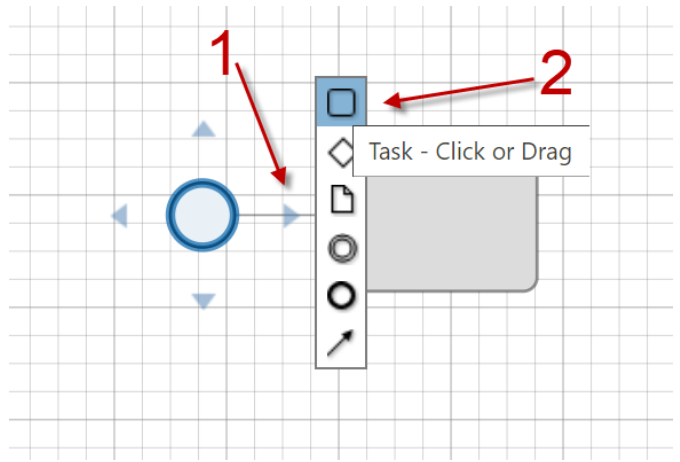
Shapes

BPMN 2.0 (Basic)

BPMN 2.0 (Advanced)

Workflow Patterns

-  Task
-  Sub-Process
-  Expanded Sub-Process
-  Start Event
-  Exclusive Gateway
-  Intermediate Event
-  End Event
-  Sequence Flow



Observation – Assessment - Finding (OAF) Pattern

Observations:

- What is the Patient Temperature?
- What is their Weight?

Observation / Value Pairs:

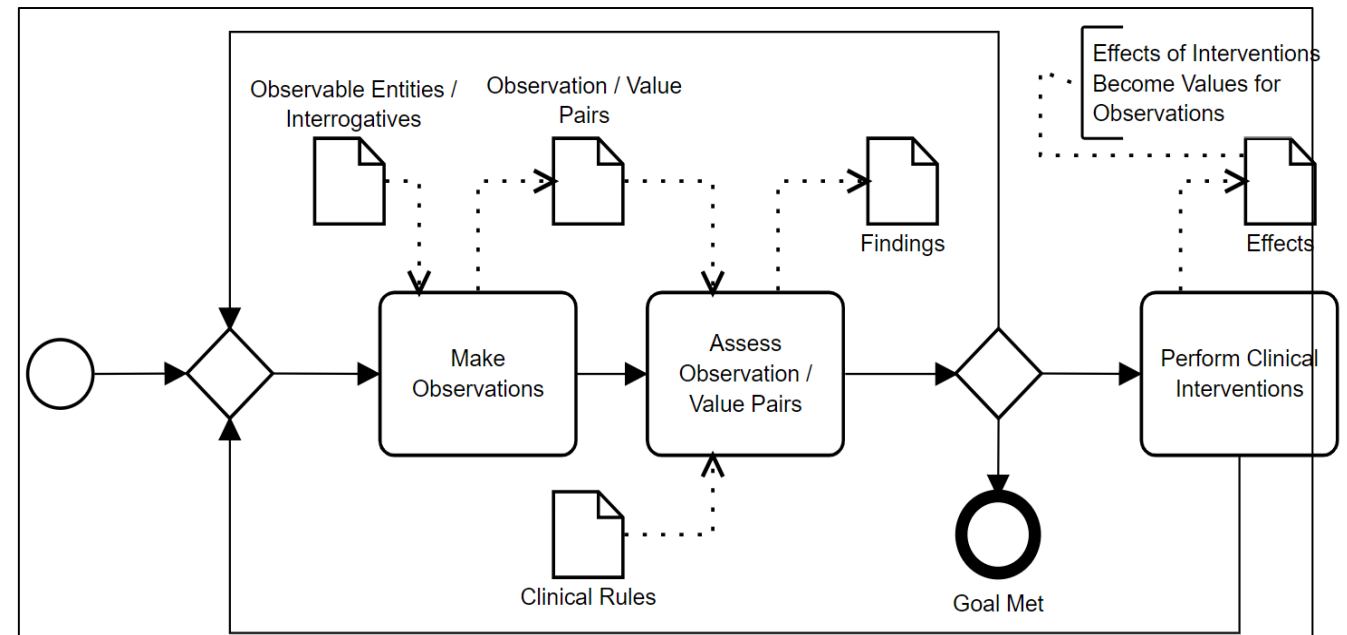
- John's Temperature is 101 Fahrenheit
- Infant's Temperature is 99 Fahrenheit

Clinical Rules:

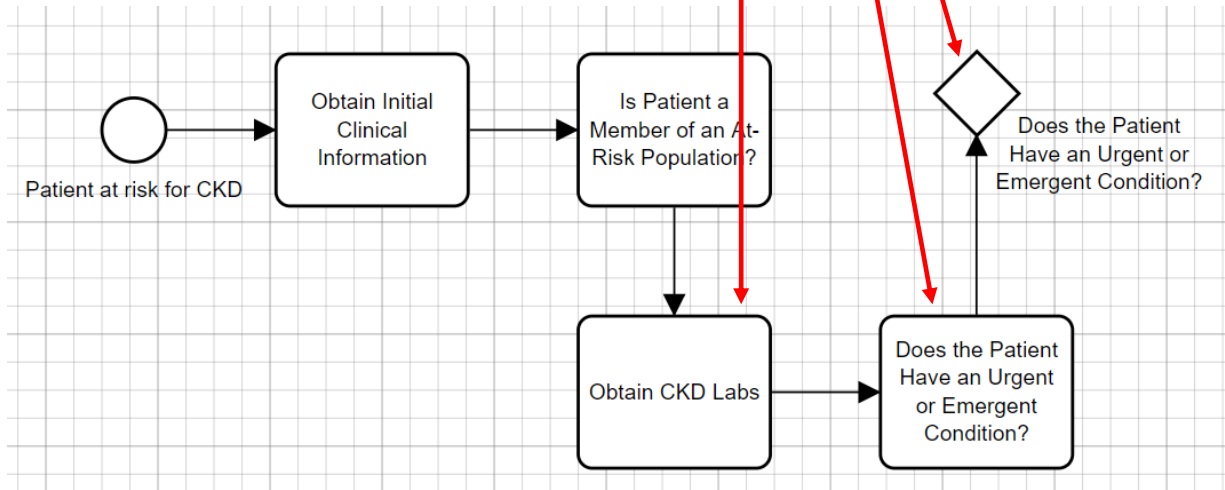
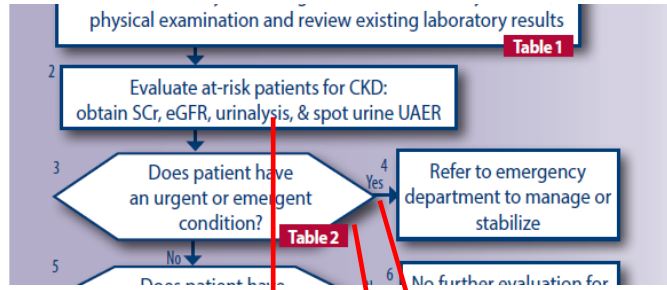
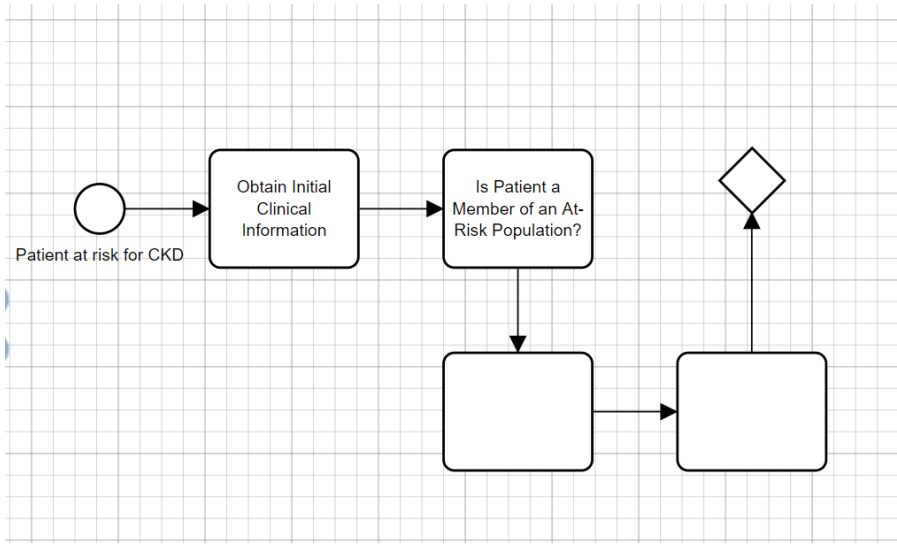
- Adults with Temperature > 100.4 are Febrile
- Infants with Temperature > 99.5 are Febrile

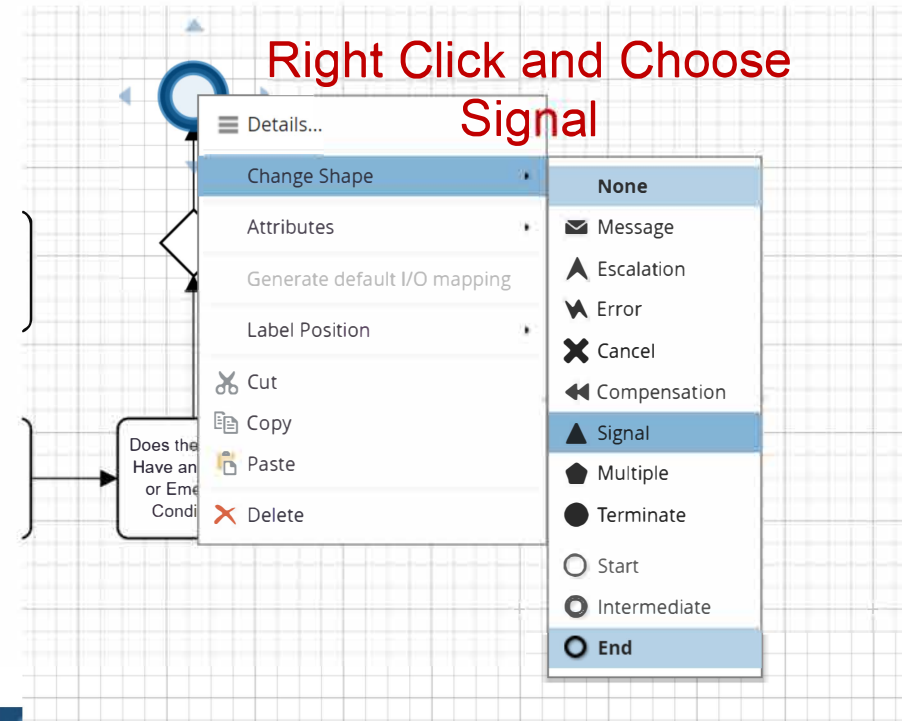
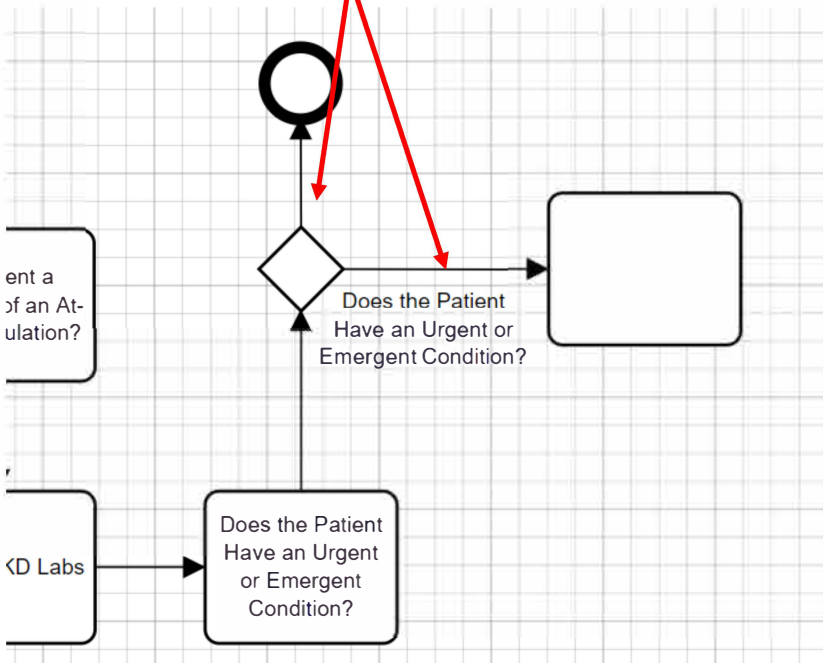
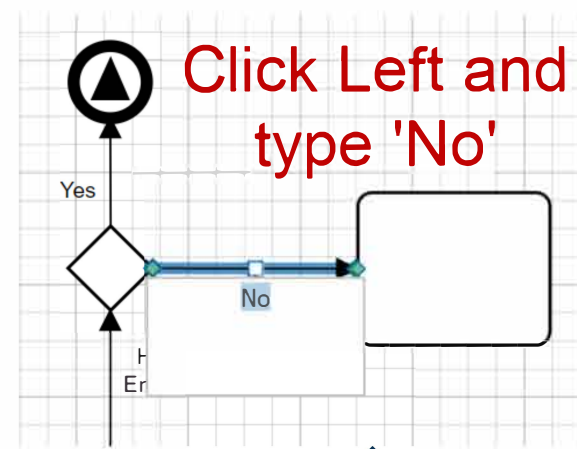
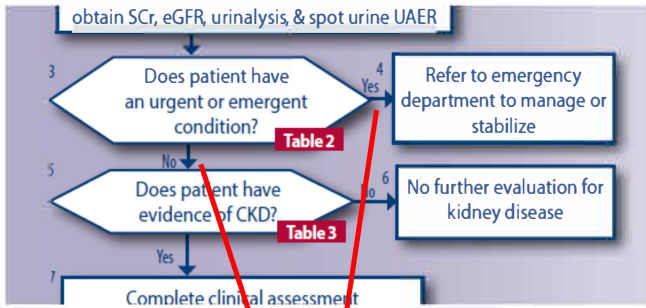
Clinical Findings:

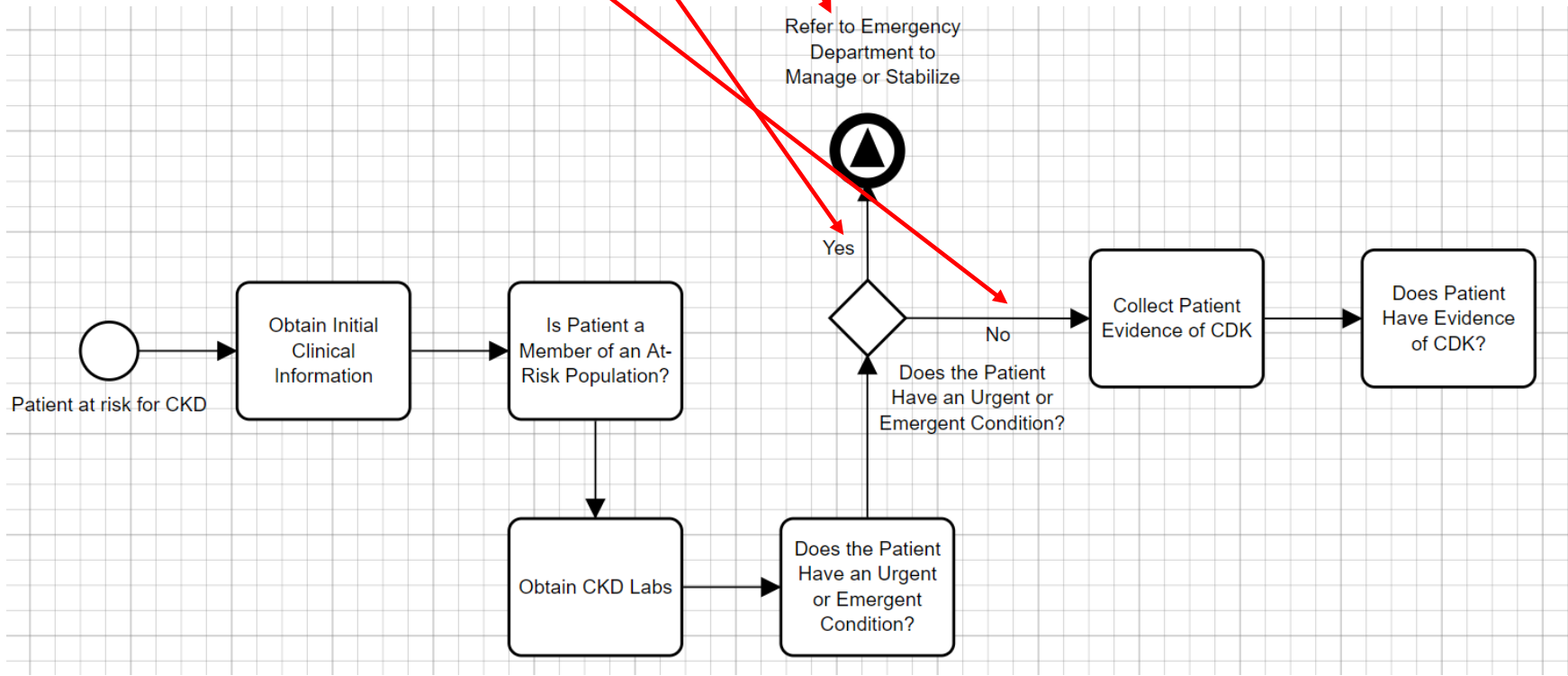
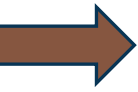
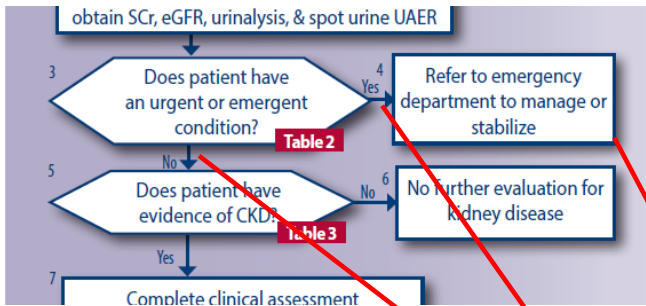
- John is Febrile




















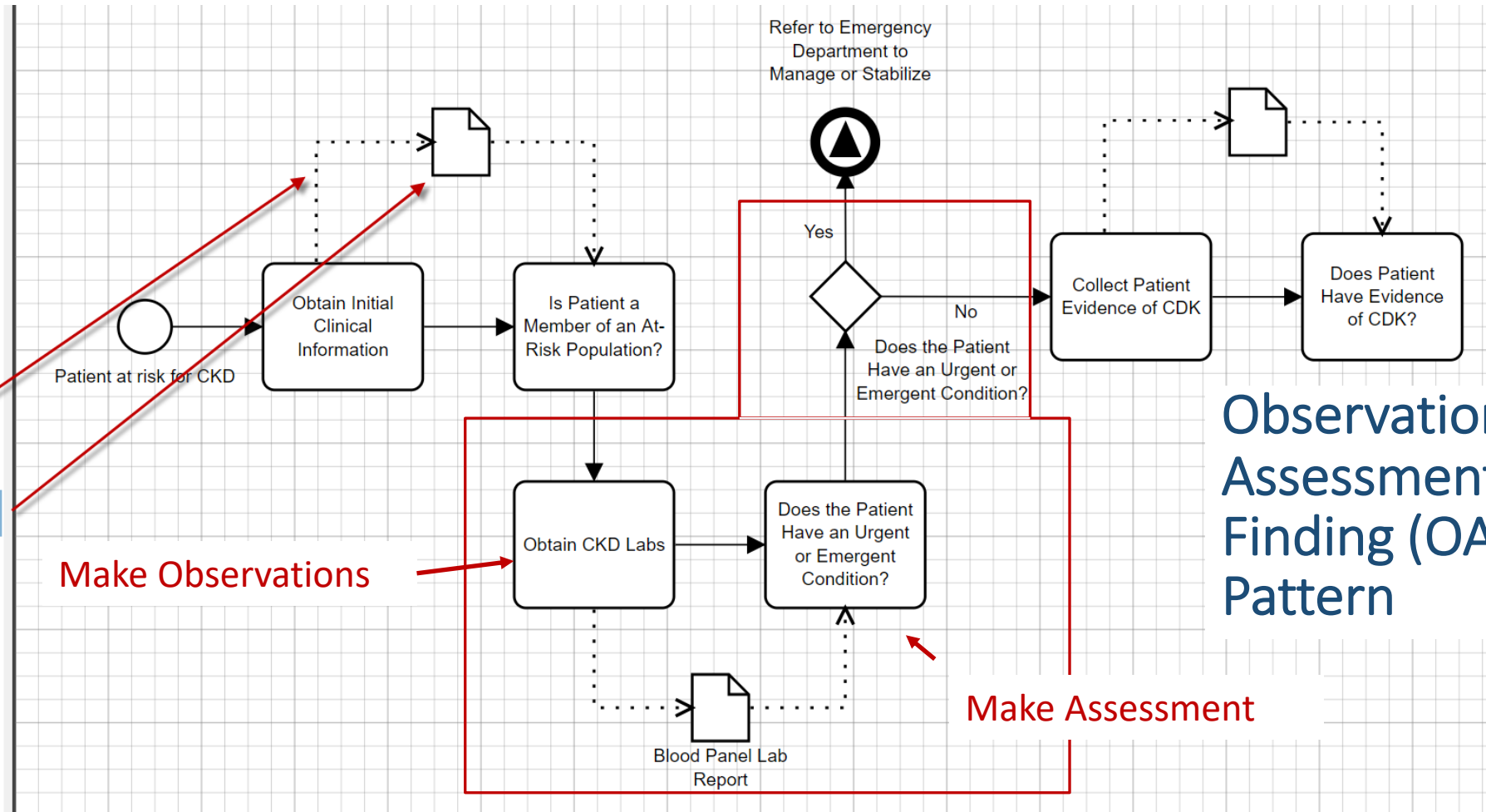
Lario, R., et al. (2020). Utilization of BPM+ Health for the Representation of Clinical Knowledge: A Framework for the Expression and Assessment of Clinical Practice Guidelines (CPG) Utilizing Existing and Emerging Object Management Group (OMG) Standards. [AMIA Annu Symp Proc.](#)







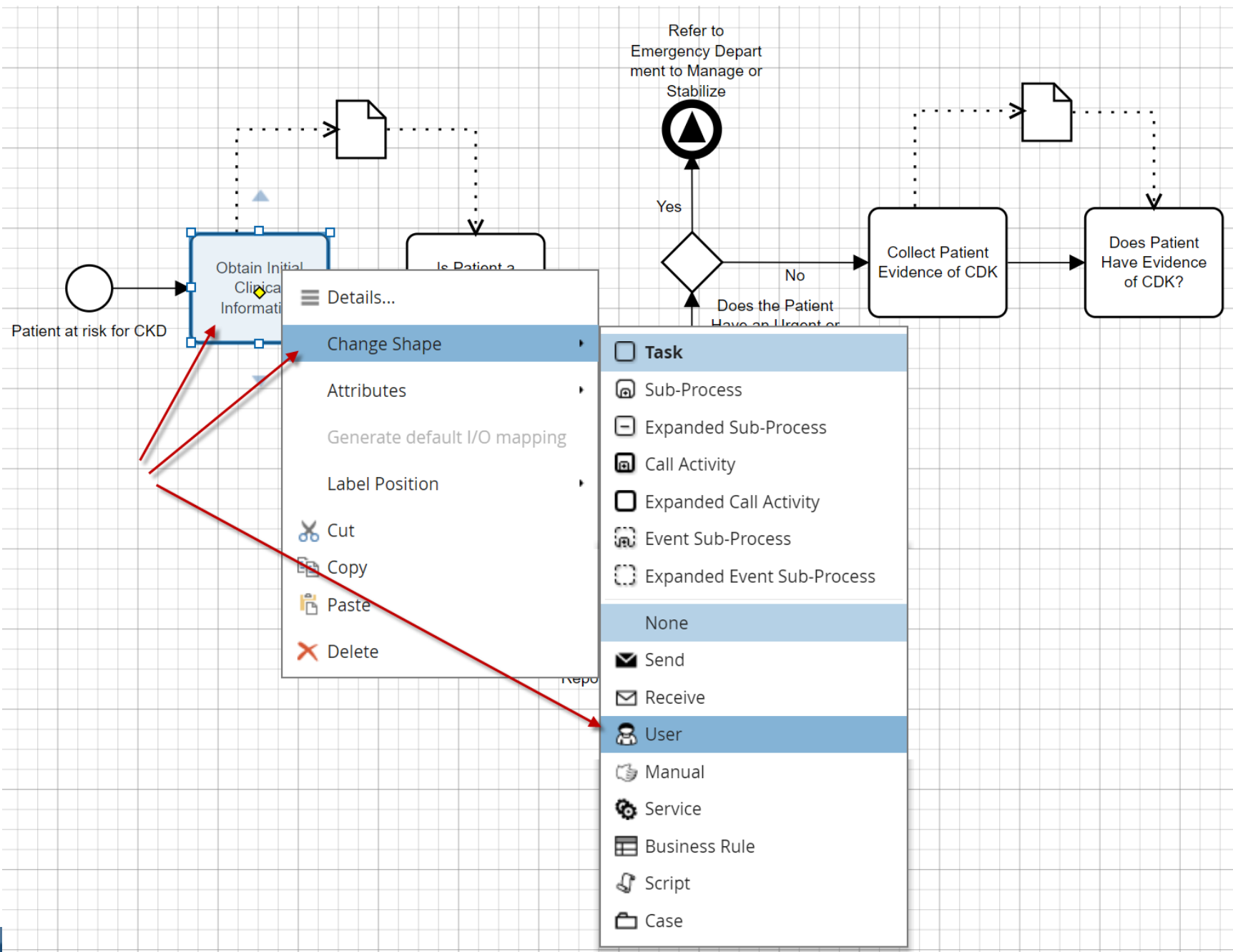
-  Sub-Process
-  Expanded Sub-Process
-  Start Event
-  Exclusive Gateway
-  Intermediate Event
-  End Event
-  Sequence Flow
-  Message Flow
-  Association
-  Data Association
-  Data Object Reference
-  Data Store Reference
-  Group
-  Annotation
-  Image
-  Pool
-  Lane

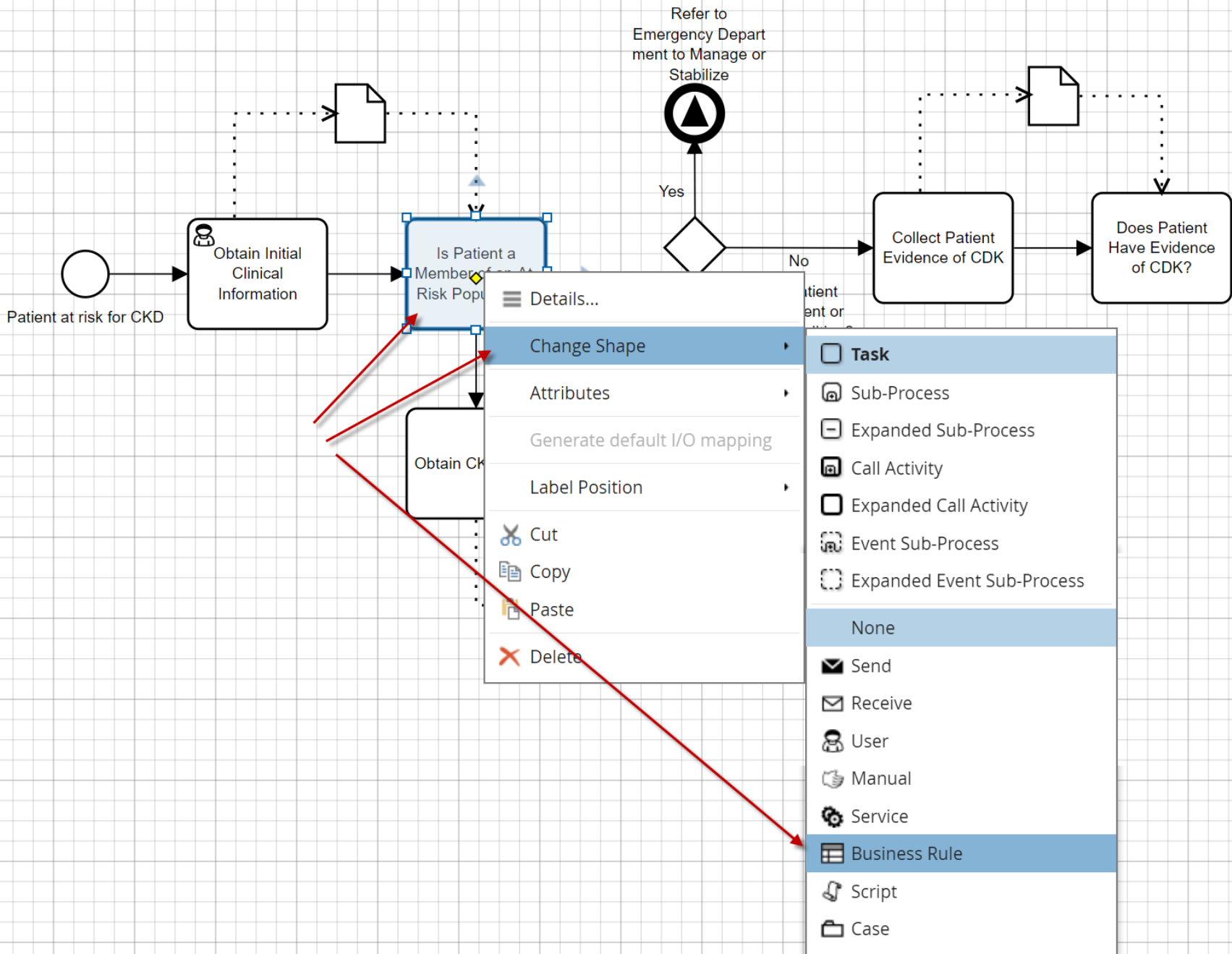


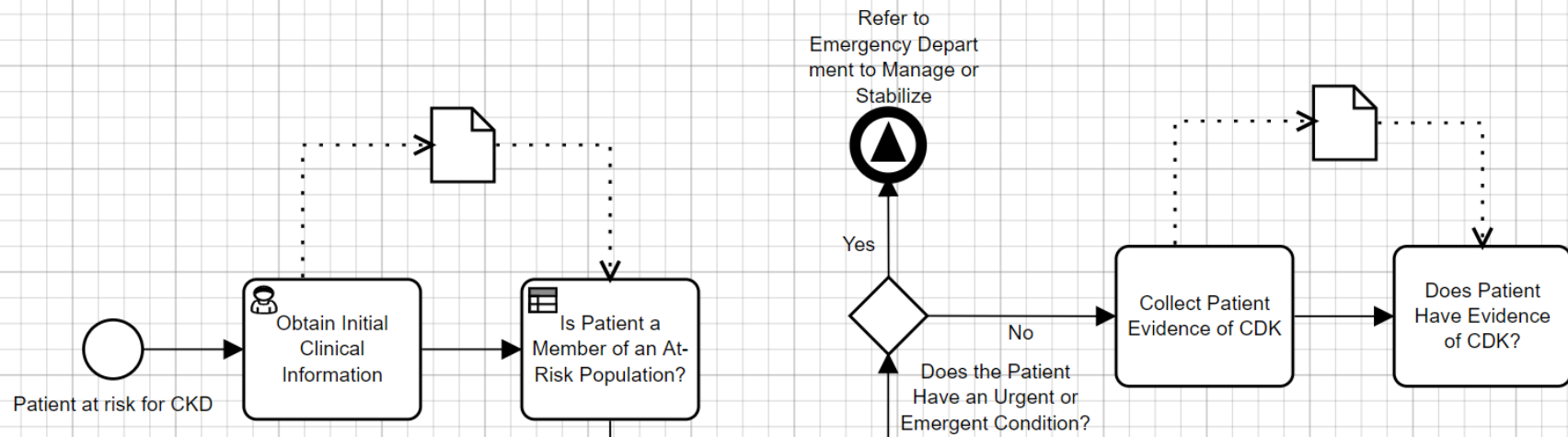
Make Observations

Make Assessment

Observation – Assessment - Finding (OAF) Pattern



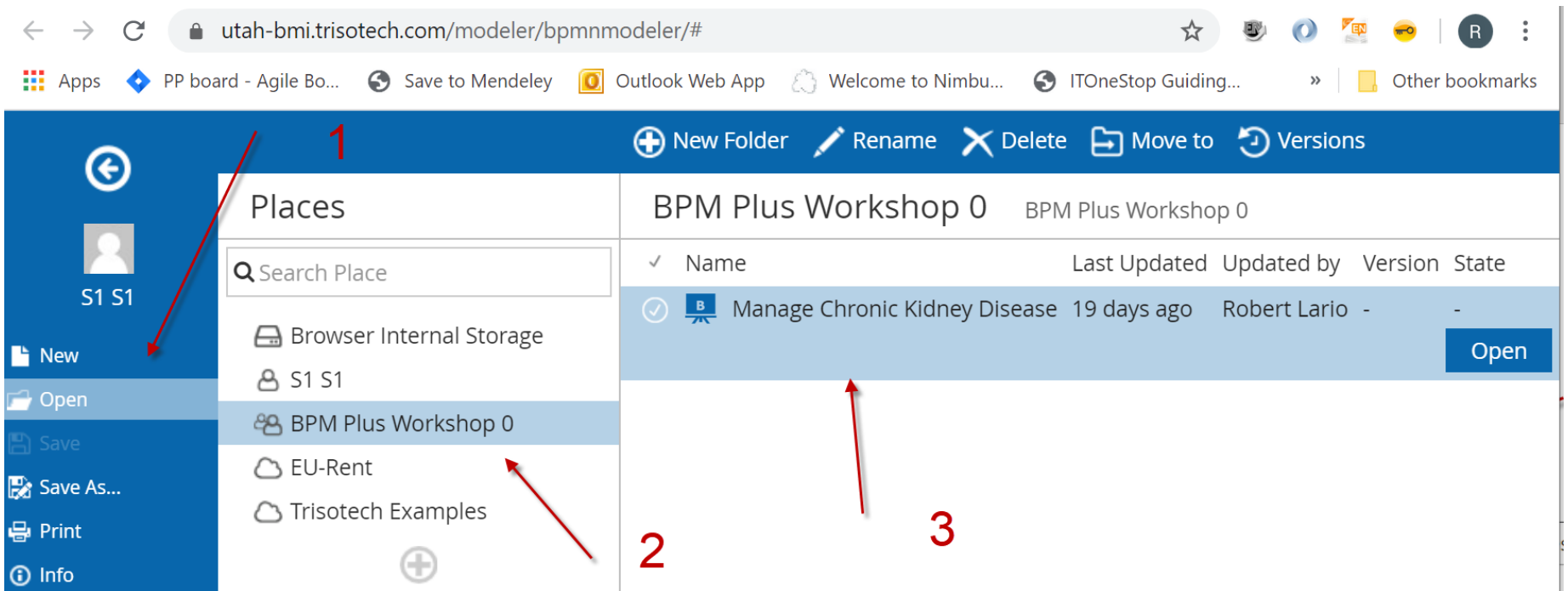
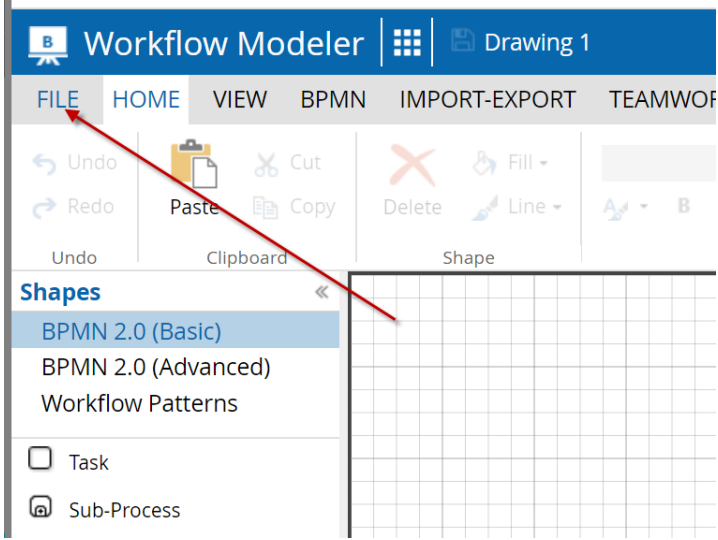




Obtain CKD L

- Details...
- Change Shape**
- Attributes
- Generate default I/O mapping
- Label Position
- Cut
- Copy
- Paste
- Delete

- Task
- Sub-Process
- Expanded Sub-Process
- Call Activity
- Expanded Call Activity
- Event Sub-Process
- Expanded Event Sub-Process
- None
- Send
- Receive
- User
- Manual
- Service
- Business Rule
- Script
- Case




 Digital Enterprise Suite	 Discovery Accelerator	 Workflow Modeler	 Case Modeler
 Decision Modeler	 Knowledge Entity Modeler	 Landscaping	 Capability Modeler
 BPMN Quick Guide	 BPMN Rule Book	 EU-Rent	 Trisotech Help
 Settings	 Administration	 1on1	

our products









Jumpstart Workshop 0 - BF


Chronic Kidney Disease

THIS FIRST

 **Click on the squares to access your products**


Places




-  Robert Lario
-  0 - BPM + Jumpstart Workshop
-  1 - BPM + Jumpstart Workshop
-  2 - BPM + Jumpstart Workshop
-  3 - BPM + Jumpstart Workshop Complete
-  Examples
-  EU-Rent
-  Trisotech Examples



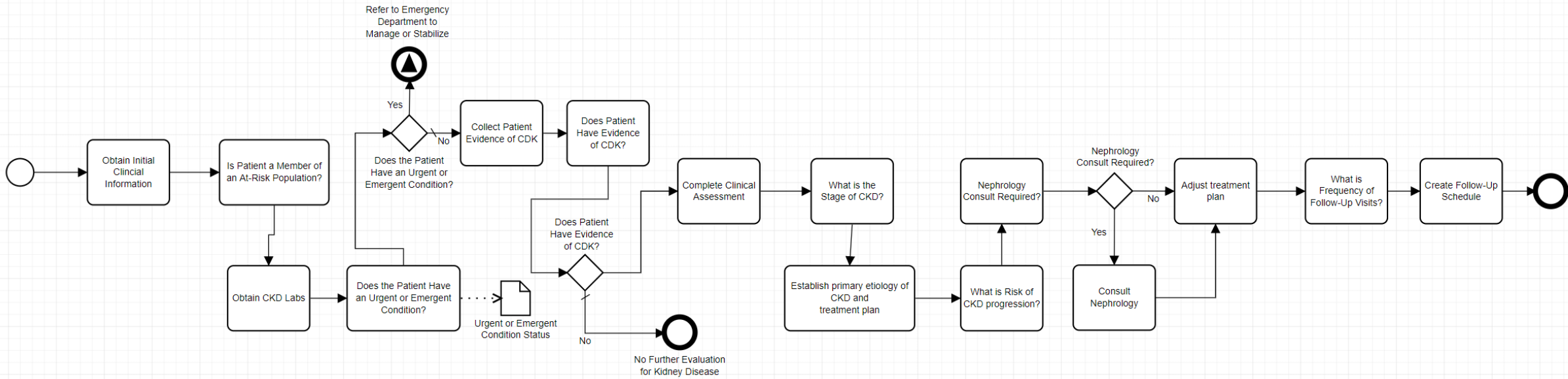
0 - BPM + Jumpstart Workshop

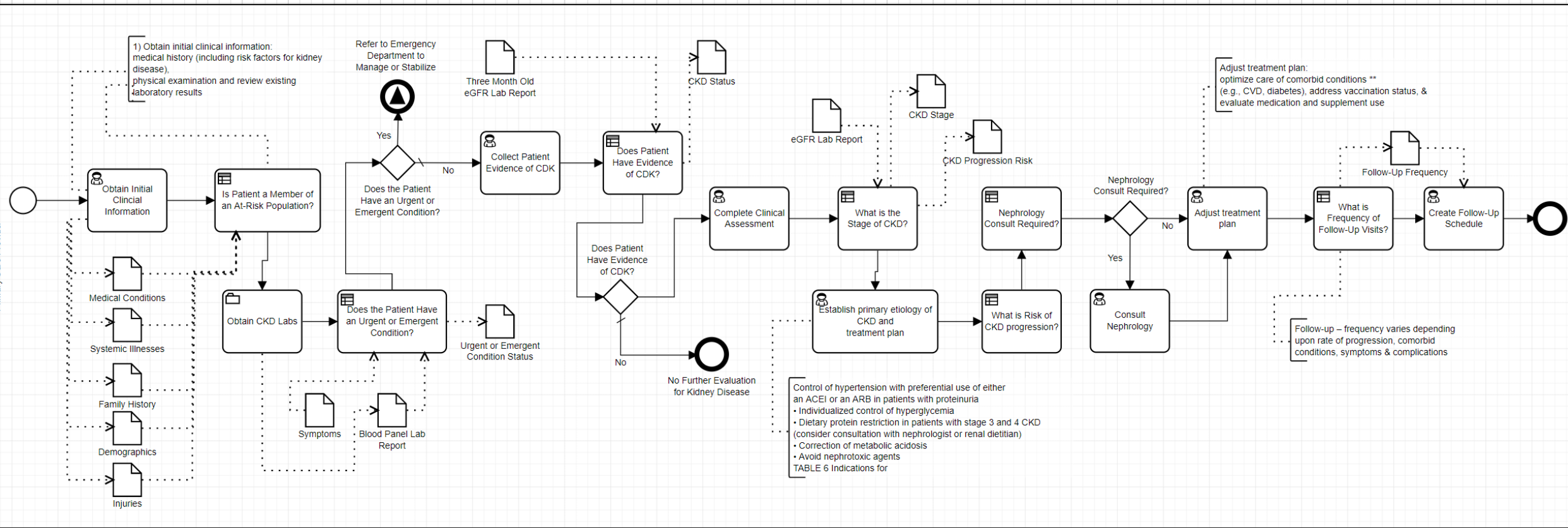
0 - BPM + Jum

✓ Name 

-   Manage Chronic Kidney Disease
-  OPEN THIS FIRST







Indian Health Service

Questions & Discussion



ROBERT LARIO, PH.D., MSE, MBA
IHS BUSINESS PROCESS MODELING CONSULTANT



Appendix

You Should See This:

The screenshot shows a web browser window with the URL `jumpstart.trisotech.com`. The page header includes the text "Jumpstart Digital Enterprise Suite" and a notification bell icon with a red "5". A dark grey banner contains the instruction "Click on the squares to access your products" with a white arrow icon. On the left, a sidebar titled "Places" features a search bar with the placeholder "Search Place" and the text "YOUR NAME HERE" in red. Below the search bar is a list of items, each with a person icon: "0 - BPM + Jumpstart Workshop", "1 - BPM + Jumpstart Workshop", "2 - BPM + Jumpstart Workshop", "3 - BPM + Jumpstart Workshop Complete", "Examples", "EU-Rent", and "Trisotech Examples". A plus sign icon is located at the bottom of the list. The main content area is currently empty, displaying the text "Please select a place." in the center.

BPM+ Health (BPMN, CMMN, and DMN)



Business Process
Model &
Notation



Case
Management
Model &
Notation



Decision
Model & Notation

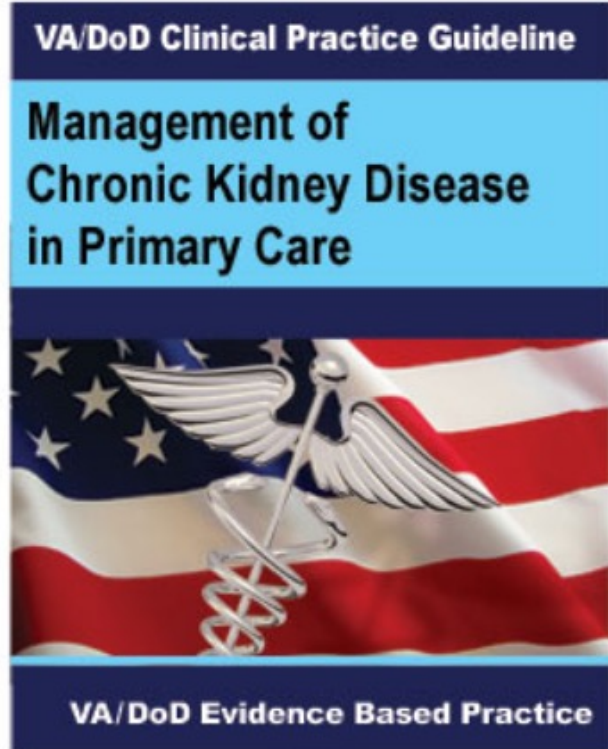
- Unambiguous format for modeling processes, cases and decisions
- Can be interchanged between different vendors' products
- Provide common and readily-transferable skills that are learned by analysts

**Provides Open and Repeatable Best Practices for the Expression of
Clinical Knowledge that is Human Readable and Machine Computable**



Management of Chronic Kidney Disease (CKD) in Primary Care (2014)

Update of CPG in Progress



The guideline describes the critical decision points in the Management of Chronic Kidney Disease in Primary Care and provides clear and comprehensive evidence based recommendations incorporating current information and practices for practitioners throughout the DoD and VA Health Care systems. The guideline is intended to improve patient outcomes and local management of patients with chronic kidney disease.

Disclaimer: This Clinical Practice Guideline is intended for use only as a tool to assist a clinician/healthcare professional and should not be used to replace clinical judgment.



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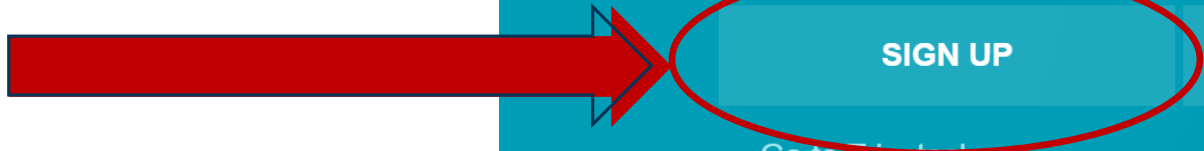
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Dear Robert Lario ,

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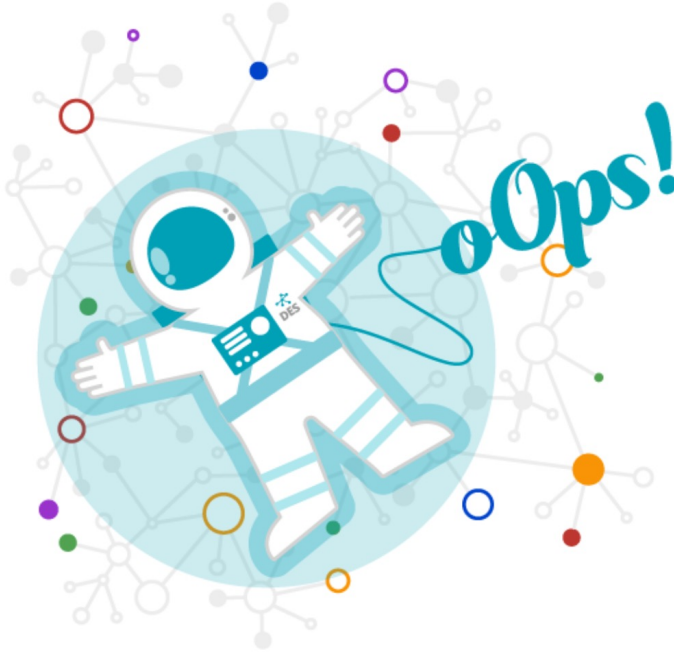
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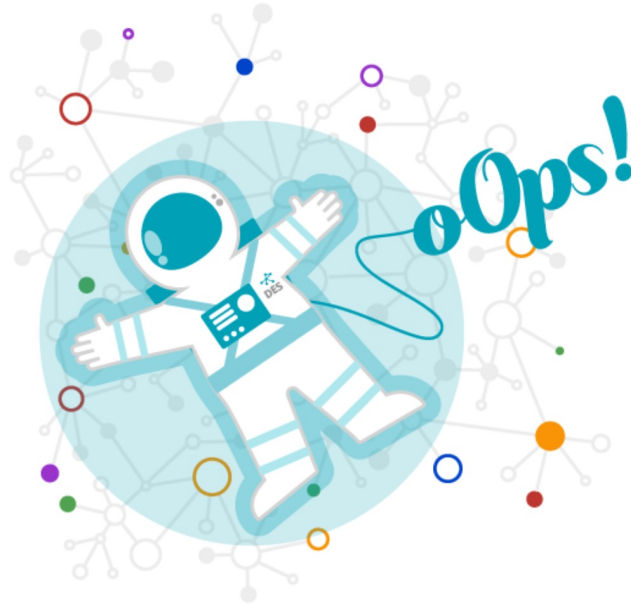


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The screenshot shows a web browser window with the URL `jumpstart.trisotech.com`. The page header includes the text "Jumpstart Digital Enterprise Suite" and navigation options "New Folder" and "Restore". A central instruction reads "Click on the squares to access your products".

The interface is divided into two main sections:

- Places:** A sidebar on the left with a search bar labeled "Search Place". Below it, a list of places is shown, with "0 - BPM + Jumpstart Workshop" highlighted. A red text overlay "YOUR NAME HERE" is positioned over the "Robert Laro" entry.
- 0 - BPM + Jumpstart Workshop:** The main content area displays a list of items under the heading "0 - BPM + Jumpstart Workshop". The list includes:
 - Name
 - Manage Chronic Kidney Disease (2)
 - OPEN THIS FIRST (1)

At the bottom right of the main content area, there is a red text instruction: "2) Click and Open this".

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**Double click your mouse here and Copy and
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Other Supporting Material:

BPM+ Field Guide:

<https://www.bpm-plus.org/DRAFT-Field-Guide-2.0.pdf>

BPMN Notation:

<https://www.bpmnquickguide.com/view-bpmn-quick-guide/>

OMG BPMN Specification:

<https://www.omg.org/spec/BPMN/2.0.2/PDF>

VA Clinical Practice Guideline Details:

<https://tinyurl.com/5a4nareu>

Management of Chronic Kidney Disease in Primary Care

KEY ELEMENTS OF THE CKD GUIDELINE

- » Diagnostic criteria and identification of early disease.
- » Identification of susceptibility factors (adult patients at increased risk for developing CKD).
- » Identification of progression factors (adult patients at high risk for worsening kidney damage and subsequent loss of kidney function).
- » Prevention of conditions that exacerbate chronic kidney disease
- » Evaluation of patients with kidney disease (estimate of GFR, blood pressure, and assessment of albuminuria as a marker of kidney damage).
- » Slowing the progression of CKD.
- » Management of comorbidities.
- » Indication for consultation and referral to a nephrologist.
- » Outline of patient education and preparation for kidney replacement therapy.

Access to full guideline and toolkit:
<http://www.healthquality.va.gov> or
<https://www.qmo.amedd.army.mil>
 December 2014



Algorithm: Management of CKD

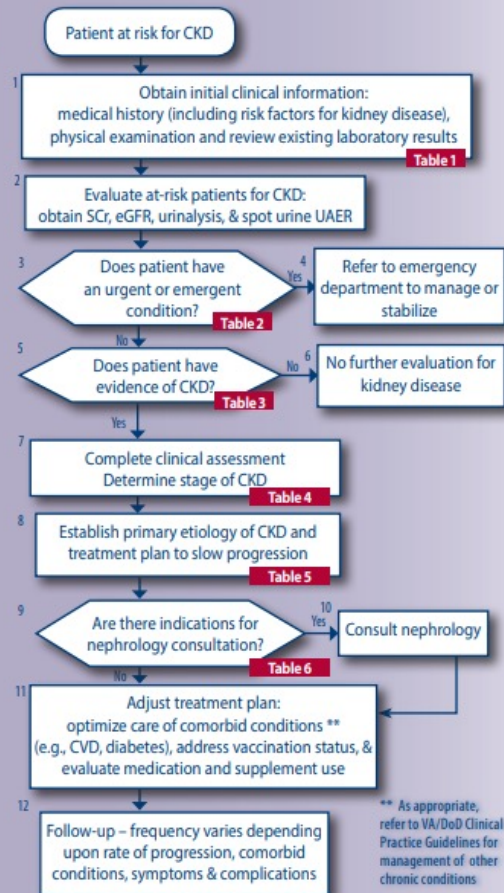


TABLE 1 At-Risk Population

- Diabetes, hypertension, other end organ disease (e.g., CHF), or personal or family history of kidney disease
- Systemic illness (e.g., human immunodeficiency virus (HIV), systemic lupus erythematosus, multiple myeloma)
- History of acute kidney injury (AKI) (e.g., acute tubular necrosis, urinary tract obstruction, interstitial nephritis)
- Elderly patients
- Races and ethnicities associated with increased risk (e.g., African Americans, Hispanics, Native Americans)

TABLE 2 Urgent/Emergent Conditions

- Acute unexplained decline in kidney function
- Heart failure/volume overload
- Hyperkalemia (potassium ≥ 6 mEq/L)
- Signs or symptoms of uremia

TABLE 3 Criteria for Confirmed CKD

CKD is defined as sustained abnormality for > 3 months of **either**:

- eGFR < 60 ml/min/1.73m²

OR any of the following:

- Albuminuria
- Urine sediment abnormality
- Abnormal renal histology
- Structural renal abnormality by imaging
- History of renal transplantation

ACEI=angiotensin-converting enzyme inhibitor; ARB= angiotensin II receptor blocker, CHF=chronic heart failure, CVD=cardiovascular disease, DM=diabetes mellitus, eGFR=estimated glomerular filtration rate, GFR=glomerular filtration rate; RAAS=renin-angiotensin-aldosterone system ; RRT=renal replacement therapy, SCR=serum creatinine, UAER=urinary albumin excretion rate

TABLE 4 Stages of CKD

Stages	eGFR (mL/min/1.73 m ²)	Description
G1	≥ 90	Kidney damage with normal or increased GFR
G2	60-89	Kidney damage with mildly decreased GFR
G3a	45-59	Mildly to moderately decreased GFR
G3b	30-44	Moderately to severely decreased GFR
G4	15-29	Severely decreased GFR
G5	<15 or dialysis	Kidney failure

Albuminuria

Category	Range (mg albumin/g creatinine)	Description
A1	<30 mg/g	Normal to mildly increased
A2	30-300 mg/g	Moderately increased
A3	>300 mg/g	Severely increased

TABLE 5 Strategies to Slow Progression

- Control of hypertension with preferential use of either an ACEI or an ARB in patients with proteinuria
- Individualized control of hyperglycemia
- Dietary protein restriction in patients with stage 3 and 4 CKD (consider consultation with nephrologist or renal dietitian)
- Correction of metabolic acidosis
- Avoid nephrotoxic agents

TABLE 6 Indications for Nephrology Consultation * †

- eGFR < 30 ml/min/1.73m²
- Rapid decline of eGFR (>5 ml/min/1.73m² per year)
- Complications of CKD (e.g., anemia, calcium or phosphorus abnormalities)
- Nephrotic range of proteinuria (>3.5 grams/24 hours)
- Underlying cause of CKD or proteinuria is unclear
- Patient's level of disease exceeds the level of comfort of the primary care provider

* Referral should be made following shared decision making with patient that ensures the referral focus is consistent with the patient values & preferences
 † This list is not exhaustive, consult the discussion of Recommendation 16 in the full CPG for more information.



<https://tinyurl.com/szydtf6>