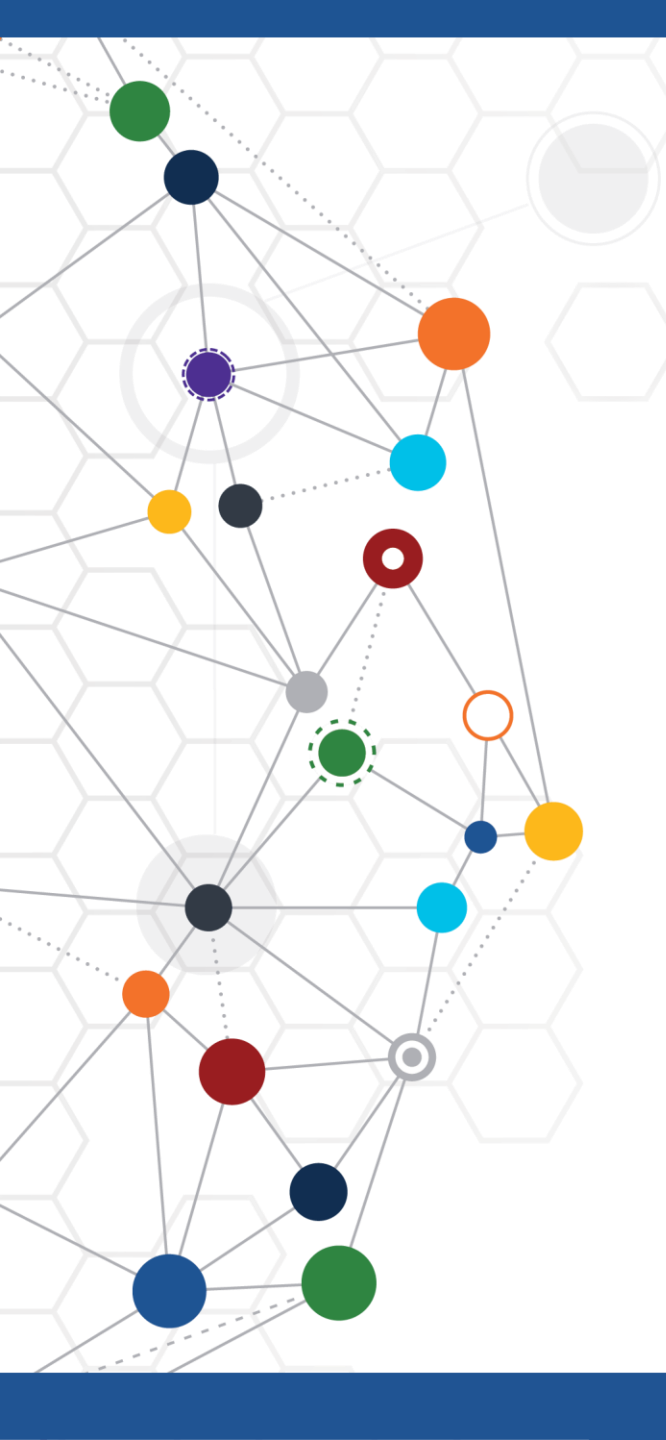




ENTERPRISE ARCHITECTURE AND MUSINGS ON HEALTHCARE TRANSFORMATION

Ken Rubin

*Interoperability Architect
Research Associate, University of Utah*

15 October 2026

Session Goal & Premise

One of the big challenges I see around health informatics is the extent of the specialization within our discipline. Pragmatic solutions require that we bring components together into cohesive solutions. With this premise, I am to:

- Discuss framework to help dissect perspectives on complex problem spaces
- Contextualize solution elements and how computable knowledge enables us to address these challenges
- Frame how clinical transformation depends (in part) upon process transformation
- Discuss the role and opportunities associated with process modeling to realize and empower the above

About Me...

- Staff position at the University of Utah (Dept of Biomedical Informatics)
- Healthcare Architect for ~25 years
- Experience in several countries: UK, US, Australia, Singapore
- Primary experience has been with large healthcare provider organizations; working at scale
- Helped form workflow-orientated community of practice (BPM+ Health) and migrated that into HL7 in 2024
- Passionate and committed to open standards



Ken Rubin

HL7 BPM Community of Practice Lead

Co-Chair, HL7
Orchestration, Services
and Architecture WG

Interoperability Architect;
University of Utah

HL7 Board of Directors
(through 2026)

Disclaimers and Disclosures

- The opinions expressed are my own and do not necessarily reflect those of any organization/institution with which I am affiliated
- This is my assessment of what I believe is emerging best-practice

NOTE: This is YOUR session, not mine. Question me. Interrupt me. Engage! We'll all get more out of it that way!

Setting the Stage

What are Learning Health Systems (LHS)

“Healthcare systems in which knowledge generation processes are embedded in daily practice to produce continual improvement in care.”

Institute of Medicine

Learning Health Systems



What is a High-Reliability Organization (HRO)?

- *The New England Journal of Medicine asserts that an HRO is an organization that consistently performs safely, efficiently, and with high quality even in the face of complex challenges...*

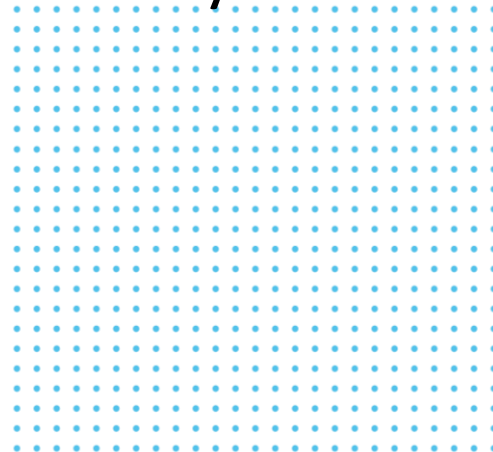


Group Exercise: Transition Planning

- You have been employed by a regional health delivery organisation
- Your task is to develop a **transition plan** to move the institution to being a world-class “learning health system”
- Your strategy shall:
 - Provide a viable transition to an LHS from current state
 - Be informed and influenced by industry best-practice
 - Presents an actionable, pragmatic approach
 - Identify clear activities/milestones
 - Present the approach in clear, thoughtful, compelling terms

Group Exercise: Outbrief

- How would you summarize the experience of the last few minutes?
- What approach did you take to organize the content?
- How would you address complexities, and interrelationships among disparate priorities?
- What confidence do you have that you could do this repeatably/consistently?



Keystone 1: Making the case for “The Big Picture”

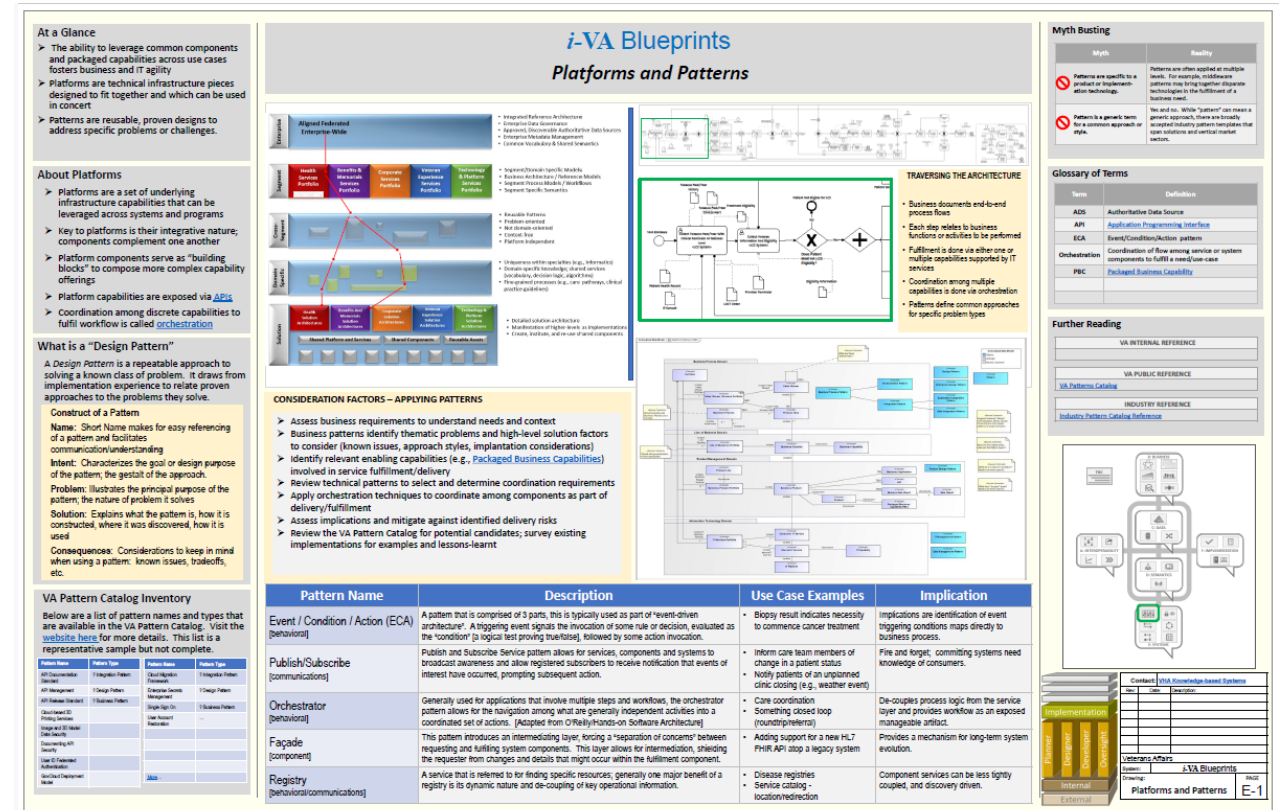
- We have become so specialized that even peers oft have limited understanding of the depth of colleagues work
- Informatics to outsiders is nearly incomprehensible
- Viable solutions cross disciplines areas
- It is often difficult (or near impossible) to articulate how similar disciplines differ or relate
- As an industry, many lack the skills, rigor, or terminology to describe the difference

EXEMPLARS

- Problems are viewed in the context of a particular solution approach, technology, or discipline
- There is implicit understanding that concepts differ, but inability to articulate why or how
- Lines often blur between problem and solution
- It is unclear how complementary components can or should fit together
- Team members are using the same labels for differing concepts (a terminology problem, but more than that)

Making the case for “The Big Picture” ... The Role of Architecture

- Simply put, architecture is the discipline that lets us bring together problem, solution, and solution components in **context**
- Architecture relies upon **cohesion** to bring together related concepts and discuss them coherently
- An architecture done well relates concepts from different disciplines, showing how they interdepend
- ***Essential to doing this successfully is “separation of concerns”...***



Architecture Example, US Veterans Health Administration, Legacy Public Version



Keystone 2: Separation Of Concerns

Architecture Viewpoints - Perspectives on a Problem”

“Business View”

How this works in the ‘real world’.

Balsamic Vinegar makes food taste better!

“Information View”

Describing attributes and characteristics.

- semi-viscous liquid
- dark amber in color
- 375ml bottle
- acidic, earthy scent

“Computational View”

Design Approach / Concept

- specify target acidity
- determine intended use (accent, cooking, etc)
- specify age, barrel type, etc.

“Technology View”

Component Parts /
Bill-of-Materials

- Grapes (juiced)
- Bottle (labeled)
- Cork

“Engineering View”

How it is made/done.

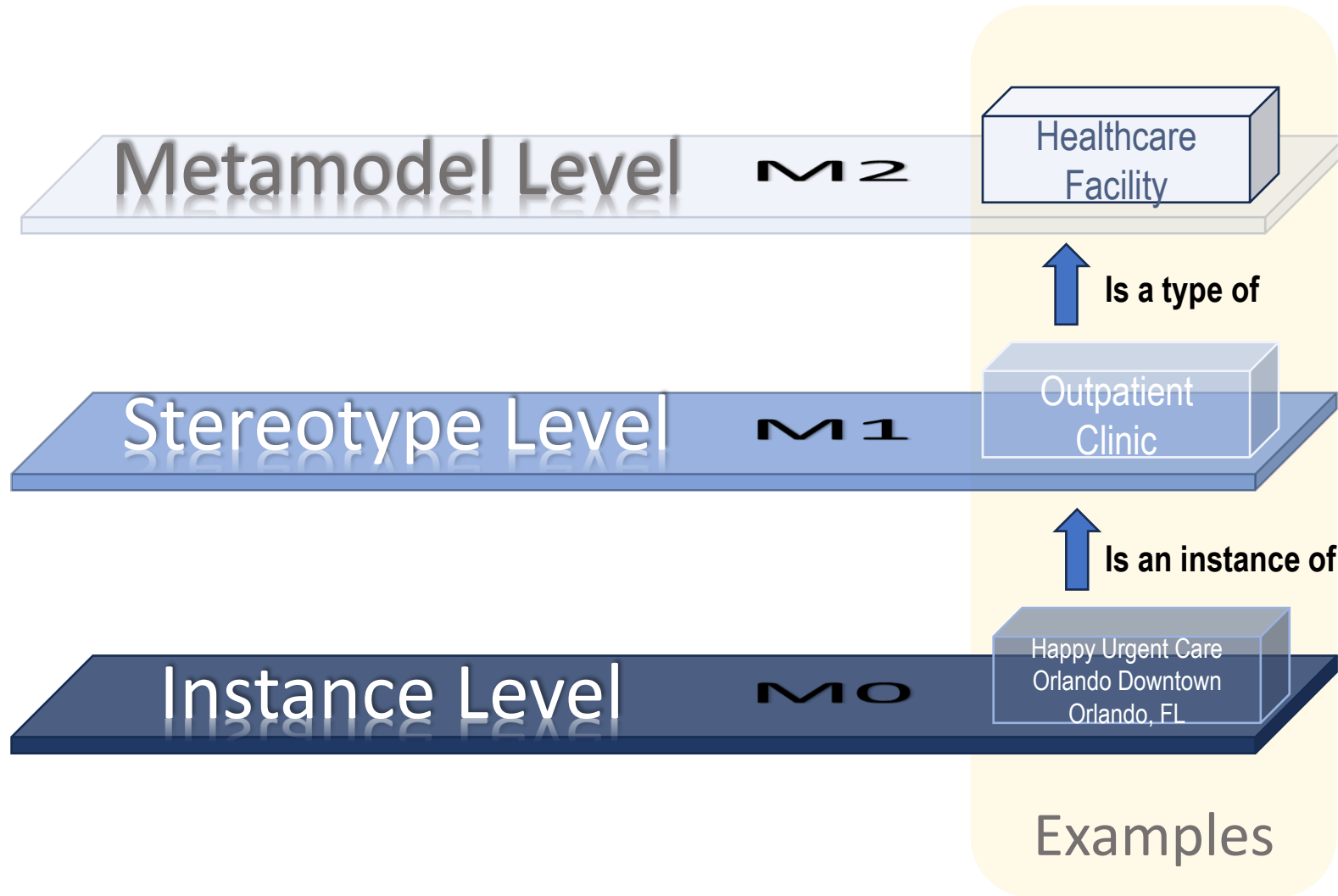
- Take sweet white grapes, press and juice
- cook over flame until reduced by 1/2
- pour into cask, cover
- Age until desired target; bottle

Things to Note

- Perspectives isolate “themes of interest”
- Each view is distinct from the others
- Views exist in tandem
- All views exist for any “subject of interest”
- Views are non-competing

Separation of Concerns - Abstraction Hierarchy

“Traversing Meta-levels”



Things to Note

- Strata represent “meta-levels” of abstraction
- Each layer is a “manifestation” of the layer above it
- Comparability is within a layer, not across layers
- Views are non-competing

Architectural Blueprints Case Study: iVA

➤ **FIRST-STOP SHOPPING.**

Create a place to look that serves as a launch-point to find things buried across VA

➤ **SIMPLIFY.**

Drive toward essential interop themes beyond the complexities to make them understandable and consumable.

➤ **CONTEXTUALIZE.**

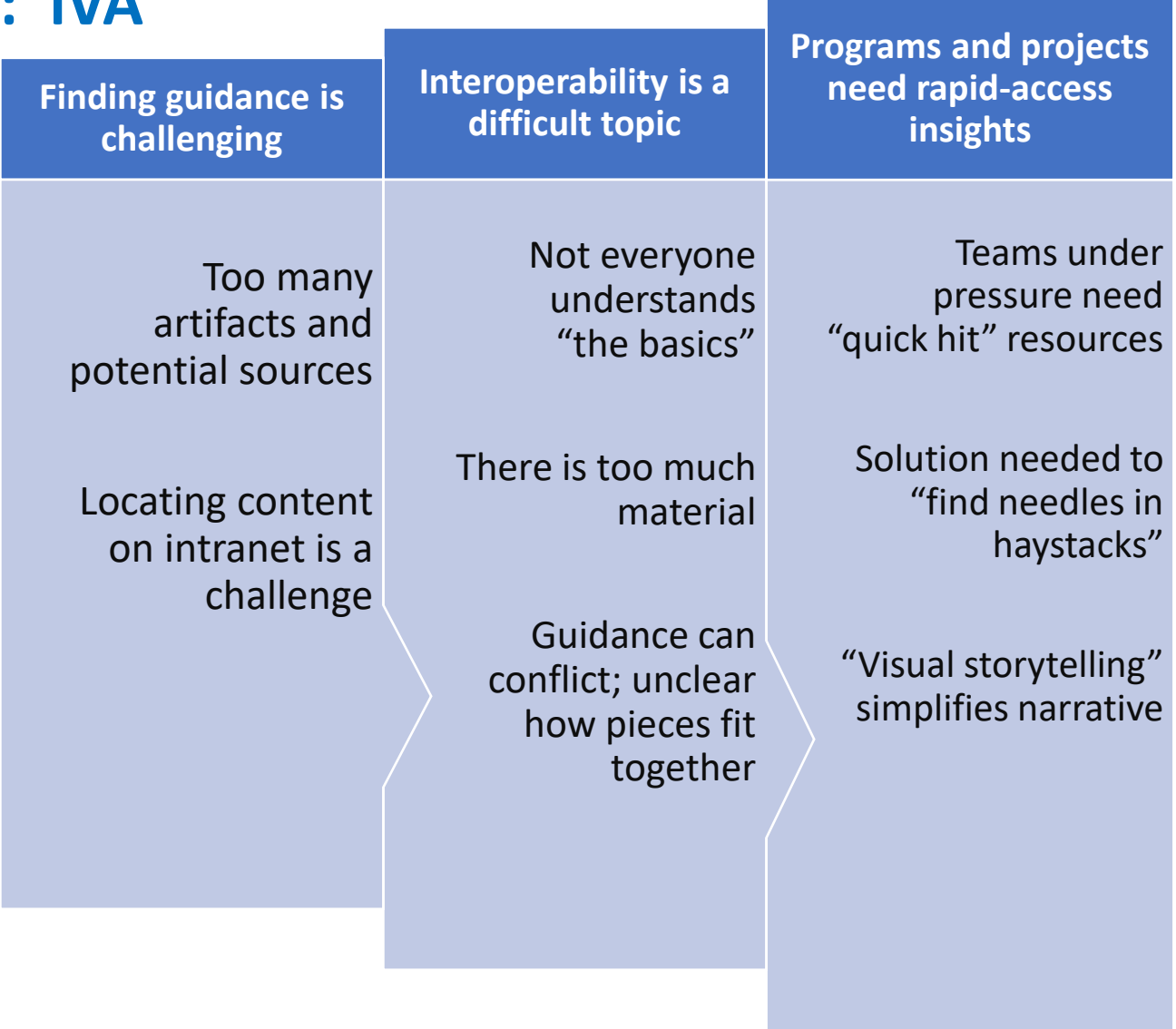
Help frame how existing pieces fit together to meet business needs, within VA and into industry

➤ **PRAGMATISM.**

Inform, arm VA stakeholders to make key decisions, find answers, and know where to “dig deeper”

➤ **REUSE.**

iVA does not seek to supercede or duplicate work, but rather to surface it and provide context.



Touring the Blueprints: The Page “Construct”

- Motif drawn from the construction industry
- Each page has a “focal” topic
- Left panel provides context
- Bottom panel elaborates detail
- Right panel contains references
- Bottom right provides navigation, versioning
- Iconography to call out role relevancy

At a Glance:

This page explains the framework of the i-VA Blueprint

- Each page is specific to a theme or purpose
- The “Anchor Graphic” depicts the key point
- The Left Panel provides relevant context
- The Bottom provides explanatory detail, exceptions, or supplemental information
- The Right Panel provides reference information
- The Bottom Right icons help navigate

Why Produce the i-VA?

- **Discovery** of relevant materials and guidance is difficult given VA's size and complexity
- Even when aware of an artifact, it can be difficult to **locate** it
- It is not always clear how different references are meant to **fit together**
- Projects need **specificity** at lower levels than the VAEA and Segment Architectures sometimes provide
- It provides a **targeted focus** on just what needs to be done, as well as where to learn more.

How to Use the i-VA Blueprint

The i-VA Blueprint was created to bring together VA guidance impacting VA programs and projects.

- Use navigation tools (Table of Contents, Page “Navigator”) to find content relevant to a need
- Each section is focused on a “theme”, with successive pages delving deeper into that theme
- The artifact is intended as a reference document, and not generally read cover-to-cover
- The i-VA helps users to make informed decisions, but does not necessarily provide the answer
- Set 18 months in the future, the i-VA helps you make project and acquisition decisions for activities planned or underway

i-VA Blueprint Intended Use

Project Teams	VA Leadership
• Provides guidance on how to select standards for use	• Improves delivery confidence on interop concerns
• Provides a consolidated point-of-reference for technical assets	• Provides consistent guidance to project teams
• Defines metadata to assist in interop tradeoff decisions	• Enhances technical transition management / versioning
• Identifies proven practice patterns	• Aligns with existing governance

Governance	Strategy
• Elaborates specificity for current technical ambiguities	• Guidance is aligned with industry strategic roadmaps
• Designed to extend existing assets (VA EA)	• Provides convergence across VNA, VBA, VCA
• VAIL provides accountability and executive visibility	• Differentiates between current, transition, future state
• Stewarded by neutral body to harmonize agency needs	

i-VA Blueprint

Navigating the Blueprints

What the i-VA Blueprint is

A guide and a technical reference to support VA project teams in implementing information systems and processes that are highly interoperable:

- Identifies relevant HIT standards
- Catalogs and classifies APIs
- Defines key terms, practice patterns, tradeoffs
- Convergence point of program and project guidance, with reference links to further reading (FHIR, HL7, terminology; VA guidance such as VA EA, VBA Business Architecture etc.)
- Based on Enterprise Architecture approach and industry best-practices

Why It Matters

- Pragmatic guidance targeted to support project teams
- Intended to underpin VA EA and VBA Business Architecture
- Facilitates discovery and appropriate use of existing agency and industry assets
- Helps project teams make informed decisions
- Contextualizes guidance for assets/ standards in the TRM
- Tools to advance interoperability across and beyond VA
- Supportive of existing governance processes

i-VA “Navigator” by Intended Use

Reference listed in order of increasing relevancy. Key objectives are in BOLD.

- **PRIMER / Overview** [A-1, A-2, A-3, A-4]
- **Acquisition Planning** [A-5, A-6, A-7, A-8]
- **Architecture**
 - Requirements Traceability [B-1]
 - Design Patterns [B-2]
 - System Architecture [B-3, B-4, B-5, B-6]
- **Data Design** [C-1, C-2]
- **Governance and Compliance** [E-1, E-2, E-3, E-4]
- **Learning Health System** [G-1, G-2, G-3]
- **Maturity** [B-7, B-8, B-9]
- **Policy** [B-10, B-11, B-12]
- **Program Management** [A-9, A-10, A-11, A-12]
- **Quality Management** [A-13, A-14, A-15, A-16]
- **System Design**
 - Data Design [C-3, C-4, C-5, C-6]
 - Interface/API Design [D-1, D-2, D-3, D-4]
 - Integration Design [D-5, D-6]
 - Requirements Traceability [B-17, B-18, B-19]
- **Standards**
 - Information Standards [B-20, B-21, B-22, B-23]
 - Knowledge Representation Standards [B-24, B-25]
 - Process Engineering Standards [C-7, C-8, C-9, C-10]
 - APIs [B-26, B-27, B-28]

Anchor Graphic

Left Panel

- Content at a Glance
- Page Context
- Core Concepts
- Key Messages
- Recommendations

Right Panel

- Glossary
- Reference
- Page
- Location
- Level of Detail
- Reader Perspective
- Title and revision history

Graphic Explanation

Further Reading

- 1. i-VA [reference document](#) with simple description here
- 2. OT [reference document](#) with simple description
- 3. DEA [reference document](#)
- 4. DDC [reference document](#)
- 5. VAIL Maturity Matrix
- 6. VAIL Roadmap
- 7. VDR

Myth Busting

On each page of the i-VA, this space will present common misconceptions about the topic being discussed, and key take-away guidance, context, or clarifications.

Glossary of Terms

Acronym or Term	Definition
API	Application Programming Interface
EA	Enterprise Architecture
FHIR	Fast Healthcare Interoperability Resources
HIT	Health Information Technology
HL7	Health Level Seven – an interoperability standards development organization
ICT	Information and Communication Technology
i-VA	Interoperable VA Blueprint
NCA	National Consumer Administration
TRM	VA Technical Reference Model
VBA	VA Business Architecture
VBA	VA Business Architecture
VBA	VA Business Architecture

Further Reading

- 1. i-VA [reference document](#) with simple description here
- 2. OT [reference document](#) with simple description
- 3. DEA [reference document](#)
- 4. DDC [reference document](#)
- 5. VAIL Maturity Matrix
- 6. VAIL Roadmap
- 7. VDR

Navigation Icons

- Table of Contents
- Page Navigator
- Search
- Home
- Back
- Forward
- Print
- Fullscreen
- Zoom In
- Zoom Out
- Reset Zoom
- Close

Footer

VAERS Affairs

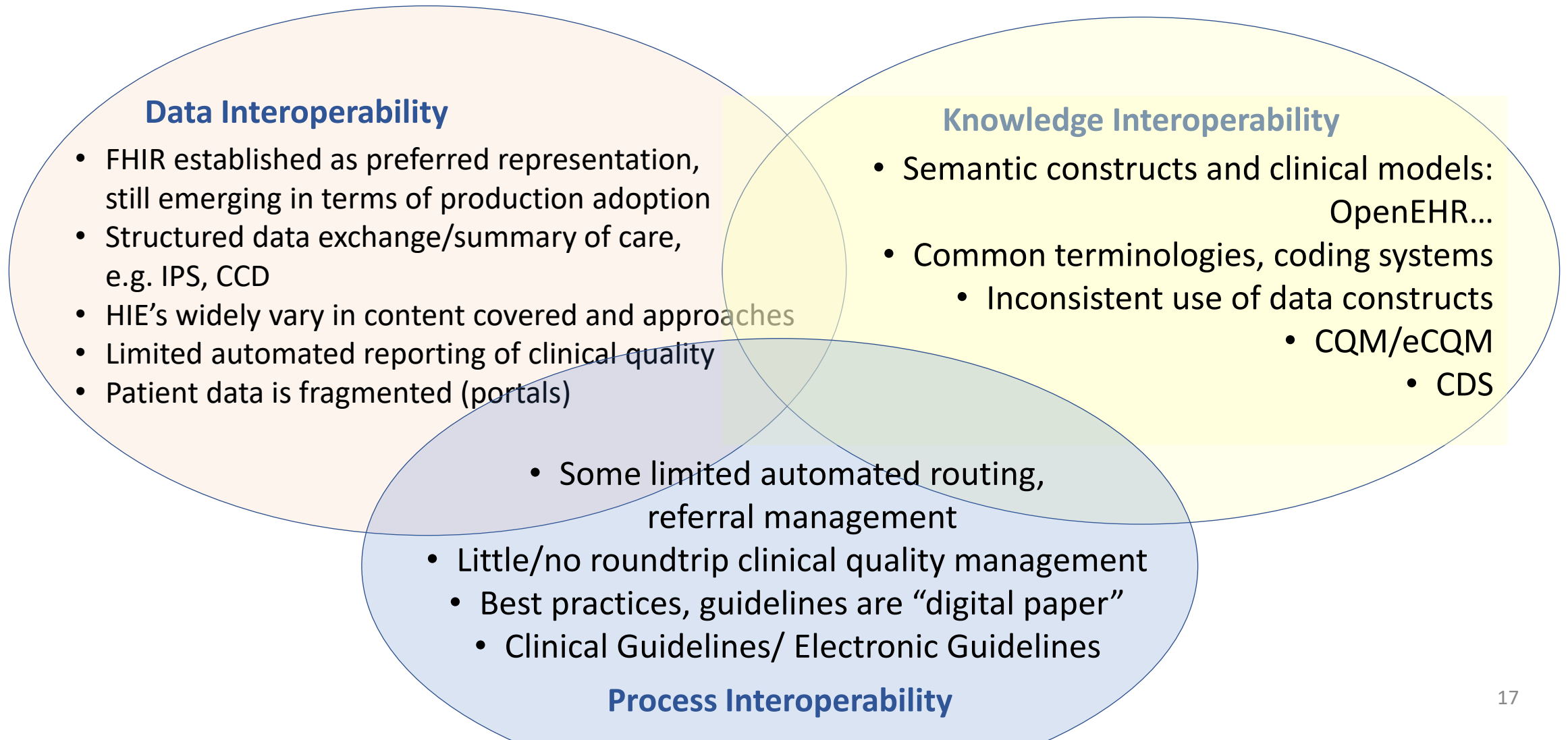
Page: i-VA Blueprint

Page: Navigating the Blueprints

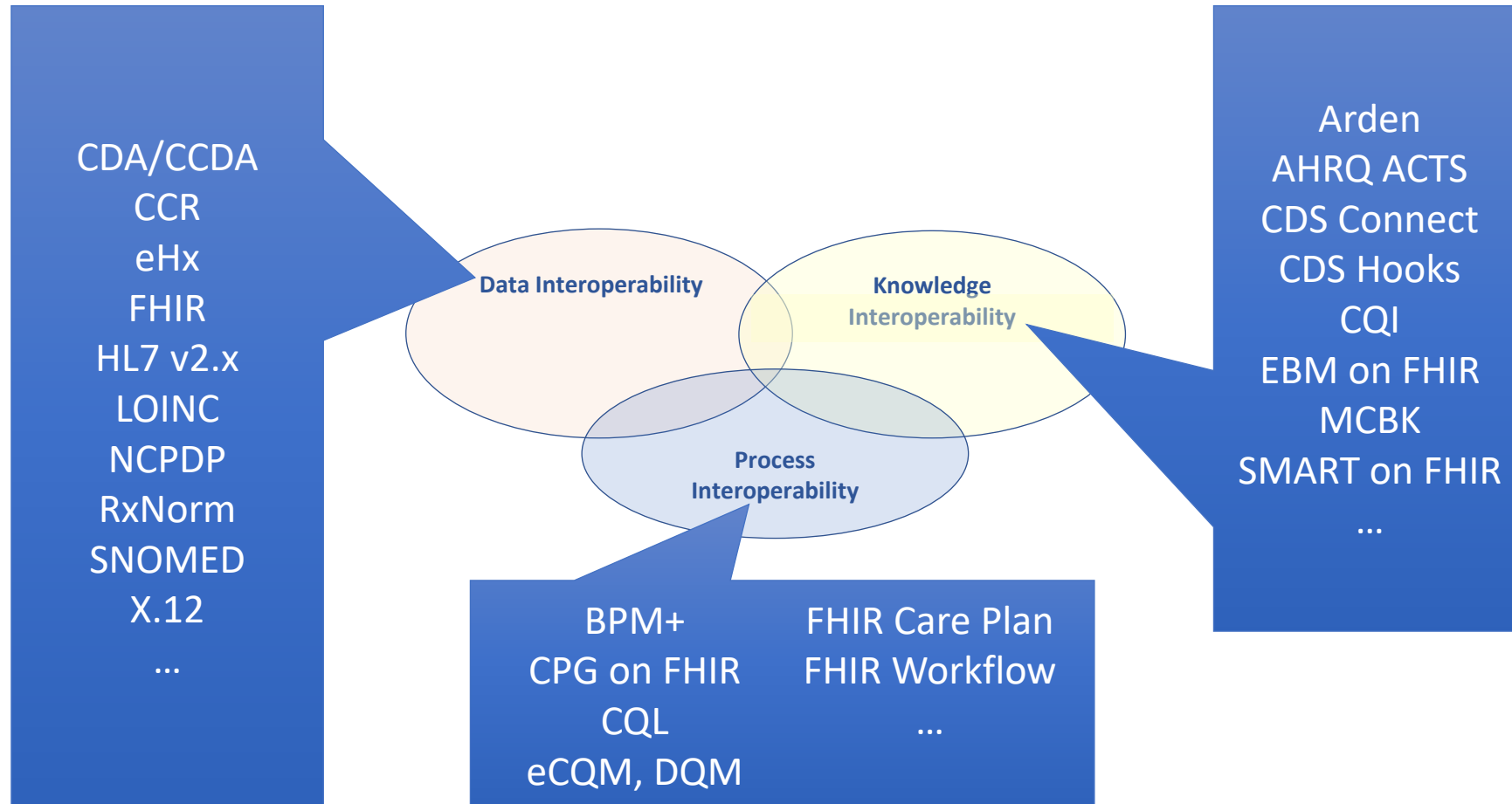
Page: A-1

Blueprints Exemplar

Keystone 3: Natures of Interoperability



So what does interoperability look like today?



The Case for BPM – Empowering Process Agility

The Status Quo is Unsustainable

- Best-practices are constantly evolving
- Each new care pathway impacts human processes, HIT, or both
- **17 years** from discovery to bedside is untenable
- Every **6 months** what we know doubles

9,000,000,000,000

So if there were only 1000 care pathways today, what would this look like....

1,000

What do care organizations want (*need!*)?

- ... to keep abreast and aligned with industry best-practices
- ... to be able to provide and assure consistency in practice
- ... to continuously improve, driving quality and efficiency
- ... to manage costs and risk
- ... to drive optimal patient outcomes and staff satisfaction

Change is a constant

- Best-practices are moving targets
- Pace of technology change is increasing
- Workforce, training, and expectations evolve and need to adapt
- And what about AI?

Ah, the case for agility...

- We need to manage and control change
 - ...in internet time
 - ... for our systems
 - ... in how our systems behave
 - ... in coordinating care
 - ... in integrating new technologies and capabilities
- So how do we bring these pieces together in our workflow to realize our potential?

Building Blocks

Model the “As Is” State

- Formally and precisely document what is happening in practice
- When possible, consider different sites, particularly exceptional and poor performers
- Consider using the Workflow Reengineering Worksheet
- Take note of outcomes, actors, data, etc

Current Processes Documentation

Health and Healthcare Opportunities

Opportunity	Current Practice
Patient Daily Activities	
Before Encounter	
Encounter: rooming	
Encounter: provider	
Encounter: checkout	
After Encounter	

Workflow Reengineering Worksheet concept courtesy of [Jerry Osheroff, MD](#) and Accelerating Care Transformation (ACT)

Envisioning the “Future” You Desire

- Re-imagine your processes based upon the outcomes and impacts you seek
- Consider the «whole» system – people, policy, technology, manual processes, automation
- What changes can we make to improve outcomes?

Potential Future State Documentation

Quality Improvement Opportunities

Opportunity	Proposed Future State Practice
Provider Education	
EHR Configuration	
Staff Roles	
Clinical policies	
Other	

Model use Formal Notations and Visual Languages

- Develop process models, using the appropriate formalism to the task
(different languages are good at different things)
- Detail and precision matter
(we have found scores of errors and inconsistencies modeling existing narrative care practices)
- Formal notations have syntax and can be validity-checked
- Utilize the Workflow Redesign Worksheets as a foundation

What is a BPM+ Process Model?

What it is

Set of diagrams illustrating flow, actions, decisions

Each box, symbol, and line has precise meaning

Suitable for use by both people and computers

Integrates several visual “languages” including BPMN



How it is used

Tool for expressing business requirements

Communication vehicle to foster shared understanding

Alternative to narrative Documentation

Consumable software asset expressing knowledge, state

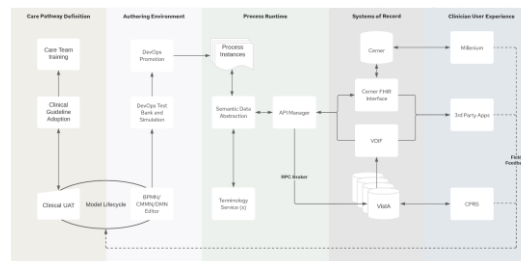
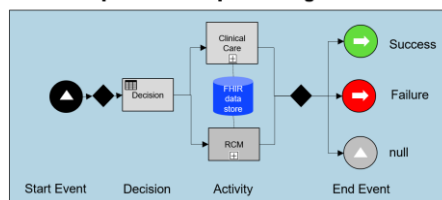
Why do I care?

VHA starting to document requirements this way

Less ambiguous than narrative requirements

This approach provides a functional complement to FHIR

Closed loop healthcare purchasing

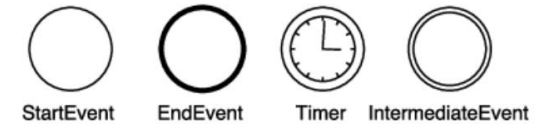


Closing the Loop

Writing in a human and machine readable language.



Events



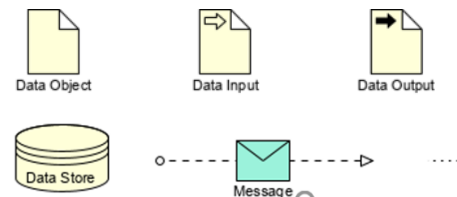
Activities



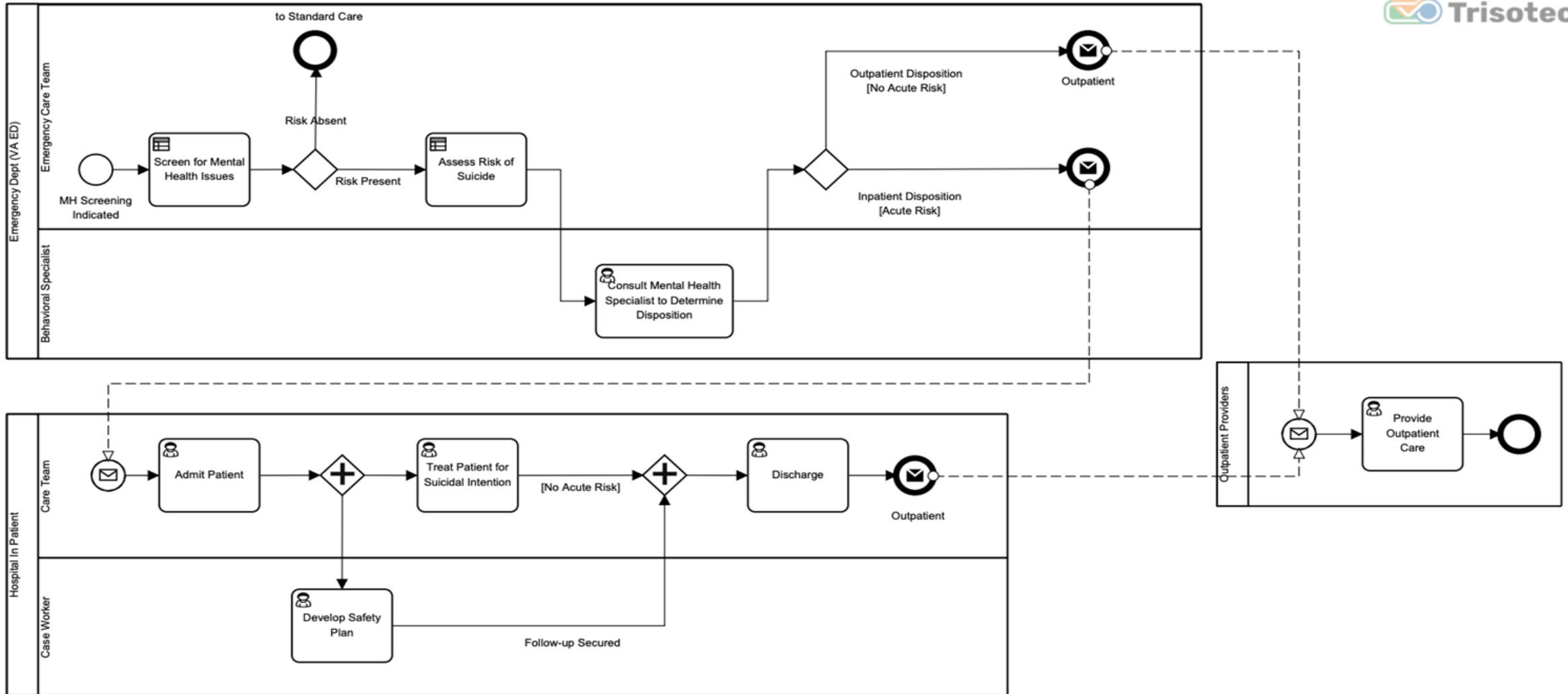
Gateways



Data



Suicide Prevention Exemplar



“Top Five” Big Opportunities opened via BPM Notations

1. Processes can manage state, tracking transition across activities and complexity
2. Models can be federated, allowing “top level” processes to be simple while dealing with complexity in supporting models
3. Model types can be intermixed, better supporting complexity needs of health
4. Actions can be escalated based upon something happening (or not happening)
5. You can integrate an AI process step into a workflow, or have AI manage activities across a workflow

(bonus) Formal models reduce interpretive error, can be directly consumed as code, and can be generated or consumed by AI

“Top Five” Implications of using BPM

1. Notations are human readable
2. Models are computable artifacts
3. Maintenance of the models can be owned/managed within the clinical community (e.g., not “IT”)
4. Understanding of flow and state within the model allow for detection of events that haven’t happened
5. Representation is software agnostic and standards-based (portable, interoperable)

These collectively help power “agility”

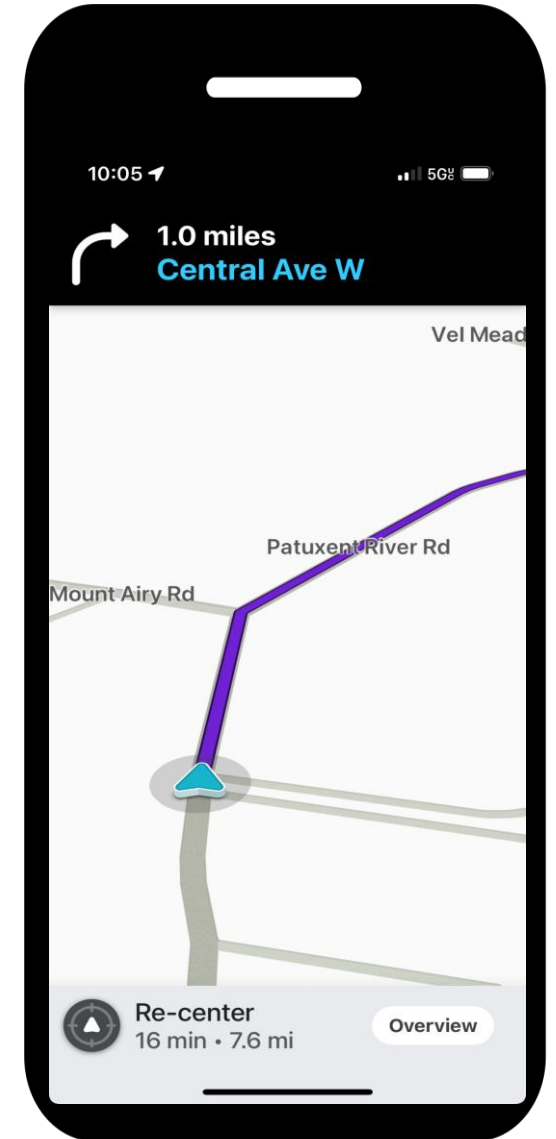
Exploring Possibilities: “Double Click” on AI – Powered by BPM?!

- Integrate and AI process step into a pathway
- Executability of BPM processes, with dynamic monitoring and adaptation (Dynamic routing within a workflow)
- Explaining an algorithm (within a model)
- Parse/ingest a narrative guideline
- Merge guidance for a new condition into a care plan
- Flag conflicts in recommended guidance related to comorbidities

**Given that the BPM suite of languages are computable,
LLMs can be taught to “speak” BPM!**

An Analogue from Daily Life... Waze!

- There are tremendous similarities between GPS apps and healthcare workflow augmentation/automation:
 - GPS provides recommendation but is not “self driving”
 - User can determine high level preferences (e.g., avoid toll roads, prefer highways, etc.)
 - Recommended routes informed by multiple (potentially unknown) data sources
 - Updates to routing algorithm not inherently transparent
 - Opportunities for AI to improve process (e.g., data source analytics)



Discussion



Supplemental Slides

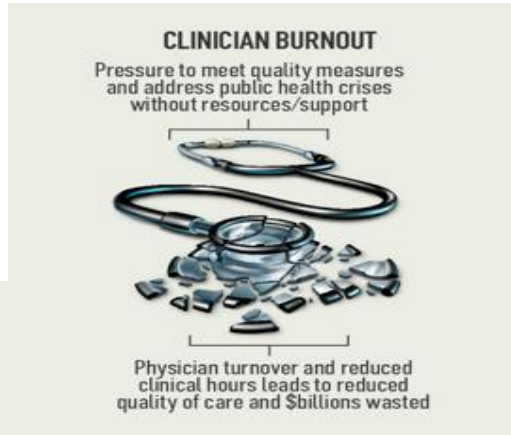
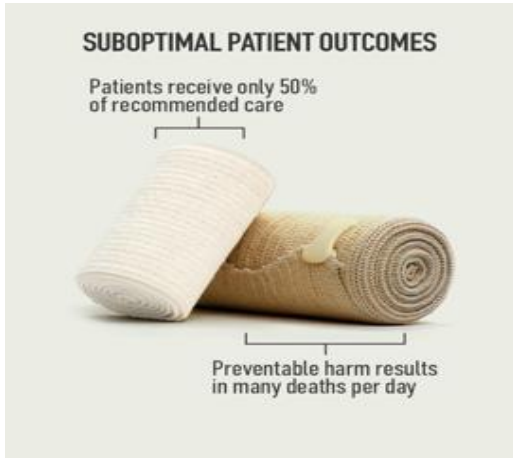
A Little Context (I)

- As an industry we have invested the last **30 years** focused on digitalizing health and **sharing data**
- Meanwhile with the introduction of the EHR we have also **added clinical burdens**
- Data is about what happened “before”
- Workflow is about what is happening now

A Little Context (II)

- Healthcare providers globally are seeking ways to achieve delivery consistency, quality, and reliability
- The emergence of AI provides tremendous opportunities, but how do we integrate it into practice?
- The disciplines of both medicine and technology are changing very quickly – keeping pace is both essential and very difficult
- *My Bold Assertion: “Data Sharing” only gets you so far*

Pressures and Challenges



These Groups (Stakeholders):

- Patients
- Health Systems
- Care Teams
- Payers
- Governments
- Product / Service Suppliers (e.g., Health IT, Drugs / Devices, Quality Improvement)

Are Facing These Challenges:

- Health Outcomes (e.g., quality, safety)
- Costs
- Revenue
- Experience (e.g., satisfaction, burnout, access to care, equity)

Common Underlying Theme:

- Care delivery **processes** often not efficient or effective in achieving goals for patients and others
- **Process complexity** and variation makes it difficult to improve processes **at scale**

So what have we learned?

- EHRs are critical tools and have the potential as game-changing enablers
- If something is hard to use it won't be (or won't be used "properly")
- Health and health care is NOT all about IT
- Humans and machines need to work together and complement the work that needs to be done
- Data is a piece of the puzzle. Putting data to use is workflow.

So, why workflow?

- Processes form the foundation for the practice of medicine (and administrative processes too)
 - **Defining how an organization does things**
 - **Professional societies describing best-practices**
 - **Establishing consistency within a speciality or practice**
 - **Fostering high reliability across an organization**
- Workflow that is repeatable can be measured for efficiency, efficacy, impact

A Peek into Workflows

- A **workflow** is a set of activities (e.g., process steps) that come together to support a business process
- Workflows are performed by humans, machines, or both
- Workflows can be very simple or extraordinarily complex
- Workflows are (generally) composable
- When expressed using precise, formal models, workflows can be executed as software
- Healthcare has several notions of repeatable-processes that influence “good” care delivery
- **Care Pathways** define processes that should be followed to administer care
- Professional organizations (and others) publish best-practices as **Clinical Practice Guidelines (CPGs)**
- There are no broadly accepted universal definitions for healthcare workflows, care processes, pathways, or Clinical practice Guidelines

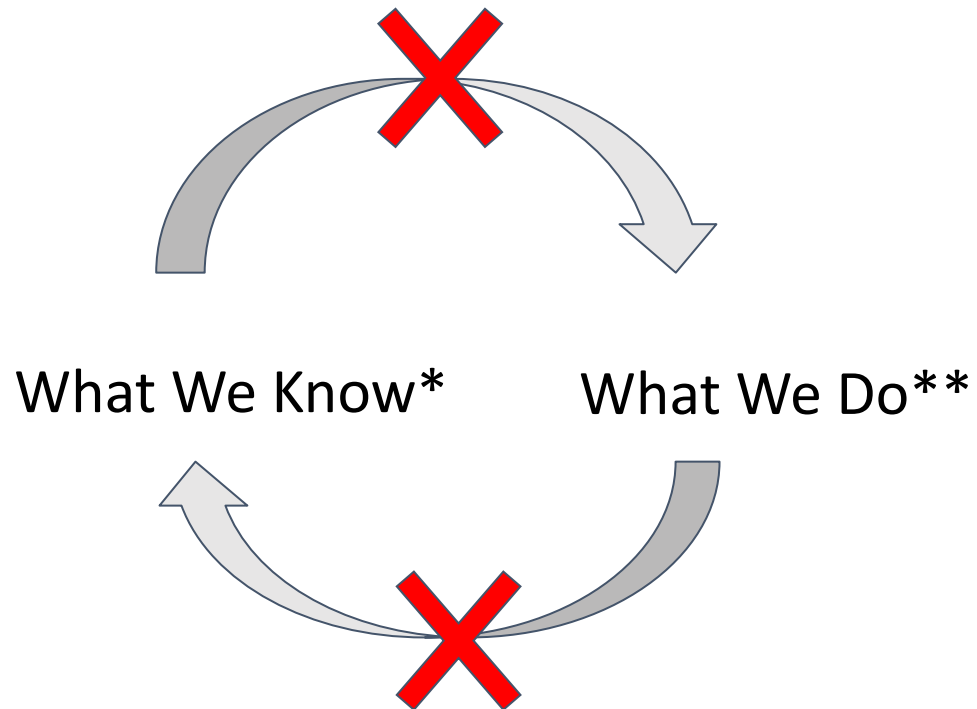
Complexities and Variety of Care Processes

- Process Natures
 - Event driven
 - Sequence
 - Complex interactions
- Human-computer
- Computer-AI
- Mixed
- Exception Conditions
 - Timing events
 - Detecting events that didn't happen
 - Setting specific variation
- Setting Specific

Framing Workflow Redesign:

Qualities of a Successful Approach

Why are we here?



* e.g., in 2018, US spent \$194B on health/medical R&D

** e.g., US has worse health outcomes of developed countries and spends the most

No organization or country has figured out how robustly create this 'virtuous cycle'!

Slide content courtesy of [Jerry Osheroff, MD](#) and adapted from Accelerating Care Transformation (ACT) brief [used with permission]

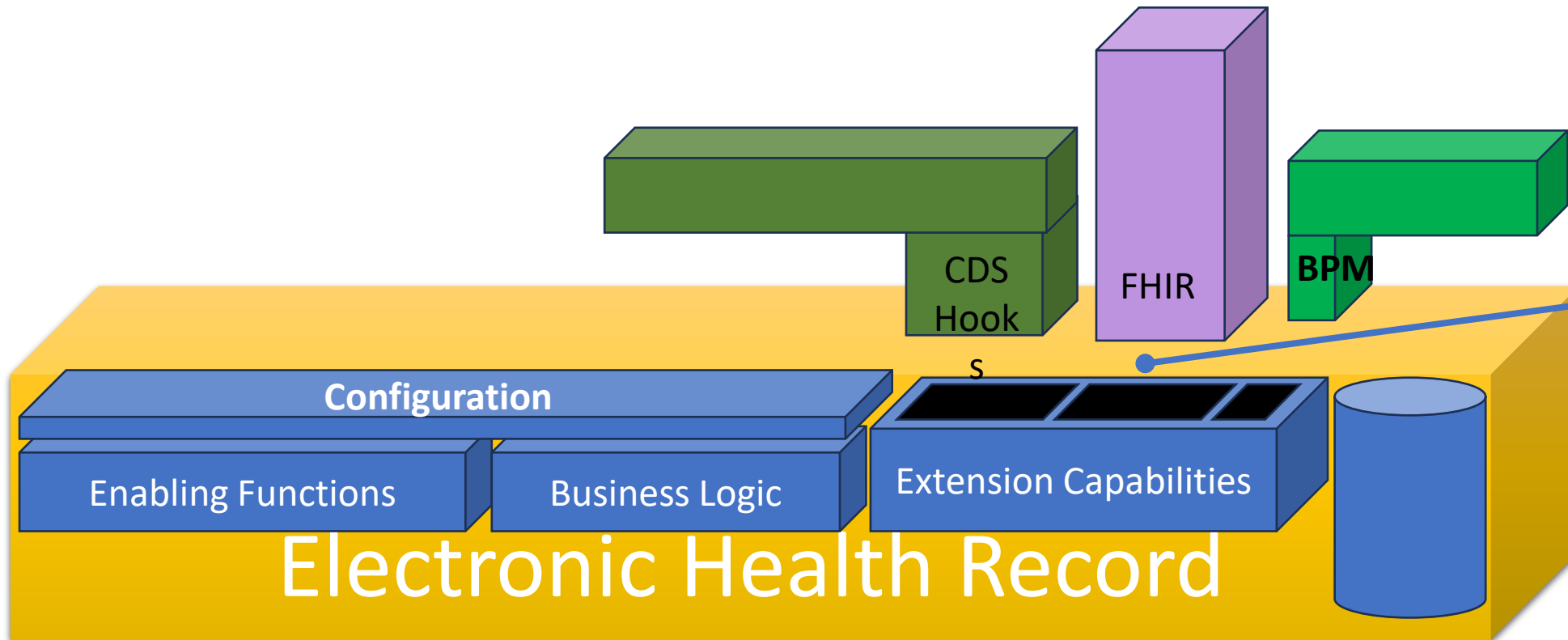
Examples of Specific Challenges

- Less than ideal achievement of **care goals**
 - Poor control of chronic disease with resulting preventable illness/costs
- Care for **aging population** with increasing utilization in timely and patient-centered manner given limited resources
 - Need more efficient strategies for managing chronic illness (including addressing root causes) than current encounter-driven approach
- **Increasing** evidence, **knowledge**, guidance, and **misinformation** that relates to delivering effective care efficiently
- Increasing demands for **measuring** care processes and outcomes causing increasing stress on providers – taking time away from valuable care for documentation, exacerbating burnout
- **Not using resources efficiently** – e.g., people not working at the top of their qualifications

Slide content courtesy of [Jerry Osheroff, MD](#) and adapted from Accelerating Care Transformation (ACT) brief [used with permission]

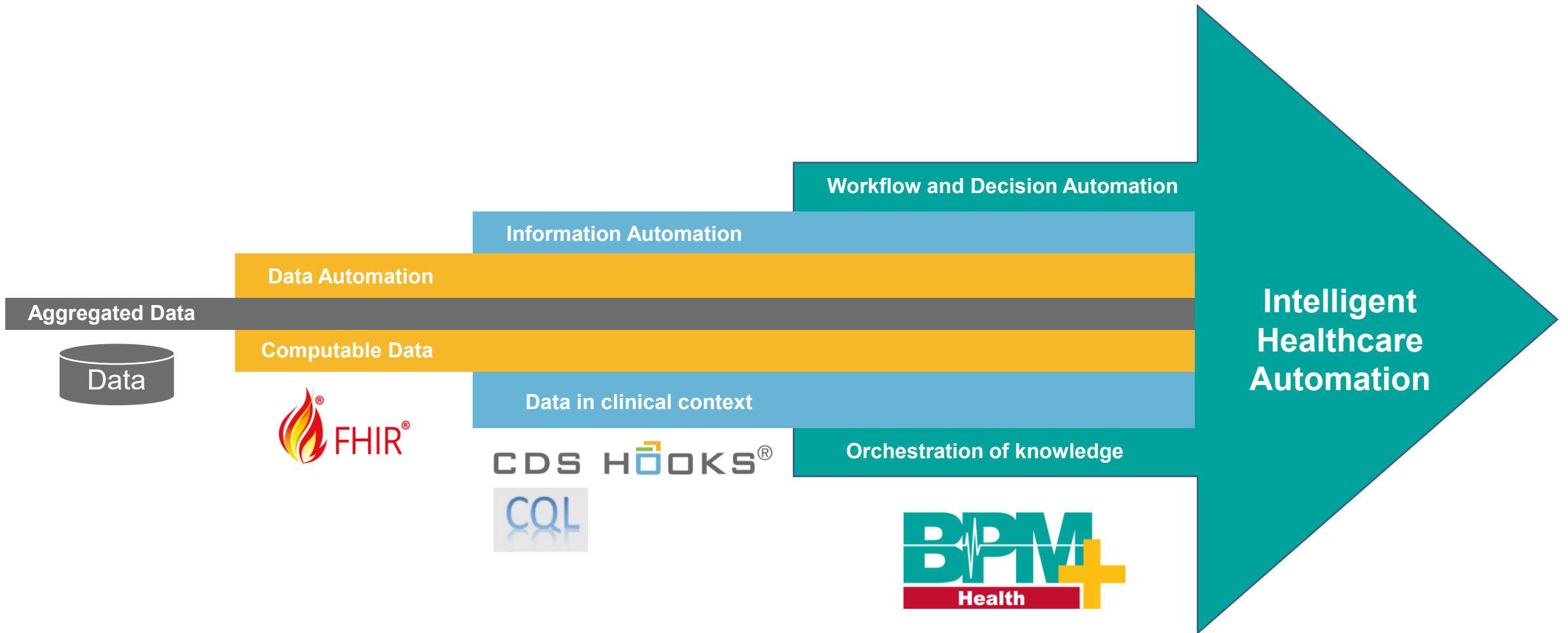
Peeking “Under the Covers”

Visual



PLUG-INS
Open APIs
Compliant Data
Terminology-based
STANDARDS BASED

Intelligent healthcare automation



#ChooseOpenStandards

Tools and Assets

BPM Community of Practice

- About
- APE
- Ambassadors
- Authoring
- Methodology
- OACM
- PAEWG

Become a BPM Member

About BPM Community of Practice

Founded in 2019, the BPM Community of Practice focuses on bringing together health organizations, professional societies, and vendors with a common goal of improving workflows using open, standards-based notations. This approach enables the sharing of best practices across the healthcare ecosystem.



BPM COP - Publications and Products

Created by Ken Rubin, last updated on Aug 05, 2025 • 1 minute read


Welcome!

All products of the HL7 BPM Community of Practice are available for free and open use by the global HIT community. Derivative work with attribution is permitted, and coordination with the community is encouraged and requested. Users of these artifacts and methods are encouraged to share their experiences and to engage within the Community, to provide constructive feedback, or to recommend future enhancements.

	For Clinical & Business Stakeholders		For Analysts & Modelers		For Technologists		For Everyone
General Education							Case Studies: - Public Health Case Study (US) Indian Health Service Case Study - Mayo Clinic Case Study - Reducing EMR Burden Case Study - Ambulatory Care Case Study
Applied Practice	BPM Adoption "Playbook"		Readiness Assessment and Maturity Model				- Human Trafficking Detection Prototype - Chronic Kidney Disease Prototype - Sepsis Detection Prototype
Tools and Techniques			Field Guide to Sharable Clinical Pathways				
General Reference					PRE-RELEASE: Service Orchestration Blueprint		- Community Overview Short Deck - BPM Joins HL7 Introdeck
	For Clinical & Business Stakeholders		For Analysts & Modelers		For Technologists		For Everyone

BPM+ Systems Lifecycle Support

Case Studies



"Field Guide" To Sharable Clinical Pathways



Adoption Playbook



Certification Program



Process Analysis

Define HIT Requirements

Advance Continuous Process Improvement

Spectrum of Needs

Documenting "Current State"

Develop Target-State Processes

Choreograph Across-System Workflows

Process Automation

Level 1	Level 2	Level 3	Level 4	Level 5
Business Process High-level business process description, including the purpose, scope, and key activities of the process.	Process Flow Detailed description of the process flow, including the sequence of activities and the roles involved.	Process Map Visual representation of the process flow, showing the sequence of activities and the roles involved.	Process Model Formal representation of the process flow, using BPMN notation.	Process Implementation Implementation of the process flow, including the development of the process model and the deployment of the process.

Readiness Assessment Maturity Model



Testbeds & Ref. Implementations

Closed loop healthcare purchasing



Computable Models