Teaching CDI* Through Interoperable Clinical Pathways Standards and Modeling Tools

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Nicole Miller, MS, RHIA
Anna Orlova, PhD
Michael Cesino, MBA
Kenneth Rubin, BS CS
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Alison Lieb, RN
Ann Nguyen, MS TM, PMP & LSSB

*CDI – Clinical Documentation Improvement/Integrity
Outline


2. Standards for Clinical Pathways, Nicole Miller
   a. Describe Process Modeling with BPM+ standards
   b. Identify Data Modeling with Fast Health Interoperability Resources (FHIR) standards

3. Standardized CDI Demonstrations:
   a. Execute Pilot Projects: Patient Registration, Anna Orlova & Child Sex Trafficking, Alison Lieb
   b. Sketch Future Projects: Inpatient Falls Prevention, Ann Nguyen & Revenue Integrity, Lee Wise

4. Describe Collaboration with BPM+ Health: Next Steps, Lee Wise
Outline

1. Business Process Management Plus (BPM+) Health Initiative:
   Implementation of Standards-based Clinical Pathways and Data Templates

2. Standards for Clinical Pathways
   a. Process Modeling with BPM+ standards
   b. Data Modeling with Fast Health Interoperability Resources (FHIR) standards

3. Standardized CDI Demonstrations:
   a. Pilot Projects: Patient Registration & Child Sex Trafficking
   b. Future Projects: Inpatient Falls Prevention & Revenue Integrity

4. Collaboration with BPM+ Health: Next Steps
BPM+ HEALTH

Putting into place industry approaches and tools based on open standards, centered on a collaborative community of practice, can help our ecosystem communicate needs and knowledge in a common way, making it easier for healthcare providers to adopt and apply best practices.
The Problem

- Healthcare guidelines & best practices for clinical pathways are not supported consistently by the electronic health record (EHR)
- Every healthcare organization implements clinical pathways in EHR in a proprietary fashion
- Adoption of standards-based practices for clinical documentation including clinical pathways representation is difficult and inconsistent

The Solution:

BPM+ Health

- Business Process Management (BPM) +Health offers a standards-based approach of modeling clinical pathways and data templates using
  - modeling language standards for workflow
  - information content standards for data templates, e.g. HL7 Fast Healthcare Interoperability Resources (FHIR)
What is

• A member-driven community of practice
• A place to collaborate to advance the “state of electronic practice” with clinicians and vendors
• Open environment in which anyone may engage
• Standards-based
• Tools based
• A collection of passionate, engaged, people advancing the next generation of health care and Health Information Technology (HIT)
What is MDMI - Model Driven Message Interoperability
What is

ACADEMIC & PROFESSIONAL EDUCATION WORKING GROUP

JOIN THIS GROUP

SIGN ME UP

CO-CHAIRS

Dr. Anna Orlova, Tufts University
Lee Wise, Clinch Valley Medical Center

BPM+ HEALTH WORKING GROUPS

• Authoring Working Group
• Implementer Working Group
• Methodology Working Group
• Institutional Adoption Working Group
• Academic and Professional Education Working Group

ACADEMIC & PROFESSIONAL EDUCATION WORKING GROUP

Healthcare organizations’ Clinical Documentation Improvement (CDI) professionals, organizations’ informatics and analytics staff, academicians, vendors’ business analysts, and standards developers join the Academic and Professional Education Working Group.

This group will

• Assess best practices for academic, professional development, and vocational education in standards-based health information technology (HIT), including the use of BPM+ standards
• Develop curriculum and content for educational modules on computable clinical pathways development and adoption
• Develop tutorials and materials for educational webinars, presentations, and online training
• “Train the trainers” to use and deliver these materials in academic courses, vocational training, and conferences

With the goal of building a workforce to participate in:

• Developing standards-based computable pathways at healthcare organizations
• Building standards for computable clinical pathways at SDOs
• Implementing standardized, computable clinical pathways in HIT products

RESOURCES

Visit the Academic & Professional Education Working Group’s collaboration site.

ROADMAP

• BPM+ Health educational strategy roadmap
• Curriculum and content for educational modules on computable clinical pathways development and adoption for academic courses, professional certification, and vocational training
• Online tutorials and materials for educational webinars, presentations, online training, etc.
• Reference Implementation Tooling/BPM+ Education Toolkit including inventory of content management, modeling and other software and tools
Goal: Build a proficient health workforce to
• Develop standards-based computable pathways (workflow & dataflow) at healthcare, public health and research organizations
• Implement standardized, computable clinical pathways in HIT products

https://www.bpm-plus.org/working-groups/academic-professional-education.htm
Outline


2. Standards for Clinical Pathways
   a. Process Modeling with BPM+ standards
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   a. Pilot Projects: Patient Registration & Child Sex Trafficking
   b. Future Projects: Inpatient Falls Prevention & Revenue Integrity

4. Collaboration with BPM+ Health: Next Steps
BPM+ Health for Data, Information & Knowledge Sharing in Healthcare

CONTENT: Knowledge → Information → Data → Information → Knowledge

Clinical Guidelines Best Practices → Clinical Pathways → Data Templates → Data Sets & Value Sets → Coded Data

CONTENT: Knowledge → Information → Data → Information → Knowledge

<table>
<thead>
<tr>
<th>Clinical Guidelines Best Practices</th>
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<td>Clinical Pathways Documents</td>
<td>Case Definition Templates</td>
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BPM+ Health for Data, Information & Knowledge Sharing in Healthcare

Professional Associations:

- AAP
- ADA
- AMA
- AHA
- ANA

Health Organization Knowledge Artifacts

Guideline Manager

Practice Manager

Data Analytics

Data Sources


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BPM+ Health for Data, Information & Knowledge Sharing in Healthcare

Professional Associations:
1 - Clinical Guidelines
   Best Practices
   Publications
2 - Clinical Pathways,
   Standard Operational
   Procedures (SOP)
3 - Data Capture Templates
4 - Decision
   Support
   Algorithms
5 - Quality Measures
   Public Health Reports
   New Knowledge
6 - Updated Clinical Guidelines

Health Organization Knowledge Artifacts

Guideline Manager

Practice Manager

Data Analytics

Data Sources


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CDI Role in Information Systems Development Process: Requirement Elicitation = Informatics Approach
Requirements Elicitation Steps:
What do you need the IT solution to do: CDI Role

1. Guidelines, best practices \(\rightarrow\) **Business Case**
2. Clinical pathways (workflow & dataflow requirements) \(\rightarrow\) **Use Case**
3. Standards selection:
   - Business Process Standards: BPM+ for clinical pathways
   - Information Content Standards: HL7 FHIR resources for data sets
   - Data Standards: ICD, SNOMED, LOINC, etc. for value sets
4. Content Management Tools
   - HL7 – Health Level Seven
   - FHIR – Fast Healthcare Interoperability Resources
   - ICD – International Classification of Diseases
   - SNOMED – Systematized Nomenclature of Medicine
   - LOINC – Logical Observations of Identifiers, Names and Codes
Requirements Elicitation Steps: *Demonstrations*

**Pilot Projects**
- Patient Registration, *Anna Orlova*
- Case Identification: Child Sex Trafficking Victims, *Katherine Ariano*

**Future Projects**
- Inpatient Falls Prevention, *Ann Nguyen*
- Revenue Integrity, *Lee Wise*
Outline

2. Standards for Clinical Pathways
   a. Process Modeling with BPM+ standards
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4. Collaboration with BPM+ Health: Next Steps
Requirement Elicitation

Business Case: PATIENT REGISTRATION

Anna Orlova, Lee Wise, Nicole Miller

Tufts University School of Medicine, Clinch Valley Medical Center, Miller And Miller Associates USA, LLC

*Use case was developed by members of AHIMA Standards Task Force (2014-2017)
Patient Registration is the process of checking-in a person to initiate the episode of care that relies on

(1) a standardized approach for patient registration (workflow) across healthcare facilities

(2) a set of standardized data elements in the patient registration process (data flow)

Patient Registration is conducted according with the organizational policies and best practices to ensure

- identity of the person receiving care
- completeness of patient registration data
- correctness of patient registration data
- eligibility for healthcare services
- timely payment for healthcare services

Use Case (IT Solution)
Ensure completeness and correctness of patient information in EHR and ancillary systems/applications involved

Use Case: Patient Registration

<table>
<thead>
<tr>
<th>Actors</th>
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<tr>
<td><strong>Business Actors:</strong> Patient (or patient’s legal representative), registrar, insurance verifier, billing staff, payor, clinician</td>
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<td><strong>Technical Actors:</strong> EHR; financial system, eg, HOST; payor system; registration document repository, eg OnBase</td>
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<td>4. Patient completes necessary forms (paper/electronic) including consent forms.</td>
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<td>5. Registrar or insurance verifier/billing staff verifies insurance information and generate bill and process payment or makes payment arrangements</td>
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<td>6. EHR communicates with the financial system to obtain/update patient insurance/billing information.</td>
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<td>7. Registrar scans signed paper documents and any paper orders carried in by patient into the registration document repository.</td>
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<td>8. Registrar validates/updates patient information in EHR, prints ID bracelet and barcoded documents, and signs the record with e-signature.</td>
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<td>9. EHR updates audit record of the encounter.</td>
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<td>10. Patient is sent to clinician.</td>
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<td>4. Consents (treatment, info sharing), etc.</td>
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<td>5&amp;6. Insurance information, bill/payment, Advanced Beneficiary Notice (ABN)</td>
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<td>7. Scanned documents</td>
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Pre-Conditions: EHR Registration Document Repository
Post-Conditions: Daily updates
Preferred Timing: Daily updates
## Use Case: Patient Registration

**Business Actors:** Patient (or patient’s legal representative), registrar, insurance verifier, billing staff, payor, clinician  
**Technical Actors:** EHR; financial system, *eg,* HOST; payor system; registration document repository, *eg* OnBase

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**Pre-Conditions:** EHR  
**Post-Conditions:** Registration Document Repository  
**Preferred Timing:** Daily updates

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**Clinical Pathways:**  
**Workflow & Data Flow**

- Pre-Conditions: EHR  
- Post-Conditions: Registration Document Repository  
- Preferred Timing: Daily updates
Data Categories & FHIR Resources: Examples

Use Case: Patient Registration

Data Categories

1&2. Patient, visit, clinician, facility demographics; reason for visit; consent to treat & information sharing

FHIR Resources

- Patient: [https://www.hl7.org/fhir/patient.html](https://www.hl7.org/fhir/patient.html)
- Facility: [https://www.hl7.org/fhir/organization.html](https://www.hl7.org/fhir/organization.html)
- Encounter: [https://www.hl7.org/fhir/encounter.html](https://www.hl7.org/fhir/encounter.html)
- Episode of care: [https://www.hl7.org/fhir/episodeofcare.html](https://www.hl7.org/fhir/episodeofcare.html)
- Care team: [https://www.hl7.org/fhir/careteam.html#9.7](https://www.hl7.org/fhir/careteam.html#9.7)
- Task: [https://www.hl7.org/fhir/task.html#Task](https://www.hl7.org/fhir/task.html#Task)
- Consent: [https://www.hl7.org/fhir/consent.html](https://www.hl7.org/fhir/consent.html)

[https://www.hl7.org/fhir/resourcelist.html](https://www.hl7.org/fhir/resourcelist.html)
Modeling Workflow and Dataflow: Content Management Tools
Using Content Management Tools: Components

Planning Statements for Clinical Pathways
(Business Processes/Workflow & Data Flow Requirements)
- Specify: WHY (Policies, Values, Goals, Success Criteria)
  WHO (Actors/Participants)
  WHAT (Business Processes as Pathways (Workflow/Dataflow))

Business Processes Models
- Specify: HOW (Clinical Pathways Models, Workflow/Data Flow)

Data Models Templates (Entities and Relationships)
- Derive: WHAT (Data Sets & Rules from Clinical Pathways)
Planning Statements for Clinical Pathways


Planning Statement Outline

1. **PATIENT REGISTRATION** *(Business Event)*
   Patient Registration Business Case defines work process (workflow) and data needs (dataflow) for registering a person for an episode of care in a healthcare organization.

   **1.1 WHY-Patient Registration Overview** *(Business Event)*
   Patient Registration is the process of checking-in a person to initiate the episode of care that relies on (1) a standardized approach for patient registration (workflow) across various healthcare facilities and (2) standardized data elements in the patient registration process (data flow).

   **1.2 WHY-Patient Registration Policy** *(Policy)*
   Conduct patient registration across healthcare organization's departments according with the organizational policies and best practices supported by the professional organization(s), e.g.

   **1.3 WHY-Patient Registration Value Statement** *(Value Statement)*
   Proper registration of the patient in the healthcare facility is a basis for reliable patient matching.

   **1.4 WHY-Patient Registration Goal** *(Goal)*
   Improve completeness and correctness of patient information in EHR and ancillary systems/applications involved.

   **1.5 WHY-Patient Registration Success Criteria** *(Critical Success Factor)*
   1. Ensure identity of the person receiving care
   2. Ensure completeness of patient registration data
   3. Ensure correctness of patient registration data
   4. Ensure eligibility for healthcare services
   5. Ensure timely payment for healthcare services

   **1.6 WHO-Patient Registration Billing Staff** *(Business Actor)*
   A person responsible for verification of patient insurance information, b-generation of invoice for a visit, and obtaining payment (AO developed definition, to be verify with LW)

   **1.7 WHO-Patient Registration Payor** *(Business Actor)*
   Insurers, including health plans, self-insured employer plans, and third party administrators, providing healthcare benefits to enrolled members and reimbursing provider organizations.

   **1.8 WHO-Patient Registration Insurance Verifier** *(Business Actor)*
   A person responsible for
Business Process Model & Records


BPM+ Workflow Model &

Patient Registration Record

Discussion

Name: Patient Registration Record
Type: Data Object

Description: Dataset
Attributes:
- patient: Undefined NULL
- name: Undefined NULL
- telecom: Undefined NULL
- gender: Undefined NULL
- birthdate: Undefined NULL
- address: Undefined NULL
- photo: Undefined NULL
- phone: Undefined NULL
- active: Undefined NULL
- maritalStatus: Undefined NULL
- contact: Undefined NULL
- communication: Undefined NULL
- generalPractitioner: Undefined NULL

Notes:

Locations:
- Name: Patient Registration - Walk in
  Type: Diagram
  PatientRegistration (Default Pool) System Boundary
Record Content Model & FHIR Standards


1. Resource Index

FHIR Information of Work Group

This page is part of the FHIR specification (v4.0.4 - Human Resources and ORU). This is the current published version for a full list of available versions, see the Work in Progress page.

2. CODING

This page is provided to help find resources quickly. There is also a more detailed classification, ontology, and description. For a breakdown to the layout on the page, see the Work in Progress page.

- Resource Index
- CODING
- Specimen
- Imaging
- Document Movement
- Person
- Substance
Publishing
Requirement Elicitation

Business Case: CHILD SEX TRAFFICKING

Katherine Ariano, Alison Lieb, Ruben Medalla

Informatics Capstone Project, Duke University School of Nursing (DUSON)

Mentors: Anna Orlova, Lee Wise, Rachel Richesson

Tufts University School of Medicine, Clinch Valley Medical Center
Human Trafficking (HT) cases in both adults and children can be identified by clinicians during patient healthcare encounters [1], such as:

- Emergency Department (ED) Visits
- Inpatient Admission
- Outpatient Visits
- Telehealth Visits

Once a victim is identified, the next steps include:

- Case investigation
- Case management and evaluation including reporting to public health and law authorities as per jurisdictional policies [2]
- Case mitigation through appropriate service coordination

Use Case (IT Solution)

Automatic case detection in Electronic Health Records (EHR) system based on

- specified triggers: visit, age, chief complaint
- patient screening via a survey tool [3]

2. Florida: General Statutes (GS) § 39.201; Hawaii Revised Statutes (HRS) § 350-1, HRS § 577A; North Carolina: GS § 7B-301, GS § 90-21.5, GS § 14-318.6
**Identification of Child Sex Trafficking Victims in ED**

**Business Actors:** Patient, Parent/Guardian/Companion, Registration Clerk, Clinicians, Social Worker/Case Manager, Interpreter Services, Primary Care Provider (PCP)

**Technical Actors:** EHR (NOTE: ADT and Registration Document Repository could be systems that are used in addition to EHR for patient registration and legal health record), PCP EHR

**Pre-Condition:** EHR

**Post-Conditions:** Primary Care Providers EHR

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<td>1&amp;2. Patient, visit, clinician, facility demographics; reason for visit; consents to treat &amp; information sharing</td>
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<tr>
<td>2. Patient is registered by registrar and given armband information is entered in the EHR</td>
<td>3. Chief complaint, weight, vital signs, medical/surgical history, allergies, current medications, acuity level; clinician discretion (of possible CST)</td>
</tr>
<tr>
<td>3. Patient placed in Triage room. Clinician conducts triage, verifies/obtains patient’s information and enters information in EHR. NOTE: in the case of Life-Threatening event, critical care is provided before triage &amp; patient registration</td>
<td>4. Room information, notification to clinician</td>
</tr>
<tr>
<td>4. Patient is moved to treatment room, waiting room, or holding area, per facility protocol. Clinician is notified by EHR of patient location</td>
<td>5.1 Standing order for CST tool; 5.2 Alert to clinician with CST survey order</td>
</tr>
<tr>
<td>5.1 If indication for CST based on clinician discretion in triage, EHR activates standing order for Greenbaum tool administration. 5.2 EHR generates alert to clinician to administer Greenbaum tool</td>
<td>6. Patient, clinician demographics; Greenbaum tool survey data; for failure to screen, eg, refusal</td>
</tr>
<tr>
<td>6. Clinician administer the tool according with organizational policies and enters responses into EHR</td>
<td>7. Patient, clinician demographics; Greenbaum tool survey data. 7.1 Alert for case investigation and notification to social worker/case manager; 7.2 Notification to proceed with routine care</td>
</tr>
<tr>
<td>7. Based on survey results: 7.1 If positive, EHR generates an alert to clinician for case investigation with social worker/case manager involvement. Clinician authorizes case investigation via signatures; 7.2 If negative, proceed with routine care</td>
<td>8. Encounter data, CPOE for labs and procedures, treatment documentation, lab and imaging results, ancillary entity demographics, care plan, medications, referrals, e-signatures</td>
</tr>
<tr>
<td>8. Clinician provides appropriate medical care as indicated based on patient’s chief complaint and enters information into EHR</td>
<td>9. Visit summary, continuity of care document</td>
</tr>
<tr>
<td>9. EHR sends electronically visit summary/care plan to PCP to coordinate care</td>
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### Actors

**Business Actors:** Patient, Parent/Guardian/Companion, Registration Clerk, Clinicians, Social Worker/Case Manager, Interpreter Services, Primary Care Provider (PCP)

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### Data Categories

1. Patient, visit, clinician, facility demographics; reason for visit; consents to treat & information sharing
2. Chief complaint, weight, vital signs, medical/surgical history, allergies, current medications, acuity level; clinician discretion (of possible CST)
3. Patient, clinician demographics; Greenbaum tool survey data; for failure to screen, eg, refusal
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### Flow of Events

1. Patient with parent/guardian/companion presents to Emergency Department.
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8. Clinician provides appropriate medical care as indicated based on patient’s chief complaint and enters information into EHR.
9. EHR sends electronically visit summary/care plan to PCP to coordinate care.
Data Categories & FHIR Resources: Examples

Use Case: Identification of Child Sex Trafficking Victims in ED

**Data Categories**

1&2. Patient, visit, clinician, facility demographics; reason for visit; consent to treat & information sharing

3. Chief complaint, weight, vital signs, medical/surgical history, allergies, current medications, acuity level; clinician discretion (of possible CST)

**FHIR Resources**

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- Encounter: [https://www.hl7.org/fhir/encounter.html](https://www.hl7.org/fhir/encounter.html)
- Episode of care: [https://www.hl7.org/fhir/episodeofcare.html](https://www.hl7.org/fhir/episodeofcare.html)
- Care team: [https://www.hl7.org/fhir/careteam.html#9.7](https://www.hl7.org/fhir/careteam.html#9.7)
- Task: [https://www.hl7.org/fhir/task.html#Task](https://www.hl7.org/fhir/task.html#Task)
- Consent: [https://www.hl7.org/fhir/consent.html](https://www.hl7.org/fhir/consent.html)

- Chief complaint: [https://www.hl7.org/fhir/condition.html](https://www.hl7.org/fhir/condition.html)
- Practitioner: [https://www.hl7.org/fhir/practitioner.html](https://www.hl7.org/fhir/practitioner.html)
- Practitioner role: [https://www.hl7.org/fhir/practitionerrole.html#PractitionerRole](https://www.hl7.org/fhir/practitionerrole.html#PractitionerRole)
- Age, weight, vital signs (Observation): [https://www.hl7.org/fhir/observation.html](https://www.hl7.org/fhir/observation.html)
- Questionnaire response: [https://www.hl7.org/fhir/questionnaireresponse.html#QuestionnaireResponse](https://www.hl7.org/fhir/questionnaireresponse.html#QuestionnaireResponse)
- Substance: [https://www.hl7.org/fhir/substance.html](https://www.hl7.org/fhir/substance.html)
- Allergy intolerance: [https://www.hl7.org/fhir/allergyintolerance.html#AllergyIntolerance](https://www.hl7.org/fhir/allergyintolerance.html#AllergyIntolerance)
- Adverse events: [https://www.hl7.org/fhir/adverseevent.html#AdverseEvent](https://www.hl7.org/fhir/adverseevent.html#AdverseEvent)

[https://www.hl7.org/fhir/resourcelist.html](https://www.hl7.org/fhir/resourcelist.html)
Workflow Models

Animated Diagram

1. ED Tech - Patient checks into ED
2. Triage RN - RN enters patient information in the EHR
3. SW/CM - Notify community & public agencies
4. ED Clinician/RN - Conditions of safety and privacy must be met before survey administration

High Risk CC? (YES)

PT age 10-18 yrs (YES)

Patient triaged and put in room

Business Process (Workflow) Model

1. Patient presents to Emergency Department
2. Patient is registered and given admitting; patient information is entered in ADT & EHR
3. Patient placed in Triage Room; clinical conducts legal, obtains patient's consent and exits into EHR
4. Patient moves to treatment room, testing, room, or holding area; clinical notification via RN of patient's location

Additional workflow steps and decision points are shown in the diagram, including
- ED Triage
- ED Admit
- ED Process
- ED Discharge
- ED Follow-up
Planning Statements for Clinical Pathways
Modeling Clinical Pathways in BPM+

- Patient presents to Emergency Department
- Patient is registered and given an ID card. Patient data is entered in ADT & EHR
- Patient placed in Triage Room, clinical conducts triage, obtains patient's data and enters into EHR
- Patient moved to treatment room, waiting room, or holding area. Clinician notified by EHR of patient's location.
Patient Registration Record Content in CST Use Case
Connect to Situational Data directly from business process.
Requirement Elicitation

*Business Case: INPATIENT FALLS PREVENTION*

Ann Nguyen, Henrik Berdel, Andrew Bernard, Kenneth Powel

*University of Kentucky Healthcare*
Inpatient Falls Prevention is the standard process of prevention trauma patient from falls

(1) a standardized approach for residents to educate patients and patient family on their fall prevention during an encounter (workflow) across Trauma surgery facilities and

(2) a set of standardized data elements on prediction of patient who is at risk of fall (data flow) and educational materials for the patients and caregivers

Predicted patient falls and education of patient on fall prevention is conducted according with the organizational policies and best practices to ensure

- Completeness of patient medical record data
- Correctness of patient medical record data
- Identity of the patient receiving falls prevention education
- Timely list of patient who are at risk of falls
- Timely education of patient/caregivers on fall risk and prevention

Use Case (IT Solution)
Ensure completeness and correctness of patient’s falls information in EHR and Tableau
## Inpatient Falls Prevention

### Actors

**Business Actors:** Patient, Caregiver, Provider, Nurse  
**Technical Actors:** EHR, Tableau

### Flow of Events

1. Provider sees patient in Trauma.  
2. Provider examines patient, enters data to EHR and orders Fall Assessment  
3. Nurse uses the Baptist Health High-Risk Falls Assessment form to assess patient’s fall risk and enters data to EHR  
4. Tableau performs daily query of EHR based on condition criteria (fall risk score, age, issue type) & sends daily Fall Risk email alert to attending Providers  
5. Providers receive daily Fall Risk email alert; educates patient/caregiver about fall risks and prevention; education is documented in EHR

### Data Categories

1. Patient, clinician, facility, visit demographics, chief complaint, consents, triage  
2. Diagnosis types: Septic, Narcan (over-narcotized), intoxicated, Fall risk assessment score (Fall Score issue type), Traumatic brain injury, Delirium, Orthostatic hypotension, anemia/hypovolemia, long bone fractures (femur), GAIT  
3. Total Fall Risk Scores: Fallen in the past 6 mos (5 points); Age: < 60 (0 pts), 60 – 69 (1pt), >70 (2pt); Mental Status: confuse (1pt); Elimination: frequent toileting (2 pts); Urgency (2pts); Mobility: New issue (2 pts); Requires assistance (walker, etc.) (2pts); Meds: Narcotics (1pt), Sedatives (1pt), Diuretics (5pts), Laxatives (1pt), Hypnotics (1pt), Insulin/Oral hypoglycemic (1 pt); Nurses’ observation (Low Risk 0-10 High Risk); High Fall Risk: score >=13  
4. Daily Fall Risk email alert: Visit ID, Patient Name, Age, hospital department, patient bed, Fall Score issue type (see #2)  
5. Daily Fall Risk email alert, education materials, education session record

### Pre-Conditions:  
EHR System

### Post-Conditions:  
Education is documented in EHR

### Preferred Timing:  
Daily
Use Case: Falls

Data Categories

1&2. Patient, visit, clinician, facility demographics; reason for visit; consent to treat & information sharing

3. Clinician assesses fall risk score, Care Plan, Physician, weight, vital signs, medical/surgical history, current medications, acuity level

Fast healthcare....

https://www.hl7.org/fhir/resourcelist.html

FHIR Resources

Patient- https://www.hl7.org/fhir/patient.html
Facility- https://www.hl7.org/fhir/organization.html
Encounter- https://www.hl7.org/fhir/encounter.html
Care team- https://www.hl7.org/fhir/careteam.html#9.7
Task- https://www.hl7.org/fhir/task.html#Task
Consent- https://www.hl7.org/fhir/consent.html

Care Plan- https://www.hl7.org/fhir/careplan.html
Medication- https://www.hl7.org/fhir/medication.html
Practitioner- https://www.hl7.org/fhir/practitioner.html
Practitioner role- https://www.hl7.org/fhir/practitionerrole.html#PractitionerRole
Age, weight, vital signs (Observation)- https://www.hl7.org/fhir/observation.html
Adverse events- https://www.hl7.org/fhir/adverseevent.html#AdverseEvent
BPM Model: **INPATIENT FALLS PREVENTION**

Under Development
Requirement Elicitation

Business Case: REVENUE INTEGRITY

Lee Wise, Anna Orlova, Nicole Miller

Clinch Valley Medical Center, Tufts University School of Medicine,
Revenue Integrity is the process of preventing recurring issues that cause compliance risks, and/or revenue loss utilizing

1. a standardized approach for effective processes
2. a set of standardized data elements for internal controls across the continuum of patient care.

Revenue Integrity is conducted according with the organizational policies and best practices to ensure

- Proper encounter documentation
- Encounters are scrubbed for information integrity
- Problem encounters are sent to be analyzed
- Denials are managed appropriately

Use Case (IT Solution)
Ensures proper and valid billing/payment for all procedures within the facility

<table>
<thead>
<tr>
<th>Name</th>
<th>Revenue Integrity, Acute Care, Inpatient</th>
</tr>
</thead>
</table>
| Actors | **Business Actors:** Revenue Integrity Analysts, Business Office, Coders, CDI, HIM, Clinicians, Payors  
**Technical Actors:** EHR; Legal Health Record (LHR); Registration Document Repository (*OnBase*)  
Coding system (3M); Data Scrubbers (*eRequest, OPERA, T-System*); Payor IS; Business Office IS (Host) |
| Flow of Events | 1. Clinician has encounter with patient in acute care setting.  
2. Clinician documents visit information in the EHR.  
3. CDI reviews the record, queries clinicians for missing information, update the EHR  
4. EHR transfers information from Step 2 and 3 to Legal Health Record (LHR)  
5. HIM scans paper documents and adds them to LHR  
6. Coders review and code the encounter in EHR, queries clinicians to verify coding, finalize account, indicate to Business Office that account is ready for bill to be sent for payment, update the EHR and LHR (further details)  
7. Scrubber systems automatically verify information integrity overnight  
8. If correct, bill is sent for payment from EHR to Payor system  
9. If incorrect, Scrubber systems generate problem reports for Revenue Integrity Analyst to address  
10. Revenue Integrity Analyst address the problems in the reports (needs to be specified in further details), indicate to Business Office that bill is ready for payment or anticipated denial; bill is sent to the Payor system  
11. Payment received from the Payor. Business office apply payment, adjust the balance for insurance contract in HER and Business IS  
12. Payor send the denial letter. Repeat steps 10-11 3 time by appealing the denial. Business office writes the balance off in EHR and Business IS |
| Pre-Conditions: | EHR System  
Post-Conditions: | EHR and Business IS  
Preferred Timing: | Daily updates |
| Data Categories | 1. Patient, clinician, facility, visit demographics  
2,3,4. History & physical, discharge summary, progress notes, orders, operative reports, nursing notes, lab reports, imaging reports, consultations, medications, case mgmt; CDI queries for missing information  
5. Paper documents  
6. Code (ICD, Snomed, Loinc, CPT, etc.); Coder queries to verify coding; notification to business office of final bill readiness  
7, 8, 9. Data Scrubbers Reports: 1-Charges Entered by Clinicians; 2-Missing Information and Internal Denial Report; 3-Observation Status Patient; Bill; Problem Reports  
10. Notification to business office of final bill readiness, or Anticipated denial  
11. Payment receipt  
12. Denial letter, appeal letter, data from steps 10-11 or balance write-off |
Outline

2. Standards for Clinical Pathways
   a. Process Modeling with BPM+ standards
   b. Data Modeling with Fast Health Interoperability Resources (FHIR) standards
3. Standardized CDI Demonstrations:
   a. Pilot Projects: Patient Registration & Child Sex Trafficking
   b. Future Projects: Inpatient Falls Prevention & Revenue Integrity
4. Collaboration with BPM+ Health: Next Steps
Next Steps

**Pilot Projects**
- Patient Registration
- Case Identification: Child Sex Trafficking Victims

**Future Projects**
- Falls Prevention – *under public review*
- Revenue Integrity – *under public review*
- Immunization – *under development*
- Diabetes – *under development*
- Dentistry – *under development*
Next Steps

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Abbreviations

AAP: American Academy of Pediatrics
ADA: American Dental Association
AHA: American Hospital Association
AMA: American Medical Association
ANA: American Nurses Association
ADT: Admission, Discharge, Transfer
CDI: Clinical Documentation Integrity
CPOE: Computerized Physician Order Entry

CST: Child Sex Trafficking
HIT: Health Information Technology
HIM: Health Information Management
ICD: International Classification of Diseases
MD: Medical Doctor
RN: Registered Nurse
PCP: Primary Care Provider
References

- Integrating the Healthcare Enterprise (IHE). [www.ihe.net](http://www.ihe.net)
- Florida: General Statutes (GS) § 39.201; Hawaii Revised Statutes (HRS) § 350-1, HRS § 577A; North Carolina: GS § 7B-301, GS § 90-21.5, GS § 14-318.6
- Visible Systems Corporation. [www.visiblesystemscorp.com](http://www.visiblesystemscorp.com)
- Trisotech. [https://www.trisotech.com/](https://www.trisotech.com/)
Participate in BPM+ APE Group

Join APE (and other BPM+ groups):
https://www.bpm-plus.org/working-groups/sign-up-form.htm

APE Website:
https://www.bpm-plus.org/working-groups/academic-professional-education.htm