

Use Case Title: Safely Caring For Those In Need

Short Description:

Follow a nurse practitioner’s journeys through Chronic Kidney Disease (CKD) and occupational hazards to see the orchestration of population health and individual patient care unfold through care coordination and analytics applications using BPM+Health automation, executable knowledge artifacts and an HL7 FHIR® interoperability platform. The patient journey will be showcased through automated reporting to public health using Electronic Case Reporting (eCR) and implementation of clinical practice guidelines using emerging BPM+Health, knowledge engineering and HL7 FHIR® standards.

Brenda is a 52-year-old adult nurse practitioner with Type II diabetes who works in a free clinic. A patient at the clinic is found to have active tuberculosis (TB), so Brenda and the other clinic employees who have potentially been exposed are screened at an occupational health clinic. Brenda tests positive. Since TB is a condition that is required to be reported to public health by the healthcare provider, the diagnosis triggers an electronic case report to be created using information in the EHR. The report is sent to an intermediary platform for routing to the appropriate public health agency. The public health agency investigates the conditions at the free clinic and makes some recommendations to improve worker protection. Brenda has no symptoms of TB, but the blood work performed by the occupational health clinic prior to starting therapy to clear the infection reveals that Brenda may also now have chronic kidney disease (CKD). The clinic’s finding automatically triggers an alert, and data exchange with Brenda’s primary care provider, who refers her to a nephrologist for follow up of this comorbidity. The nephrologist diagnoses Brenda with early stage CKD and begins a monitoring program that helps her to better manage her diabetes to slow the CKD progression.

Value Statement: Managing emerging Chronic Kidney Disease and occupational hazards via Automated reporting to public health using Electronic Case Reporting (eCR) and implementation of clinical practice guidelines using BPM+Health, and HL7 FHIR® interoperability results in more safely caring for those in need.

Participating Organizations: CDC, Oracle Health, APHL/CSTE, BPM+, IOI, Konica Minolta, NYC Dept of Health, Red Hat, Smile Digital Health

Part 1: Evaluation of Occupational Exposure and Automated Reporting to Public Health	Vendor	Products	Standards
Providing clinical care and triggering a report for public health. Although symptom-free, Brenda is seen at the New York Occupational Health Clinic (NYOC)	Oracle Cerner	Millennium eCR Now FHIR App	FHIR R4

<p>after possible exposure to tuberculosis (TB) at her job as a nurse practitioner at the Big Apple Free Clinic. At NYOC, Dr. Smith orders appropriate laboratory tests and a Chest X-Ray to assess for TB and records a diagnosis of suspected TB. Documentation of suspected TB in the EHR matches an electronic Surveillance and Distribution (eRSD) trigger code and initiates the creation and transmission of a FHIR® electronic initial case report (eICR). The eCR FHIR® App integrated with Oracle Cerner Millennium is used for this reporting.</p>			HL7 FHIR eCR IG - eRSD and eICR
<p>Determination of reportability. The FHIR® eICR is received at the AIMS platform. The eICR is received, validated, and processed by the Reportable Conditions Knowledge Management System (RCKMS) to determine reportability. The eICR is routed to the New York City public health agency. A FHIR® Reportability Response (RR) is also created and routed back to Dr. Smith at the New York Occupational Clinic.</p>	APHL/CSTE	AIMS RCKMS	HL7 FHIR eCR IG - eICR and RR
<p>PHA receipt and use of eICR and RR. At the NYC DHMH, the eICR and RR are received using FHIR® and processed into the disease surveillance system. NYC DHMH reviews the case report, begins additional case investigation and identifies the case as due to an occupation exposure. The public health agency investigates the conditions at the Big Apple Free Clinic and makes some recommendations to improve worker protection. The free clinic works with the public health agency to establish procedures to promptly identify and isolate a patient with active TB, and provide appropriate respiratory protection for employees.</p>	NYC DHMH	Disease Surveillance System	HL7 FHIR eCR - eICR and RR profiles
<p>Public health feedback to the healthcare provider. The RR is received back into Millenium and made available for Dr. Smith at NYOC to review which includes treatment guidelines for TB from the NYC Department of Health and Mental Hygiene (NYC DHMH). Dr. Smith reviews the lab results that are positive for TB and orders additional blood tests as well as the Chest X-Ray results prior to starting treatment for latent TB infection. Because Brenda is asymptomatic, she can return to work at Big Apple Free Clinic during therapy. However, the additional blood tests showed evidence of abnormal renal function (abnormal serum creatinine) and recommends Brenda follow up with her primary care provider.</p>	Oracle Cerner	Millennium eCR Now FHIR app	HL7 FHIR eCR IG - RR
Part 2: Assessment of CKD Risk	Vendor	Products	Standards
<p>Automatable Clinical Guidelines' workflow and decision modeling</p> <p>Explaining complex concepts and practices in natural language is challenging, and highly dependent on the writing skills and style of the author(s). As a result, narrative clinical</p>	Red Hat	Red Hat Kogito	BPM+Health

<p>guidelines are often ambiguous, leaving readers to different interpretations of the knowledge communicated. The BPM+ family of international open standards can visually capture/depict the activities of care workflows and the logic of clinical decisions using intuitive and unambiguous visual notations. The resulting “shareable clinical pathways” are consumable by both humans and machines. One single visual knowledge artifact acts as the guideline’s specification, documentation, logic, and automation code, making it a true unambiguous shareable knowledge artifact.</p>			
<p>Primary Care notification of abnormal renal function and automated data exchange. Due to a secure health data fabric and exchange between FHIR systems, Oracle Cerner and Smile Digital Health, the laboratory data is made available to Brenda’s primary care provider, Dr. John Oats. Dr. Oats receives an automated notification of the new FHIR Observation within his EHR, and the system begins following a BPM+Health CKD Risk Assessment Clinical Care Pathway. A referral has already been generated for Dr. Oats to approve based on Brenda’s past medical history and her newly found decreased kidney function. Dr. Oats approves the newly generated Referral, and it is faxed to the Nephrologist, Dr. Nancy Wheeler, along with the abnormal lab results, and other supporting documents. Dr. Oats calls Brenda Sanders to speak with her about the referral and why the additional tests are necessary.</p>	<p>Smile Digital Health, Konica Minolta, Red Hat</p>	<p>Smile Health Data Fabric, Konica Minolta Connected Care, Red Hat OpenShift, Fuse, and Kogito</p>	<p>HL7 FHIR Observation, Encounter, and Patient resources, CDS Hooks</p>
<p>HL7 FHIR® interoperability platform - In order to securely exchange validated data between multiple systems, a data fabric must be used alongside a BMP+Health tool to drive data between healthcare systems. Healthcare systems have emerged from a siloed world where patient data is fragmented, but the data and communication standards are not compatible. The Smile Health Data Fabric (HDF) solution provides enterprise level FHIR® data interoperability and data exchange capabilities, backed by the set of core capabilities that enable these systems to talk to a common language, and follow a data standard (FHIR). This enables trusted systems to exchange data between them, enabling care across various provider boundaries.</p>	<p>Smile Digital Health</p>	<p>Smile Health Data Fabric</p>	<p>HL7 FHIR Server and Exchange, CQL, CDS Hooks</p>
<p>Confirm Presence of CKD - Automation of patient pathways in CKD clinical practice guidelines The Nephrologist, Dr. Nancy Wheeler meets with Brenda Sanders, and follows the CKD Risk Assessment clinical care pathway. For this encounter, Dr. Wheeler orders a Urinalysis, and Renal Panel. The urinalysis confirms small amounts of protein in Brenda’s urine. Recommendation is keeping diabetes controlled with a HbA1c</p>	<p>Red Hat, Konica Minolta</p>	<p>Red Hat Kogito, Konica Minolta Connected Care</p>	<p>JSON, HL7 & FHIR, and BPM+Health clinical guidelines</p>

<p>level, 6.5%, or below, and regular blood pressure(BP) monitoring ideally with a BP below 130/80mmHg. Follow-up with primary care in 6 months. Follow-up with nephrology in a year unless symptoms worsen and/or deemed necessary by primary care.</p>			
<p><i>Transforming Unstructured Content into Meaningful & Actionable Patient Data</i></p> <p>Faxes, and the movement of paper to disseminate medical information, is still a reality in our healthcare system. Konica Minolta’s mission is to help clinicians derive insights from disparate sources to help treat patients.</p> <p>Konica Minolta facilitates:</p> <ul style="list-style-type: none"> • The capture of unstructured data received via fax from PCP to specialists • The use of intelligent and/or optical character recognition(ICR/OCR) along with other form and data processing technology to convert the unstructured data into structured discrete data. This data is put into the appropriate format for ingestion into a database or EHR. • The use of FHIR standards to integrate the discrete data into the EHR. <p>This will initiate the sharing of information with public health officials and her provider for her ongoing treatment. Konica Minolta will use its Connected Care platform to achieve this goal. Konica Minolta Connected Care is a HIPAA-compliant, SaaS-based, healthcare workflow automation platform that can securely process unstructured data from diverse input sources (eFax, Fax Server, Shared Network Folder, Scan, Portal, etc.) and convert it into structured ePHI for bi-directional integration into an EHR or other end data repository.</p>	<p>Konica Minolta</p>	<p>Konica Minolta Connected Care</p>	<p>JSON, HL7 & FHIR</p>

Data Exchange Standards:

Vendor	Product	Category	Protocol	Interop Body	Interop Profile	Interop Actor/Role	Interop Message	Send or Receive	Transaction Description
Oracle Cerner	Millennium	Electronic Health Record	HL7		eCR	Receiver	FHIR eRSD	Receive	electronic Reporting and Surveillance Distribution
			HL7	eHealth Exchange; Carequality; CommonWell; DirectTrust	eCR	Reporter	FHIR eICR	Send	electronic Initial Case Report
			HL7	eHealth Exchange; Carequality; CommonWell; DirectTrust	eCR	Receiver	FHIR RR	Receive	Reportability Response from Public Health
Association of Public Health Laboratories (APHL)/ Council of State and Territorial Epidemiologists (CSTE)	APHL Informatics Messaging Services Platform (AIMS)/ Reportable Conditions Knowledge Management System (RCKMS)	Shared Services Platform	HL7		eCR	Sender	FHIR eRSD	Sender	electronic Reporting and Surveillance Distribution
			HL7	eHealth Exchange; Carequality; CommonWell; DirectTrust	eCR	Receiver	FHIR eICR	Receive	electronic Initial Case Report from Healthcare
			HL7	eHealth Exchange; Carequality; CommonWell; DirectTrust	eCR	Sender	FHIR RR	Send	Reportability Response to Healthcare
			HL7		eCR	Sender	FHIR eICR	Send	electronic Initial Case Report to Public Health
			HL7		eCR	Sender	FHIR RR	Send	Reportability Response to Public Health
New York City Department of Health and Mental Hygiene	Surveillance System	Public Health Agency	HL7		eCR	Receiver	FHIR eICR	Receive	electronic Initial Case Report from Healthcare
			HL7		eCR	Receiver	FHIR RR	Receive	Reportability Response from Public Health

Red Hat	Red Hat Fuse	Data Exchange Interface	HL7	Health Layer 7	FHIR v4	Automation and PCP	/Patient	GET	Patient Identity & Demographics
			HL7	Health Layer 7	FHIR v4	Automation and PCP	/Observation	GET	Albumin, Creatinine) - eGFR - Urinalysis
			HL7	Health Layer 7	FHIR v4	Automation and PCP	/Encounter	GET	Patient Visit from Occupational Health Clinic
			HL7	Health Layer 7	FHIR v4	Nephrologist	/DocumentReference	POST	Nephrology Referral & Lab Data (see observations), Past Medical History
Smile Digital Health	Smile Health Fabric and CDR	FHIR Server	HL7	Health Layer 7	FHIR v4	Automation and PCP	/Patient	Receive	Patient Identity & Demographics
			HL7	Health Layer 7	FHIR v4	Automation and PCP	/Observation	Receive	Albumin, Creatinine) - eGFR - Urinalysis
			HL7	Health Layer 7	FHIR v4	Automation and PCP	/Encounter	Receive	Patient Visit from Occupational Health Clinic
			HL7	Health Layer 7	FHIR v4	Nephrologist	/DocumentReference	Receive	Nephrology Referral & Lab Data (see observations), Past Medical History
Konica Minolta	Konica Minolta Connected Care	Fax Transformation	HL7	Health Layer 7	FHIR v4	Nephrologist	/DocumentReference	POST	Nephrology Referral & Lab Data (see observations), Past Medical History
Red Hat	Red Hat Kogito	Process Automation	HL7	Health Layer 7	FHIR v4	Automation and PCP	/Patient	READ	Patient Identity & Demographics
			HL7	Health Layer 7	FHIR v4	Automation and PCP	/Observation	READ	Albumin, Creatinine) - eGFR - Urinalysis
			HL7	Health Layer 7	FHIR v4	Automation and PCP	/Encounter	READ	Patient Visit from Occupational Health Clinic
			HL7	Health Layer 7	FHIR v4	Nephrologist	/DocumentReference	CREATE	Nephrology Referral & Lab Data (see observations), Past Medical History

References

- 1) United States Renal Data System: <https://www.usrds.org/adr.aspx>
- 2) Journal of the Royal Society of Medicine: <https://journals.sagepub.com/doi/full/10.1258/jrsm.2011.110180>

Smile Health Data Fabric: <https://www.smilecdr.com/smilecdr>

Red Hat OpenShift: <https://www.openshift.com/>

Electronic Case Reporting: www.cdc.gov/ecr and <https://ecr.aimsplatform.org>