INTEROPERABILITY SHOWCASE™

HIMSS 23

Use Case Title: Connecting the Whole Person to Public Health Reporting

Short Description: Rosa is a procurement clerk who works in a plastic bottle manufacturing facility. At Rosa's routine clinic visit, her primary care provider refers Rosa for a screening colonoscopy, based on her age and family history. Rosa receives the colonoscopy screening, and subsequently a biopsy. The oncologist receives the pathology results that confirms a diagnosis of colon cancer. A Multidisciplinary Team works through interoperable systems to provide her with an optimal treatment plan and integrated care, building off of her medical history retrieved from her PCP. Oncologist recommends Rosa be isolated to reduce the impact of immunosuppression from her treatment, and recommends workplace accommodation. Her ongoing care assists her with returning to work and treatment details are collected by reporting to the jurisdictional cancer registry, which includes the data in analysis of the link between cancer and work.

Rosa is in a fatal car accident. The use of FHIR® based interoperability between Medical Examiner and Coroner systems, State and National Vital Records and State Cancer Registry contribute to the timely reporting of mortality information. Information from Rosa's case report and the use of interoperable systems contribute to Vital Statistics Registries and Cancer Registries at both State and National levels. Interoperable systems provide more complete, timely, and improved quality data for monitoring the burden of cancer, evaluating cancer prevention & control programs, and identifying needs for additional efforts at national, state, and local levels.

Value Statement: FHIR® standards and advanced technology enable Rosa's team to precisely diagnose, accurately stage, and present an evidence based, personalized treatment plan. Exchanging information with clinical teams, which enables her return to work; and contributes to real-time public health reporting.

Participating Organizations: CDC, Epic, CDC/CAP, CDC /NAPHSIS, Endosoft, Minnesota Dept of Health (MDH), Philips

Scenario	Vendor	Products	Standards
Introduction In this demo, we meet Rosa, a 56 year old procurement clerk in a plastics product manufacturing plant with a family history of colon cancer. During a checkup with her PCP, Rosa reports some concerning symptoms, so her PCP orders a screening colonoscopy which Epic sends automatically to Endosoft. Rosa's colonoscopy does find a cancerous polyp, so the gastroenterologist uses Endosoft to send diagnostic information to Philips ahead of Rosa's tumor board review. Once Rosa's treatment plan is finalized, Endosoft automatically sends the treatment plan to the Minnesota Cancer Registry, and Rosa can see her treatment information and message her care team in a mobile app. In the Minnesota Cancer Registry, users are able to tie together occupation and industry data alongside cancer diagnoses to help researchers monitor known and identify any new linkages between those data sets. During the course of Rosa's treatment, she'	Epic	Epic	

s involved in a fatal car crash. The Medical Examiner reviewing Rosa's cause of death is able to send that information to the Minnesota Vital Records Office and NAPHSIS, who work with Minnesota Cancer Registry to close out Rosa's case. While this is not a patient flow that we typically highlight in the healthcare space, it is important that we handle these situations in a timely and sensitive manner. Through the integrations between health systems, specialists, and state and national registries that we'll show off today, we're able to manage and care for populations across communities, care settings, and life events.			
Stop #1 - Epic (PCP): Let's follow Rosa's story, starting off with a visit with her PCP back in December. Rosa's health concerns include a recent bout of diarrhea and weight loss. Paired with her family history of colon cancer, I'll refer her for a colonoscopy at a local specialist. I'll also order a CBC and a CEA for Rosa to complete before she shows up for her colonoscopy in a few weeks.	Epic	Epic	HL7® V2, FHIR®

Stop #2 - EndoSoft (gastroenterologist/oncologist): ● Endosoft represents a Gastroenterologist, Pathologist, Colorectal Surgeon, and Oncologist in this use case. All physicians are using EndoVault which is our EHR and it is a 2015 Edition ONC Health IT certified application for ambulatory and in-patient. ● EndoVault will have some of Rosa's demographics and visit scheduled, ahead of her visit after receiving the message from Epic via the HL7®Interface. EndoVault will retrieve Rosa's patient history from her PCP records directly from Epic via another HL7®message. Rosa arrives for her colonoscopy and her physician opens the patient chart in EndoVault. The physician asks Rosa about her work and enters that information, and Rosa can digitally review and sign her procedural consent form, HIPAA form, Anesthesia consent forms. After the Pre-op workup is finished, the physician performs the colonoscopy using EndoSoft's artificial intelligence technology, Argus, to assist with polyp detection and sizing during the procedure. Argus is automatically adding a bounding box to identify potential polyps for her physician to review during Rosa's procedure. While using Argus, the gastroenterologist performs a polypectomy on a suspicious polyp in the sigmoid colon. The images and quality metrics are captured automatically and documented within EndoVault. Rosa's physician further finishes their procedure report where all the appropriate measures are collected, and coding is performed automatically. EndoVault comes with a list of typical reports and procedure technique templates that the physician can use to save time while writing reports. ● Once the report is finalized, the application optimally generates the post procedure, pathology requisition, discharge report and the referring physicians report automatically bringing in pertinent information from all sections of the application to reduce the amount of work and clicks for the physicians. Once the procedure is electronically signed off, the colonoscopy report, pathology requisition, and any other messages are automatically transmitted using HL7®or FHIR® engines. ● Once the pathology lab receives the requisition and sample from the gastroenterologist, the pathologist will test the sample. Unfortunately, Rosa's sample is confirmed to be cancer and the pathologist documents that in the report and that result is electronically sent back to Rosa's gastroenterologist for future follow up. ● Rosa's gastroenterologist receives a notification within EndoVault that a pathology report needs to be reviewed. Upon review, the gastroenterologist refers Rosa for a CT scan for what is believed to be a mass identified on the sigmoid colon. The CT confirms the mass is present while her liver, spleen and kidneys all appear to be normal. One slightly enlarged lymph node is also found, otherwise no evidence of lymphadenopathy. EndoVault sends the colonoscopy images and report, pathology report, and images from the CT scan to Philips via a FHIR® Bundle.	EndoSoft	EndoVault Argus	HL7®V2 FHIR®

STOP#3 - Philips Healthcare **Philips IntelliSpace Precision Medicine - MDTO:** Philips Multidisciplinary Team Orchestrator brings actionable clinical patient information together from disparate data sources, including the electronic medical records, lab systems, pathology, radiology, and genomic systems across the patient care journey to facilitate collaborative diagnostic, treatment and follow-up decisions by Multidisciplinary Tumor Boards. This cloud-based solution enables a comprehensive view of the patient by offering the power to visualize & analyze relevant data, review diagnostics and staging information, document decisions, and communicate across specialties**.** **MDTO Review-1:** Continuing with the journey of Rosa(patient) from the state where she is diagnosed with Colorectal Cancer, the Oncologist refers her case to a Multi-Disciplinary Tumor (MDT) board to review and recommend a suitable Treatment plan. HL7 FHIR based interoperability ensures that clinically relevant records are fetched from Epic & Endosoft as a part of the MDT preparation phase. MDT Team: Oncologist Surgeon, Medical Oncologist, GI Pathologist, GI Radiologist Analysis: During the MDT Session, the team reviews the Tumor staging information, Radiology, Pathology & Endoscopy reports along with existing the Medical History, existing comorbidities with other Risk factors and recommends Surgery as the primary treatment. Once the Summary report is generated, patient information and captured recommendation is automatically transmitted back to the Oncologists office (using Endosoft) for the next steps.	Philips	Philips IntelliSpace Precision Medicine - MDTO	HL7 FHIR ®

Stop 4 Endosoft [Colorectal Surgeon] Per the tumor board's recommended treatment plan, Rosa is admitted to the hospital for an exploratory laparotomy and sigmoid colectomy. Rosa has lymphadenectomy with 12 lymph nodes removed. A tumor is present in one out of twelve lymph nodes examined. pT2 pN1a M0 (Stage III) Genetic testing was completed that found an intact presence of DNA mismatch repair protein MSH2 in the tumor. Final Diagnosis: Adenocarcinoma, mucinous type, moderately differentiated with tumor measuring 3.5 x 2.8 x 2.5 cm. Invading the muscularis propria. Lymphovascular invasion not identified. Perineural invasion not identified. Metastasis to 1/12 pericolic lymph nodes Free surgical margins Anastomotic edges: No evidence of malignancy The colorectal surgeon completes the procedure report for Rosa and the SCT/ICD-10 code in Diagnosis (report) from resection triggers referral back to Philips and Tumor Board. EndoVault sends a FHIR® bundle to Philips.	Endosoft		

Scenario	Vendor	Products	Standards
Stop #4A - Philips IntelliSpace Precision Medicine - MDTO: **MDTO Review-2:** A new tumor board review is requested, the resection report is added to the tumor board in addition to the longitudinal representation of the already collected clinical records. The data is visualized in a rich dashboard to support the MDT members to recommend precise follow up treatment. **MDT Team**: Oncology Surgeon, Medical Oncologist, Radiation Oncologist, GI Pathologist, GI Radiologist **Analysis**: The Oncologist's surgeon hosts the MDTO to review the surgery report and determine the follow up treatment plan. Chemotherapy is recommended, a precise treatment plan is developed based on the Tumor Board report, to begin four weeks after surgery. FOLFOX combination chemotherapy regimen recommended.	Philips	Philips IntelliSpace Precision Medicine - MDTO	HL7 FHIR ®

Stop #4B - Endosoft (Oncologist for Cancer Treatment) ● Rosa is starting her cancer treatment plan 4 weeks after her surgery. Her oncologist reviews the cancer treatment plan from Phillips and the Tumor Board. Rosa's oncologist then creates a report with the chemotherapy treatment plan and updates the diagnosis codes, C34.11 (ICD). Rosa is able to schedule her chemotherapy treatments in **EndoVault's patient portal**. This will help her schedule treatments at her convenience and help her workplace accommodations be utilized optimally. In addition, the oncologist provides Rosa with a letter she can give to her employer, requesting a workplace accommodation. Rosa's employer is able to allow Rosa to telework, which keeps her isolated while she is completing her chemotherapy treatments. ● FOLFOX combination chemotherapy regimen recommended: ● FOL – Leucovorin calcium ● F – Fluorouracil ● OX – Oxaliplatin ● Rosa's cancer report with treatment plan is available to be queried for state cancer registry represented by CDC. ● EndoVault uses the FHIR® standard to send this notification and report to the State Cancer Registry. ● Medmorph compliant application, MedPlum creates the HL7®FHIR® Cancer reporting bundle to Minnesota Cancer Registry.	EndoSoft	EndoVault	FHIR®
Stop #5 - Minnesota Cancer Registry (CDC): ● All state cancer registries have state laws requiring various healthcare providers, including doctors, pathology laboratories, and hospitals, to submit cancer reports for every patient diagnosed or treated for cancer that lives in their state. Both the laboratory and physician reports related to Rosa's cancer diagnosis and treatment have been received from the pathologist and oncologist. I am demonstrating the state cancer registry's ability to receive and process these reports using the CDC-developed FHIR® Endpoint and eMaRC Plus integration tool. **eMaRC Plus software is made freely available to all state cancer registries.** ● We received reports from the EndoSoft Laboratory Dept that provides patient information and diagnosis. The pathologist used the **College of American Pathologists (CAP) Integrating the Healthcare Enterprise (IHE) Structured**	CDC	eMaRC PLus	HL7®FHIR® Cancer Pathology Data Sharing IG HL7®IHE SDC/ECC on FHIR® IG MedMorph HL7®FHIR® Central

Data Capture (SDC) electronic Cancer Protocols (eCPs) forms within the LIS. The CAP eCPs have all questions and answers encoded with SNOMED CT concepts and value sets. Upon completion of the case, the **MedMorph Reference Architecture Health Data Exchange App (supported by MedPlum's MedMorph-compliant tool) flags the case as reportable based on the SNOMED CT trigger code. MedPlum compiles the patient and diagnosis information from EndoSoft lab into the appropriate FHIR® resources and transmits the data using the HL7®FHIR® Cancer Pathology Data Sharing IG and HL7®IHE SDC/ECC on FHIR® IG to the MN Cancer Registry.** ● The first report received is the biopsy taken during the colonoscopy that identified an initial diagnosis of **mucinous adenocarcinoma**. This report is used by the registry to create a real-time incidence report and alerts that additional case information will be forthcoming from other sources. The cancer registry later received the more detailed surgical resection and biomarker reports after her surgery. HL7®FHIR® payload that contains the biopsy, resection and biomarker data and parsed data. The surgical resection resulted with a diagnosis of Colon Cancer of the sigmoid colon. The CAP biomarker report is used by the Pathologist to document the MMR test that was performed, which found the tumor has an MSH2 DNA mismatch repair protein. The MMR biomarker test results are used to better direct treatment. ● We also received the patient report from the **Ambulatory Oncologist**, represented by Endosoft, using the same **MedMorph Health Data Exchange App (supported by MedPlum's MedMorph-compliant app).** Similar to how the pathology reports were identified for reportability, the MedMorph-compliant app (MedPlum, which is open source, and samples with sample code are available) was used in real-time to identify the case as a reportable cancer case within the EHR through the MedMorph triggering mechanism and created the FHIR® bundle in accordance with the MedMorph HL7®Central Cancer Registry Reporting IG. MedMorph will automatically send an update at 6 months after the initial report with any new encounter information, then at 12 months from diagnosis. Updated reports will be sent automatically on an annual basis, until either the patient is deceased or there have been no updates made in the patient's EHR. ● The value of receiving the Oncologist report, in addition to the pathology report, is that it provides information about Rosa's treatment and her **occupation as a purchasing administrative assistant in the plastic bottle manufacturing industry. While her occupation and industry may not have an established link to this cancer diagnosis, work can be related to cancer and including occupation and industry data helps researchers to monitor known linkages and identify any new linkages between work and cancer, as well as to direct the development of new preventive programs.** Due to Rosa's biomarker testing and multi-disciplinary review board directing the appropriate treatment for her cancer, her **treatment began with a Sigmoid Colectomy and chemotherapy started 4**			Cancer Registry Reporting IG HL7®IHE SDC/ECC on FHIR® IG HL7®FHIR® Making EHR Data More Available for Research and Public Health (MedMorph) Reference Architecture IG

weeks after surgery (FOLFOX Regimen (FOL – Leucovorin calcium; F – Fluorouracil; OX – Oxaliplatin). The state cancer registry will continue to capture information on this case over time. ● Vital Records will now talk about the processes that are impacted by a patient's death.			
Scenario	**Vendor**	**Products**	**Standards**
Stop #6: High-level Mortality Introduction & Minnesota Medical Examiner/Coroner, MN Vital Records ● The National Vital Statistics System or NVSS Modernization Initiative seeks to improve the timeliness of vital records data available for public health decision making by transitioning to FHIR® based interoperability, modernizing existing workflows and moving from batch to real-time record level processing. The National Center for Health Statistics (NCHS) is working with 57 Jurisdictional Vital Records Offices and their technical partners to transition to FHIR® based interoperability between State electronic death registration systems (EDRS) and the NVSS over the next few years. In addition, NCHS modernization efforts seek to standardize the secure exchange of HL7®FHIR® encoded medicolegal death investigation (MDI) data between the ME/C case management systems (CMS) and EDRS because it impacts the timeliness of data available for public health use. For example, during this demonstration, the MN Vital Records Office will demonstrate the end-to-end FHIR® based interoperability between MN's Southern Medical Examiner's CMS to MN Vital Records Office EDRS to State and Territorial Exchange of Vital Events (STEVE) to NVSS. ● MN's Southern Medical Examiner's CMS to MN Vital Records Office EDRS workflow has been in production using HL7®VRDR FHIR® since April 2022 ● Within this stop you will see the process in which the MN Vital Records system EDRS, verifies the Cause of Death information that was sent from MN's Southern Medical Examiner's CMS and Finalizes the Death Record which is then sent on to the National Association for Public Health Statistics and Information Systems (NAPHSIS) via a FHIR® endpoint hosted on the STEVE system.	CDC/Minnesota	Minnesota EDRS	HL7®FHIR® - Medicolegal Death Investigation (MDI) supporting ME/C to EDRS HL7®FHIR® Vital Records Death Reporting (VRDR) supporting EDRS to NVSS
Stop #7: NAPHSIS ● STEVE, managed by NAPHSIS, plays an important role in facilitating and triaging data from the state EDRS to NCHS, as well as facilitating interjurisdictional exchange between and across Jurisdictional vital records offices. ● The future of interjurisdictional exchange will include: ○ Replicate existing 55-jurisdiction inter-jurisdictional exchange in the future FHIR® world ○ Include existing and new public health data partners such as DRH, NSSP, SSA, and jurisdictional public health programs. ● Going back to the demonstration, STEVE receives the HL7®VRDR FHIR® bundle from MN's EDRS ● Using OAuth2 the jurisdiction accesses the STEVE/FHIR® POST bundle endpoint and sends the FHIR® message	CDC/NAPHSIS	STEVE	HL7®FHIR® - VRDR

● The STEVE/FHIR® API receives this FHIR® messages from the sending jurisdiction, filters this message using STEVE FHIR® filtering services, and sends this message to the NVSS/FHIR® API ● NVSS will then receive the HL7®VRDR FHIR® message via the NVSS API ● Validation of filtering can occur asynchronously between NCHS and sending jurisdiction ● NCHS queues the jurisdiction to acknowledge they have received the HL7®VRDR FHIR® message ● The HL7®VRDR FHIR® message moves along the NVSS mortality flow to NVSS for data quality checks and coding systems. These processes will be shown in Stop 8 - presented by NCHS.			
Stop #8: NCHS ● After receiving the HL7®VRDR FHIR® message from STEVE, this part of the demonstration will walk through the process for parsing, validating and coding within the NVSS database server. The NVSS (at NCHS) receives the death certificate FHIR® bundle and it codes the cause of death literal text and race & ethnicity and sends back to MN Vital Records Office. ● Before moving on to Stop 9, we want to show statistics generated on mortality data. These are the data submitted by vital records offices that support US mortality statistics such as provisional estimates for different causes of death. Provisional estimates, based on complete death records received and processed by the NVSS, allow NCHS to produce timelier estimates such as death rates from COVID-19. Additionally, including occupation and industry has allowed public health researchers to show the relationship between work and COVID-19 mortality. ● Interoperability between state vital record offices and state surveillance system(s) is important in supporting the timeliness and completeness of data for public health use. To this end, in the next segment, MN state cancer registry will review how Rosa's cause of death in the EDRS informs public health surveillance reporting for cancer.	CDC/NCHS	NVSS NCHS Provisional data - Mortality Dashboard	HL7®FHIR® - VRDR
Stop #9: MN Cancer Registry/CDC National Program of Cancer Registries ● State cancer registries often receive data related to the same patient from multiple sources, including autopsy reports and death records from the state Vital Records Office. **While Rosa's death was not cancer related, through a local request the coded cause of death would be sent back to the MN Cancer Registry. The receipt of the death reports allows the cancer registry to document the patient vital status and close the case in their system.** Reports	CDC/Minnesota	Minnesota EDRS CDC Data Visualization Tool	

are exported out of eMaRC Plus and imported into the state's central database, where consolidation is performed to pull together the data from the various sources into a single record for every cancer. This consolidation occurs on a regular basis, and must be completed before the cancer registry sends their data to the CDC. ● Once a year, the cancer registry compiles, consolidates, and processes all data received for each patient and tumor. The data are de-identified and transmitted to the CDC NPCR Program at the National level, where CDC produces the United States Cancer Statistics (USCS) public use databases for researchers, and publishes articles based on national data analyses. The data can be accessed through (https://gis.cdc.gov/Cancer/USCS/DataViz.html) this online interactive tool. You can click on a state to see immediate statistics, such as rates for the top 10 cancers. You will notice that the most recent data is 2019. Implementation of the standards and solutions that have been presented here today will provide more complete and timely data for use.			

Data Exchange standards:

Vendor	Product	Category	Protocol	Interop Body	Interop Profile	Interop Actor	Interop Message	Send or Receive	Transaction Description

References: