Multi-Practice Accountable Care Organization: Solving Data Aggregation and Quality Challenges to Support Medicare Quality Reporting

A recently established Accountable Care Organization (ACO) aimed to participate in CMS' alternative payment model, which shifts the focus from volume to value and outcomes, promoting accountability for a patient population. This model coordinates items and services for beneficiaries of Medicare Fee for Service (FFS) while encouraging investment in high-quality and efficient care. To participate in these programs, ACOs must measure and improve quality annually and publicly report results.

Background

In 2012, the Centers for Medicare & Medicaid Services (CMS) established the Shared Savings Program under the Affordable Care Act (ACA) to incentivize healthcare providers (e.g., doctors and nurses) and hospitals to work together to coordinate care for Medicare patients. This program, also known as the Medicare Shared Savings Program (MSSP), shifted healthcare practices towards value-based and risk-bearing care. Through MSSPs, ACOs are rewarded for improving value by improving care quality and reducing healthcare costs. To measure value, ACOs must submit data on 33 measures specified by CMS. These measures determine Medicare reimbursement rates for participating healthcare practices, making it a high-stakes deliverable. The ACO enlisted the services of a Population Health Management Services Organization (MSO) to gather clinical data from the ACO Participants, calculate the required quality measures and report them pursuant to the requirements under the new CMS alternative payment program.

Problem

The MSO realized how challenging it was to acquire and aggregate data from numerous entities participating in an ACO. The ACO consisted of over forty participants including: providers from primary care, pediatrics, and specialties covering care areas such as inpatient and outpatient settings. Collectively, the ACO members used eight commercial Electronic Health Records (EHR) vendors. The MSO was required to aggregate clinical data from eight different EHRs which operated on different system architectures, data models, and database schemas. This data would then need to be normalized and structured into the required data elements to attest to the 33 required measures to satisfy CMS MSSP measure specifications.

The Population Health MSO requested "representative" samples of condition, encounter, allergy, immunization, medication, and procedure data from each ACO provider/entity in the form of Consolidated Clinical Document Architecture (C-CDA) artifacts. Each entity EHR was functionally able to generate and send patient summaries using the C-CDA clinical document standard as required by CMS' EHR Incentive Program. Unfortunately, each of these entity C-CDA submissions to the MSO utilized different field definitions and were not syntactically similar enough to properly compile and aggregate the required quality measures.

The MSO counteracted this problem by engaging SavantSolutions4HIT to conduct semantic data quality evaluations of C-CDA documents, create an executive level heat map identifying the completeness and quality of the data, and determine if C-CDAs were fit for purpose for MSSP reporting.

Approach

Savant's first task was to determine if the C-CDA documents met the data element requirements of the MSSP measures. Savant began by identifying and cataloguing the clinical concepts and data elements for each measure using the Unified Modeling Language

(UML). Savant used UML class diagrams to delineate and organize the clinical concepts and data elements required by the MSSP measures. See Fig. 1.

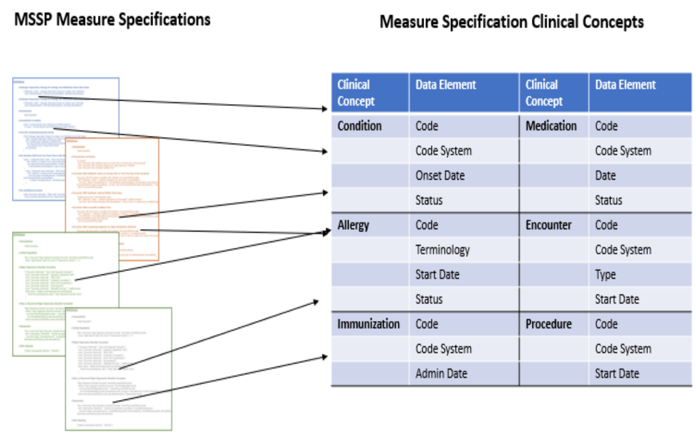

Figure 1. Clinical concepts and data elements identified in MSSP measure specifications.

Next, Savant evaluated the C-CDA documents against each concept and data element included in an MSSP measure. Savant considered whether 1) the concept and/or data element was present (completeness) in the C-CDA, 2) whether the concept was encoded using the correct terminology system, 3) whether data elements were captured as discreet data points or captured in text "blobs", and 4) the location of the coded concepts included in the C-CDA. For example, Immunization data could be found in three different locations of the C-CDA. Many factors influenced whether the data was in the Immunization, Procedure, or Medication “domain” (or a combination of all three). The location of the vaccine information, within the C-CDA, is dependent on various factors including local workflow, person administering the vaccine, the age of the patient, if counseling was provided at the time of administration, the route of administration, the number of vaccine components administered during an encounter, and the type of insurance a patient had.

Findings

Savant’s approach highlighted some challenges. Savant discovered data points could not be accessed from the C-CDA structure using the existing approach. For example, vaccine data are expressed in many different formats within the C-CDA structure. These differences are tied to C-CDA implementation decisions carried out by the local entities. These variances remain despite the persistent evolution and acceleration of health information exchange maturation since passage of the ACA.

Additionally, Savant’s analysis discovered widespread concatenation of data elements making field extraction challenging and accurate measure calculation seemingly impossible due to the variability amongst the different data sources provided to the MSO in the raw C-CDA structured data extracts. Please consider one example of the syntactic and semantic challenges of “conformant” medication data in different C-CDA feeds. These structured and semi-structured formats make it challenging to evaluate whether the data is suitable for purpose, accessible, accurate, and consistent. See Figure 2.

Medication	Directions	Start Date	End Date
Ceftrixone 100 MG/ML Injectable Solution	BID	June 22, 2015	June 30, 2015
Acetaminophen 500 MG Oral Tablet [Tylenol]	For 10 days as needed	June 22, 2015	June 30, 2015

Medication	Directions	Start Date	Status	Indication	Fill Instructions
Ceftriaxone 100MG/ML	BID	2015-06-22	Active	Fever	_none_
Tylenol 500 mg	For 10 days as needed	2015-06-22	Active	Fever	_none_

Medication	Code	Code	Start Date	Stop Date	Route	Directons	Status
Ceftriaxone 100 MG/ML	309090	RxNorm	6/22/2015	42185	INTRAMUSCULAR INJECTABLE	1 Unit Two times daily	Completed
Tylenol 500 mg	209459	RxNorm	6/22/2015	42187	ORAL	For 10 days, starting from 6/22/2015 1 Unit	Inactive

Name	Ceftriaxone (ceftriaxone) RXNORM: 309090, NDC: 66288610001		
Start	6/22/15	Stop	6/30/15
Timing	twice a day 2 d	Route	

Name	Tylenol (acetaminophen) RXNORM: 209459, NDC: 50580044913		
Start	6/22/2015	Stop	7/2/2015
Timing		Route	oral C38288
Duration	10 days	Quantity	
Take 1 tablet by mouth as needed.			

Fig. 2 Four examples of variation in syntax and semantics of C-CDA segments for Medicaiotn data.

Though these data format may be useful in a clinical setting, they are inadequate for quality measurement. Therefore, it was concluded that the data could not be used for quality measurement without significant transformation.

Converting clinical data from EHRs into useful information is a complex process that requires specific expertise to ensure accuracy and efficiency. Savant's clinical informaticians developed a tool that handled the C-CDA documents by breaking the data into smaller pieces using a process called "element field parsing". They used logic to separate the information into individual data elements aligned with the Fast Healthcare Interoperable Resources (FHIR) framework. This framework captures data at the atomic level, maintains semantic integrity, and makes it computable. During the time of this development, FHIR was an emerging HL7 standard, and Savant was the first company to use it to guide the parsing of the C-CDA document.

Solution

To ensure the data met the requirements of MSSP measures, specific vocabularies/value sets, fields required by the logic calculation, and format standards defined by FHIR were compared for each data element. The method revealed that the data's feasibility, validity, and reliability in C-CDAs were not "fit for purpose" for CMS measures without significant translation and transformation. Savant produced an executive-level heat map depicting the extraction feasibility and semantic quality of the data produced by each ACO participant. See Fig. 3. The heat map showed significant variation in the fitness of the data by ACO participant and EMR vendor.

Savant then identified specific data architecture, processes, and coding recommendations for conducting quality assurance testing and created a roadmap for how the Population Health MSO could prepare data from CCDAs for reporting MSSP quality measures going forward.

Conclusion/Key Takeaway

This case study highlights the complexity of using clinical data from Electronic Health Records, specifically the variability of data representation in C-CDA documents from diverse organizations with different EHR systems. With the increased move to value-based payment and delivery models and interest in the use of Clinical Decision Support (CDS) and Artificial Intelligence (AI) to decrease physician burden, healthcare providers face increased responsibility for ensuring data from EHRs is mapped accurately, preserves semantic context, is valid and reliable, and is “fit for purpose.” Savant is poised to fill that gap in the industry drawing on decades of experience, giving customers what they need to take the next step into health data interoperability.

SavantSolutions4HIT brings over 20 years of experience working with organizations to improve data architecture, semantic integrity, and usability for healthcare organizations and is available to help your organization succeed today.

Practice	Setting	Vendor	IMMUNIZATIC	PROCEDURE	ENCOUNTER	ALLERGY	PROBLEMS	OBSERVATIC
[illegible]	Spec	GE		79	92	23	100	
[illegible]	PCP	GE		79	79	79		
[illegible]	Urgent Care	GE		80	93	63	100	
[illegible]	spec	GE		71	84	31	100	
[illegible]	UC	GE		50	86	33	100	
[illegible]	Peds	Allscripts-Peds	100	92	73	1	25	
[illegible]	Peds	Allscripts-Peds	100	88	81	0		
[illegible]	Peds	Allscripts-Peds	100	98	74	0		
[illegible]	peds	Allscripts-Peds	100	86	85	0		
[illegible]	peds	Allscripts-Peds	100	91	54	13		
[illegible]	PEds	Allscripts-Peds	100	90	57	0		
[illegible]	Peds	Allscripts-Peds	100	85	54	4		
[illegible]	spec	Allscripts-Peds	100	87	50	0		
[illegible]	Specialty	Allscripts-Peds	100	88	54	0		
[illegible]	PCP	Allscripts	100	75	45	0		
[illegible]	peds	Allscripts-Peds	100	97	15	1	2	
[illegible]	peds	Allscripts-Peds	100	99	15	1	1	
[illegible]	MSO	ReliMed	100	72	0	99		
[illegible]	PCP	Allscripts	87	62	1	0	2	
[illegible]	UC	GE		73	86	60		
[illegible]	UC	GE		43	84	50	100	
[illegible]	Specialties	Allscripts		0	100		100	
[illegible]	PCP	Allscripts	73	36	66	0		
[illegible]	PCP	NextGen	99	36	11	97		
[illegible]	PCP	Allscripts	93	33	12	0	100	
[illegible]	PCP	Allscripts	80	30	48	14	8	
[illegible]	PCP	Allscripts	87	30	22	51	5	
[illegible]	PCP	Allscripts	75	25	24	0	0	
[illegible]	PCP	Allscripts	79	25	21	0	89	
[illegible]	PCP	Allscripts	86	23	20	22	0	
[illegible]	Endo	Allscripts	74	22	23	19	3	
[illegible]	Specialties	Allscripts	58	17	21	17	13	
[illegible]	Specialties	Allscripts	66	27	40	1	8	
[illegible]	spec	Allscripts	62	17	35	1	7	
[illegible]	peds	Allscripts	71	12	13	16	0	
[illegible]	specialty	Allscripts	50	12	17	0		
[illegible]	PCP	Allscripts		0	25	0		
[illegible]	Endo	Allscripts		0	7	0		
[illegible]	PCP	Quest	36	0	0	0		
[illegible]	spec	Quest	35	0	0	0		
[illegible]	hosp	EPIC		0	0	0	100	
[illegible]	PCP	Quest	0	0	0			

Figure 3: The heatmap is a table format that shows how well the CCDA standard was able to pull and transmit them from the Electronic Health Record systems used by different 45 healthcare practices. Rows represent each practice (CCDA) and the columns include: EHRs Vendor, Immunizations, Procedures, Encounters, Allergies, and Problem (conditions). Cells are numbered with 0-100 and are color coded with higher numbers (better data) being darker green to lighter green, middle ranges are yellow, and cells are orange to red for lowest performing CCDAs. While a handful of CCDAs are green (high performing across the board) the map shows considerable variation with several CCDAs mostly low performing across the board. In general Immunizations performed the best.