

———— NCQA & HL7® PRESENT ————



# DIGITAL QUALITY SUMMIT

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# HL7 Standards for Quality Measures

- **Track 2: Data Quality as the Pathway to Next Generation of Person-Driven Outcome Measures**

# Agenda

- Calculating Quality Measures: Numerator / Denominator
- HL7 Standards
  - V2 Messaging (ORU)
  - CDA (CCD / QRDA)
  - FHIR
- Terminologies / Code Systems
- EHR Extract

# Quality Measures

- Denominator
  - Population to include
  - Patients may be excluded: age, sex, condition, etc
- Numerator
- Data must be **coded**
  - Specific fields
  - Code systems
- Extract data elements from HL7 **standard** formats



# HL7 V2 Messaging

# HL7 V2 Basics

- Point-to-point messaging protocol
  - Not intended for storage
- Widely used for 30+ years
- Multiple message types
  - ADT
  - ORU
  - MDM
  - Etc.
- Delimited text format
  - “Vertical bar”
  - Similar to EDI

# ORU^R01 Unsolicited Observation

- Primarily for lab results
- Patient demographics for inclusion / exclusion
  - Birth date (age)
  - Sex
- Coded observations
  - LOINC code for observation type
  - Value
  - Units

# ORU^R01 Unsolicited Observation

- Lacks some data for inclusion / exclusion
  - Payers
  - Diagnosed conditions
  - Medications / vaccinations
  - Procedures
- Link data with other sources



# ORU^R01 Sample

MSH|^~\&|||20190715144322||ORU^R01|MSG1|P|2.5.1

PID|||123^^^MR||Everyman^Adam||19500716|M

OBR||ORDER1||55399-0^Diabetes tracking  
panel^LN||20190715144737-0500

OBX|1|NM|2345-7^Glucose^LN||130|mg/dL|<100|H|||F

OBX|2|NM|4548-4^Hemoglobin A1c^LN||8.2|%|4.0-  
5.6|HH|||F

OBX|3|NM|14957-5^Albumin^LN||5.3|mg/dL|3.4-5.4|||F



# HL7 Clinical Document Architecture (CDA)

# CDA Basics

- Intended to for storage in patient chart
- Header: document metadata, patient, providers, organizations
- Body
  - Sections
  - Coded entries
  - Unstructured narrative text
- Many specialized document types
- XML document format

# Continuity of Care Document (CCD)

- Complete summary data to transfer patient to another provider
- Includes (almost) everything needed for quality measures
  - Patient identity and demographics
  - Provider attribution
  - Encounters
  - Observations (lab results and vital signs)
  - Problems (conditions)
  - Procedures
  - Medications
  - Immunizations (vaccines)
  - Allergies
  - Payers

# CCD Fragment

```
<component>
  <observation classCode="OBS" moodCode="EVN">
    <templateId root="2.16.840.1.113883.10.20.22.4.27" extension="2014-06-09"/>
    <templateId root="2.16.840.1.113883.10.20.22.4.27"/>
    <id root="f4e729e2-a97f-4a7e-8e23-c92f9b6b55cf"/>
    <code code="39156-5" codeSystem="2.16.840.1.113883.6.1" codeSystemName="LOINC" displayName="BMI"/>
    <statusCode code="completed"/>
    <effectiveTime value="20120910"/>
    <value xsi:type="PQ" value="26.1" unit="kg/m2"/>
    <interpretationCode code="H" codeSystem="2.16.840.1.113883.5.83"/>
  </observation>
</component>
```

# QRDA

- Specialization of CDA R2
- Category I
  - Data for single patient
  - Multiple quality measures
- Category III
  - Aggregate data for multiple patient population
  - Applies to health system
  - Multiple quality measures



# HL7 Fast Healthcare Interoperability Resources (FHIR)



# HL7 FHIR

- Latest standard for healthcare interoperability
- Leverages modern “Web 2.0” technical standards
- Based on **resources**
  - Patient
  - Observation
  - Condition
  - MedicationStatement
  - Etc.



# FHIR API

- Web service API built into standard
- Supported by most EHRs
- Real time query for minimum necessary clinical data
- Avoid generating / transporting / storing entire CCD
- Example: HbA1c Observations for Patient X in 2019

# FHIR Observation Fragment

```
{
  "resourceType": "Observation",
  "id": "f001",
  "status": "final",
  "code": {
    "coding": [
      {
        "system": "http://loinc.org",
        "code": "15074-8",
        "display": "Glucose [Moles/volume] in Blood"
      }
    ]
  },
  "subject": {
    "reference": "Patient/f001",
    "display": "P. van de Heuvel"
  },
  "effectivePeriod": {
    "start": "2013-04-02T09:30:10+01:00"
  },
  "issued": "2013-04-03T15:30:10+01:00",
  "valueQuantity": {
    "value": 6.3,
    "unit": "mmol/l",
    "system": "http://unitsofmeasure.org",
    "code": "mmol/L"
  },
  "interpretation": [
    {
      "coding": [
        {
          "system": "http://terminology.hl7.org/CodeSystem/v3-ObservationInterpretation",
          "code": "H",
          "display": "High"
        }
      ]
    }
  ],
  "referenceRange": [
    {
      "low": {
        "value": 3.1,
        "unit": "mmol/l",
        "system": "http://unitsofmeasure.org",
        "code": "mmol/L"
      },
      "high": {
        "value": 6.2,
        "unit": "mmol/l",
        "system": "http://unitsofmeasure.org",
        "code": "mmol/L"
      }
    }
  ]
}
```

# Terminologies / Code Systems

And here is the code

```
def select_active_objects():  
    objects = []  
    for object in objects:  
        if object.active == 1:  
            objects.append(object)
```

# Terminologies / Code Systems

- Most quality measures require **coded** data
  - Measures written in terms of common code systems
  - Some activity on NLP for unstructured text, still early stages
- Implementation guides constrain code system use
- Code system tags on each data element

# Common HL7 Code Systems

- ICD-10-CM: problems / diagnoses
- CPT / HCPCS: procedures
- LOINC: observations
- RxNorm: medications
- CVX: vaccines
- SNOMED-CT: everything + modifiers

# Identifying Code Systems in HL7

- V2 Messaging: Table 0396
  - LOINC = “LN”
  - CPT = “C4”
- V3 / CDA: ISO Object Identifier (OID)
  - LOINC = 2.16.840.1.113883.6.1
  - CPT = 2.16.840.1.113883.6.12
- FHIR: Uniform Resource Identifier (URI)
  - LOINC = <http://loinc.org/>
  - CPT = <http://www.ama-assn.org/go/cpt>



# EHR Extract

```
def extract_ehr_data():
    """Extract EHR data from the database"""
    # Connect to the database
    conn = psycopg2.connect(
        host="localhost",
        database="ehr_data",
        user="postgres",
        password="password"
    )
    cursor = conn.cursor()

    # Query the database for EHR data
    cursor.execute(
        """
        SELECT *
        FROM ehr_data
        WHERE active = 1
        """
    )
    rows = cursor.fetchall()

    # Process the data
    for row in rows:
        # Do something with the data
        pass
```

# EHR Extract Options

- Vendor proprietary
  - Query API
  - Custom flat file (CSV) batch export
- Standards based
  - Split off copies of HL7 V2 messages
  - CCD / QRDA periodic batch or triggered
  - Query FHIR API

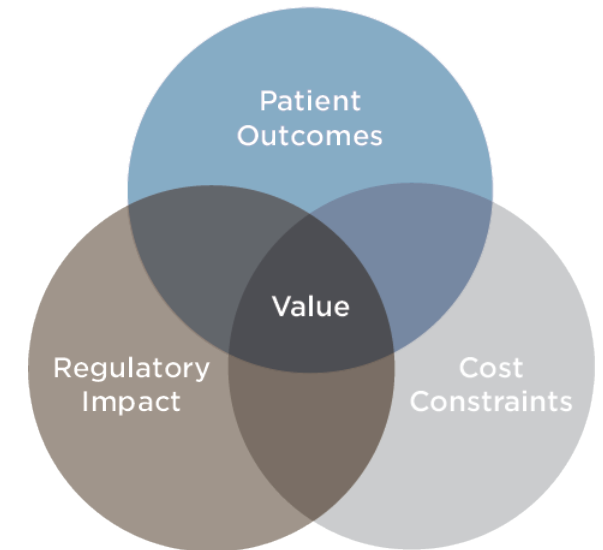


# Why didn't that CCD close a BMI gap?

- Check document structure in HHS C-CDA Scorecard
  - <https://sitenv.org/ccda-smart-scorecard/>
- Missing LOINC code **39156-5**
- Wrong / missing observation units “kg/m2”
- Observation in wrong section
  - Should be entry in **Vital Signs** section
  - Not in Results / Encounters / Procedures sections
- Observation only in narrative text

# HL7 Da Vinci Project

- Industry initiative for value-based care
  - Providers
  - Payers
  - EHR Vendors
- Key quality use cases
  - Data Exchange for Quality Measures (DEQM)
  - eHealth Record Exchange
    - Clinical Data Exchange (CDex)
    - Payer Data Exchange (PDex)
  - Gaps in Care and Information



# HL7 Links

- V2 Messaging: [http://www.hl7.org/implement/standards/product\\_brief.cfm?product\\_id=185](http://www.hl7.org/implement/standards/product_brief.cfm?product_id=185)
- CDA: [http://www.hl7.org/implement/standards/product\\_brief.cfm?product\\_id=7](http://www.hl7.org/implement/standards/product_brief.cfm?product_id=7)
- FHIR: <http://www.hl7.org/fhir/>
- Da Vinci Project: <http://www.hl7.org/about/davinci/>

# Questions?

Nick Radov

Sr. Principal Engineer, TLCP

UnitedHealthcare

[nradow@uhc.com](mailto:nradov@uhc.com)

+1 (612) 632-2612

