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ONC Opportunities in Health IT and Big Data

June 18, 2014
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ONC Opportunities in Health IT and Big Data

Julia Skapik, MD, MPH
Medical Officer
Office of the National Coordinator for Health IT
Federal Health IT Strategic Plan

**2011 – 2012: Data Capture and Sharing**
- Accelerated adoption
- Data capture and exchange

**2013 – 2014: Demonstrate Health System Improvement**
- Widespread adoption and data exchange
- Process improvement

**2015+: Transform Health Care and Population Health through Health IT**
- Demonstrated improvements in care, efficiency, and population health
- Breakthrough examples of delivery and payment reform

**Beyond 2015: Transformed Health Care**
- Enhanced ability to study care delivery and payment systems
- Empowered individuals and increased transparency
- Improved care, efficiency, and population health outcomes

**Strategic Goals**
- Achieve Adoption and Information Exchange through Meaningful Use of Health IT
- Improve Care, Improve Population Health, and Reduce Health Care Costs through the Use of Health IT
- Inspire Confidence and Trust in Health IT
- Empower Individuals with Health IT to Improve their Health and the Health Care System
- Achieve Rapid Learning and Technological Advancement
Goal I: Achieve Adoption and Information Exchange through Meaningful Use of Health IT
Meaningful Use

• EHR Incentive Program contains three stages of increasing technological complexity and function required by HHS in EHRs

• Program started with ARRA funding in an initiative known as HITECH (Health Information Technology for Economic and Clinical Health)

• In 2010, only 25 percent of physician offices and 15 percent of acute care hospitals used EHRs
<table>
<thead>
<tr>
<th>Meaningful Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>• In May 2013, program announced it had surpassed its 2013 goals by achieving more than 80% of hospitals and more than 50% of providers with meaningful EHR use</td>
</tr>
<tr>
<td>• Program has 2 major components: objectives and electronic clinical quality measures (eCQMs)</td>
</tr>
<tr>
<td>• Stage 2 included 29 hospital (EH) and 64 outpatient measures (EP)</td>
</tr>
<tr>
<td>eMeasure Title</td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td>eMeasure Identifier (Measure Authoring Tool)</td>
</tr>
<tr>
<td>eMeasure Version number</td>
</tr>
<tr>
<td>NQF Number</td>
</tr>
<tr>
<td>GUID</td>
</tr>
<tr>
<td>Measurement Period</td>
</tr>
<tr>
<td>Measure Steward</td>
</tr>
<tr>
<td>Measure Developer</td>
</tr>
<tr>
<td>Endorsed By</td>
</tr>
<tr>
<td>Description</td>
</tr>
<tr>
<td>Copyright</td>
</tr>
</tbody>
</table>

Disclaimer: These performance Measures are not clinical guidelines and do not establish a standard of medical care, and have not been tested for all potential applications.

THE MEASURES AND SPECIFICATIONS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND.
<table>
<thead>
<tr>
<th><strong>Initial Performance of eCQMs</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• 100% defect rate</td>
</tr>
<tr>
<td>• Minimal standardization</td>
</tr>
<tr>
<td>• Much paper or claims-based measure content can not be specified—leads to complex logic that ignores clinical workflow</td>
</tr>
<tr>
<td>• Standards underpinning program still in DSTU</td>
</tr>
<tr>
<td>• Standards for eCQMs differ from clinical decision support</td>
</tr>
<tr>
<td>• No applied clinical testing and minimal wild-type data testing</td>
</tr>
</tbody>
</table>

02/01/2013
<table>
<thead>
<tr>
<th></th>
<th>HHS Improvements to eCQM Development</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• LEAN process improvement for federal coordination of technology and policy</td>
</tr>
<tr>
<td></td>
<td>• Agile software development</td>
</tr>
<tr>
<td></td>
<td>• Coordination between agencies</td>
</tr>
<tr>
<td></td>
<td>• Value Set Authority Center</td>
</tr>
<tr>
<td></td>
<td>• Vendor feedback before release</td>
</tr>
<tr>
<td></td>
<td>• Testing throughout the process</td>
</tr>
<tr>
<td></td>
<td>• Ongoing standards improvements</td>
</tr>
</tbody>
</table>
Stroke guidance regarding carotid intervention

The logic for Carotid Interventions seems as though there is potential for encounters to be excluded that are not intended to be excluded. Recommend: Standardize the logic across all measures.

2014 EH Measures: CMS102v1/NQF441, CMS104v1/NQF435, CMS105v1/NQF439, CMS107v1/NQF440, ... (2)
Discharged on Antithrombotic Therapy

**Description:**
Ischemic stroke patients prescribed antithrombotic therapy at hospital discharge

**Initial Patient Population:**
- **AND:** Patient Characteristic Birthdate: birth date >= 18 years starts before start of Occurrence A: Encounter, Performed: Inpatient Encounter
- **AND:** Occurrence A: Encounter, Performed: Inpatient Encounter (Length of Stay <= 120 days)
- **AND:** Occurrence A: Encounter, Performed: Inpatient Encounter (Discharge Date/Time) during "Measurement Period"
- **AND:**
  - **OR:** Diagnosis, Active: Hemorrhagic Stroke (Ordinal: Principal Diagnosis) starts during Occurrence A: Encounter, Performed: Inpatient Encounter
  - **OR:** Diagnosis, Active: Ischemic Stroke (Ordinal: Principal Diagnosis) starts during Occurrence A: Encounter, Performed: Inpatient Encounter

**Denominator: None**

**Numerator:**
- **AND:** Medication, Discharge: Antithrombotic Therapy during Occurrence A: Encounter, Performed: Inpatient Encounter

**Denominator Exceptions:**
- **AND:**
  - **OR:** Medication, Order: Antithrombotic Therapy (Not Done: Medical Reason) starts during Occurrence A: Encounter, Performed: Inpatient Encounter
  - **OR:** Medication, Order: Antithrombotic Therapy (Not Done: Patient Refusal) starts during Occurrence A: Encounter, Performed: Inpatient Encounter

**Denominator Exclusions:**
- **AND:**
  - **OR:** Occurrence A: Encounter, Performed: Inpatient Encounter (Reason: Carotid Intervention)
  - **OR:** Occurrence A: Encounter, Performed: Inpatient Encounter (Discharge Status: Discharge To Another Hospital)
  - **OR:** Occurrence A: Encounter, Performed: Inpatient Encounter (Discharge Status: Left Against Medical Advice)
  - **OR:** Occurrence A: Encounter, Performed: Inpatient Encounter (Discharge Status: Other Discharge Status)
A Quality Improvement Framework

Research
- What is happening?

Guidelines
- What SHOULD happen?

CDS
- Does the patient need this?

Quality Measures
- Did it happen?
Goal V: Achieve Rapid Learning and Technological Advancement
<table>
<thead>
<tr>
<th>Potential Gains From EHR Meaningful Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Data exchange and interoperability →</td>
</tr>
<tr>
<td>improved follow up with less waste</td>
</tr>
<tr>
<td>• Standardization of data capture</td>
</tr>
<tr>
<td>• Improved safety through decision support</td>
</tr>
<tr>
<td>• Real-time evidence-based medical care</td>
</tr>
<tr>
<td>• Improved patient engagement</td>
</tr>
<tr>
<td>• More team-based, remote, and home-based care</td>
</tr>
</tbody>
</table>
Learning Healthcare System: The Promise

• Real time machine learning and algorithm calculation
• Ability to detect small but clinically relevant trends prospectively
• Generate instantaneous population health information and provide early warnings
• Provide personalized medicine for each patient based on big data
How do Standards, Interoperability and Information exchange fit together?

- Personal Health Record
- Electronic Health Record
- Health Information Exchange
- National and International Health Analytics

- Quality Measures
- Standards
- Certification
- Policy
- Privacy and Security
- Measurement, Monitoring, Evaluation

- Public Health
- Clinical Research

- Patient
- Practice
- Population
- Public

- Clinical Decision Support
- Public Health Policy
- Clinical Guidelines

- e.g., TOC, Registries, Labs, Provider Directories, Patient Indexes
## What Data Does the EHR Contain Now?

- **Clinical elements:**
  - Structured fields (vital signs, medications, ROS)
  - Free text notes
  - Laboratory results
  - Images
  - Diagnostic test results

- **Administrative information**
  - Process performance metrics
  - Billing (i.e. ICD codes)
<table>
<thead>
<tr>
<th>What Could We Capture and Integrate with EHR Data?</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Personal health records</td>
</tr>
<tr>
<td>• External sources from the health system (i.e. school records, correctional records, alternative medicine providers)</td>
</tr>
<tr>
<td>• Longitudinal reports of fitness, vital signs, symptoms, and family history</td>
</tr>
<tr>
<td>• Environmental data like air quality</td>
</tr>
</tbody>
</table>
Pediatric Care Coordination: Enabling Data Sharing to Create a Care Team

School Health Clinic

Pediatricians & Behavioral Health

Child and Parent

Teachers and Counselors
Patient-Generated Healthcare Data
Healthcare + Your Body = Really Big Data

HHS Opportunities in Big Data
Examples of health data resources that are available

Listed below are just some of the key health data sets available that could be utilized in applications/services that help care providers, consumers and communities. See pages following for brief summaries of each data set. And check out Health.Data.gov for a much more comprehensive listing of available data resources.

<table>
<thead>
<tr>
<th>Type of Data Set</th>
<th>Providers</th>
<th>Consumers</th>
<th>Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provider Quality COMPARE APIs at data.medicare.gov</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Hospital / Nursing Home / Home Health / Dialysis Compare</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>FQHC (Federally Qualified Health Center) Directory</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>National Plan and Provider Enumeration System (NPPES) Downloadable File</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>National Library of Medicine API Portal</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MedlinePlus Connect</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Clinicaltrials.gov API</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>NIH’s Visible Human Project</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>NLM’s TOXMAP: Online Toxicology Maps</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>VitalStats</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Cancer Incidence – Surveillance, Epidemiology, and End Results (SEER) Registries</td>
<td>✔</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>FDA Recalls (drug, food and product)</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>HealthCare.gov Insurance Plan Directory</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Mental Health Services Directory/Substance Abuse Treatment Center Directory</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>
Examples of health data resources that are available

* Note: text in light blue hyperlinks to the data set as it’s available via Health.Data.gov

MyFood-a-Pedia
• MyFood-a-Pedia provides information on the total calories; calories from solid fats, added sugars, and alcohol (extras); MyPyramid food group and subgroup amounts; and saturated fat content of over 1,000 commonly eaten foods with corresponding commonly used portion amounts.

“Blue Button” Data
• The Blue Button download capability enables veterans, Medicare beneficiaries, and members of the military to download electronic copies of their personal health information (via secure web portals)
• Learn more about Blue Button and examine sample file formats at www.bluebuttondata.org

Dietary Supplements Labels Database: brands, ingredients, and references
• Designed to help both the general public and health care providers find information about ingredients in brand-name products, including name, form, active and inactive ingredients, amount of active ingredient/unit, manufacturer/distributor information, suggested dose, label claims, warnings, percentage of daily value, and further label information.

Hospital, Skilled Nursing Facility, Home Health Agency, Renal Dialysis Facility, Hospice Cost Report Data
• Collections of cost report data from annual reports filed with CMS by hospitals, skilled nursing facilities, home health agencies, renal dialysis facilities, and hospices
Examples of health data resources that are available
* Note: text in light blue hyperlinks to the data set as it's available via HealthData.gov

**Medicare Expenditure Panel Survey (MEPS)**
- The Medical Expenditure Panel Survey (MEPS) is a set of large-scale surveys of families and individuals, their medical providers, and employers across the United States. MEPS is the most complete source of data on the cost and use of health care and health insurance coverage.

**Wide-ranging Online Data for Epidemiologic Research (WONDER)**
- Massive array of public health databases re: births, deaths, disease incidence, health event case reports, demographics, community health

**Your Food Environment Atlas**
- Contains detailed community-level statistics on food environment indicators (e.g., access and proximity to grocery stores, food prices, etc.) – providing a spatial overview of a community’s ability to access healthy food and its success in doing so

**Web-based Injury Statistics Query and Reporting System (WISQARS)**
- WISQARS is an interactive query system that provides data on injury deaths, violent deaths, and nonfatal injuries treated in U.S. emergency departments

**Behavioral Risk Factor Surveillance System (BRFSS)**
- The Behavioral Risk Factor Surveillance System (BRFSS) is the world’s largest, on-going telephone health survey system, tracking health conditions and risk behaviors in the United States yearly since 1984. Currently, data are collected monthly in all 50 states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and Guam.
Examples of health data resources that are available

* Note: text in light blue hyperlinks to the data set as it’s available via HealthData.gov

**Provider Quality Compare APIs**
- New user interface/analytical tool/APIs for health care provider quality Compare data at data.medicare.gov
- Quality and patient satisfaction data available via APIs for thousands of nursing homes, hospitals, home health agencies, and dialysis centers

**FQHC Directory**
- Downloadable directory of all federally qualified health centers (FQHCs) across the U.S., which provide comprehensive primary and preventive care to persons of all ages, regardless of ability to pay
  
  National Plan and Provider Enumeration System (NPPES) Downloadable File
  - Contains FOIA-disclosable health care provider data for providers who have been assigned National Provider Identifiers (NPIs) – e.g., name, business address, phone number, NPI number, provider license number

**Hospital Compare / Nursing Home Compare / Home Health Compare / Dialysis Facility Compare**
- Downloadable databases of quality and patient satisfaction measures for thousands of hospitals and nursing homes

**National Library of Medicine API Portal**
- One-stop access to a growing array of NLM Application Programming Interfaces (APIs) that enable you to access an array of remarkably powerful medical and scientific information resources

**Medline Plus Connect**
- This new service provides patient portals and electronic health record (EHR) systems with customized patient education information in electronic form that maps to the diagnoses, medications, and lab tests about which you are asking. Info is drawn from the National Library of Medicine’s MedlinePlus, an authoritative, up-to-date health information resource for patients, families, and health care providers
Examples of health data resources that are available
* Note: text in light blue hyperlinks to the data set as it's available via HealthData.gov

Medicare Claims “Basic Standalone Files”
- Claim-level public use files (“slimmed” for privacy protection) made available for free public download for all major types of care: inpatient, prescription drug, home health, skilled nursing, outpatient procedures, physician, hospice, durable medical equipment
- Helps users understand patterns of utilization of services and cost in the Medicare population

QuitNowTXT
- A new health text message library developed by the National Cancer Institute (NCI) that contains interactive and evidence-based smoking cessation text messages targeted to adult smokers
- Text messages offer tips, motivation, encouragement and information tailored to the user’s responses
- Also available at http://smokefree.gov/hp.aspx

National Health Expenditures - State (Provider), State (Residence), Age/Gender, Sponsors (Businesses, Households, and Governments), Historical
- The National Health Expenditure Accounts (NHEA) are the official estimates of total health care spending in the United States

Health Indicators Warehouse
- Provides data on over 1,100 metrics of community health, health care system, and determinants-of-health performance (at whatever level of granularity this data is available – national, state, hospital referral region, county)
- Available both via downloadable files and via web service APIs

Assisted Reproductive Technology (ART) Surveillance
- The data collected include patient’s diagnosis, type of ART, clinical information pertaining to the ART procedure, and information on pregnancy outcomes.
• $13 million annual investment in for researchers to virtually access CMS data from their own workstation
• Reduces cost and improves speed of access to CMS data
• Enhances privacy and security of protected beneficiary information by ensuring identifiable data does not leave the VRDC environment
• On-demand data refreshing → faster research completion times
Critical Techniques and Technologies for Advancing Big Data Science & Engineering (BIGDATA)
<table>
<thead>
<tr>
<th>NIH Big Data to Knowledge (BD2K)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Multiyear, multimillion dollar investment to develop new approaches, standards, methods, tools, software, and competencies necessary for biomedical scientists to capitalize on big data</td>
</tr>
<tr>
<td>• Technology and policy approach to widespread data sharing, management, and meaningful re-use</td>
</tr>
<tr>
<td>• Additional focus on training new biomedical data researchers</td>
</tr>
<tr>
<td>• NIH has budgeted $27 million in funding to BD2K in FY2014</td>
</tr>
</tbody>
</table>
Search
Substance Registration System - Unique Ingredient Identifier (UNII)

Search by Name
DIPHENDRYLAMINE

Search Results
Preferred Substance Name: DIPHENDRYLAMINE
UNII: 8GT68Z583M
Formula: C17H21NO
InChIKey: ZZVUWRHKOJYTH-UHFFFAOYSA-N

Resources
- ChemIDplus
- DrugPortal
- NCI Thesaurus

Go back to previous page.
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>• Originally stood up in October 2012 for Meaningful Use value sets</td>
<td></td>
</tr>
<tr>
<td>• Content now expanding to research, HL7, data model, intensional content</td>
<td></td>
</tr>
<tr>
<td>• Now allows authoring and QA</td>
<td></td>
</tr>
<tr>
<td>• Automatically provides updates based on new code system versions</td>
<td></td>
</tr>
<tr>
<td>• Soon to include crowdsourcing—VSAC Share</td>
<td></td>
</tr>
</tbody>
</table>
Value Set Authority Center
http://vsac.nlm.nih.gov/
The Current Frontier:
The Health IT Interoperability Problem
## The Interoperability Problem in Healthcare

### System 1

- **Symptom:** Rash
  - Site: arm
    - Laterality: left
  - Site: leg
    - Laterality: left
- **Color:** red
- **Texture:** bumpy
- **Shape:** oval
- **Severity:** high

### System 2

- **Symptom:** Severe Rash
  - Site(s): Left arm; Left leg
  - Appearance: red bumpy oval

---

Machines, unlike humans, cannot recognize the equivalence between System 1 and System 2— they need the data to have common structure and definitions.
"Old" vs. "New" Data Element: Ethnicity

"Patient Characteristic Ethnicity: Ethnicity"
(QDM Datatype)

using "Ethnicity CDC Value Set"
(2.16.840.1.114222.4.11.837)
(Value Set – values listed below)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>System</th>
<th>Version</th>
<th>OID</th>
</tr>
</thead>
<tbody>
<tr>
<td>2135-2</td>
<td>Hispanic or Latino</td>
<td>CDCREC</td>
<td>1.0</td>
<td>2.16.840.1.113883.6.238</td>
</tr>
<tr>
<td>2186-5</td>
<td>Not Hispanic or Latino</td>
<td>CDCREC</td>
<td>1.0</td>
<td>2.16.840.1.113883.6.238</td>
</tr>
</tbody>
</table>
Data Elements that are unambiguously defined enable access to and sharing of health information across the spectrum of clinical and clinical research domains (“Free-flow” of information between EHRs and research information systems).

Common Data Elements (CDEs) are those DEs that are developed, maintained and used based on commonly agreed upon principles by the user community. CDEs are reusable across a variety of clinical and non-clinical domains.
### Where Is Health IT Moving?

| • Integration of disparate records and data sources |
| • Harmonization of data elements |
| • New, more agile and modular standards |
| • New research methodologies like Large Simple Trials |
| • Aggregate data for population health |
| • Better patient safety and improved workflow |
## JASON Report: Recommendations for Unified Federal Health Data Architecture

### User Interface Apps
- Stovepipe Legacy Systems
- Middleware Apps
- Semantics and Language Translation
- Search and Index Functionality
- "chart/record" data
- "atomic" data w/ metadata

### Identity, Authentication, Authorization
- Patient Privacy Bundle Management
- Key and Certificate Management

### Crypto Layer
- Published API
- Data Storage (logical)
- Data Transport (logical)
- Data Storage (physical)
- Data Transport (physical)
### Where Is Health IT Moving?

- Learning EHR
- Natural Language Processing
- Personalized medicine
- Telehealth and point of care anywhere
- Educational opportunities for providers and patients integrated into care
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Questions and Feedback

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Office of the National Coordinator for Health IT

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