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SNOMED CT, ICD-10-CM and Data Integrity

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Health Information Exchange

- Marked benefits in health care and improvements in patient safety could occur with HIE (Kaelber and Bates, J. Biomed Inform. 2007 Dec;40(6 Suppl):S40-5)
- Marked acceleration of HIT adoption could result in patient safety issues related to:
  - Provider knowledge
  - System design
  - Workflow considerations
  - Stressed resources
  - Other factors
    - "The Dangerous Decade" E.g., Coiera , et. al. J Am Med Inform Assoc 2012;19:2e5

HIT Patient Safety

- Focus primarily on EHRs
  - Patient Safety Organizations
- Institute of Medicine Report – 2011
  - EHRs and HIEs specifically mentioned
- Potential patient safety concerns involving HIEs
  - Data integrity
  - Workflow
    - Change management
    - Information overload
    - Overreliance on HIE as an information resource
  - Data reconciliation challenges
  - Patient privacy vs. provider access to information
  - Patient identification issues (not within the scope of this discussion)

Data Integrity in HIE

Clinical Data Type Primer

- Most clinical information is stored as free text
  - Difficult to use in computer systems
  - Many ways to say the same thing…
- Structured data
  - Stored as information in defined fields
    - E.g., “Last Name” field
- Codified data
  - Concepts are stored as codes
  - Facilitates machine based processing of information
    - Clinical care uses such as decision support
    - Population health
    - Research

Data Integrity

- Clinical decisions depend upon information that is not compromised
  - Need is amplified in emergency care situations

- Data integrity includes:
  - Accuracy
  - Completeness
  - Context
  - Currency

Potential Data Vulnerability Points

- Point of care capture (e.g., EHR, PHR)
- Local storage and use in EHR
- Export from EHR into a secondary repository
- Import process into another EHR system
- Reconciliation process:
  - Temporal issues
  - Provider type issues
  - Patient entered data
  - Interoperability barriers (incomplete data)
- Segmentation issues (e.g., mental health)

Point of Care Data Collection

- Ambulatory EHRs are often built around generating documents that are compliant with requirements related to claims submission
  - E.g., ICD-9-CM, CPT, HCPCS
    - 1995 & 1997 E&M (CPT) coding guidelines
- Multiple types of documentation methods used by EHRs create challenges related to how information is gathered (e.g., Rosenbloom, et. al.J Am Med Inform Assoc 2011;18:181e186. doi:10.1136/jamia.2010.007237)
- Claims data is not designed for clinical information systems
  - Billing
  - Epidemiology

How are ICD codes chosen?

- ICD codes are chosen by clinicians based on:
  - Identical match to disease (when available)
    - E.g., Appendicitis (a matching ICD-9-CM code is available)
  - Best available choice
    - Staphylococcal pericarditis (no ICD-9-CM or ICD-10-CM match)
      - **ICD-10-CM code I30.8 (Other forms of acute pericarditis), or**
      - **ICD-10-CM code I30.9 (Acute pericarditis, unspecified)**

Claims Data Challenges – Clinical Examples in ICD-9-CM and ICD-10-CM

- Chronic pelvic pain in ICD-9-CM
  - No code for pelvic pain in ICD-9-CM
    - Providers use right lower quadrant pain, left lower quadrant pain or a non-specific female reproductive system symptom for reimbursement
- E.g., Chronic pelvic pain in ICD-10-CM
  - R10.2 Pelvic and perineal pain *(what if there is no perineal pain or if the pain is perineal alone?)*
  - R10.30 Lower abdominal pain, unspecified
  - R10.31 Right lower quadrant pain
  - R10.32 Left lower quadrant pain
  - R10.33 Periumbilical pain
- In addition, there is no way of codifying the difference between acute and chronic pelvic pain in ICD-9 or ICD-10 if using claims data

Reason for Choosing an ICD Code (continued)

- Carrier rules
  - Clinicians may feel compelled to choose a particular code due to insurance rules
    - Personal reimbursement
    - Patient reimbursement
    - Justification of a procedure
    - Justification of admission to hospital
- Diagnostic inaccuracies may originate at the point of care if claims data is the terminology resource
  - Downstream effect in HIE can be difficult to manage

ICD Example: Multiple unique concepts used by one code – This can create errors if the code is used incorrectly

G43.1 Migraine with aura

- Basilar migraine
- Classical migraine
- Migraine equivalents
- Migraine preceded or accompanied by transient focal neurological phenomena
- Migraine triggered seizures
- Migraine with acute-onset aura
- Migraine with aura without headache (migraine equivalents)
- Migraine with prolonged aura
- Retinal migraine

Problem: ICD-10-CM Code R40.2

- **R40.2 Unspecified Coma**
  - Coma NOS
  - Unconsciousness NOS
- Clearly coma and being unconscious for an unspecified period of time are different
- Downstream impact of inaccurate data difficult to assess, but it may introduce errors that lead to medical misadventures…

Problem: ICD-10-CM

- **R51 Headache**
  - Includes: facial pain NOS
- Headache and facial pain are in most cases markedly different diagnoses with different causes, diagnostic evaluations and treatments

- Note: These are symptom codes, and we are asked to code at the most specific level of diagnosed disease, however, facial pain is a common presentation for a large number of conditions

ICD-9/10-CM

- Advantages
  - As noted previously, a tremendous amount of codified information is currently stored in systems as “claims data”
  - Very familiar to the health care industry
- Disadvantages
  - Has evolved into a billing terminology
  - Codes are often chosen inaccurately, as a best approximation, or for reimbursement purposes
  - Lack of granularity and complex rules create situations where codes are selected based on proximity to actual diagnosis
  - Not safe for use in clinical information systems “as is” without a complete and thorough understanding of the potential errors that can be introduced

Reference Terminologies

- Designed to accurately represent clinical information through codified concepts
- Example: SNOMED Clinical Terms
  - Large number of concepts (including pelvic pain)
  - Modifiers that represent “acute,” “chronic” and others exist as unique concepts
  - Very few systems have adopted SNOMED CT as their core terminology
  - Required for MU Stage 2 (problem lists)

SNOMED CT®

"Common language that enables a consistent way of indexing, storing, retrieving, and aggregating clinical data across specialties and sites of care."

Developed by U.S. and U.K. in combined effort, now managed by the International Health Terminology Standards Development Organization

- Translated into multiple languages
- http://www.nlm.nih.gov/research/umls/Snomed/snomed_main.html for more information

SNOMED CT®

- >365,000 Concepts
- >1,000,000 terms
- >1,000,000 logically defined relationships
- Meets approved federal standards
- Optional coding terminology (with ICD-9/10-CM) for codification of problem lists in the Continuity of Care Document (CCD) for Meaningful Use

SNOMED CT

- Designed for computer applications
- Concept based
- Meets other criteria essential to a controlled terminology (e.g., “Desiderata”)
- Not in wide use at this time
- May be further mandated for Stage 2 and 3 MU
- Would potentially allow for more accurate and reliable information sharing

SNOMED CT and ICD-10-CM Comparison Based on the "Desiderata"

Methods Inf Med. 1998 Nov;37(4-5):394-403. Review

Desiderata	SNOMED CT	ICD-10-CM
Content coverage	High	Low
Concept orientation	Yes	No
Concept permanence	Yes	Difficult without above
Non-semantic concept identifiers	Yes	No
Polyhierachy	Yes	No
Formal concept definitions	Yes	No
Rejection of "Not Elsewhere Classified" terms	Yes	No
Multiple granularities	High (20 levels)	Low (four levels)
Multiple consistent views	Yes (can be implemented)	No (very limited)
Context representation	Yes	No
Graceful evolution	Strong history mechanism	Basic history mechanism
Recognized redundancy	Yes	No

However…

- Claims data is all that is available at this time in most settings
- It can have value in health information technology settings but only if used wisely
- Systems designers and users need to be aware of the potential fail points of claims data
- SNOMED CT is a better solution, but it also has a number of challenges
- Solution: maintain link to source documentation for all information as appropriate, at least until HIEs are more mature

The Value of Accurate Information

- Clinical Example
  - Patient record states
    - Impetigo
    - Otitis externa
  - ICD-10-CM would use the following code
    - I.01.00 Impetigo, unspecified
    - H62.41 Otitis externa in other diseases classified elsewhere, right ear
- The otitis externa may or may not have been caused by the impetigo
- SNOMED CT would allow for a relationship between the two that would read
  - Otitis externa AND has etiology AND Impetigo
  - “Has etiology” is represented by an attribute relationship code
  - This provides a great deal of precision as to the relationship between these two conditions

ICD-11

- Designed for electronic health records and other computational systems
- Ontology built around SNOMED CT
  - Concept oriented
  - Synonyms
  - Polyhierarchy
- Due out as early as 2015
- Some (e.g., AMA) have suggested exploring the implications of skipping ICD-10-CM and going right to ICD-11
  - Not going to happen…

Local Data Storage in the Electronic Health Record

Challenges with storing data locally:

- Information is used for clinical decision support, population health management, research and other purposes
- Data integrity errors could influence patient care negatively at a local level
- Challenges are not unique to this setting, although access to the source documentation should be a given within the same system

Why we need access to the source documents (clinical example)

- Physicians often communicate via complex clinical expressions:
  - E.g., “doubt multiple sclerosis based on normal MRI and evidence of radiculopathy on nerve conduction and electromyography studies”
- Context difficult to codify, especially in situations where inaccurate models lead to the patient carrying the diagnosis of multiple sclerosis as an disease code inaccurately

Data Sharing Challenges

Semantic Interoperability

- Sharing of codified data between systems that preserves data integrity
  - Complete
    - All components of post-coordinated message, including the proper order of the concepts
      - E.g., *"left occipital arteriovenous malformation – ruptured with secondary intracranial hemorrhage and coma – no hydrocephalus."*
    - Including modifiers
      - Anatomic
      - Severity
      - Negation
      - Uncertainty
      - Others…
  - Accurate
    - Recognize and preserve negation
      - E.g., "no history of diabetes" does not get mistranslated as "diabetes"

HIE Data Management

- Information sent from an EHR, due to lack of implemented standards/requirements will:
  - Be difficult to store with its integrity preserved in a local repository
  - Multiple EHRs require large numbers of point-to-point interfaces at high cost
  - Multiple terminologies (e.g., ICD-9/10, SNOMED CT and others are allowed with CCD and other data transport mechanisms
  - Lack of defined mechanism to preserve key modifiers
    - E.g., “doubt multiple sclerosis” converted into codes
    - Kaiser and VA working on potential solution…

Challenges

- Sharing the data
  - Converting clinical information into codified data, storing and sending it to other applications, and then ensuring that data integrity is preserved creates significant challenges
  - A great deal of research and development is needed
- In order for any of this to occur, standards related to how codes sets and messaging formats are used must be finalized

Key HIE Safety Construct

- Data may not accurately represent the exact meaning, including surrounding context of a clinical expression
- However, it generally is in the “semantic vicinity” of the actual clinical information
- An efficient method of linking this to the source documentation, when available, would help to reduce potential errors that might be caused by the data collection and management process

Data Import into a Secondary EHR

EHR Data Upload

- Over 400 EHR vendors
- All with proprietary mechanisms for storing information
  - Claims data
  - Reference terminology data
  - Modifier mechanisms likely not supported
  - Varying reconciliation tools available
    - E.g., conflicting CCDs
  - Challenges may be faced with how more complex data is stored locally

HIE Patient Safety Considerations

- Inconsistent Policies and Laws
  - States and even regions have varying policies on what data can and cannot be shared
    - E.g., Mental health conditions cannot be shared in some states without written permission but in others this is not required
    - Many communities in the U.S. have patient that cross state and international borders to receive care
    - This could create challenges to completeness of information
      - Does the provider have all the information?

HIE Workflow

- At what point in the encounter should the HIE review be conducted?
- Should it be done by the provider in all cases?
- Where is HIE training provided as part of medical education
- How skilled should providers be in understanding the reliability of information obtained via HIE?
- What tools are available to accelerate this process?
  - E.g., Text data mining and “pointer” services

HIE Safety Considerations

- Information Overload
  - Providers have limited time to take a history, examine patient, and review labs
  - How will they approach the additional information available to them on the HIE?
    - E.g., old x-rays and EKGs
    - Home monitoring data
    - Case management input
  - The information will need to be presented to the provider in a manner that prevent tedious searches of massive amounts of information

Overreliance on HIE

- This has already occurred with e-prescribing tools
  - Lack of alerts was assumed to mean that the medication was safe
  - Alerts were actually turned off by accident at an enterprise level, but clinicians assumed no alert meant no contraindication
- Could a provider not pursue other traditional information sources (e.g., requesting hospital records) if they assume this information would be available to them on an HIE search?
  - Challenges exist with full access to information in communities

Dynamic Between Patient Privacy and Patient Safety

- Ideally sensitive information would be under the control of the patient but shared in a way that did not impact patient care or secondary data use (e.g., research)
  - Patients are more likely to share information if they feel they have control over what will be shared
- However, removal of selected information, called segmentation, has potential patient safety implications
  - Providers may be blocked from seeing clinical information that could be critical in their care
  - Break the glass is available but may not be safe in all situations

Reconciliation

- Multiple CCDs being generated by multiple EHRs on the same patient
- Providers need to harmonize the information to make sure it is up to date
  - If decisions are made on a CCD or other information that is not current, patient safety issues could arise (e.g., patient was started on Coumadin yesterday by cardiologist)
- Potential role for Patient Centered Medical Home provider as “Single definitive source of information”

Conclusions

- Claims data, including ICD-9/10-CM, may create data integrity issues if used in clinical application without proper quality assurance and refinement processes in place
- Complex clinical expressions can be difficult to accurately represent as codified data abstracted from clinical records, regardless of the terminology that is being used
- The adoption of standards is an evolving process, but additional standards need to be implemented in order for greater amounts of data to be shared
- The impact of changes in workflow brought by HIE need to be taken into consideration
- Patient privacy and segmentation may represent additional challenges

Recommendations

- Adopt processes which identify and ameliorate data integrity issues that may impact healthcare
  - Whenever possible, maintain linkages to source documentation
- Educate stakeholders as to the challenges of interoperability and methods to avoid potential errors in data collection, sharing and usage
- Research and test methods of sharing data in a way that preserves the full context and meaning of the information being shared
- Test tools that improve the efficiency of HIE searches, such as text data mining

Questions?

Thank You

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