FOURTH PARADIGM OF QUALITY MEASURES

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Speed any given discipline advances will depend on

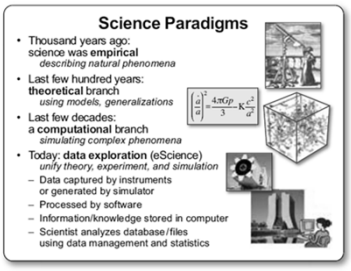
- how well its [members] collaborate with
  - one another,
  - technologists,
- in areas of eScience such as
  - [data capture],
  - Databases,
  - Workflow management,
  - Visualization
  - Computing technologies.

http://www.sciencemag.org/site/special/data/ScienceData-hi.pdf

4th Paradigm of Science

Hey H, Tansley S Tolle K. (Eds.) (2009). *The Fourth Paradigm: Data-Intensive Scientific Discovery.* Microsoft Corporation, Seattle, WA.
Horn SD, Gassaway J. Practice-based evidence study design for comparative effectiveness research. Med Care 2007;45: S50-7.

Science Paradigms



http://research.microsoft.com/en-us/collaboration/fourthparadigm/4th_paradigm_book_jim_gray_transcript.pdf

Ocean Science

Ocean cover 70% of the earth

Complex biome

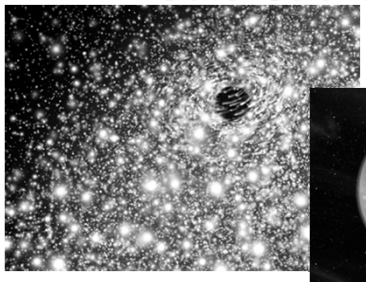
Influences global health

How do we understand it

Multiple types of data input
- Sensors
- Video
- Internet

- Connecting countries' computers
- Longitudinal data

Other Science

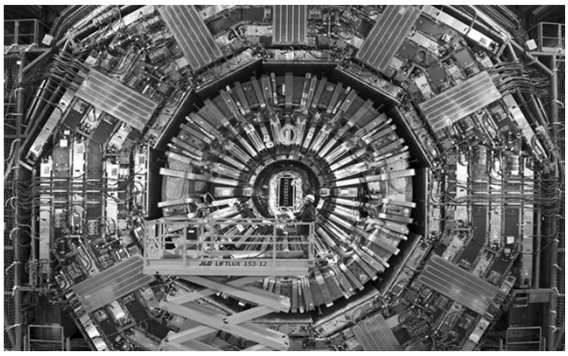


Earth-like planet found, Kepler 22b

300 million light years away from Earth, each black hole has a mass equivalent to 10 billion suns.

http://www.csmonitor.com/Science/2011 http://news.nationalgeographic.com

Discoveries



Enabling Technologies

Computational Thinking

http://www.cs.cmu.edu/~CompThink/

Computational Thinking

Mystery

Heuristics

Algorhithms

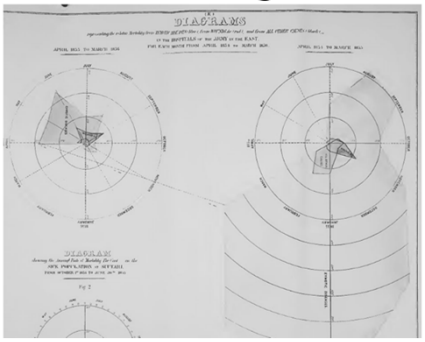
Martin, R. (2009). Design of Business. Publisher: Harvard Business School Press Publish Date: November 2009

Computational Technologies

- Fingers & toes
- Abacus
- Calculators
- Computerized calculations
- Artificial intelligence
  - Siri – iPhone 4
  - Watson
- Parallel processing

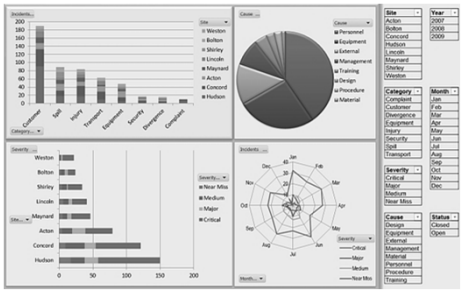
Humanity took a beating from the machines this week. The world's best *Jeopardy* player is no longer from the human race

Understanding Data

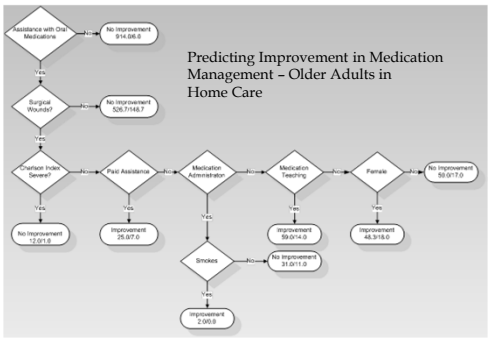


http://www.guardian.co.uk/news/datablog/2010/aug/13/florence-nightingale-graphics#zoomed-picture

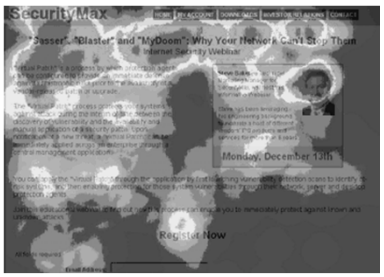
Drill Down



Visualization

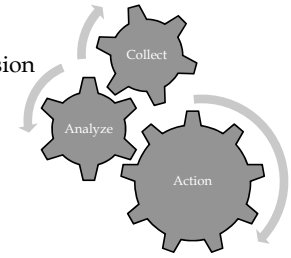


Eye Tracker – Heat Mapping



Quality Measurement & Improvement

- Quality improvement = applied science
- Collect data
- Analyze data
- Draw a conclusion
- Take action



Meaningful Use of EHRs Statutory Framework

- Congress - 3 criteria of requirements for meaningful use:
  - Use certified EHR
  - Exchange of health information to improve the quality and coordination of care
  - Provider submits clinical quality measures and other measures as determined by the secretary
- Quality measures must be from certified EHRs (not other data sources)

Source: Brian Wagner, SENIOR DIRECTOR OF POLICY AND PUBLIC AFFAIRS, eHealth Initiative (eHI) presentation to the MN Exchange and Meaningful Use Workgroup January 15, 2010

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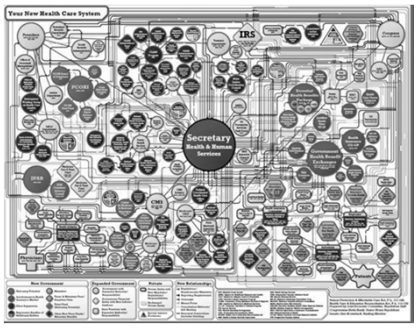
Requirements

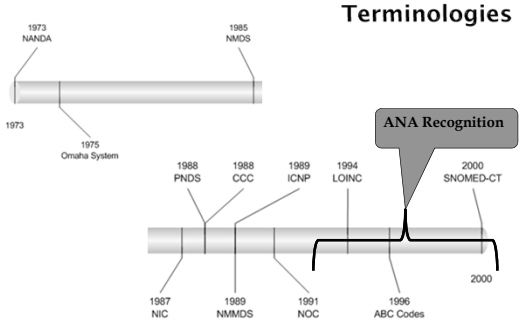
- Data storage
  - IBM is assembling 120 petabyte storage array for research (1024 Terabytes)
- Nationally recognized terminologies
  - "While the coming era of computerized health records promises more accessible and more detailed medical data, the usability of this information will require the adoption of standard forms of encoding so that inferences can be made across datasets." (Hey et al, 2009, p.56)
- Data capture – consistency

Information Flow



http://westanddivided.blogspot.com/2010/08/cre-precise-number-of-new-entities-that.html

Development/ Recognition of Nursing Terminologies



Westra, B.L., Delaney, C.W., Konicek, D., & Keenan, G. (2008). Nursing Standards to Support the Electronic Health Record. Nursing Outlook, 56, 258-266.e1

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NIDSEC℠

- Nursing Information & Data Set Evaluation Center
- To evaluate information systems that support the documentation of nursing practice.

NIDSEC SM Standards

- Nomenclature
- Clinical Content
- Data Repository
- General Systems Characteristics

1995

NIDSEC SM Standards
Nomenclature

- Terminology is appropriate for the domain of nursing
  - ANA recognized nomenclatures
  - Accommodates use of UMLS
  - Local terms are mapped; can add new terms
- Structured terminology is
- Available to document the all phases of the nursing process
- Used in all relevant methods of nursing documentation: standardized care plans, flow sheets, critical paths, etc.

NIDSEC SM Standards
Clinical Content

- Associations exist
  - assessment, diagnoses, expected outcomes, interventions, actual outcomes
- Complete, appropriate, & accurate choices within pathways
- Ability to record all actions for care plan
- progress notes, flow sheets, critical paths, and other forms of nursing documentation.
- Planned care and delivered care stored

NIDSEC[SM] Standards
Data Repository

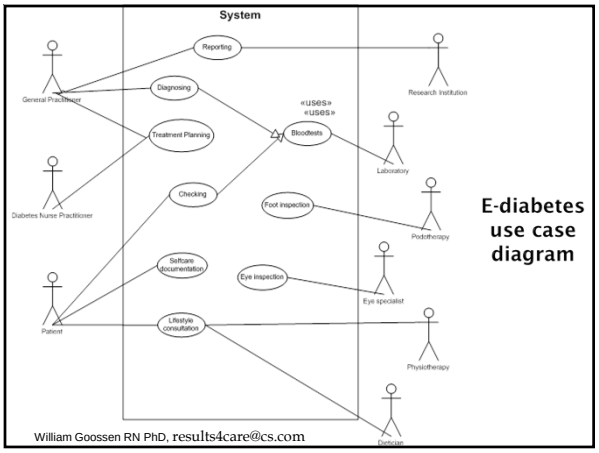
- Patient-specific data stored permanently in standard database format, using recognized coding schemes
- NMDS stored permanently
- Associations reflecting clinical decision making retained in repository
- Data retrieval by standard & ad hoc reports
- Electronic data interchange
- Confidentiality & security of data
- Stored data linked to nurse provider

CDelaney 2004

NIDSEC[SM] Standards
General Systems Characteristics

- Storage requirements
  - verified by formula provided by vendor
- Processing requirements
  - verified by formula for transaction volume

CDelaney 2004



E-diabetes use case diagram

William Goossen RN PhD, results4care@cs.com

Linkage of Data for Minimum Data Sets & Nursing

Nursing Care Elements
1. **Nursing Diagnoses**
2. **Nursing Interventions**
3. **Nursing Outcomes**
4. **Nursing Intensity of Care**

Patient Demographics
5. * Personal Identification
6. * Date of Birth
7. * Sex
8. * Race
9. * Ethnicity
10. * Residence

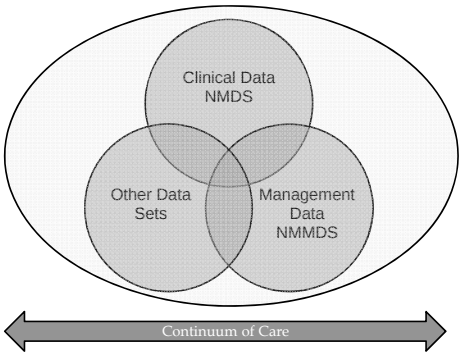
Service
11. * Unique facility or agency number
12. **Unique number of principle RN**
13. * Episode Admission or Encounter Date
14. * Discharge or Termination Date
15. * Disposition of patient or client
16. * Expected payer for this bill

Environment
1. Unit/Service Unique Identifier *
2. Type Of Nursing Delivery Unit/Service
3. Patient/Client Population
4. Volume Of Nursing Delivery Unit/Service
5. Care Delivery Structure And Outcomes
6. Patient/Client Accessibility
7. Clinical Decision Making Complexity
8. Environmental Complexity
9. Autonomy
10. Nursing Delivery Unit/Service Accreditation

Nurse Resources
11. Management Demographic Profile
12. Staff Demographic Profile
13. Staffing
14. Satisfaction

Financial Resources
15. Payer Type *
16. Reimbursement
17. Nursing Delivery Unit/Service Budget
18. Expenses

Data Warehouse



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Summary

- Data-drive science
- Technology exists
- Ability to store, manage, and process data exists
- ANA has been developing information infrastructure to support new science
- Meaningful use – resuse EHR data for quality measurement
- Build on changing trends to increase efficiency and knowledge of what improves quality

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NDNQI PRESSURE ULCER QUALITY MODEL

Judith J. Warren, PhD, RN, BC, FAAN, FACMI

NDNQI®
NATIONAL DATABASE OF NURSING QUALITY INDICATORS

What does IT mean for Nursing?

"If nursing data is organized in a standard way, it can also be shared and compared across regional or national databases to identify trends, report outcomes, and research new opportunities to improve nursing practice."

- TIGER Initiative

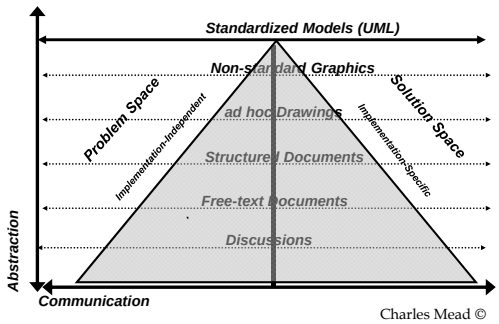
The Tipping Point: ensuring Nursing's Role in Health IT

- Result of some nurses talking about the future of meaningful use at a conference in July 2010
- Tipping Point invitational meeting in August 2010, funded by University of Colorado College of Nursing and Thomson Reuters
- Tipping Point 2 sponsored by ANA
- Engaged in strategic planning
  - Where do we need to be
  - Who do we know who is there
  - Who can we place there

A Meaningful Role for Nursing

- Nursing documentation can be a tool to transform practice and outcomes
- Clinical data needs to be in a discrete format for electronic data exchange
- Need to transition from expensive retrospective chart reviews to quality reporting as a byproduct of nursing practice
- Secondary use of data is a by-product of patient care documentation

The Communication Pyramid



Charles Mead ©

Clinical Domain Modeling

- Looks like a lot of work, BUT…..
- If done well, modeling supports
  - Data mining strategies
  - Semantic interoperability
  - Transformation of practice
  - Creation of Wisdom

A Replicable Process to Create Interoperability

1. **Evaluate the Evidence**
2. **Leverage Clinical Expertise**
3. **Develop Optimum Data Sets**
   a. **Clinical data**
   b. **Quality Metrics**
4. **Harmonize the Data**
5. **Map to Reference Terminologies**
6. **Formalize the Model in UML**
7. **Link to HL7 with a CDA**
8. **Validate the Model**

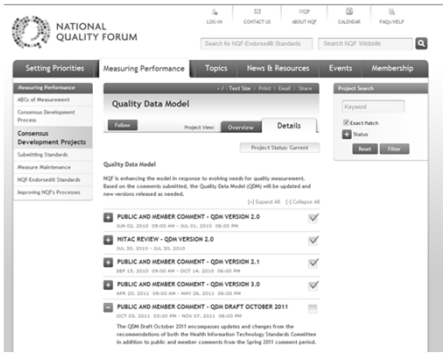
Chow & Beene, 2011

Example with NDNQI Pressure Ulcers

- Use the process developed by Kaiser and VA to model quality indicators
- Compare the results to insure collection of the metric is a by product of care

Step 1: Evaluate the Base of Evidence

- Literature reviews
  - Conducted by NDNQI and their Pressure Ulcer Panel of Experts
- National Quality Forum (NQF)
  - Review requirements of the Data Quality Model
  - Review requirements of the eMeasures specifications
- Strategies for automatically generating these reports from data that is documented during the course of care delivery within the EHR



http://www.qualityforum.org/Projects/h/QDS_Model/Quality_Data_Model.aspx#t=2&s=&p=5%7C

https://www.cms.gov/QualityMeasures/03_ElectronicSpecifications.asp

Step 2: Leverage Clinical Experts

- NDNQI Panel of Experts
  - Chaired by Sandra Bergquist-Beringer
  - Members: Expertise supplied by
    - National Pressure Ulcer Advisory Panel (NPUAP) and Wound, Ostomy and Continence Nurses (WOCN)
    - Nurse Researchers specializing in Wound and Skin Care
- Requirements developed with use of APNs, use cases, terminology specialists, quality measures, and tools
  - Workflow diagrams, MindMaps, and UML
- Use Cases developed (clinical scenarios) for numerous collections of indicator information

Pressure Ulcer Indicator Workflow

Admission to Hospital	Admission to Unit	Care on Unit	Prevalence Study
Pressure Ulcer present • Community acquired Not present	Pressure Ulcer present • Acquired elsewhere in hospital Not present	Ongoing skin and risk assessment Ulcer prevention	Unit based Conducted quarterly Report to NDNQI

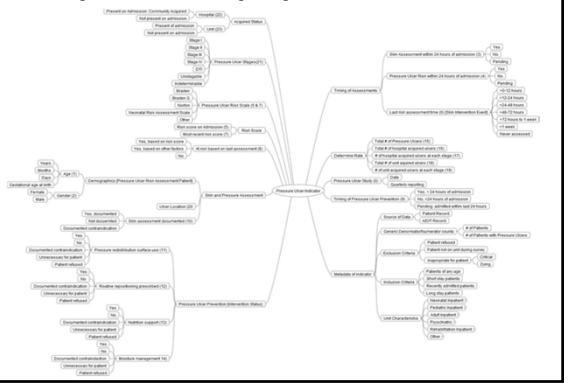
Step 3: Develop optimal data sets
Example for Kaiser/VA

Subject matter experts reviewed spreadsheets and created mind maps to ensure content is comprehensive

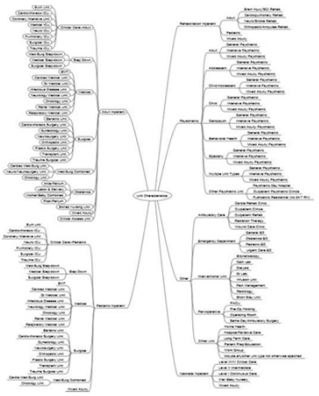
Then:
Determined the optimal data set per use case based on both evidence based practice and context of scenario

Chow & Beene, 2011

Step 3: Develop optimal data sets



Data Set Model, Nursing Unit Charac-teristics



Step 4: Harmonize the data
Example from Kaiser/VA

VA Nursing Intervention: Manage Moisture		KP Nursing Intervention: Incontinence / Moisture Mgt
Maintain clean and dry skin		GAP
Apply condom catheter		Urinary containment device in place
Apply fecal collector (especially if skin breakdown)		Fecal containment device in place
Apply protective barrier ointment		Applied moisture barrier ointment / cream Applied skin barrier film / wipe Applied skin barrier film / wipe
Offer bedpan at scheduled intervals if patient is bed-bound		GAP
Offer urinal at scheduled intervals if patient is bed-bound		Prompted voiding
Schedule toileting		Prompted voiding
Instruct patient/caregiver to request assistance as needed		GAP
GAP		Absorbent underpad in place

Chow & Beene, 2011

Step 4: Harmonize the data

NDNQI Pressure Ulcer Indicator	HL7 Pressure Ulcer Domain Model

- HL7 will ballot the model in early 2012
- If ballot is successful
  - Comparison will be made
  - Harmonization will occur

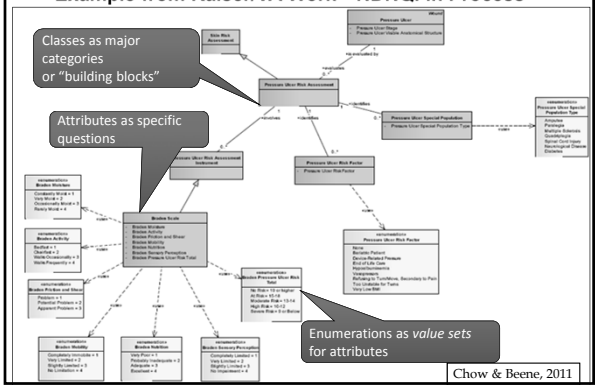
Step 5: Map to Reference Terminologies

NDNQI element	SNOMED CT Concept	Code
Pressure ulcer stage	pressure ulcer stage (observable entity)	420592002
Pressure ulcer stage I	pressure ulcer stage 1 (disorder)	421076008
Pressure ulcer stage II	pressure ulcer stage 2 (disorder)	420324007
Pressure ulcer stage III	pressure ulcer stage 3 (disorder)	421927004
Pressure ulcer stage IV	pressure ulcer stage 4 (disorder)	420597008
Pressure ulcer unstagable	nonstageable pressure ulcer (disorder)	421594008
Pressure ulcer indeterminable	pressure ulcer not visible (disorder)	421434007
Deep tissue injury	soft tissue injury (disorder)	282026002

NDNQI element	SNOMED CT Concepts	Code		Comment
community acquired pressure ulcer				gap
community acquired pressure ulcer present	pressure sore (disorder); community acquired (qualifier value)	399912005; 277057000		requires post-coodination
community acquired pressure ulcer absent	pressure sore (disorder); community acquired (qualifier value)	399912005; 277057001		requires post-coodination
hospital acquired pressure ulcer				gap
hospital acquired pressure ulcer present	hospital acquired pressure ulcer (disorder)	446261004		
hospital acquired pressure ulcer absent	hospital acquired pressure ulcer (disorder)	446261005		
unit acquired pressure ulcer				gap
unit acquired pressure ulcer present				gap
unit acquired pressure ulcer absent				gap

Step 6: Formalize the Model in UML

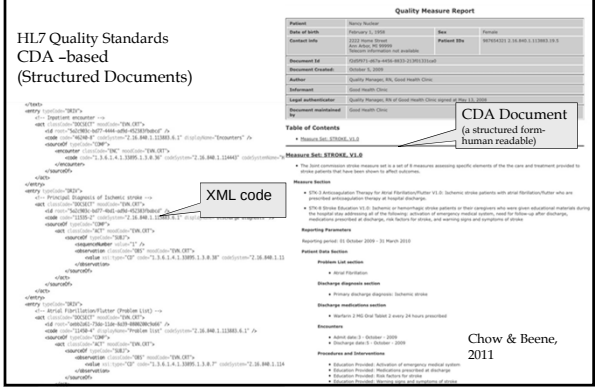
Example from Kaiser/VA Work—NDNQI in Process



Chow & Beene, 2011

Step 7: Link Concept Models to HL7

HL7 Quality Standards
CDA –based
(Structured Documents)



Chow & Beene, 2011

Step 8: Validate the Model

- Utilize professional organization expertise (e.g., NPUAP, WOCN) and NQF to review information model
- Validate use cases against information model
- Compare information model to current EHR systems
- Address reference terminology gaps with standards development organizations (IHTSDO and LOINC)
- Publish information model for public consumption, including terminology mappings
  - National Library of Medicine UMLS
- Publish process to encourage others to participate in nursing information model development

Issues

- Terminology overlaps and gaps—terminology models
  - SNOMED CT does not identify all pressure ulcer sites
    - Will need to submit request for inclusion
    - Will need to submit project proposal to IHTSDO Nursing SIG
      - Will require support from pressure ulcer nurses worldwide
  - There is overlap on what is covered in SNOMED CT and LOINC
    - How do we determine which terminology to use where

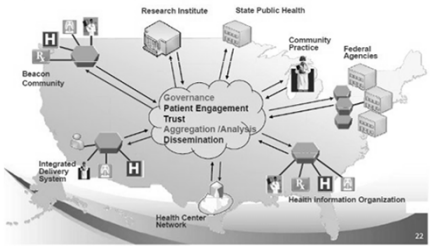
Issues

- Some indicators must result from queries with a time dependency—information model
  - Time of admission
  - Hospital acquired
  - Unit acquired
- Changes in national quality measures strategies and requirements—the moving target

Modeling Facilitates Drill Down

- If data, information, and knowledge is modeled correctly in the EHR, then can query for quality indicator information and create benchmarks for quality improvement
- Model the data so you can use the information from practice to create knowledge and clinical wisdom
- It is Time to create Meaningful models of the impact made by Nurses

Complexity of the EHR: Modeling Manages Complexity and Let's Us Link to the Learning Heath System for the US



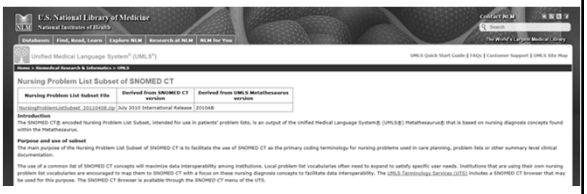
Next Steps

- Steps 6 and 7: Harmonize the information model and terminology bindings with the Skin Assessment and Care domain models
  - Collaborate with
    - NQF/TJC/NDNQI
    - HL7
    - IHTSDO
    - LOINC
- Lobby for inclusion in MU Stage Three Criteria
- Develop Pressure Ulcer Prevention Indicator
- Other NDNQI Indicators?
  - Tipping Point recommends Falls Prevention as next domain

Modeling Exercise

- Download FreeMind
  - Free mind mapping software
  - http://freemind.sourceforge.net/wiki/index.php/Main_Page
- Create a Mind Map of
  - Select one of the following
    - Pressure Ulcer Risk Assessment: Braden Scale
    - Pressure Ulcer Prevention: Handout
    - Skin assessment: Handout
    - Pressure Ulcer Quality Indicator: Handout

Other Linked Initiatives: Nursing Problem List for Meaningful Use



- Developed by a team lead by Susan Matney and Judith Warren
  - Available at www.nlm.nih.gov/research/umls/Snomed/nursing_problemlist_subset.html
  - Article in Journal of Biomedical Informatics forthcoming

"Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever does"

Margaret Mead

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TRUST AND TRUSTWORTHINESS

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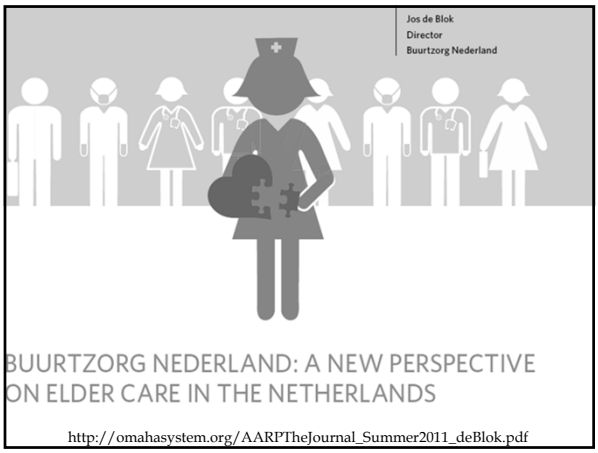
Meaningful Use of EHR

- Data must be extracted from EHR
- Create quality measures
- Nursing not required to demonstrate meaningful use
- Nationally we are asking for nurse-sensitive quality measures that reflect meaningful use of EHRs
- Future – need to trust nurses and create trustworthy data

Trust and Trustworthiness

- Models of trust
  - Point prevalence needs to change
    - Previously - needed valid reliable data
  - Future of nurses
    - Charting should be valid and reliable
    - Practicing at top of license
- Creation of trust and trustworthy data



BUURTZORG NEDERLAND: A NEW PERSPECTIVE ON ELDER CARE IN THE NETHERLANDS

http://omahasystem.org/AARPTheJournal_Summer2011_deBlok.pdf

IOM & RWJF Vision

Ensure that nurses can practice to the fullest extent of their training

Data Collection Methods

- Point prevalence study – pressure ulcers, restraint use
- Method
  - Review of chart
  - Observation of patient
- Strengths and weaknesses of method
- Alternative methods
- Assure validity and reliability of data

Standards Committee - Interoperability

- Technical interoperability
  - Accurate and secure conveyance of data from one point to another.
  - Includes the structure of the data in the data base
- Semantic interoperability
  - Accurately communicating the meaning of the data
  - Communicating information in a form that will be understood in exactly the same way by both sender and receiver
  - Requires using data standards
- Process interoperability
  - Accurate and useful integration of information in a work setting
  - Workflow analysis to gain consistency
  - Human factors – usability of the system for nurses

Minnesota e-Health Standards Committee (2009)

Pressure Ulcer Risk Data

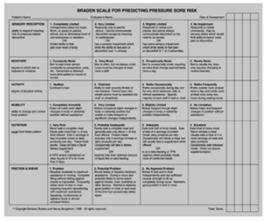
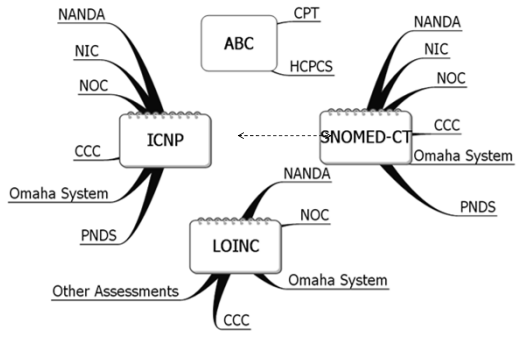


Figure 1. The Braden Scale for Predicting Pressure Sore Risk.

- *BUN*
- *Creatinin*
- *Other Risk Assessment Score*
- *Pressure Ulcer Prevention Protocol*
- *Pressure Ulcer Risk*
- *Primary Reason for Hospitalization*
- *Serum Albumin*
- *Serum Prealbumin*

National Library of Medicine Metathesaurus



EHR Data – Create Algorhithms

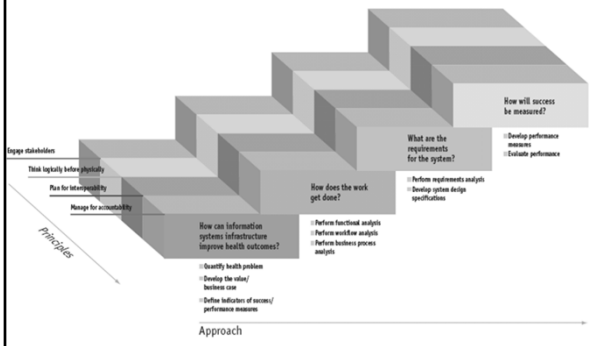
- Hospital Acquired Pressure Ulcers – Pressure Ulcers of Stage II or greater
- Hospitalized 3 days or greater
- 18 and older
- Braden scale completed
- **Excluded Populations:**
  - Patients with skin breakdown due to arterial occlusion, venous insufficiency, diabetes related neuropathy, or incontinence dermatitis.
  - Patients with NO ulcers greater than stage I on the day of the prevalence study.
  - Patients with an ulcer (any stage) present on the patient's first day in the hospital.
  - Patients with ulcers greater than Stage I on the day of the prevalence study where ALL the ulcers were documented to be present on day 2 of the patient's hospitalization.

Validity & Reliability of Data

- What is the instrument used?
  - Home care – OASIS
  - Nursing home – MDS
  - Hospital?
- Valid for use in a specific setting and for a specific population
- Reliably collected

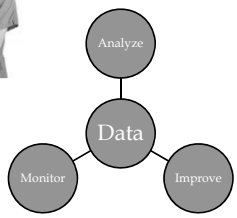
Validity & Reliability

- Is the data logical?
  - Consistency checks
- Does the data reflect the current patient situation
  - Copy forward is problematic
  - Copy/ paste is problematic
- Is there a pattern by nurse, unit, shift, other?
  - Run reports and examine patterns



•Public Health Informatics Institute. (2004). Guiding Principles for Effective Health Information Systems. Decatur, GA: Public Health Informatics Institute. http://www.phii.org/Files/PHII_Brochure.pdf

Nurses are Meaningful EHR Users



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Skin Assessment and Prevention of Pressure Ulcers

Adapted from Institute for Healthcare Improvement, 2011, and Patient Assessment Texts

Assessment

1. Conduct a Skin and Pressure Ulcer Admission Assessment
   - Assess for risk factors contributing to the development of pressure ulcers: age, immobility, incontinence, inadequate nutrition, sensory deficiency, device-related pressure, multiple co-morbidities, circulatory abnormalities, and dehydration.
   - Administer the Braden Scale
   - Improve processes to ensure that risk assessment is conducted within four hours of admission for all patients.
   - Skin color: normal for ethnicity, flushed, cyanotic, dusky, jaundiced, other
   - Variations in skin color: birthmarks, moles, tattoos, other
   - Skin characteristics: abrasion, cracked, clammy, diaphoretic, dry, intact, moist, mottled, smooth
   - Primary and secondary lesions: describe
   - Skin turgor: elastic, non-elastic, tenting < few seconds, tenting > few seconds
   - Skin temperature: warm, cold, cool, hot
   - Nail description: clubbed, pitted, ridged, smooth, thick, brittle, spooning
   - Lesions: cyst, fissure, keloid, macule, nodule, papule, patch, pustule, scar, ulcer, vesicle, wheal, body piercing
     - For each lesion describe: size, pattern, edge, shape, characteristics, drainage color and amount

2. Reassess Risk for All Patients Daily

3. Inspect Skin Daily
   - Special attention should be given to areas at high risk for pressure ulcer development such as the sacrum, back, buttocks, heels, elbows, and areas subjected to device-related pressure.
   - Upon recognition of any change in skin integrity, notify staff so that appropriate interventions can be put in place and place the nursing diagnosis on the patient's problem list

Interventions

4. Manage Moisture: Keep the Patient Dry and Moisturize Skin
   - Skin should be cleansed at time of soiling and at routine intervals
   - The process of cleaning the skin should include gentle use of a mild cleansing agent that minimizes irritation and dryness of the skin
   - Treating dry skin with moisturizers
   - Care should be taken to minimize exposure of the skin to moisture due to incontinence, perspiration, or wound drainage

- When these sources of moisture cannot be controlled, use underpads made of materials that absorb moisture and present a quick-drying surface to the skin
- Use topical agents that act as moisture barriers and moisturize the skin
- Provide supplies at the bedside of each at-risk patient who is incontinent
- Provide underpads that pull the moisture away from the skin, and limit the use of disposable briefs or containment garments if at all possible
- Provide pre-moistened, disposable barrier wipes to help cleanse, moisturize, deodorize, and protect patients from perineal dermatitis due to incontinence.

5. Optimize Nutrition and Hydration
- Assessment of nutritional factors and hydration
- Assist patient with meals, snacks, and hydration. Every effort should be made to allow patient preferences when medically appropriate
- Document the amount of nutritional intake
- Offer toileting, assess for needs of cleanliness, change wet surfaces, and offer water when patient is turned

6. Minimize Pressure
- Turn/reposition patients every two hours.
    - Pillows and blankets may be utilized to assist in pressure redistribution.
    - Use pillows under the calf to elevate the patient's heels off the bed surface.
    - Place cushioning devices between the legs/ankles to maintain alignment and prevent pressure on bony prominences
    - Use lift devices or "drawsheets" to move, rather than drag, individuals who are not able to assist during transfers and position changes.

- Use pressure-redistribution surfaces**.**
    - Specialized support surfaces (such as mattresses, beds, and cushions)
        - Pressure-redistributing surfaces may be classified as powered or non-powered, reactive or active..
    - Utilize positioning, transferring, and turning techniques to minimize friction/shear injury.
    - Use pressure redistribution mattresses/overlays to assist with minimizing pressure.

Pressure Ulcer Quality Indicator

- Age
- Gender
- Skin assessment documented within 24 hours
- Pressure ulcer assessment documented within 24 hours
- Admission risk assessment scale and score
- When was risk assessment last performed
- Is patient at risk?
- Pressure ulcer prevention in use within last 24 hours

- Skin assessment documented
- Pressure redistribution surface used
- Routine repositioning prescribe
- Nutritional support given
- Moisture management prescribed
- Total number of pressure ulcers
- Pressure ulcer location
- Pressure ulcer stage for each pressure ulcer
- Is pressure ulcer present on admission to hospital
- Is pressure ulcer present on admission to nursing unit