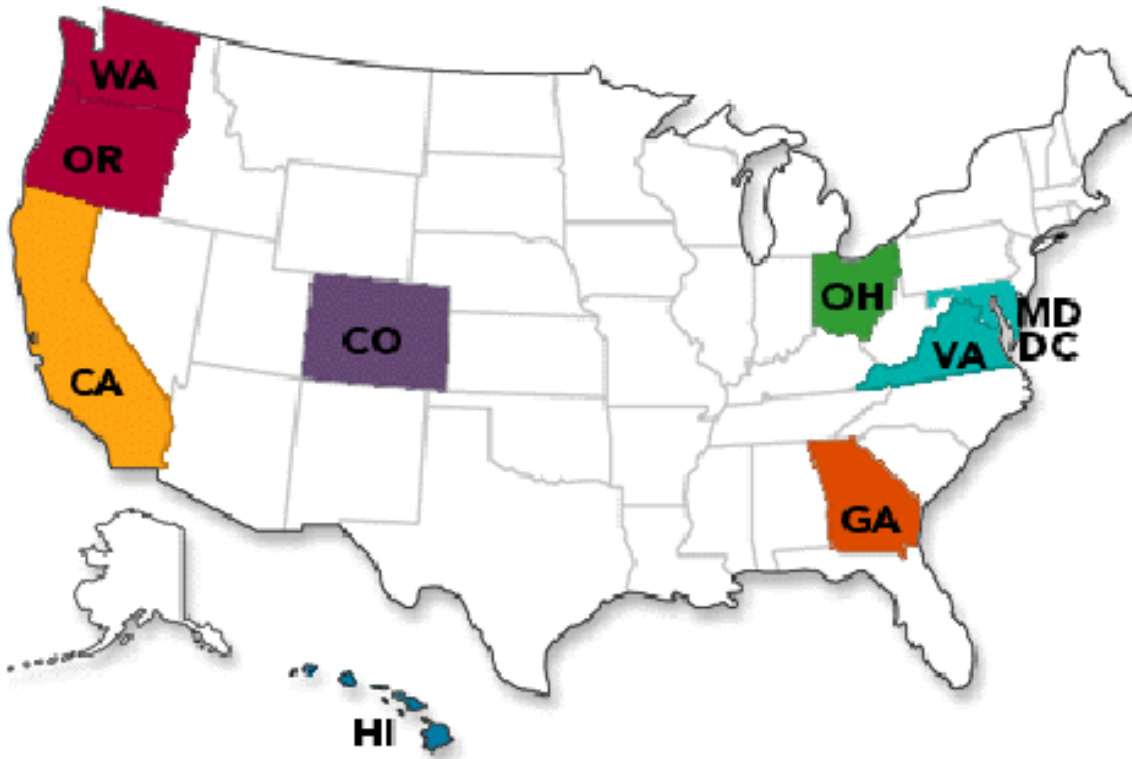# A Framework for Sharing Nursing Data:
The Quality Jackpot

Tim Cromwell, RN, PhD
Department of Veterans Affairs
Veterans Health Administration

Ann O'Brien, RN, MSN
Kaiser Permanente

Kaiser Permanente (KP)

- Integrated health care delivery system

- 8.8 million members

- 16,000+ physicians

- 46, 000+ nurses

- 170,000+ employees

- 36 hospitals

- 568 medical offices
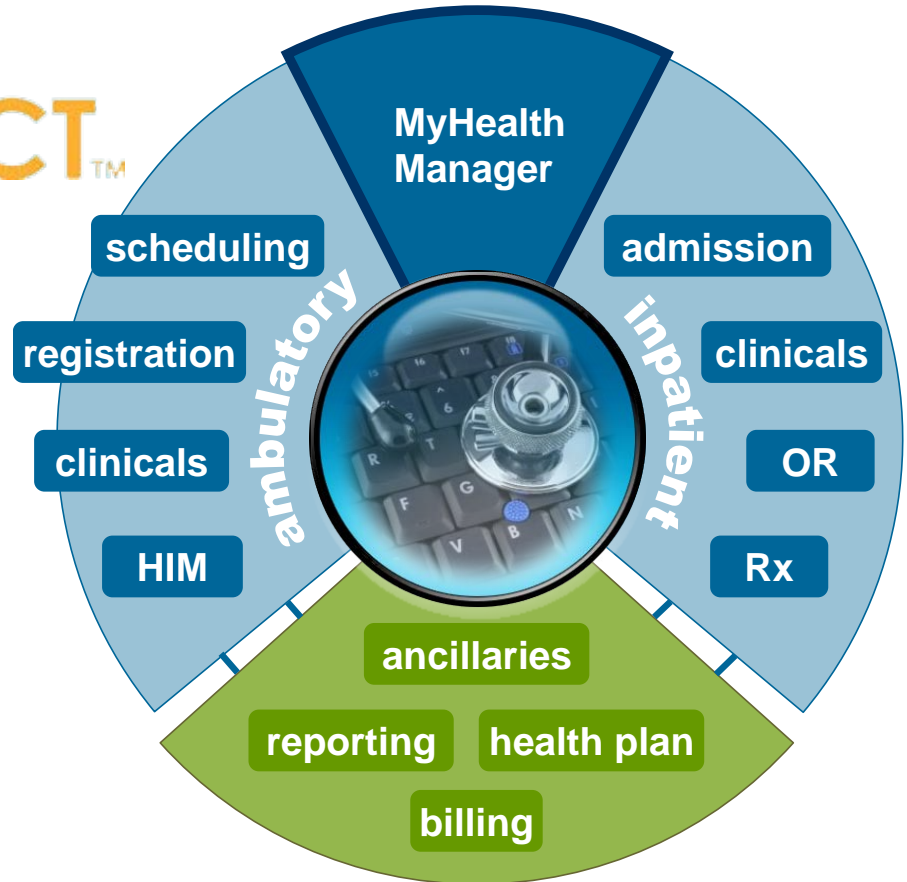
- 44 billion annual revenues

Comprehensive Tool

KAISER PERMANENTE
HEALTH CONNECT™

Not just an electronic medical record

Program-wide system integrates clinical record appointments, registration, ancillaries, health plan

Highly-sophisticated information management and delivery system

Member access to health information and outcomes

MyHealth Manager

ambulatory
- scheduling
- registration
- clinicals
- HIM

inpatient
- admission
- clinicals
- OR
- Rx

- ancillaries
- reporting
- health plan
- billing

Acronym Key:
HIM - Health Information Management
OR – Operating Room
RX – Pharmacy/Prescription

Sweeping the Stage

US EMR Adoption Model^SM

Stage	Cumulative Capabilities	2011 Q2	2011 Q3
Stage 7	Complete EMR; CCD transactions to share data; Data warehousing; Data continuity with ED, ambulatory, OP	1.1%	1.1%
Stage 6	Physician documentation (structured templates), full CDSS (variance & compliance), full R-PACS	4.0%	4.4%
Stage 5	Closed loop medication administration	6.1%	7.1%
Stage 4	CPOE, Clinical Decision Support (clinical protocols)	12.3%	13.2%
Stage 3	Nursing/clinical documentation (flow sheets), CDSS (error checking), PACS available outside Radiology	46.3%	46.1%
Stage 2	CDR, Controlled Medical Vocabulary, CDS, may have Document Imaging; HIE capable	13.7%	12.6%
Stage 1	Ancillaries - Lab, Rad, Pharmacy - All Installed	6.6%	5.9%
Stage 0	All Three Ancillaries Not Installed	10.0%	9.6%

Data from HIMSS Analytics^TM Database © 2011   N = 5,310   N = 5,299

At the end of 2011 only 1.1% of U.S. hospitals had Electronic Health Records (EHR) at "Stage 7"

100% of Kaiser Permanente Hospitals (36) have achieved "Stage 7" recognition

More than any other health care system in the U.S.

Acronym Key:
CCD – Continuity of Care Document
CDR – Clinical Data Repository
CDS – Clinical Data Services
CDSS – Clinical Decision Support System
CPOE – Computerized Physician Order Entry
ED – Emergency Department
EMR – Electronic Medical Record
HIE – Health Information Exchange
HIMSS - Healthcare Information and Management Systems Society
OP – Outpatient Pharmacy
R-PACS – Radiology Picture Archiving and Communications System

Veterans Heath Administration (VHA) Network
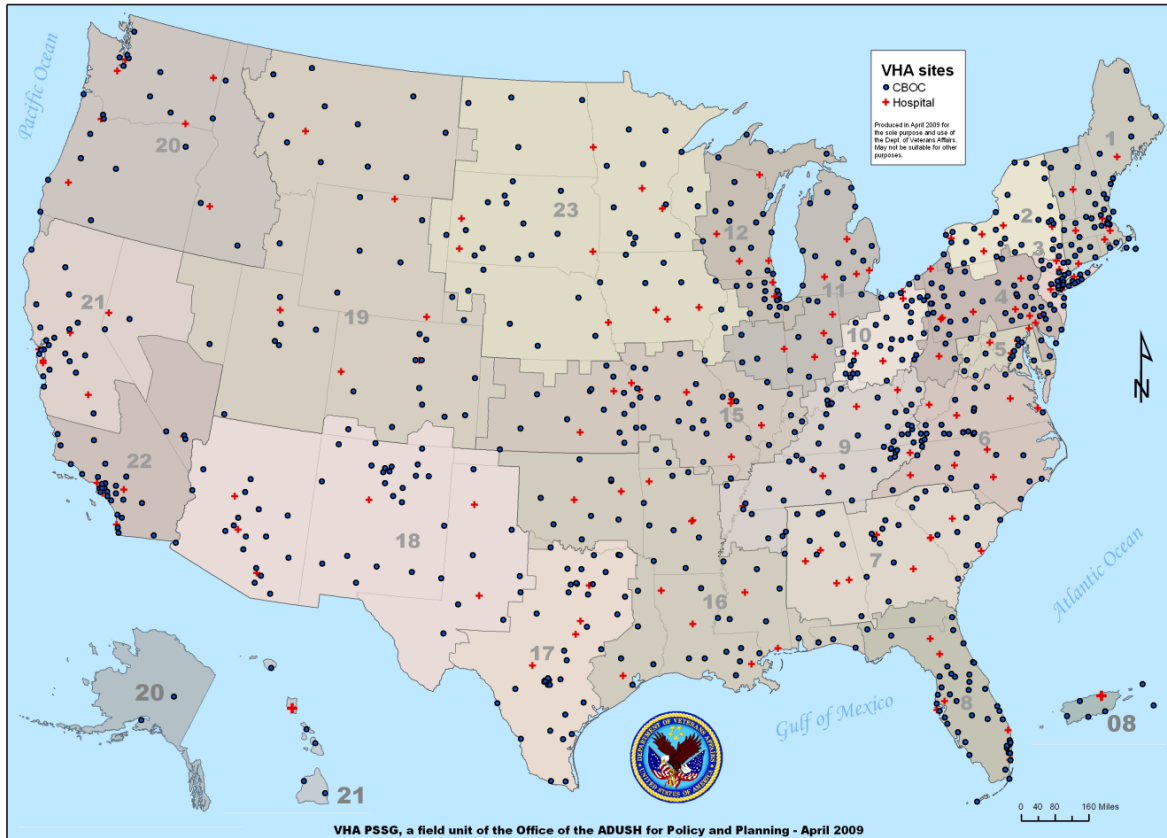
- Largest Integrated Health Care Delivery System
- 8.45 million enrollees
- 254,000 Employees
- 19,000 Physicians
- 70,000 Nurses
- 21 Regions
- 152 Hospitals & Medical Centers
- 802 Community Based Outpatient Clinics
- 293 Veteran Centers
- 133 Community Living Centers

VistA*

VistA includes many components to deliver high-quality health care to our Nation's Veterans:

- Computerized Patient Record System (CPRS)
- Bar Code Medication Administration (BCRO)
- Personal Health Record, My Health*e*Vet
- Used throughout the VA health care system:
  - Inpatient
  - Outpatient
  - Long-term care
  - Home care
  - Telemedicine
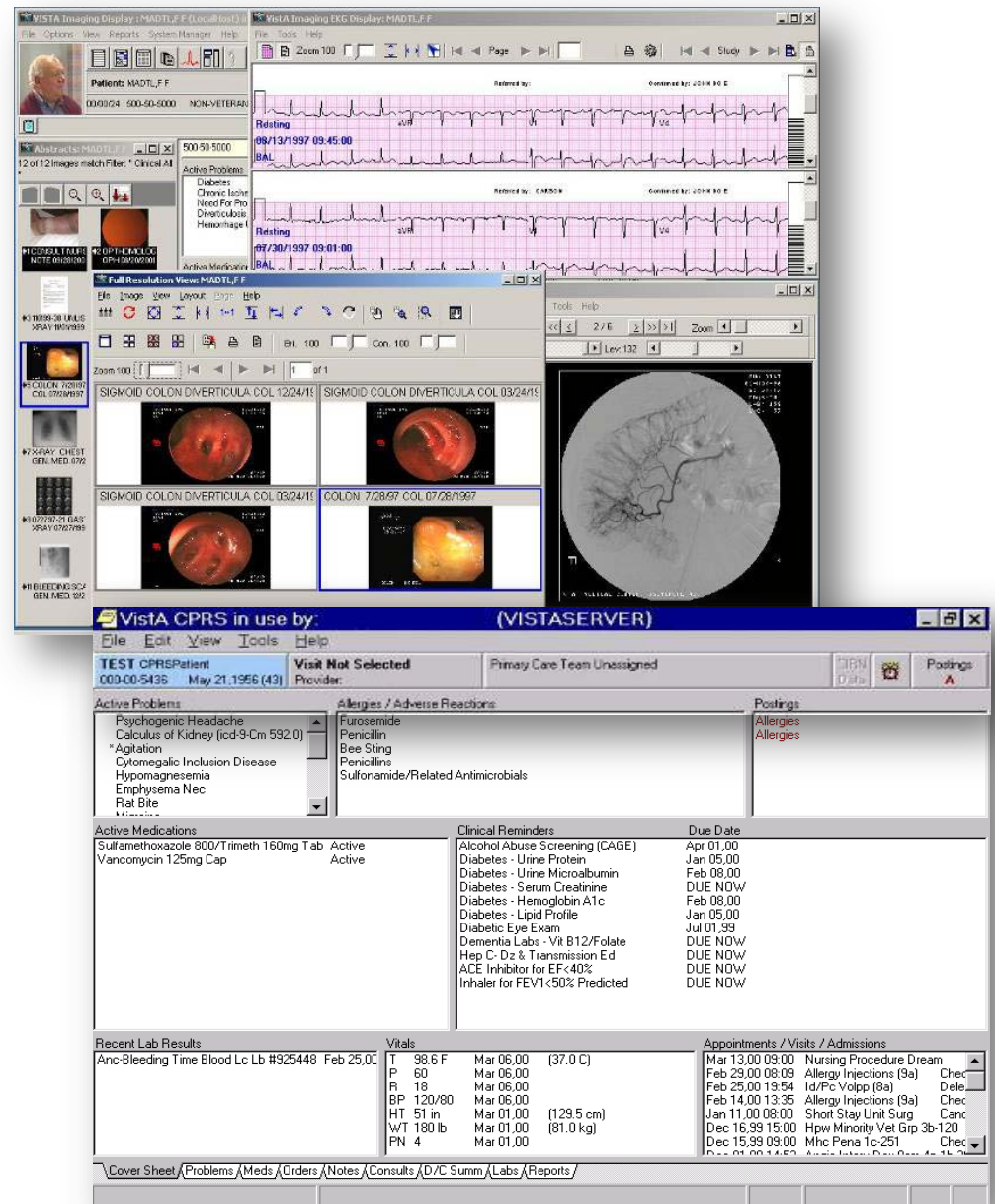
*VistA = Veterans Health Information Systems and Technology Architecture Imaging

Objectives

- Describe how nursing data collected during patient care can be used for quality reporting, research & real time clinical decision support

- Describe a prototype mobile health application for collecting, displaying and reporting skin assessment data

- Describe a future vision where patient-centered data informs the development of information models and results in interoperability and improved care

Setting the Context

- Kaiser Permanente and the Veterans Health Administration are comparable in size and geographic area
- KP & VHA have been working on similar paths in Health Information Exchange (HIE) and standardized data models
- KP & VHA formalized the relationship with the Nationwide Health Information Network (NwHIN) – 2009 - 2010
- We initiated a nursing-led project in 2010 to define a standard information model driven by nursing practice that enables:
  - Data capture
  - Data re-use
  - Data sharing within and outside organizations.
  - Facilitates the measurement and extraction of data for meaningful EHR use to support quality, safety, efficiency and decision support.

** Nursing can lead this area that can yield better information exchange and better quality outcomes

A Nursing Information Model

1. Evaluate the Evidence
2. Leverage Clinical Expertise
3. Develop Optimum Data Sets
4. Harmonize the Data
5. Map to Reference Terminologies
6. Formalize the Model in UML
7. Link to HL7
8. Validate the Model

Outcomes of the KP-VA Collaborative

- Balloted a Domain Analysis Model (DAM) at Health Level 7 (HL7) in May 2011 with ballot reconciliation in September 2011
- Engaged with various professional organizations to support and extend this work
- Increased the direct involvement of nursing in establishing and enforcing data standards for EHR use
- Collaborated with the ANA to support the addition of *Pressure Ulcers* to the proposed list of Stage 2 and 3 meaningful use quality measures
- Enabled the increasingly visible role of nursing in Health Information Technology (HIT) committees

The Quality Concern

- The current state of quality reporting is very manual & labor intensive within and across organizations
- KP – VA Collaborative selected Pressure Ulcer Risk as a prototype
- As many as 3 million patients are treated in U.S. health care facilities each year for pressure ulcers*
- Annual cost of pressure ulcers is $3.2 billion**
- 60,000 patients die annually from pressure ulcer complications
- Most pressure ulcers are preventable
- Per standards of care, patients are assessed for pressure ulcer risk on admission and at prescribed intervals
- Quality data for pressure ulcers are already collected but reported in a variety of ways
-
-

* Dorner, Posthauer, & Thomas, 2009

** "The $17 Billion Problem" : Health Affairs April 2011

Current State:
VA Nursing Outcomes Database (VANOD)

- Nurses document skin assessments in structured format on national VANOD template in legacy system (CPRS)
- Template may be an additional tool depending on local documentation practices (double documentation)
- Populates <u>retrospective</u> quality reports
- Missed opportunity to impact care at the bedside

Admission Skin Assessment

```
Braden Scale - For Predicting Pressure Sore Risk
Sensory Perception:1 = Completely Limited
Moisture:          2 = Very Moist
Activity:          3 = Walks Occasionally
Mobility:          2 = Very Limited
Nutrition:         2 = Probably Inadequate
Friction:          1 = Problem
   10-12   High Risk
     Score:  11

CURRENT SKIN ASSESSMENT
    Skin Color:
       Color:  Flushed, Mottled
    Skin Temperature
       Temp:  Hot
    Skin Moisture
       Moisture:  Diaphoretic
    Skin Turgor
       Turgor:  Within normal limits

SKIN PROBLEMS
    PRESSURE ULCER ASSESSMENT
       Prior Pressure Ulcer Locations:
       PRESSURE ULCER STAGE
         STAGE II
                   Sacrum/coccyx
       Current pressure ulcer assessment
          no change in the ulcer
```

In the electronic health record, information is stored and displayed as text.

It is useful to the creator, once.

It is not computable.

It is extremely difficult to <u>re-use</u>

- **in a consultation note**
- **in a patient transfer summary**
- **in creating a care plan**

VA Current State

VA moving to structured data collection

Use advanced analytics to link data to context due to the lack of an information model

KP Current State

- Nurses document in discrete fields
- Data is captured for reporting and data mining
- Limited by vendor's data structures and data model

# Clinical Decision Support

Linking it All Together

- **Reference Terminologies** ensure conceptual equivalency – they define the "words"
  - Stage I left heel and Stage III right hip
  - Stage I right heel and Stage III left hip
  - Stage III left hip and Stage I right heel
  - Stage III right hip and Stage I left heel

- **Information Models** – describes the "full sentence" with meaning. The order of the words impact the meaning
- The context of this patient and the patient's story is still unknown with terminology alone

Desired Future State

- Documentation tools grounded in terminology and information models to be interoperable between:
  - Care settings and providers
  - Applications
  - Organizations
- EHRs that enable automatic extraction and reporting of quality data to enhance true interoperability and improved outcomes

American Nurses Association Recognition

- NANDA
- NIC
- NOC
- ABC Codes
- CCC
- OMAHA
- PNDS
- ICNP
- LOINC
- SNOMED CT
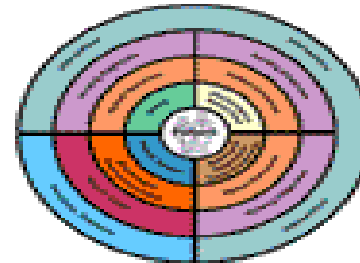
The Quality Jackpot

- Development and adoption of an agreed upon data model that enhances the ability to share and compare information

- Transformation from nurses as the "human interface" between vendor applications to real time display of relevant information available at the point of care

- Utilization of common information models with new technology applications to improve care and reduce preventable adverse events

The Opportunity Is Now

- As health care providers, we have the opportunity to establish a leadership position with mobile health application vendors to build models in a collaborative, non-siloed manner.

- As nurses we have the opportunity to lead the way in developing clinical models that define our practice.

- To drive value, we need to build a set of detailed clinical models to promote interoperability and ease of use.

- In order to achieve interoperability, nurses should develop and adopt common data models, code sets, terminologies to promote interoperability.

- We need coherence in what the data means and how to get the data in and out of Electronic Health Records (EHRs).

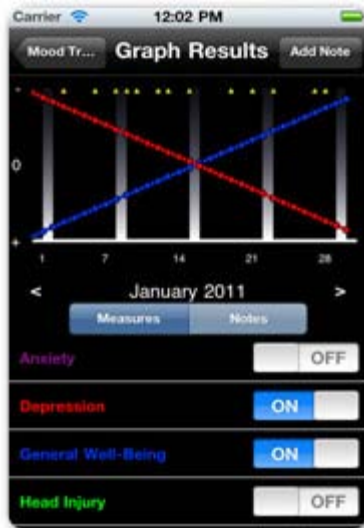# Applications (Apps) from Other Industries

Smart Traveler

Science360

National Weather Service
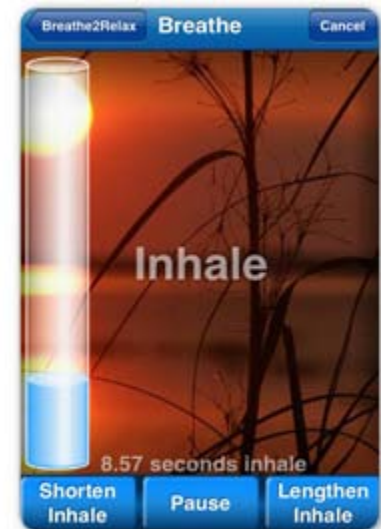
Apps in Health Care

T2 Mood Tracker

My Dietary Supplements (MyDS)

Breathe2Relax

VA Post-Traumatic Stress Disorder (PTSD) Mobile App
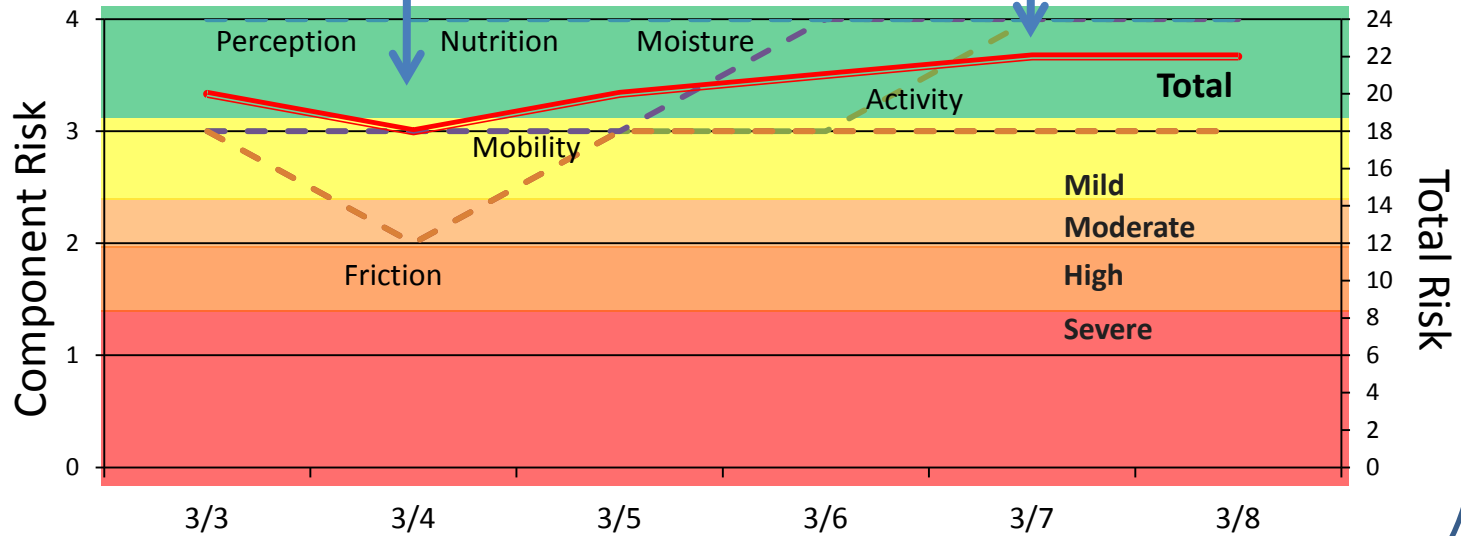
Skin Risk Assessment Prototype

- Identify the scope: Skin risk assessment prototype within a mobile health "App"
    - Develop the common models and reference terminology to provide the framework
- Provide the infrastructure in which the open source community can work
    - Vendors can get off-the-shelf models and terminology that have been vetted by the clinical community
    - Identify a custodial agent who coordinates the open source community
    - Provide business requirements for building an "App" to be used by clinicians to assess risk of skin breakdown

Pressure Ulcer Risk

Score enters risk band: DSS prompts clinician for protocol

Prednisone ordered; DSS will not take action on low-risk patient

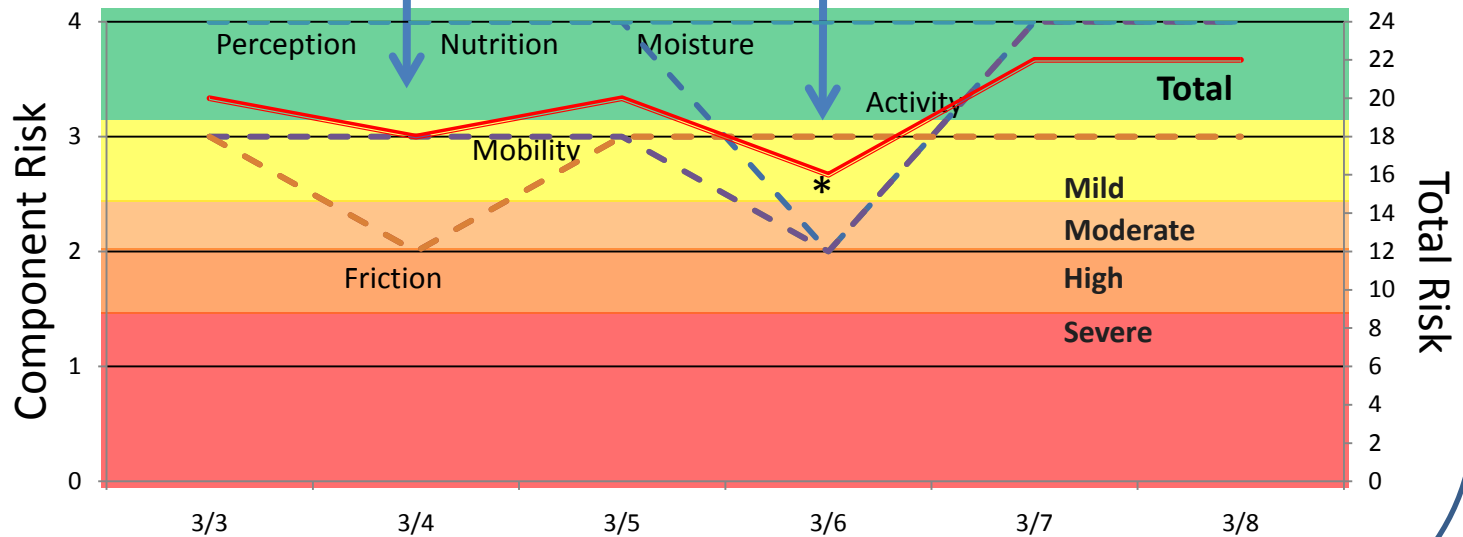The view shows scores from multiple sources in one view

*DSS – Decision Support System

Pressure Ulcer Risk

*DSS – Decision Support System

Skin Observations

SNOMED CT:
399912005
pressure sore
(clinical
finding)

*SNOMED CT - Systemized Nomenclature of Medicine Clinical Terms

Scenario: Order Logic

SCT 27242001
methylprednisolone
(pharmaceutical /
biologic product)
Is A
Adrenal Corticosteroid
[NDFRT HS050]

This patient is at mild risk for skin breakdown (Braden score = 18).
This drug is a risk factor for skin breakdown.

Reusable Components (Content and Structure) Provide the Framework

class Braden Scale

Pressure Ulcer Risk Assessment Instrument
Braden Scale

- braden activity: Braden Activity
- braden friction and shear: Braden Friction and Shear
- braden mobility: Braden Mobility
- braden moisture: Braden Moisture
- braden nutrition: Braden Nutrition
- braden pressure ulcer risk total: Braden Pressure Ulcer Risk Total
- braden pressure ulcer risk total description: Text
- braden sensory perception: Braden Sensory Perception

«enumeration»
Braden Scale::Braden Sensory Perception

Completely Limited = 1
Very Limited = 2
Slightly Limited = 3
No Impairment = 4

«enumeration»
Braden Pressure Ulcer Risk Total

No Risk = 19 or higher
At Risk = 15-18
Moderate Risk = 13-14
High Risk = 10-12
Severe Risk = 9 or Below

«enumeration»
Braden Scale::Braden Moisture

Constantly Moist = 1
Very Moist = 2
Occasionally Moist = 3
Rarely Moist = 4

Patient Unconscious

«enumeration»
Braden Friction and Shear

Problem = 1
Potential Problem = 2
No Apparent Problem = 3

«enumeration»
Braden Scale::Braden Activity

Bedfast = 1
Chairfast = 2
Walks Occasionally = 3
Walks Frequently = 4

«enumeration»
Braden Scale::Braden Mobility

Completely Immobile = 1
Very Limited = 2
Slightly Limited = 3
No Limitation = 4

«enumeration»
Braden Nutrition

Very Poor = 1
Probably Inadequate = 2
Adequate = 3
Excellent = 4

The Future: All Information is Described With Reusable Models and Terminology

class Medication Use Detail

Pressure Ulcer Risk Assessment Item
Medication Use

- medication: CD
- medication type: Therapeutic Class

0..*

Medication Impact

- Medication Impact Type: Medication Impact Type

«enumeration»
Therapeutic Class

vasopressor
steroid
sedative
paralytic
anesthetic
hypnotic
analgesic
antibiotic
chemotherapeutic agent
appetite stimulant
appetite depressant

«enumeration»
Medication Impact Type

perfusion compromise
skin structure compromise
mobility and sensory perception alteration
GI function alteration

Pharmacy Model

79440004
corticosteroid
Is A
Steroid

Detailed Clinical Model Template

A clinical decision support system can be used to *infer* the presence or absence of a given clinical finding / disorder based upon multiple inputs, including those directly entered by a clinician. These can be used to populate an assessment scale component. Similarly, given an asserted assessment scale component, you can *infer* a range of things with a known risk of error (uncertainty).

The source (.   ) of the prediction would be the CDSS (not shown)

Every **assessment scale component** is a simplified categorical view of one or more clinical findings. Even when the label / surface form is the same, there is always an *interpretation* (by a **Provider** or **Decision Support System**) of a real-world observation to the more narrowly constrained

ObservationEvent_
- templateId : DSET<II>
- code : CD
- title : ED_text
- effectiveTime : URG<TS>
- activityTime : TS
- value : PPD<CD>

* + couldBePresent

1..*

ObservationEvent_AssessmentScaleComponent
- templateId : DSET<II>
- code : CD
- title : ED_text
- effectiveTime : URG<TS>
- activityTime : TS
- value : CO

+ hasInterpretation

+ evidenceFor

*

*

+ hasInterpretation

*

*

ObservationEvent_HnP_CodedFinding
- templateId : DSET<II>
- code : CD
- title : ED_text
- effectiveTime : URG<TS>
- activityTime : TS
- value : CD

1..*

+ hasComponent   1..*

Each component can only be used in the context of the specific assessment scale.

1

H&P Findings

code << 363788007|Clinical history/examination observable

value << 250171008|Clinical history and observation findings

ObservationEvent_AssessmentScale
- templateId : DSET<II>
- code : CD
- title : ED_text
- effectiveTime : IVL<TS>
- activityTime : TS
- value : CO

Method: Formalize the Model in Unified Modeling Language (UML)

Classes as major categories or "building blocks"

Attributes as specific questions

Enumerations as *value sets* for attributes
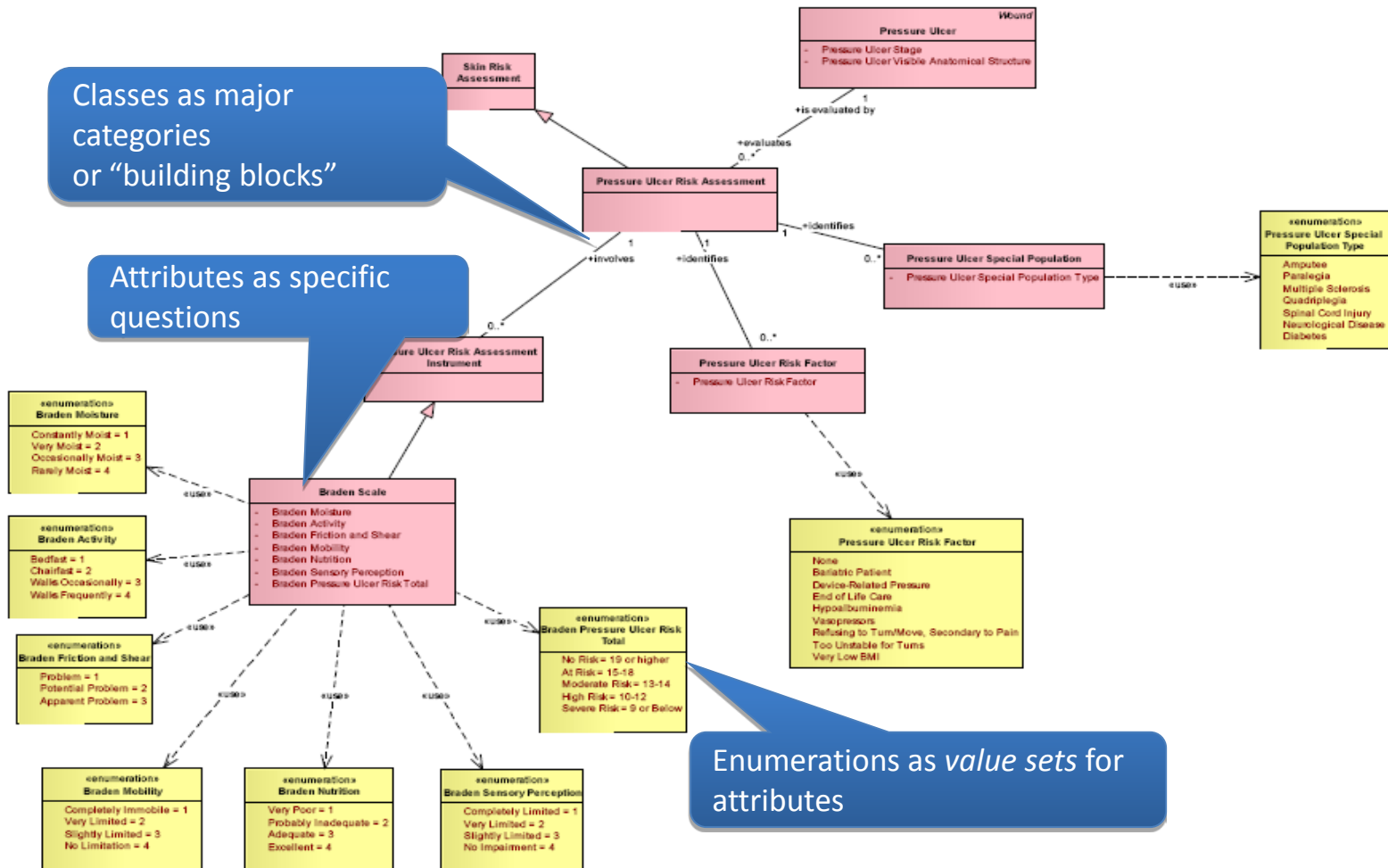
Impact to National Database of Nursing Quality Indicators (NDNQI) and Other Current Quality Reporting

- We as health care providers have undesirable variation in the way we collect data for quality reporting
- We can reduce undesirable variation with standards for terminology and common models
- We can automate data collection and reporting when we implement standards for terminology and common models

What Nursing Leaders Need to Know

Three Key Questions to Ask Vendors:
- Is nursing documentation data structured in a discrete and standardized format to facilitate data capture, data re-use and data sharing?
- Is the nursing data mapped to a reference terminology?
- How do you demonstrate data portability between settings and organizations? -provide specific examples of nursing data

Summary

- **The imperatives are clear**
- **Nursing has a strong voice and a plan**
- **Nurses can leverage the EHR to improve practice**
- **Nursing leaders need to ensure that data is organized in a standardized way to make it accessible for clinical decision making, quality reporting and research**
- **Standardization of patient data exchange has the potential for improving patient safety and clinical outcomes**

QUESTIONS?