Managing change for a return on Healthcare Information Technology investment

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Digitizing Healthcare: The EMR Experience at Packard Children’s

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Conflict of Interest Disclosure

Christopher Longhurst, MD, MS

Has no real or apparent conflicts of interest to report
Lucile Packard Children’s Hospital at Stanford

- Located in Palo Alto, CA
- Opened in 1991
- Major pediatric/obstetric teaching hospital associated with Stanford Univ. School of Medicine
- Patient stats (FY 2008)
  - 14k discharges + 5k births
  - 134k Clinic visits
  - 303 Active Beds
  - 40%+ critical care patients
- Top 10 children’s hospital by US News & World Report

Data Source: Centers for Medicare and Medicaid Services
Physician Orders at LPCH, 2006

Lucile Salter Packard
Children's Hospital at Stanford
725 Welch Road • Palo Alto • CA 94304
PHYSICIAN'S ORDER RECORD

Please order ECHC R/O POA
Condamycin 8.5 mg IU TID (w/ 17)

MCS 4.1 mg IU 9 2-4° per pain
Physician Orders at LPCH, 2007
Documentation at LPCH Before Clinical Transformation

5/13/1895!
Documentation at LPCH After Clinical Transformation
## EMR Adoption Model

<table>
<thead>
<tr>
<th>Stage</th>
<th>Cumulative Capabilities</th>
<th>% of US hospitals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 7</td>
<td>Medical record fully electronic; CDO able to contribute to EHR as byproduct of EMR</td>
<td>1%</td>
</tr>
<tr>
<td>Stage 6</td>
<td>MD Documentation (structured templates), full CDSS (variance and compliance), full PACS</td>
<td>3.2%</td>
</tr>
<tr>
<td>Stage 5</td>
<td>Closed loop medication administration</td>
<td>4.5%</td>
</tr>
<tr>
<td>Stage 4</td>
<td>CPOE, CDSS (clinical protocols)</td>
<td>10.5%</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Clinical documentation (flow sheets), CDSS (error checking), PACS available outside of radiology</td>
<td>49.0%</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Clinical data repository, Controlled Medical Vocabulary, Clinical Decision Support System (CDSS) capability</td>
<td>14.6%</td>
</tr>
<tr>
<td>Stage 1</td>
<td>Ancillaries – Lab, Rad, Pharmacy</td>
<td>7.1%</td>
</tr>
<tr>
<td>Stage 0</td>
<td>All three ancillaries NOT installed</td>
<td>10.1%</td>
</tr>
</tbody>
</table>

Source: HIMSS Analytics™ Database © 2011. N=5,281
"After EMR implementation, the mean monthly adjusted mortality rate decreased by 20%. Based on these data, we estimate 36 children’s lives were saved over 18 months in association with the EMR intervention."
Mortality Decreases After Implementation of Computerized Physician Order Entry System

From Medscape Medical News

May 3, 2010 — Today in Pediatrics, a paper reported an association with an increased number of computerized physician order entry (CPOE) systems and a decrease in mortality rates. The study was published in the journal Pediatrics, which reported the findings of an investigation conducted at Children's Hospital in California, in a study published from 2008.

In theory, the idea that computerized technology would reduce the number of deaths in a hospital is appealing, but it's not yet clear how effective this approach is in practice. The findings show that by using computerized systems to improve patient care, doctors and nurses are more likely to make accurate medical decisions, which can reduce the number of deaths.

The authors concluded that CPOE systems may help improve patient care and reduce the number of deaths in hospitals. The findings are important because they suggest that computerized systems can be effective in reducing mortality rates, and this could have a significant impact on public health.

Electronic medical orders may save lives

By Frederik Joehling

NEW YORK (Reuters Health) - Doctors at a California children's hospital have found the first evidence that using an electronic system to communicate their orders may save lives.

After the system was introduced in 2007, the hospital witnessed a 20-percent drop in mortality rate, the equivalent of 36 fewer deaths over a year and a half.

"It's the lowest rate ever observed in a children's hospital," said Dr. Chris Longhurst, of Stanford University and Lucile Packard Children's Hospital in Palo Alto, California, whose findings are published in the journal Pediatrics. "It begs the question how many lives could be rescued on a national level."

In 1999, a report from the Institute of Medicine blamed medical errors for between 44,000 and 98,000 deaths per year in the United States. Many hospitals have since introduced so-called computerized physician order entry, or CPOE, in an effort to lower that number. Such systems allow doctors to relay prescriptions to pharmacists without delay, and without the need for the pharmacist to decipher doctors' scrawl.

"What used to take 40 minutes or so now takes 20," Longhurst told Reuters Health.
Observed to Expected Mortality Ratios, 2008
What happened?

What is happening?

What will happen?

- Optimizing capabilities will occur as transformation progresses.
- It is not possible to skip steps in the sequence.
Using EMR data to identify areas of focus – Variability in Laboratory Utilization Rates Rates

LabTests PPD - 2008 PICU Patients
PICU LOS ≥ 2 Days
N=416 Patient Encounters

Over 50 fold difference in lab tests per patient day rate in the PICU
Using EMR to Change Practice - Implement Rules and Alerts: PICU Lab Tests Duration of 1 Day Only

WARNING

As part of the ongoing Clinical Resource Management effort, CBC orders cannot be placed in the 2E PICU with a recurring frequency that continues past tomorrow. Please edit the Duration/Duration Unit fields appropriately or change the start date/time and use a frequency of 'once'.

Alert Action

☑ modify CBC

OK
Eliminating standing orders reduced chemistry tests per patient day in the PICU by over 50% (Pediatric Critical Care Medicine, in press)
"In stable, critically ill children a hemoglobin threshold of 7 g per deciliter for red-cell transfusion can decrease transfusion requirements without increasing adverse outcomes."
WHAT'S KNOWN ON THIS SUBJECT: Studies reveal red blood cell transfusion practices to be variable among pediatricians. Recent data suggests significant risks to children receiving transfusions, and supports a conservative transfusion strategy. Computerized physician order entry with decision support has potential to improve transfusion utilization.

WHAT THIS STUDY ADDS: A significant lag exists between the dissemination of evidence-based recommendations and integration into clinical practice. This study reveals a strategy where computerized decision support improved the use of red blood cell transfusions, suggesting enhanced adoption of evidence-based recommendations.

TABLE 3  Average Hemoglobin Level at the Time of RBCT Order Entry for the PICU and Acute Care Wards

<table>
<thead>
<tr>
<th>Ward</th>
<th>Average (SD)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pretransfusion Hemoglobin, g/dL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>Study</td>
</tr>
<tr>
<td>PICU</td>
<td>9.83 (0.09)</td>
<td>8.7 (0.07)</td>
</tr>
<tr>
<td>Acute care</td>
<td>7.5 (0.04)</td>
<td>7.1 (0.07)</td>
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</table>

The control period was between February 1, 2008, and January 31, 2009, and the study period was between February 1, 2009, and January 31, 2010.

a P values represent the difference between the means in the control versus the study cohort.
<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Sex</th>
<th>Admission Date</th>
<th>Diagnosis</th>
<th>Bed</th>
<th>Status</th>
<th>Vital Signs</th>
<th>Meds</th>
<th>Discharge Date</th>
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<tr>
<td>Smith</td>
<td>26</td>
<td>M</td>
<td>2023-01-10</td>
<td>Acute Care</td>
<td>154</td>
<td>Open</td>
<td>Normal</td>
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<td>Brown</td>
<td>32</td>
<td>F</td>
<td>2023-01-15</td>
<td>Chronic</td>
<td>110</td>
<td>Closed</td>
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<td>None</td>
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<td>Jones</td>
<td>40</td>
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<td>Surgery</td>
<td>174</td>
<td>Open</td>
<td>Normal</td>
<td>None</td>
<td>2023-02-05</td>
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*Developed with support from Hewlett Packard*
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<th>Name</th>
<th>MD Team</th>
<th>Assigned RN</th>
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<th>CABS</th>
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</tbody>
</table>
Patient Dashboard in the EMR

Dashboard prompting a change in care

- Less frequent labs
- Oral medications
- Taking lines out
- Adjusting sedation
- Positioning to prevent pneumonia

34 %
Evidence-Based Medicine in the EMR Era

Jennifer Frankovich, M.D., Christopher A. Longhurst, M.D., and Scott M. Sutherland, M.D.

Many physicians take great pride in the practice of evidence-based medicine. Modern medical education emphasizes the value of the randomized, controlled trial, and we learn early on to not rely on anecdotal evidence. But the application of such superior evidence, however admirable the ambition, can be constrained by trials’ strict inclusion and exclusion criteria — or the complete absence of a relevant trial. For those of us practicing pediatric medicine, this reality is all too familiar. In such situations, we are used to relying on evidence at Levels III through V — expert opinion — or resorting to anecdotal evidence. What should we do, though, when there aren’t even meager data available and we don’t have a single anecdote on which to draw?

We recently found ourselves in such a situation as we admitted to our service a 13-year-old girl range proteinuria, antiphospholipid antibodies, and pancreatitis. Although anticoagulation is not standard practice for children with SLE even when they’re critically ill, these additional factors put our patient at potential risk for thrombosis, and we considered anticoagulation. However, we were unable to find studies pertaining to anticoagulation in our patient’s situation and were therefore reluctant to pursue that course, given the risk of bleeding. A survey of our pediatric rheumatology colleagues — a review of our collective Level V evidence, so to speak — was equally fruitless and failed to produce a consensus.

approach, using the data captured in our institution’s electronic medical record (EMR) and an innovative research data warehouse. The platform, called the Stanford Translational Research Integrated Database Environment (STRIDE), acquires and stores all patient data contained in the EMR at our hospital and provides immediate advanced text searching capability.1 Through STRIDE, we could rapidly review data on an SLE cohort that included pediatric patients with SLE cared for by clinicians in our division between October 2004 and July 2009. This “electronic cohort” was originally created for use in studying complications associated with pediatric SLE and exists under a protocol approved by our institutional review board.

Of the 98 patients in our pediatric lupus cohort, 10 patients developed thrombosis, documented
“All practice errors can not be attributed to the human causes of ignorance and avarice. Some are intrinsic to the human mind. Thus, I conclude that though the individual physician is not perfectable, the system of care is, and that the computer will play a major part in the perfection of future care systems.”
"We make a living by what we get, we make a life by what we give." - Winston Churchill
Improving Quality, Safety and Efficiency

- Old tools:
  - Whining, complaining, cajoling, threatening
  - Incentives (Money, power, glory...Money)
    - Used for ages without dramatic success
  - Bad data (3/5 Kubler-Ross): Denial, Anger, Bargaining

- New tools
  - Electronic Health Record
    - Alerting and better data (Analytics)

Not much change!
Kaiser Permanente Hawaii Goal: Improving Mammogram Screening

- Improve primary care and non-PCP ordering
  - Identifying
  - Alerting
  - Ease ordering
- Improve cycle time
- Improve patient satisfaction with process

- Earlier detection $\rightarrow$ Improved outcome
Make it easy! Effective for Primary care

Outreach: Mail, Marketing, Screenings

Self sufficiency: Auto order protocol

Yes, ordered if I can see it

In-Reach: MA/RN protocol Ask/Order

Well Done!
The real barrier for Non-PCP

Alerted to Order study, Ordered?
  No, WIFM?

Bonus for screening Ordered?
  No
  I don’t have time to deal with inbox

RN to screen and support Ordered?

NO!
 I Don’t know what to do with result

Breast team to support ordering clinicians. Ordered?
  NO
  I don’t want deal with result

Results intercepted by APN team and accountability transferred Ordered?
  Yes, ordered if I can see it

Well Done!
Mitigating Reluctance of non-PCP

**Result-o-phobia**
The irrational fear of looking stupid in not knowing how to deal with an abnormal result

- Ordering provider gets “Courtesy” copy
- APN to intercept ALL results
  - APN accountable for negative study communication and follow-up by protocol
  - Communicates with Breast team non-negative
- **Breast team accountable for all subsequent care**
Breast care improvement

- Kaiser Permanente Hawaii in 2009
  - NCQA:
    - Highest breast CA screening rate (42 – 69) ~72% → 85% in 2009
  - EHR can alert and facilitate
  - Out reach and In reach
  - Incentives and accountability
  - Operations to support workflow
Change Management: Switch*

- Direct the rider
  - Appeal to the intellect
- Motivate the Elephant
  - Encourage the emotions
- Shape the path

http://www.heathbrothers.com/switch
CM: Direct the rider

The easy part...

Quality

Safety

Efficiency

Baseball, Apple pie and Chevrolet
CM: Motivate the Elephant

- Make it feel do-able
  - Connect your team to the outcome
  - Don’t let success feel too distant
  - Positive peer pressure
- Does it pass the Champagne test?
- Analytics and Process
  - Metrics are tools, not destinations
  - Move from process to outcome
A picture is STILL worth a thousand words

Make the right thing the easy thing
- Shrink the change
- Look for quick wins
- Perfection is the enemy of good enough
- Can you “one click” the process

Script the critical moves—Be clear about actions
- Pick a place to start
- Emphasize the Tweak
- What can you do in the short run
Preparation for CPOE

- Electronic Order Entry with Paper Output
  - Increase the number of order sets
  - Reduce the # of actual paper forms
  - Expedite creation and maintenance of order set content
  - “Test drive” order set
Drivers for Change

- Shrink the change
  - Go-live based on paper forms
  - Paper output
  - Medicine admission
  - Medicine Discharge
  - Surgery Post procedure

- Look for quick wins
  - Legibility
  - Code status and admit order calls stopped
  - Listen (suggestion), Look (Metric), Optimize

- Rapid PDCA cycle (ICCC)
Care quality improvement

- Improved compliance with ordering of complete insulin coverage
- DVT prophylaxis compliance has increased from 50% to 97%
- Compliance with required orders
  - E.g. Admit, Code status, Telemetry criteria, Resident/Attending/Service identification
- 28% reduction in time from decision to admit to creation of inpatient orders
Improved Performance Measures

- Stroke treatment improvements–
  - Time to Admission Thrombolytic therapy
  - Time to Antithrombotic therapy by day 2
  - Discharge on statins
  - Stroke education
  - Rehabilitation assessment

- VTE: Reduction of potentially preventable VTE
  - Prophylaxis
  - Anticoagulation overlap therapy
  - Platelet monitoring on unfractionated heparin
  - VTE discharge instructions
Return on Investment

- Just because you build it does NOT mean they will come!
- Managing the change is as critical as the change itself.
- The road to hell is paved with good intentions...and (in Healthcare information technology) bad implementations
IOM on Health care costs:
“If shopping were like health care, product prices would not be posted and the price charged would vary widely within the same store, depending on the source of the payment”

Response:
“If healthcare were like shopping, every product would be uniquely designed for the customer, we would be told what we are paid for the products and would to give products away to anyone could not pay for them.”
Clinical Registries: Improving Healthcare With Population Data Sets

Michael Hogarth, MD
Medical Director, Clinical Registries
Professor, Internal Medicine
Professor, Pathology/Lab Medicine
UC Davis Health System
michael.hogarth@ucdmc.ucdavis.edu
http://www.hogarth.org
Two Important Quality Improvement Principles

“The key is to practice continual improvement and think of manufacturing as a system, not as bits and pieces”

“In God I trust....all others must bring data”

William Edward Deming (1900 – 1993)
Statistician, Quality Improvement Innovator
What we need...
Instrumentation is key to managing complex systems
eHealthcare Environments are “data rich”

Mr. Doe has a painful swollen right knee and makes appointment with his primary care doctor.

Dr. Smith sees Mr. Doe in clinic and performs a knee aspiration. A sample is sent to the lab with an order for white cell count, gram stain, culture, and cytological examination to evaluate for the presence of crystals typical of gout. She also orders an MRI of the knee given Mr. Doe reports trauma a month ago.

The radiologist reviews the MRI and dictates a report into the Radiology Information System (RIS).
Our Approach: A Single “Tethered Meta-Registry”

80% of data in registries are common

Meta-Registry
- One common data repository
- Algorithmic case definitions
- Cross-registry analysis (ie, sepsis and cancer)
- Multiple data sources (not just EHR system)
The Value Proposition

- $ Pay for Performance
- Quality Measurement and Improvement (QI)
- Real-time monitoring of clinical care delivery
- Becoming Predictive
  - Predicting who is at risk for what complication
  - Tailoring care based on *personal risk*
What do you need?

• An eHealthcare Environment
  • EHR, computerized ancillary systems (lab, radiology, pharm)

• A Registry Team
  • Clinical domain experts
  • Epidemiology / Population health
  • Health informatics
  • Clinical data engineers (software, database, clinical data)

• A Registry Information System
  • Clinical data repository
  • Case identification/Registry system
  • Visualization system
Defining the Registry

UCD Sepsis Registry High Level Requirements and Specifications

1. Initial measurement of serum lactate level
   - Total number of patients in SIC cohort
   - Lactic acid test result +/- 12-hours of "SIC identification"
     1. Chemistry lab
     2. ABG lab

2. Total IV fluid administration amount must be equal to or greater than 20ml/kg within 6 hours*
   - Total number of patients in SIC cohort
   - Fluids administered must be equal to or greater than 20ml/kg and any fluid administration plus 6 hours or minus 1 hour of identification.
     1. SBP <90
     2. Lactic Acid >4.0
     3. Order set
     **T0 = Initiation of Severe Sepsis Orderset (606)**
     **Definitions:** order for 20ml/kg within 6 hours of T0 for crystalloids and blood products

3. Blood culture obtained before antibiotics administered
   - Total number of patients in SIC cohort
   - At least one blood culture set taken <24 hours preceding the first qualifying antibiotic administration.

4. Initial antibiotic administration in appropriate time frame
   - Total number of patients in SIC cohort
   - Antibiotics administered within a period starting 12 hours prior to the start time through 168-minutes (ECU/ICU) of "SIC identification"
     1. SBP <90
     2. Lactic Acid >4.0
     3. Order set
     **T0 = Initiation of Severe Sepsis Orderset (606)**
     **Definitions:** Antibiotic defined as medication group 103
     1. Exempt: Amoxicillin/Sulfadiazine, which is in group 103.
     2. Excluding antibiotics not used for treatment of severe sepsis (i.e., quinolone and HIV medications)

High Level Requirements and Specifications

for

UCD Sepsis Registry

Version 1.4

July 12, 2012
Process Mapping – what data, from where?
<table>
<thead>
<tr>
<th>Registry Element</th>
<th>Registry Element Definition</th>
<th>Purpose</th>
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<tbody>
<tr>
<td>PAT_CSN_ID</td>
<td>Unique ID of one complete hospital stay</td>
<td>Used to group actions taken during a stay with one another</td>
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<tr>
<td>START_TIME</td>
<td>The point in time the sepsis case is deemed to have started. For bp cases: the instant the Alert popup form is responded to (alt_history.alt_action_inst). For lactic cases: the instant the Lactic Acid lab test was resulted (order_results.result_time). For orderset cases: the time the order was placed (order_metrics.order_dttm).</td>
<td>All of the Bundle Measures center around having taken certain actions within a specific time frame. The Start_Time serves as the beginning point for all of these types of calculations. Bundles 2, 5, and 6 receive an automatic &quot;Pass&quot; for cases originating from the Orderset cohort. Other than that, it's just an important informational field.</td>
</tr>
<tr>
<td>COHORT</td>
<td>Name of Qualifying Cohort where this case originated. Values are &quot;bp&quot;, &quot;lactic&quot;, and &quot;orderset&quot;</td>
<td>Bundles 2, 5, and 6 receive an automatic &quot;Pass&quot; for cases originating from the Orderset cohort. Other than that, it's just an important informational field.</td>
</tr>
<tr>
<td>BPA_LOCATOR_ID</td>
<td>The main category of the Alert (also known as &quot;BPA&quot;). Values are: 500214 (SEPSIS BASE SRS) and 500216 (SEPSIS: SRS BASE FOR THE EMERGENCY DEPARTMENT).</td>
<td>Informational only.</td>
</tr>
<tr>
<td>PAT_ID</td>
<td>Unique ID of a patient. This is the Clarity Pat_id.</td>
<td>Used to identify one patient across many encounters</td>
</tr>
<tr>
<td>PAT_MRN_ID</td>
<td>MRN from the Clarity patient table.</td>
<td>Useful when doing any kind of QA.</td>
</tr>
<tr>
<td>DOB</td>
<td>Patient's birth date</td>
<td>Used for calculating Age_at_Start.</td>
</tr>
<tr>
<td>AGE_AT_START</td>
<td>Calculated age as of the Start_Time</td>
<td>Used by Visualization filters.</td>
</tr>
<tr>
<td>BILL_NUM</td>
<td>The Bill_Num in Clarity links to the Account_Number in legacy systems such as Invision, Signature, Quantum, TSI, etc. Sometimes it's not a direct link; for specific systems, you may have to strip off the check digit from bill_num, and skip the first character of the account_number.</td>
<td>Links to the TSI data for visualizations.</td>
</tr>
<tr>
<td>INPATIENT_DATA_ID</td>
<td>Clarity value from the pat_enc_hsp table.</td>
<td>Links to Flowsheet data in Clarity when creating the Fluids table.</td>
</tr>
<tr>
<td>FIRST_ADT</td>
<td>Earliest ADT &quot;effective time&quot; for this csn.</td>
<td>Informational only.</td>
</tr>
<tr>
<td>DEPARTMENT_ID</td>
<td>Unique ID of a hospital department</td>
<td>Allows reporting by department</td>
</tr>
<tr>
<td>DEPARTMENT_NAME</td>
<td>Descriptive name of a hospital department</td>
<td>Allows reporting by department</td>
</tr>
<tr>
<td>HOSP_SERV_C</td>
<td>Unique ID of a hospital service</td>
<td>Allows reporting by service</td>
</tr>
<tr>
<td>SERVICE</td>
<td>Descriptive name of a hospital service</td>
<td>Allows reporting by service</td>
</tr>
<tr>
<td>INP_ADM_DATE</td>
<td>Inp_adm_date from the pat_enc_hsp record in Clarity for this csn.</td>
<td>Informational only.</td>
</tr>
<tr>
<td>HOSP_ADMSN_TIME</td>
<td>Hosp_admsn_time from the pat_enc_hsp record in Clarity for this csn.</td>
<td>Informational only.</td>
</tr>
<tr>
<td>HOSP_DISCH_TIME</td>
<td>Hosp_disch_time from the pat_enc_hsp record in Clarity for this csn.</td>
<td>Informational only.</td>
</tr>
<tr>
<td>EMER_ADM_DATE</td>
<td>Emer_adm_date from the pat_enc_hsp record in Clarity for this csn.</td>
<td>Informational only.</td>
</tr>
<tr>
<td>ED_DEPARTURE_TIME</td>
<td>ED_departure_time from the pat_enc_hsp record in Clarity for this csn.</td>
<td>Used to determine if this visit began in the Emergency Department. Also, for patients who have returned to the hospital (the &quot;next_peh_admit&quot; field has a value), this date is compared with next_peh_admit to determine if the return was within 72 hours of discharge.</td>
</tr>
<tr>
<td>ADT_PAT_CLASS_C</td>
<td>Adt_pat_class_c from the pat_enc_hsp record in Clarity for this csn.</td>
<td>Used to determine if the patient was discharged directly from the ED, or was admitted to the hospital. 1 = Admitted. 2 = Discharged directly from the ED.</td>
</tr>
</tbody>
</table>
Establishing Algorithms

The sepsis registry is a collection of sepsis cases. Since sepsis has an onset and a terminus it is possible that one patient may be included here more than once. We speak in cases when we define the cohort.

MAP values are not directly used, rather MAP is calculated from BP flowsheet entries (flow_meas_id = 5) using this formula:
From Reactive to Predictive

Who is at risk of Sepsis?

What is my Sepsis rate?

Why do they get Sepsis?

Who should get Sepsis risk reduction intervention?
## A UC-Wide Clinical Data Repository

<table>
<thead>
<tr>
<th></th>
<th>PATIENT DIMENSION</th>
<th>OBSERVATION_FACTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>UCSD</td>
<td>2,156,004</td>
<td>21,013,128</td>
</tr>
<tr>
<td>UCI</td>
<td>1,426,986</td>
<td>25,130,449</td>
</tr>
<tr>
<td>UCSF</td>
<td>2,974,048</td>
<td>142,721,257</td>
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<tr>
<td>UCD</td>
<td>1,935,972</td>
<td>37,048,141</td>
</tr>
<tr>
<td>UCLA</td>
<td>~2,200,000</td>
<td>~40,000,000</td>
</tr>
<tr>
<td>TOTAL</td>
<td><strong>10,693,010</strong></td>
<td><strong>265,912,975</strong></td>
</tr>
</tbody>
</table>
UC-ReX – Brain cancer (Jul 25, 2012)

SHRINE

<table>
<thead>
<tr>
<th>Navigate Terms</th>
<th>Find Terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury and poisoning (800-999)</td>
<td></td>
</tr>
<tr>
<td>Mental, behavioral and neurodevelopmental disorders (290-319)</td>
<td></td>
</tr>
<tr>
<td>Neoplasms (140-239)</td>
<td></td>
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<tr>
<td>Benign neoplasms (210-229)</td>
<td></td>
</tr>
<tr>
<td>Carcinoma in situ (230-234)</td>
<td></td>
</tr>
<tr>
<td>Malignant neoplasm of bone, connective tissue, skin, and breast (170-176)</td>
<td></td>
</tr>
<tr>
<td>Malignant neoplasm of digestive organs and peritoneum (150-159)</td>
<td></td>
</tr>
<tr>
<td>Malignant neoplasm of genitourinary organs (179-189)</td>
<td></td>
</tr>
<tr>
<td>Malignant neoplasm of lip, oral cavity, and pharynx (140-149)</td>
<td></td>
</tr>
<tr>
<td>Malignant neoplasm of lymphatic and hematopoetic tissue (200-208)</td>
<td></td>
</tr>
<tr>
<td>Malignant neoplasm of other and unspecified tissue (190-199)</td>
<td></td>
</tr>
<tr>
<td>Malignant neoplasm of brain (191)</td>
<td></td>
</tr>
<tr>
<td>Malignant neoplasm of eye (190)</td>
<td></td>
</tr>
<tr>
<td>Malignant neoplasm of other and ill-defined sites (195)</td>
<td></td>
</tr>
<tr>
<td>Malignant neoplasm of other and unspecified parts of nervous system (192)</td>
<td></td>
</tr>
<tr>
<td>Malignant neoplasm of other endocrine glands and related structures (194)</td>
<td></td>
</tr>
<tr>
<td>Malignant neoplasm of thyroid gland (193)</td>
<td></td>
</tr>
<tr>
<td>Malignant neoplasm without specification of site (199)</td>
<td></td>
</tr>
<tr>
<td>Secondary and unspecified malignant neoplasm of lymph nodes (195)</td>
<td></td>
</tr>
<tr>
<td>Secondary malignant neoplasm of other specified sites (198)</td>
<td></td>
</tr>
<tr>
<td>Secondary malignant neoplasm of respiratory and digestive systems (197)</td>
<td></td>
</tr>
<tr>
<td>Malignant neoplasm of respiratory and intrathoracic organs (160-165)</td>
<td></td>
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<tr>
<td>Neoplasms of uncertain behavior (235-238)</td>
<td></td>
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<tr>
<td>Neoplasms of unspecified nature (239-239)</td>
<td></td>
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<tr>
<td>Neuroendocrine tumors (208-209)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Query Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Query Name: Malignant neoplasm @ 21:06:50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>Occurs &gt; 0</td>
<td>Exclude</td>
</tr>
<tr>
<td>Malignant neoplasm of brain</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Run Query | New Query | Print Query |
|-----------|-----------|-------------|

Previous Queries:
- Malignant neoplasm [21:08:50] [7-20-2012] [mhorganth]
- Neurofibromatosis [19:50:20] [7-20-2012] [mhorganth]
- Malignant neoplasm [19:18:14] [7-20-2012] [mhorganth]
- Malignant neoplasm [18:11:34] [7-20-2012] [mhorganth]
- Neurofibromatosis [20:41:09] [7-17-2012] [mhorganth]
- Neurofibromatosis [23:45:37] [7-16-2012] [mhorganth]

Query Status:
- Finished Query: "Malignant neoplasm @ 21:06:50"
  - UCD Node - 694 ±3 patients
  - UCSD - 643 ±3 patients
  - UCSF Node - 520 ±3 patients
  - UCI Shrinne - 1519 ±3 patients
- FINISHED [1.0 sec(s)]
"If you want a second opinion, I'll ask my computer."
Questions...