

# Beyond big health data



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**Cerner's mission is to contribute to the systemic improvement of health care delivery and the health of communities**





# How fast is the pace of change in medical knowledge?

“

Medical knowledge doubles every **19** years - physician needs 2 million facts to practice (NEJM)

1973

Medical knowledge doubles itself every **17** years.

Volume of new medical information doubles every **10 to 15** years and increases tenfold in 23 to 50 years

Medical knowledge doubles every **seven** years

Today it is recognized that medical knowledge doubles every **6–8** years, with new medical procedures emerging everyday

There are about 20,000 – 30,000 medical journals published and the amount of medical information doubles every **fifth** year

Medical information doubles every **four** years

Medical information doubles every **three** years

Medical knowledge doubles every **two** years ... and with that kind of growth it is nice to know that Children's Hospital of Michigan offers plenty of research

Clinical knowledge is estimated to double every **18 months**.

”

2013

Source: based on The Organization of Knowledge. Concepts of Information i218, Geoff Nunberg, UC Berkeley school of Information  
17 Feb 2009

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# What information consumes is rather obvious: it consumes the attention of its recipients

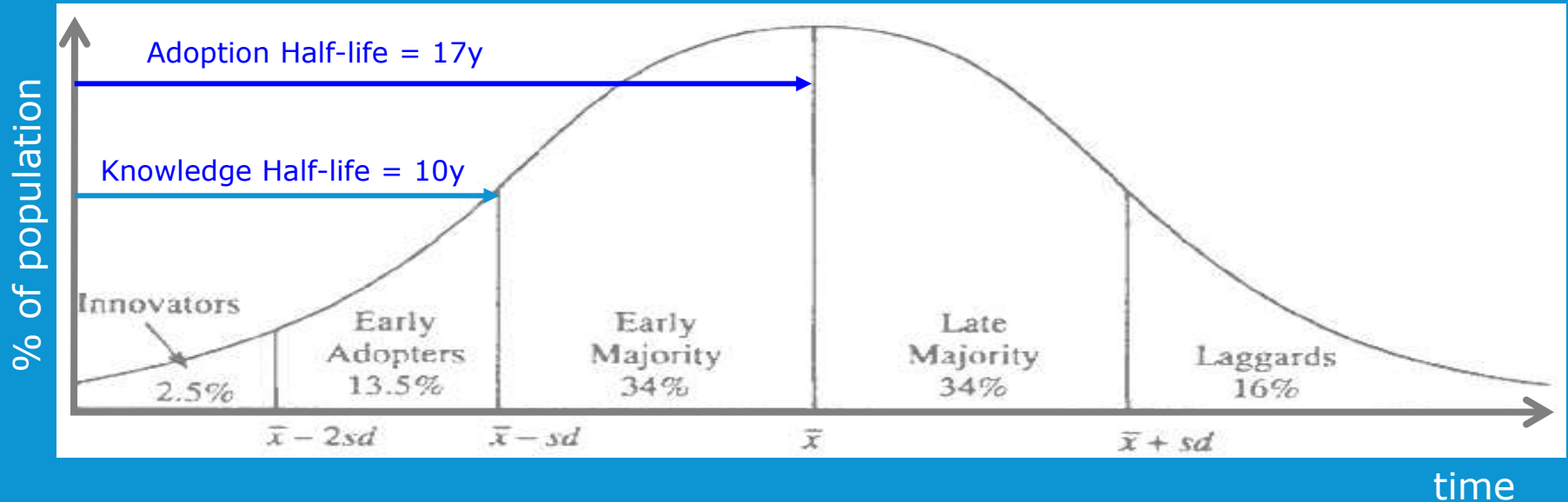


Hence a wealth of information creates a poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it

***Herbert A. Simon***  
***Nobel Laureate***  
***1971***

# Address slow innovation adoption

Time new knowledge discovered until ½ of physicians act on it = 15 - 17 years



Everett Rogers, Diffusion of Innovations, 1995

Balas, Boren. Managing Clinical Knowledge for Health Care Improvement.

Yearbook of Medical Informatics 2000



# Technology enabled decision support works

75% of decision support interventions succeed when the information is provided to clinicians automatically, whereas none succeed when clinicians are required to seek out the advice

Predictors of Success	Adjusted OR
Automatic provision of decision support as part of workflow	112.1
Provision of decision support at the time & location of decision making	15.4
Provision of recommendation rather than just an assessment	7.1
Computer-based generation of decision support	6.3

Kawamoto K, Houlihan CA, Balas EA, Lobach DF. Improving clinical practice using clinical decision support systems: a systematic review of trials to identify features critical to success. **BMJ.** 2005 Apr 2;330(7494):765. PMID: 15767266

# Integrating evidence based care

4 Fall Risk Scale Morse	<input checked="" type="checkbox"/>
History of Fall in Last 3 Months Morse	Yes
Presence of Secondary Diagnosis Morse	Yes
Use of Amb	
IV/Heplock	
Gait Weak	
Mental Stat	
Morse Fall R	

**Discern Notification Message**

Subject: Discern Alert

Priority Status: High Priority Value: 100

Event Date/Time: 03/04/2013 16:22:56

Message class/subclass: APPLICATION/DISCEARN

NAME: Jurek, Scott

DATE: 03 April, 2013 16:22:56 WEST

MRN: BWMC 00

**Morse Fall Risk**

View

- Orders for Signature
- Plans
- Suggested Plans (2)**
  - Interdisciplinary
    - Fall Prevention and Man:
  - Care Team
    - Interdisciplinary Care Pl:
- Orders
  - ☐ Patient Status
  - ☐ Vital Signs
  - ☐ Activity
  - ☒ Diet
  - ☒ Patient Care
  - ☐ IV Solutions

Your documentat  
"At Risk for Falls"  
Management" Pl

Initiate Accept Reject

	Offset	Component	Status	Dose ...	Details
<b>Fall Prevention and Management EBP Adult, High Fall Risk Management</b>					
Suggested On: 3/21/2013 9:48 AM					
<b>Outcomes</b>					
<input checked="" type="checkbox"/>		Verbalizes Understanding of Fall Risk/Precaution			By Phase End
<input checked="" type="checkbox"/>		Patient Specific Fall Injury Risk Factors			During Phase
<input checked="" type="checkbox"/>		Takes Action to Control Fall Related Risks			By Phase End
<input checked="" type="checkbox"/>		Adherence to Fall Risk Specific Precautions			During Phase
<b>Interventions</b>					
<input checked="" type="checkbox"/>		Fall Interventions High Risk			q8hr
<input checked="" type="checkbox"/>		Education Fall Risk Prevention			Constant order
<input checked="" type="checkbox"/>		Communicate Environmental Safety Plan			During Phase
<input checked="" type="checkbox"/>		Fall Risk Alert System in Place			During Phase
<input type="checkbox"/>		Work w Physician to Assure Assistive Device Eval is Complete			During Phase
<input type="checkbox"/>		Collaborate with physician for Physical Therapy to evaluate gait, balance, and transfer mobility			



# Clinical performance improvement



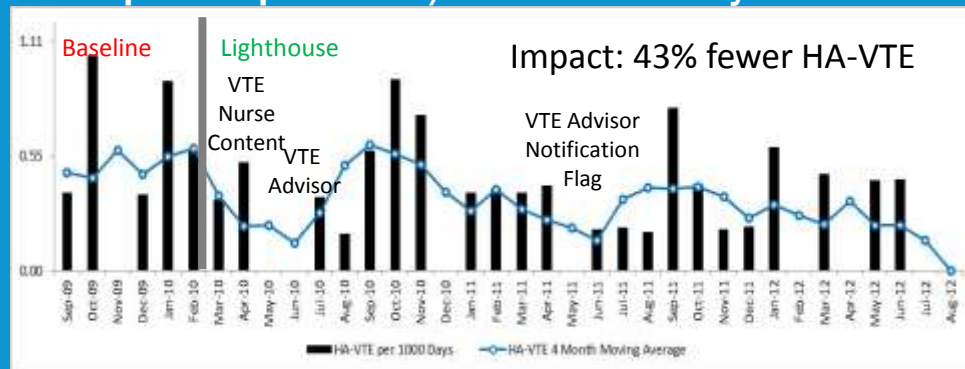
In 3 years:

- 43% fewer VTE's
- 47% fewer 30 day readmissions

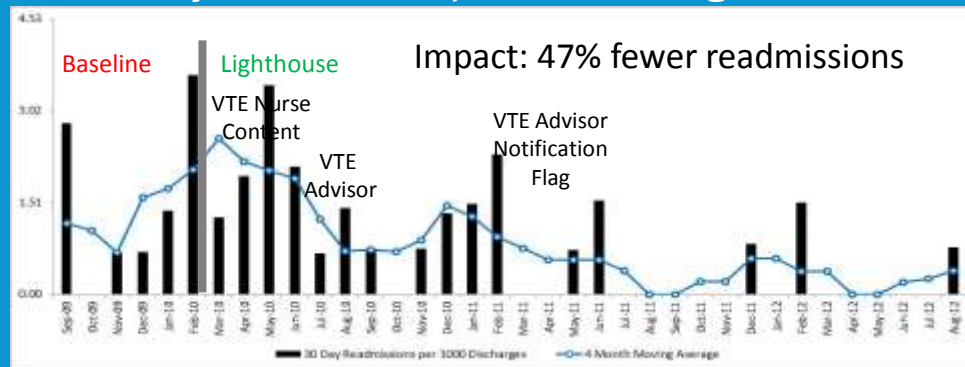
Avoided

- 46 DVTs
- 22 PE's
- 4 patient deaths
- 1,509 high acuity bed days

## Hospital Acquired VTE / 1000 Patient Days

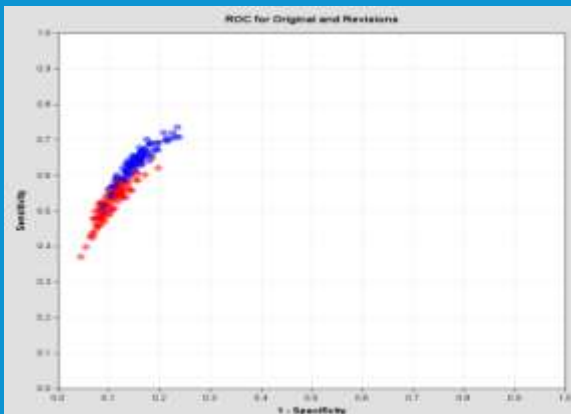


## 30 Day Readmissions / 1000 Discharges



# Using technology to improve clinical algorithms

- Original alerting 35%
- Need good specificity and sensitivity, but less alerts
- Health Facts identified over 68,000 patients that met study criteria



	V1	V6	V13
<b>SIRS</b>			
Temp.	<36°C or >38°C	<36°C or >38°C	<36°C or > <b>38.3°C</b>
HR	>90 bpm	> <b>95 bpm</b>	> <b>95 bpm</b>
RR	>20 bpm	> <b>21 bpm</b>	> <b>21 bpm</b>
Glucose	>120 mg/dL	>120 mg/dL	> <b>120 mg/dL</b> and < 200 mg/dL
WBC	> 12k or <4k	> 12k or <4k	> 12k or <4k
Bands	> 10%	> 10%	> 10%
Mental status change	Acute Δ	<b>Acute Δ</b>	<b>Acute Δ</b>
<b>OD</b>			
SBP	< 90 mmHg	< 90 mmHg	< 90 mmHg
SBP decrease	Δ > 40 mmHg	Δ > 40 mmHg	<b>Δ &gt; 40 mmHg</b>
MAP	< 65 mmHg	< 65 mmHg	< 65 mmHg
Lactate	> 2.0 mmol/L	> 2.0 mmol/L	> 2.0 mmol/L
Creatinine	> 2 mg/dL	> 2 mg/dL	> <b>2 mg/dL</b> Increase ≥ .5 mg/dL
Bilirubin	> 2 mg/dL	> 2 mg/dL	> 2 mg/dL and < 10 mg/dL
Platelets	< 100k	< 100k	<b>&lt; 100k</b>
Mental status change	-	<b>Acute Δ</b>	<b>Acute Δ</b>
INR/PTT	> 1.5 or > 60 sec.	> 1.5 or > 60 sec.	<b>&gt; 1.5 or &gt; 60 sec.</b>
PaO2/FiO2	< 300	< 300	<b>&lt; 300</b>
<b>Processing logic</b>			
OD lookback period	48 hr.	48 hr.	<b>12 hr. for lactate, 30 hr. all others</b>
<b>Alert Operating Characteristics</b>			
Alert Rate	35%	25%	15%
Sensitivity	84%	63%	70%
Specificity	65%	71%	80%

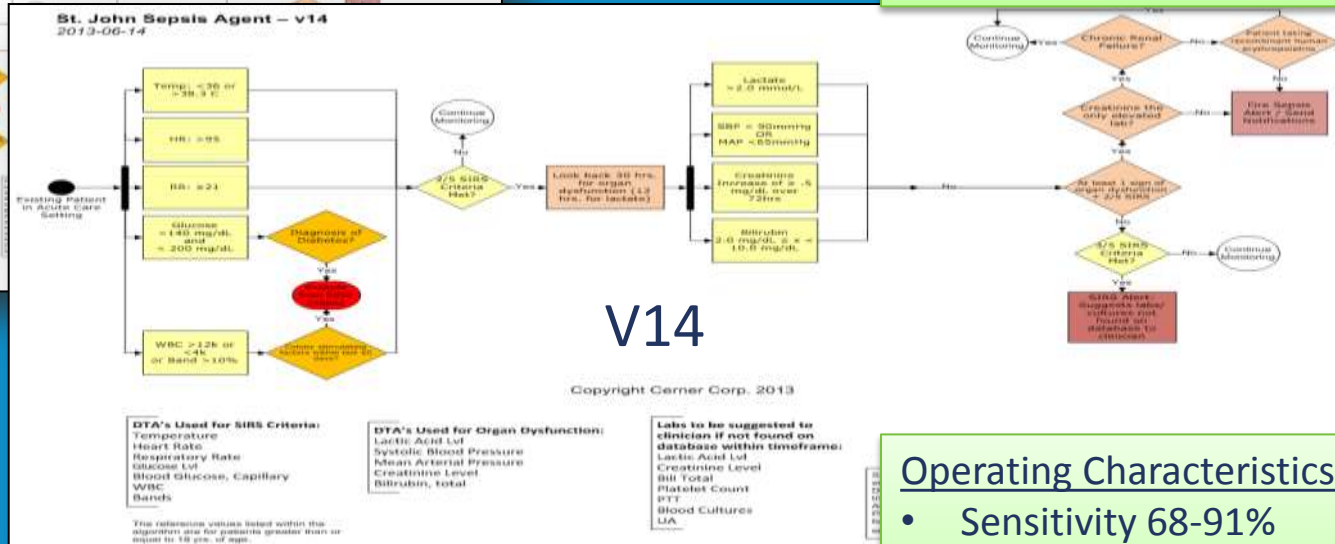
To match our Health Facts Simulation it would take over 4 years to accumulate enough cases to perform the same tests



# Sepsis Identification

## Monitoring

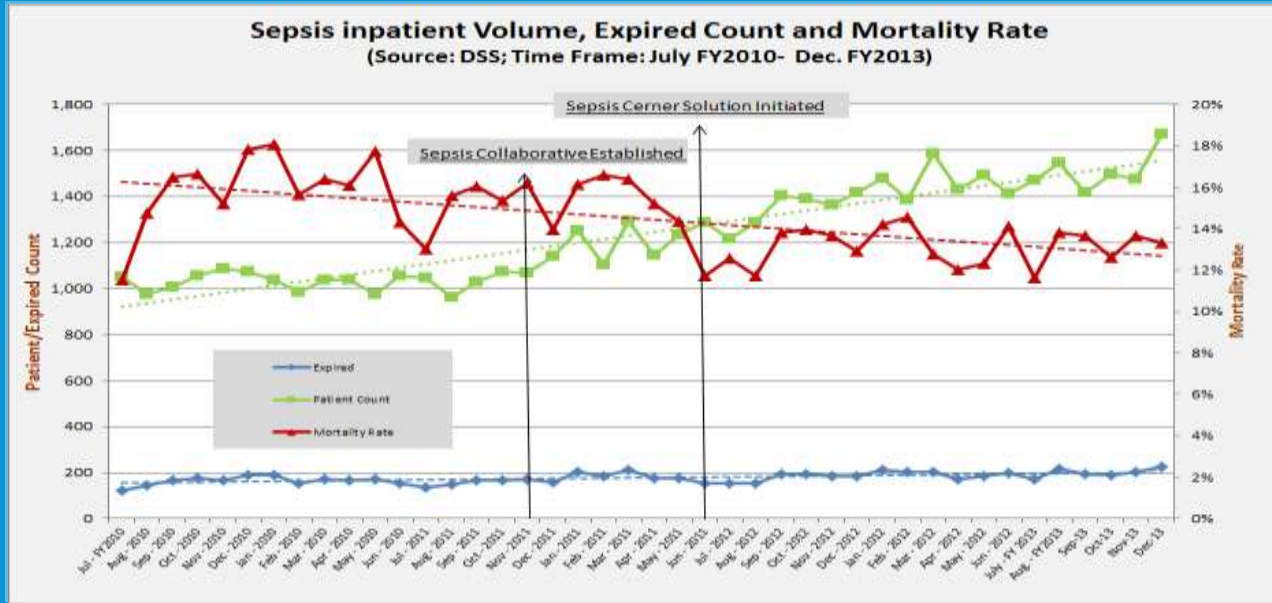
- Over 130 facilities
- 32,960 persons per hour
- 791,040 lives per day



## Operating Characteristics

- Sensitivity 68-91%
- Specificity 91-97.6%
- PPV up to 68%

# Trinity Health Sepsis Performance Trends



- 506 lives saved over 2 yrs
- 33% ↑ case identification
- Sepsis mortality ↓15.8 to 13.3% all categories
- Simple Sepsis to Septic Shock progression ↓12%
- Sepsis LOS ↓0.9 days (severe 1.4 days)

## &gt; My Sepsis Dashboard

2009 - 2014 ▾

Q1 - Q4 ▾

Select Months ▾

Export ▾

## Grace Medical Center

Sepsis LOS **9.2**

Septic Shock LOS **11.8**

**Mortality % 27.5%**

Total Deaths **46**

Septic Shock % **21%**

Incidence % **2%**

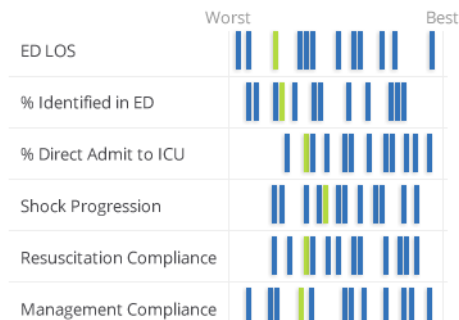
Shock Progression % **28%**

Resuscitation Bundle % **38%**

Management Bundle % **22%**

## Peer Comparison

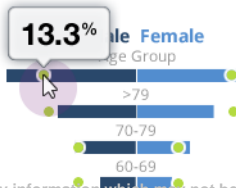
🔍 Grace Medical Center



## KPI Impact



## Sepsis Incidence (% of population)





**1,871**  
organizations

## ORGANIZATION PROFILE

### 10 Acute Care Hospitals

- 1 Children's Hospital
- 5 Level 1 Trauma Centers
- 4 Teaching Hospitals
- 4 Magnet Designations
- More than 250 Sites of Care



**4,174**  
providers



Advocate  
Physician Partners

**11,292**  
unique users



## DATA SOURCES



**20**  
unique data  
sources

## LIVES

Largest clinically  
integrated ACO  
in the nation



**500,000+**  
at-risk  
covered lives

## ENABLED CAPABILITIES

- Registries
- Scorecards
- Analytics
- Outreach
- Pharmacy Management
- Announcements

“Very intuitive – able to sort and filter to view our data in many different ways. Able to **assess and measure our outcomes to drive improved quality and efficiency.**”

- Thomas Holmes, MD, Internal Medicine

## CLIENT FEEDBACK

“I value how easy it is to search the database and use this information to **improve patient care.**”

- Kathy Niebling, Quality Improvement  
& Clinical Integration Manager

“It's great how health care has grown with technology and how we can **monitor our patients' chronic diseases more closely.**”

- Rosemary Reiker, Quality Improvement Specialist



# Advocate Cerner Collaborative (ACC)

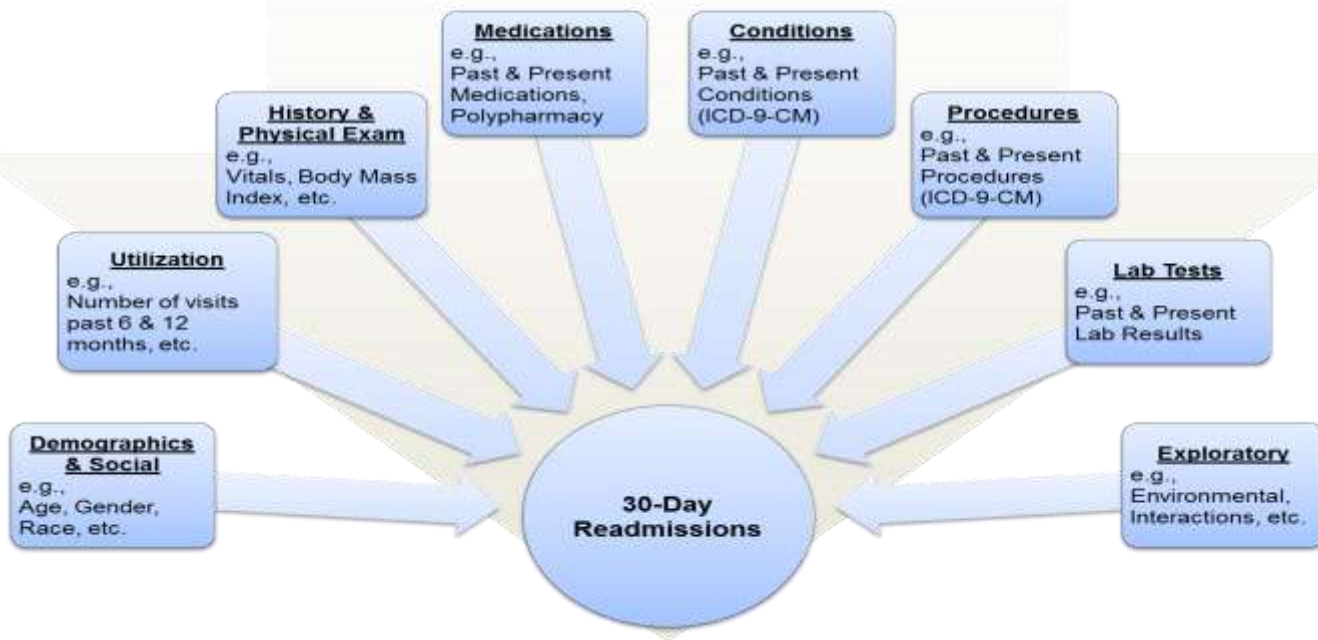
- Mission
  - Leverage Advocate's experience in clinical integration and Cerner's experience in health care automation to improve population health management capabilities
- Together the collaborative team will innovate to:
  - Identify /risk stratify patients at risk
  - Facilitate appropriate and early interventions
  - Guide care across the continuum







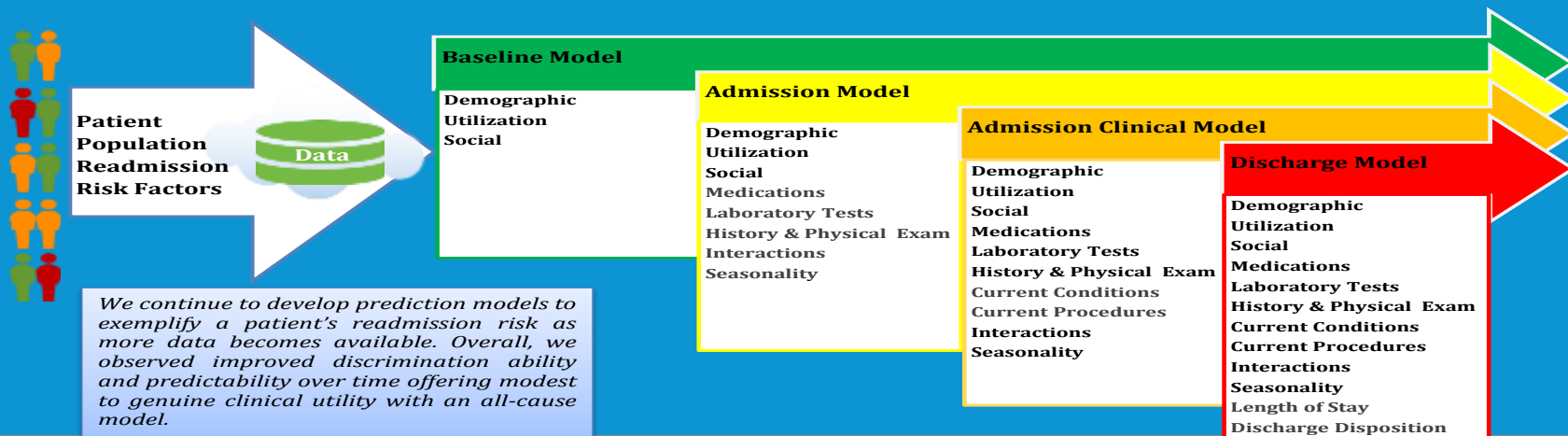
**Readmission Risk Factors Analyzed > 700**



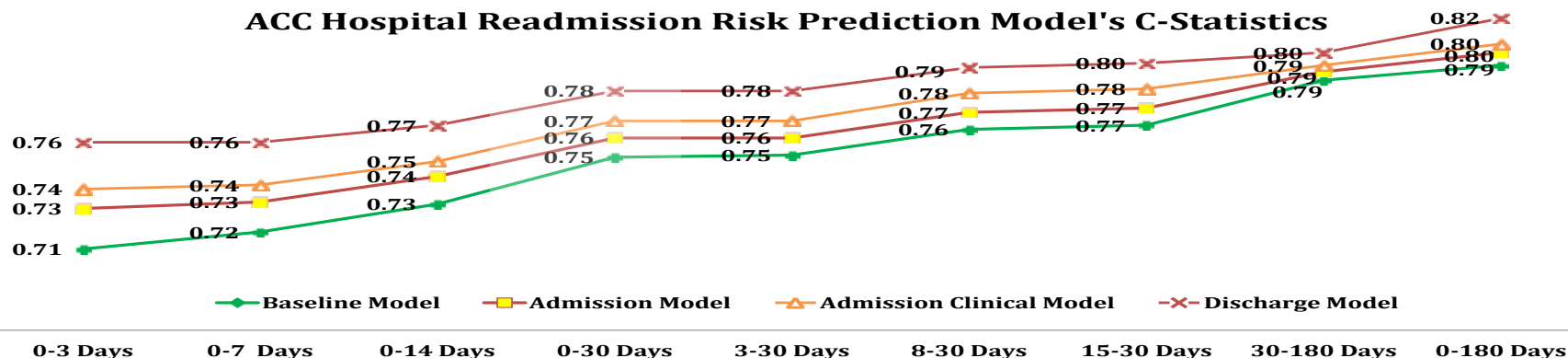
- 192,000 people with hospitals encounters
- 8 hospitals in Chicago-land area
- Analyzed observation, medical, and surgical patients
- Considered all conditions except mental health



# Readmission Prediction Model



ACC Hospital Readmission Risk Prediction Model's C-Statistics



# Interdisciplinary Plan of Care

The screenshot displays a medical software interface for a patient named Fred Sledog. The patient's information includes DOB 3/11/1937, Age 76 years, Gender Female, and a location of Loc 4 North - ICU: 405. The interface shows a list of orders under the 'PowerOrders' section, with a 'Medication List' tab selected. A red arrow points to a specific order: 'Verbalizes Understanding of Fluid Volume Excess Management', which is marked as 'By Phase End'. A callout box explains that healthcare providers or preventionists select goals, interventions, and specialty consults to individualize the IPOC to the patient's disease process. The interface also includes a 'Menu - All' sidebar with various options like 'Home Summary', 'Neonate Summary', 'ICU Summary', 'Patient Case Summary', 'ICU Dashboard DEMO', 'Medication List', 'Vital Signs', 'Lab', 'Radiology', 'Assessments', 'I-View & PowerNote', 'Lines/Tubes/Drains M/Lage', 'ICP Summary', 'Problems and Diagnosis', 'Patient Information', 'Form Browser', 'Medication Profile', and '24 HR Physician Rounds Report'.

Readmission, IPOC - 00023123 - Opened by Kirkland, Kerry

Task Edit View Patient Chart Links Notifications Options Current Add Help

Patient List Patient Access List LearningLIVE Multi-Patient Task List In-Bed APACHE Staff Assignment Tracking List MedWatch ADE List

Links Task Off Attach Change Interpret Change Entry EGR Calculator Ad Hoc Depart Patient Education Explorer Menu New Sticky Note

Readmission, IPOC Sledog, Fred

DOB: 3/11/1937 Age: 76 years ENR: 00023123 Gender: Female Fin #: 000027062 Loc: 4 North - ICU: 405

Menu - All

- Orders
- Home Summary
- Neonate Summary
- ICP Summary - DEV
- Flowchart
- Patient Case Summary
- ICU Dashboard DEMO
- Medication List
- Clinical Tools
- EasyScript
- Document Viewing
- Vital Signs
- Lab
- Radiology
- Assessments
- I-View & PowerNote
- Lines/Tubes/Drains M/Lage
- ICP Summary
- Problems and Diagnosis
- Patient Information
- Form Browser
- Medication Profile
- 24 HR Physician Rounds Report

Orders

PowerOrders

+ Add Document Medication by M Reconciliation Check Interactions

Status Meds History Adm. Meds Rec Disch. Meds Rec

Orders Medication List Document In Plan

View

Orders for Sg Plans

- Document
- Interdiscipl
- Readmissi
- Suggested P
- Interdiscipl
- Medicatio
- Delirium
- Pressure
- Orders
- Admit/T
- Patient I
- Activity
- Laborato
- Procedu
- Diet/Nut
- Continu
- Medicati
- Radiolog

Component

Component	Status	Details
Verbalizes Understanding of Heart Failure	By Phase End	
Verbalizes Understanding of Fluid Volume Excess Management	By Phase End	
Smoking Cessation	During Phase	
Activity Precautions	During Phase	
Weight Monitoring	During Phase	
Diet/Nutrition	During Phase	
Fluid Restriction	During Phase	
Symptom Monitoring Fluid Volume Excess	During Phase	
Disease Process	During Phase	
When to Call 911	During Phase	
Verbalize Understanding of AMI	By Phase End	
Cardiac Rehabilitation	During Phase	
Smoking Cessation	During Phase	
Physical Limitations	During Phase	
Physical Activity Plan	During Phase	
Diet/Nutrition	During Phase	
Disease Process	During Phase	
When to Call 911	During Phase	
Verbalizes Understanding of Pneumonia	By Phase End	

Healthcare Provider or Preventionist will select the goals, interventions and specialty consults to individualize the IPOC to the patient's disease process.

Details

Diagnosis In Related Results

On Table

Initiate Orders For Signature

CMTDEV KK017082 March 11, 2013 2:13 PM CDT



- 2012 paying out 68% of at-risk dollars in readmission penalties. End of 2013 dropped to 13% of at-risk dollars
- Readmission rates were 4% higher among high risk patients that did not receive readmission prevention ( $p < .001$ )
- 12% of high risk patients (N=4116) with COPD who received COPD education (N=68) were readmitted while 24% of COPD patients without education were readmitted ( $p = .02$ )

“What Advocate and Cerner are doing together around readmissions is about 15-20% better than anything that exists in the industry today”

Dr. Rishi Sikka, Senior VP of Clinical Transformation for Advocate Health Care

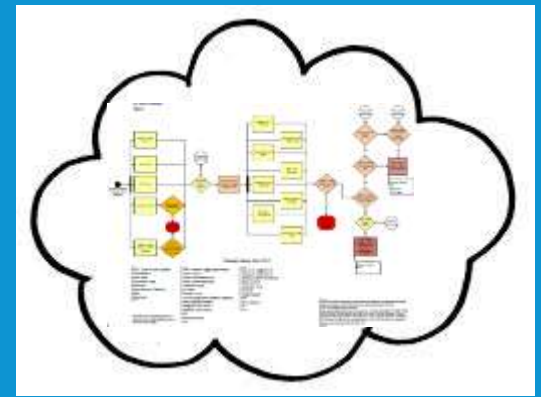
## 1<sup>st</sup> Generation



## 2<sup>nd</sup> Generation



## 3<sup>rd</sup> Generation





Health care is too important to stay the same.<sup>™</sup>

