"Working Smartly: Better Communication and Reduced Error through Improved Clinical Informatics"

Healthcare Transformation Services

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innovation you

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Data, Data Everywhere

How do we keep from missing what is truly important?

"We failed to anticipate Pearl Harbor not for want of the relevant materials, but because of a plethora of irrelevant ones."

Attributed to Roberta Wohlstetter

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Objective

At the end of the session, the attendee will be able to:

- Describe challenges faced while attempting to gather information from existing data sources
- Provide examples of how those challenges have been addressed and mitigated through improved clinical informatics

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Pressure on caregivers has never been greater

Healthcare workers are under pressure to deliver better quality, value, and outcomes

While being productive and efficient in an era of interruptions and information and data overload

A provider must review data and information from multiple/disparate systems: i.e. labs, meds, vitals, X-rays, etc.

Errors in ICU care delivery

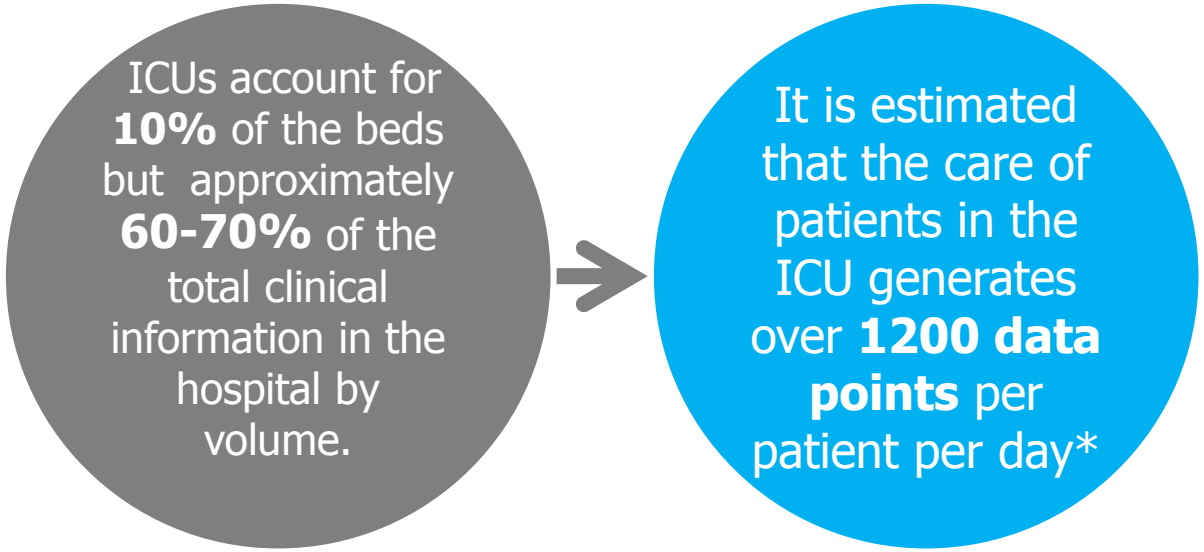
Clinicians today are frustrated with cumbersome EMRs and multiple platforms required to access to receive relevant patient data

One study reported that an average of **178 processes** of care were delivered to the ICU patient per day of stay with 1.7 of those associated with some error[2]. The same study identified 554 errors and over **200 serious errors** in a single ICU over a 4-month period

Healthcare must make better use of the abundance of data available in order improve care quality and the patient experience

Data, Data Everywhere In Critical Care

It is difficult to determine which data is relevant



*]. O. ManorShulman, J. Beyene, H. Frndova, C.S. Parshuram, Quantifying the volume of documented clinical information in critical illness, J. Crit. Care 23 (2008) 245–250.

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Data, Cognitive Load, and Patient Safety

Research by Patricia Potter, PhD, RN, FAAN

- “Cognitive load is about how many activities and distinct pieces of information a person holds in his or her head at any one time.”
- “It’s brain flow not work flow.”
- "[The cognitive work] is invisible to the eye, but it is the stress of what the work is. If that breaks down, if the person just can't carry all that in her head or can't get interrupted and go back, and loses focus, that's a **safety issue.“**

Karen Zander, RN, MS, CMAC, FAAN, in “Cognitive Load Increasing In Health Care,” AHCA Media, April, 2017 discussing Potter’s research

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Cognitive Overload Can Lead To Adverse Events

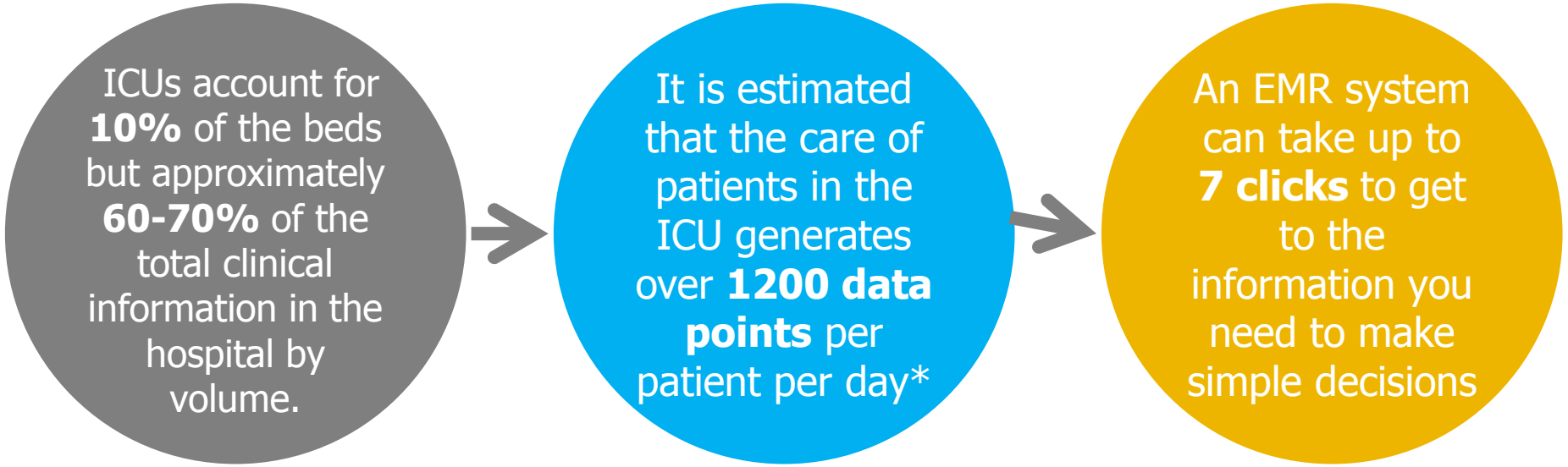
Potential consequences of Adverse Events

- Preventable adverse events are a leading cause of death in the United States
- Studies have shown that between 44,000 and 98,000 Americans die in hospitals each year as a result of medical errors.
- This is the equivalent of a jumbo jet a day crashing
- Total national costs (lost income, lost household production, disability, health care costs) are estimated to be between $17 billion and $29 billion for preventable adverse events.

To Err Is Human, 1999

Data, Data Everywhere In Critical Care

It is difficult to determine which data is relevant



*]. O. ManorShulman, J. Beyene, H. Frndova, C.S. Parshuram, Quantifying the volume of documented clinical information in critical illness, J. Crit. Care 23 (2008) 245–250.

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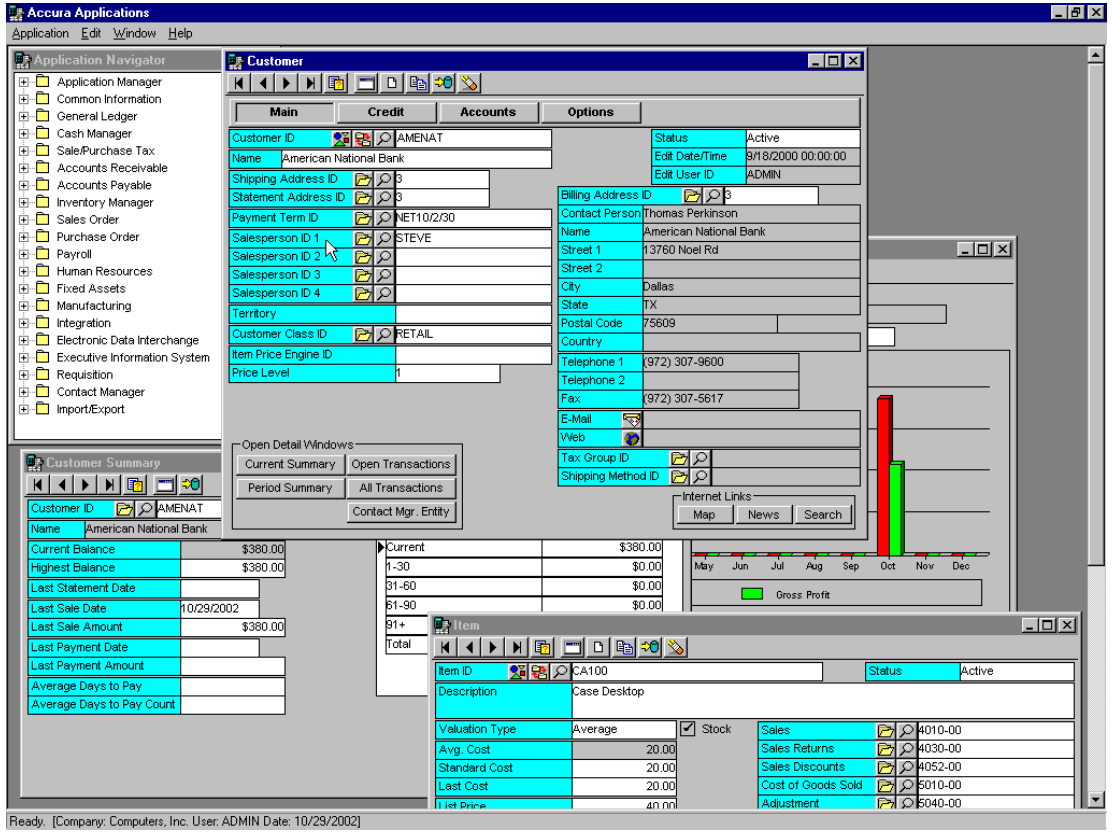
Question: Which of these is an EMR?



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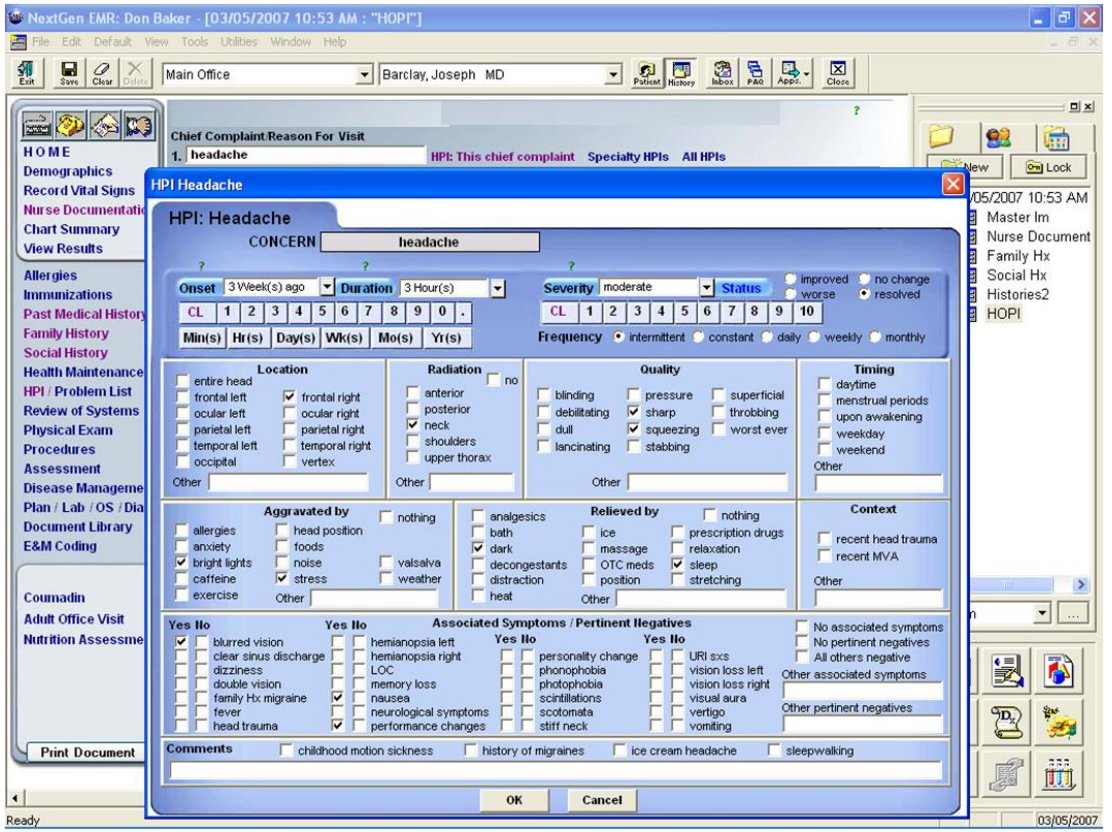

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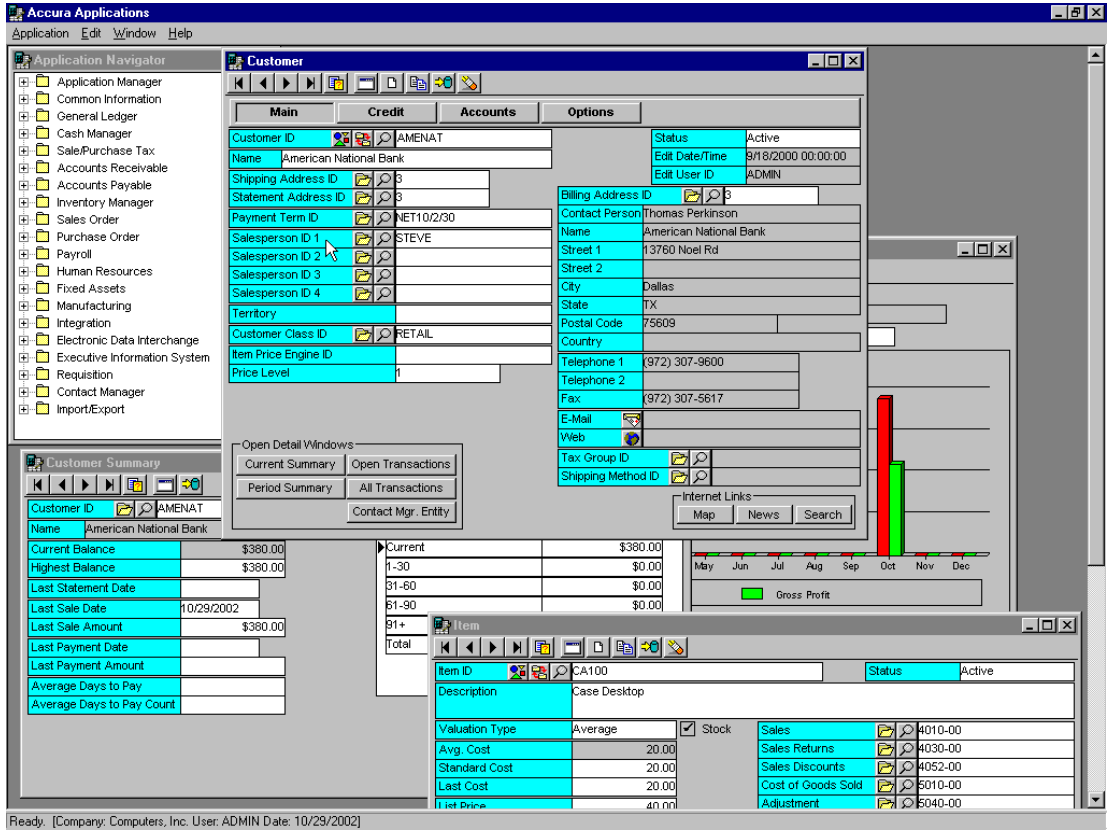
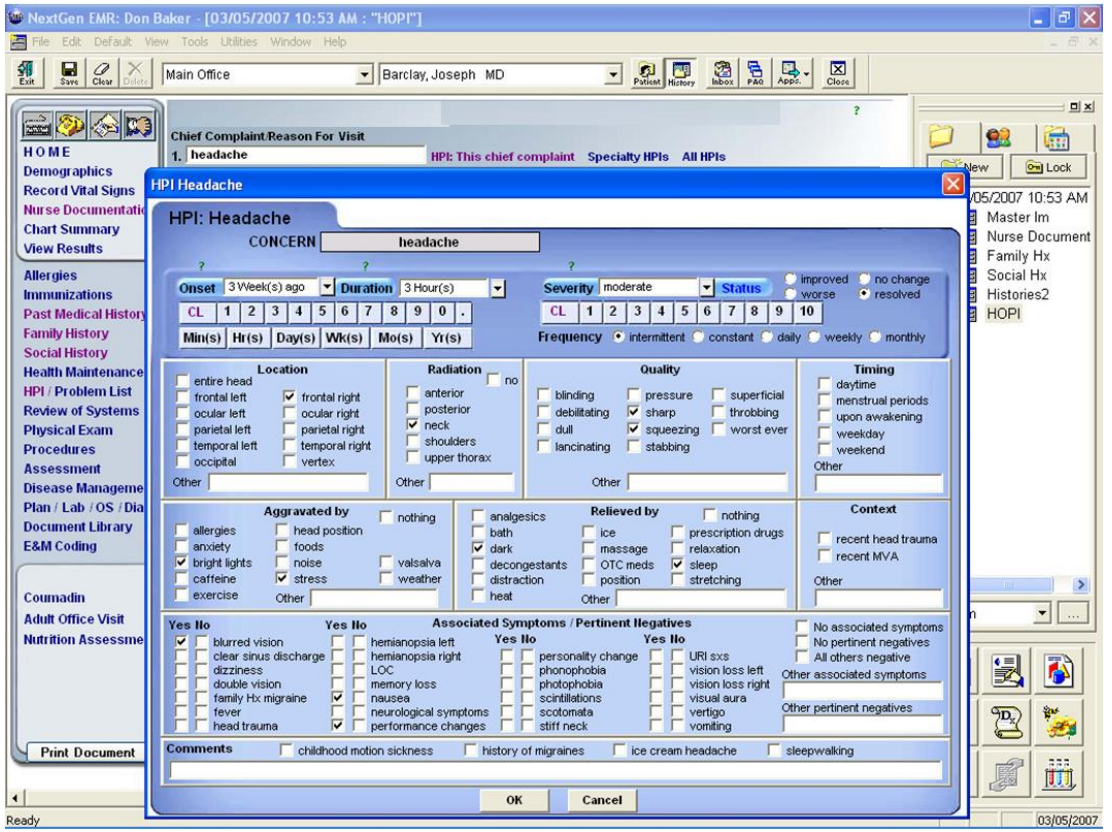
Question: Which of these is an EMR?



Accounting System



EMR

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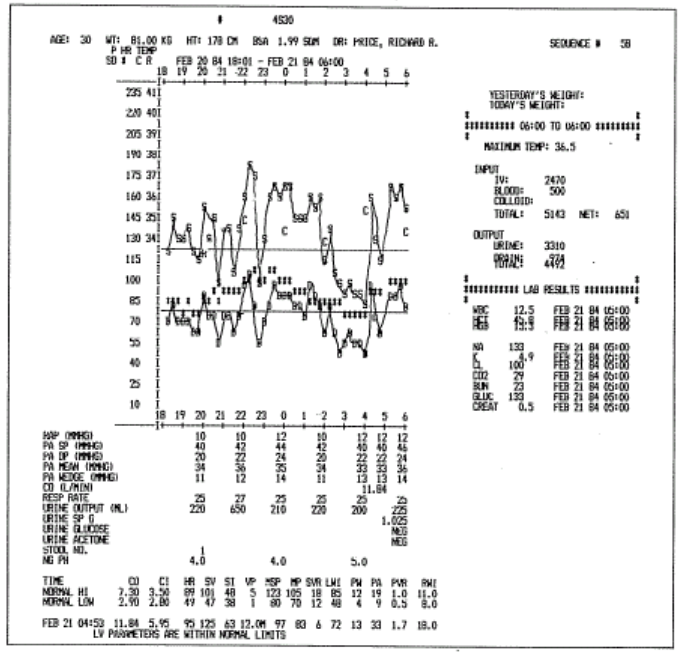

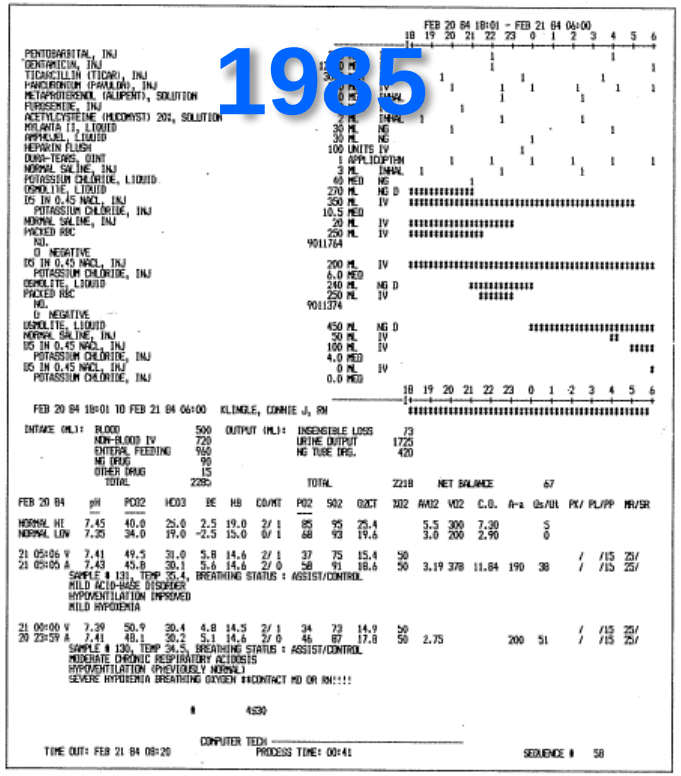

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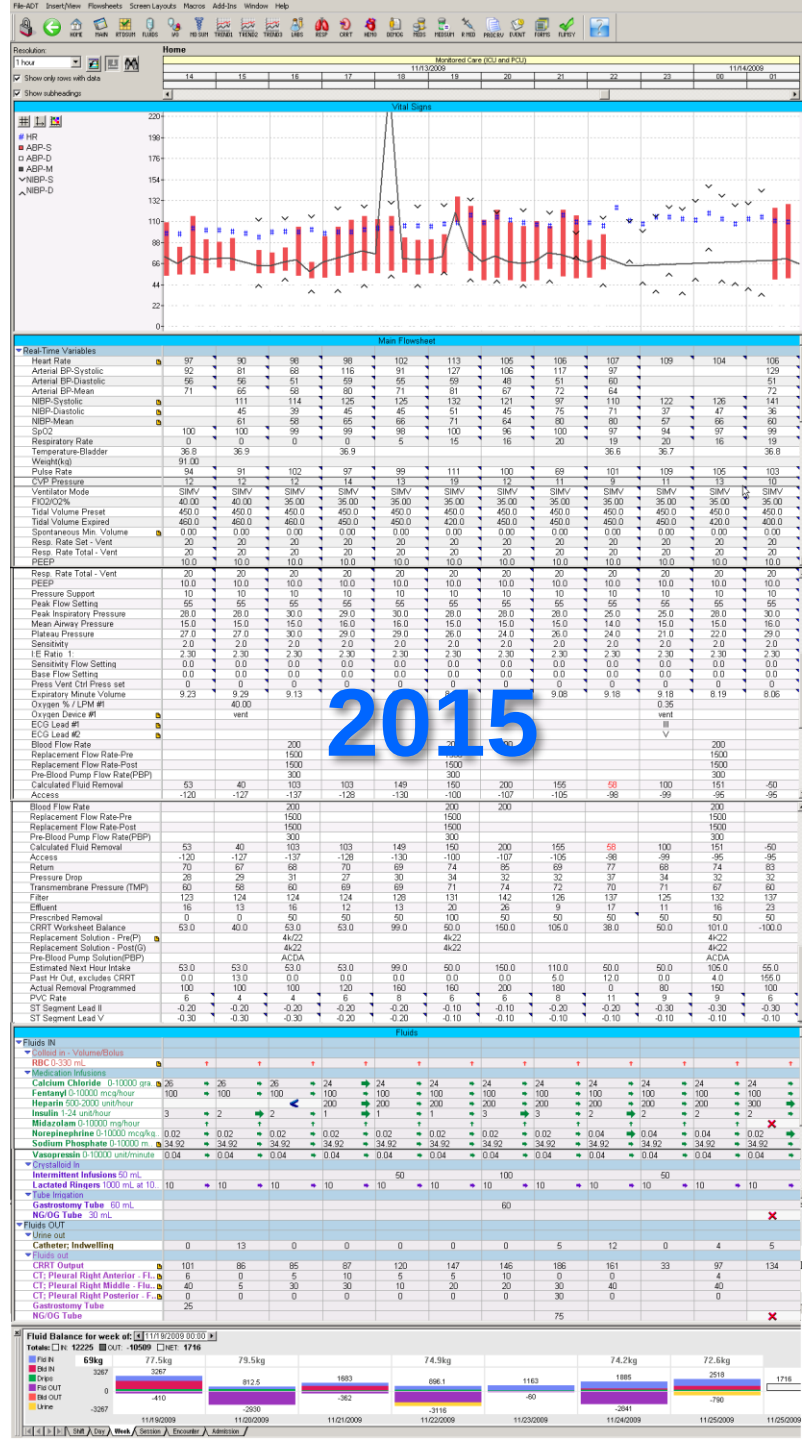
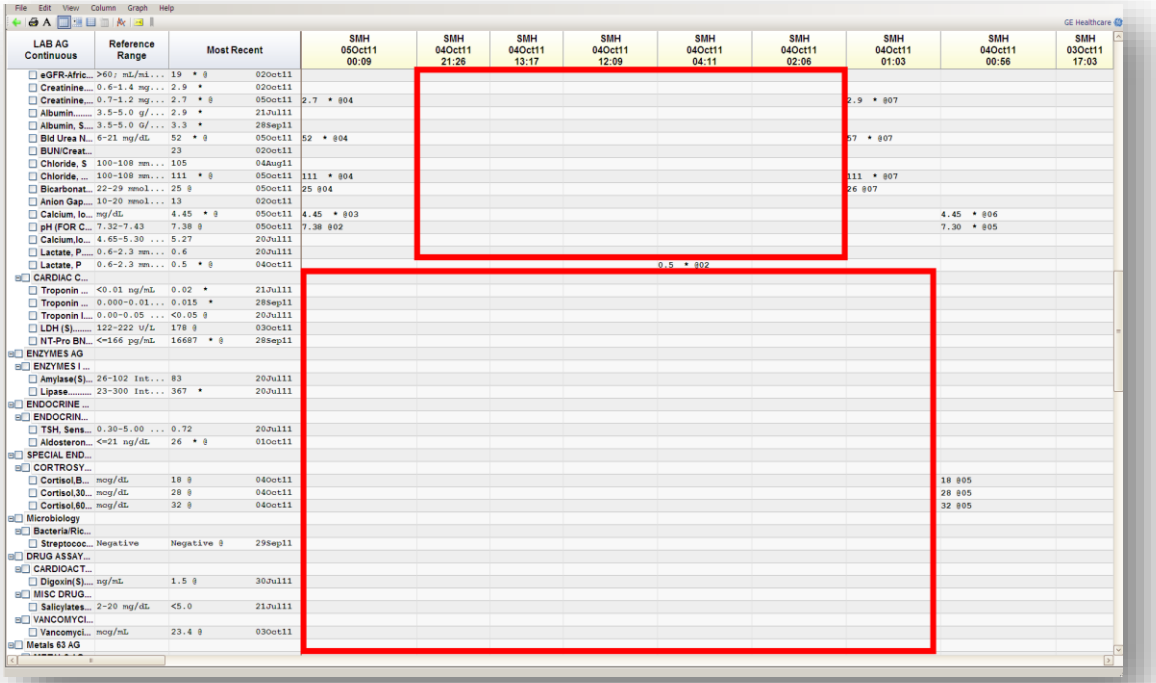
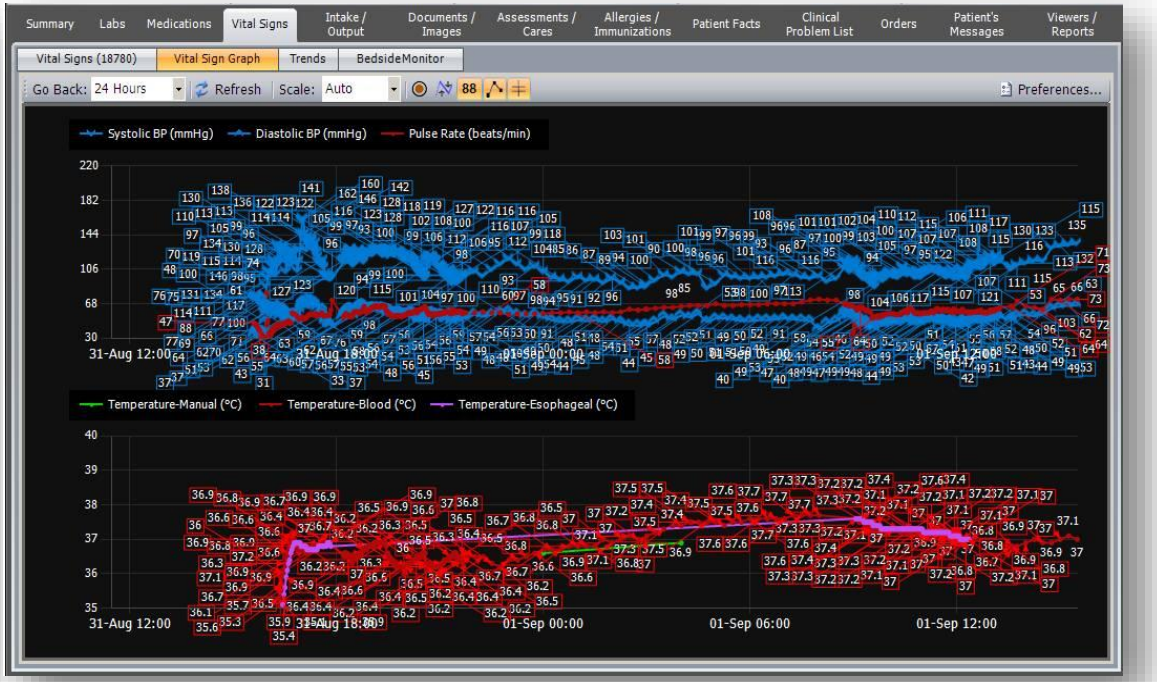


2015

EMR Data

Can be not enough or too much





LACK OF INFORMATION

INFORMATION OVERLOAD

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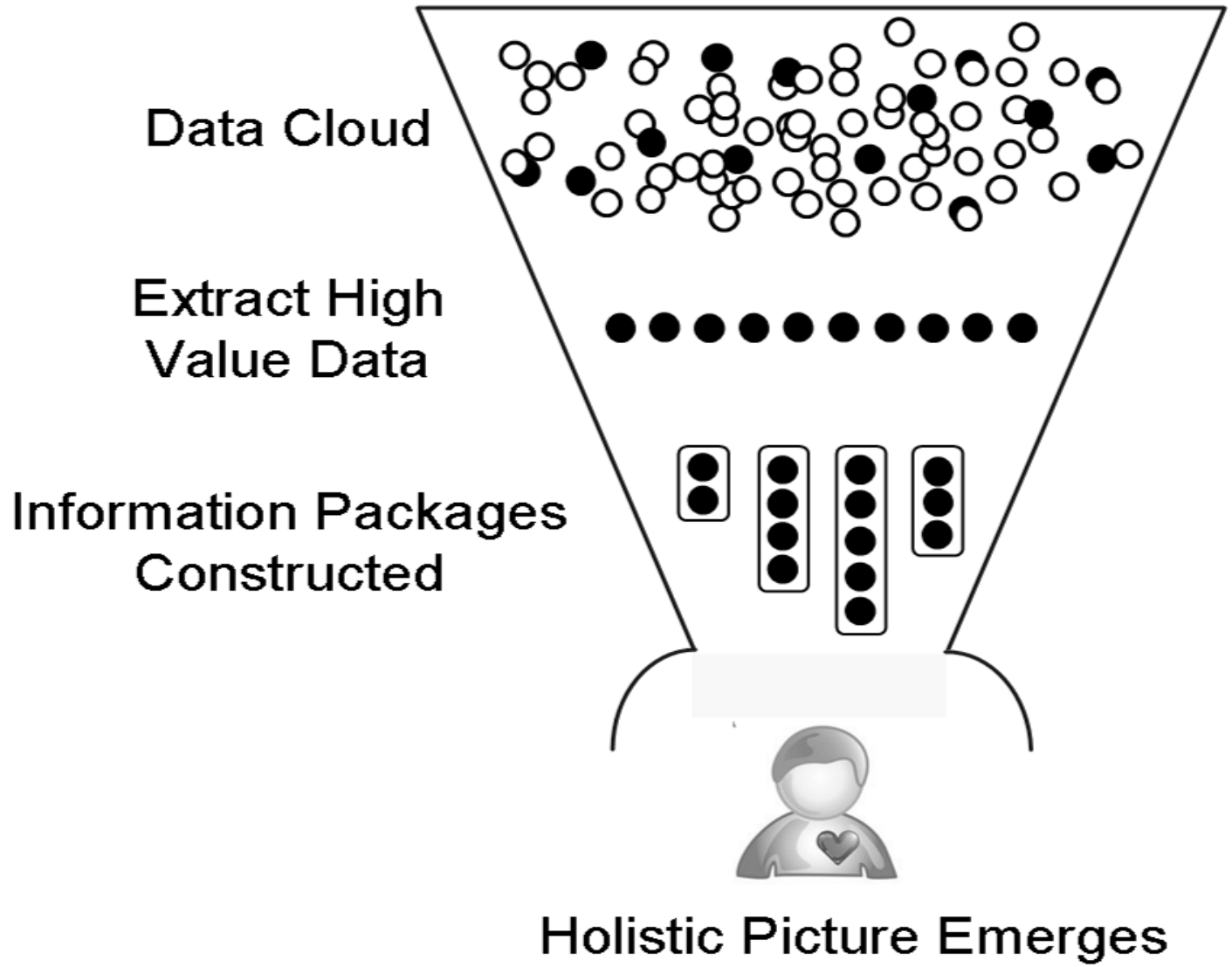
How clinician* works



*** - and AWARE**

Ambient Warning And Response Evaluation (AWARE)

Developed at Mayo with intent to focus on the patient rather than the service

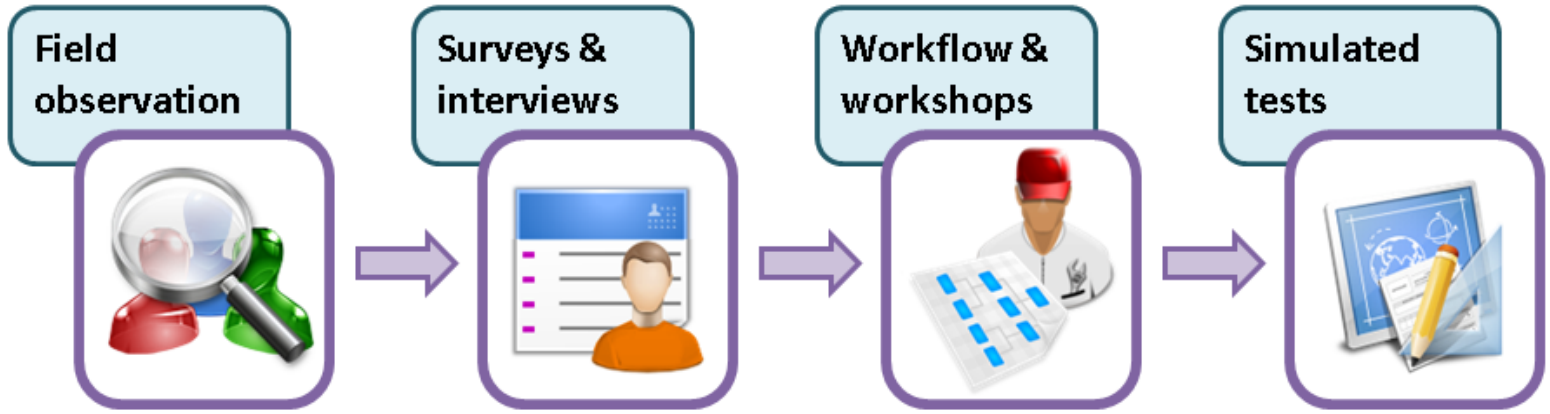
- Mayo physicians recognized prevalence of medical errors and the relationship to information overload in the ICU.

- They were frustrated with the database-centric nature of their Electronic Medical Record

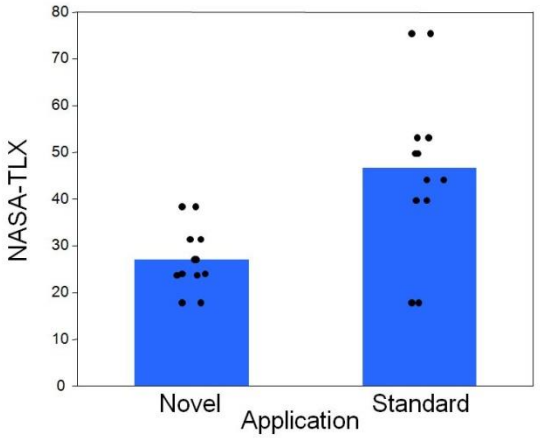
- The clinicians wanted to:
  - Identify, filter and display the most relevant and high priority patient data from multiple data systems in a single application
  - Present the information in an organized dashboard format to save clinicians time
  - Allow clinicians to make decisions better, faster and more collaboratively

AWARE Was Provider Built

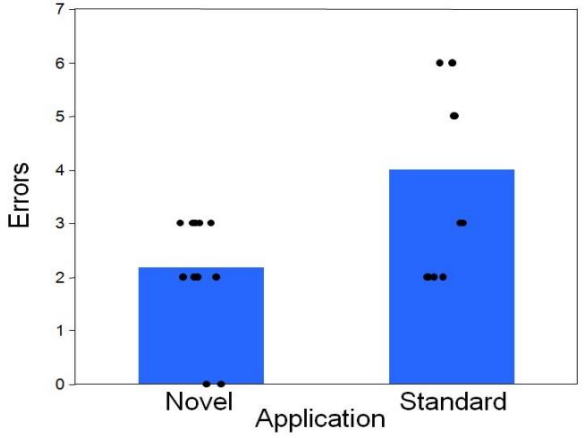
Tested and evaluated at Mayo



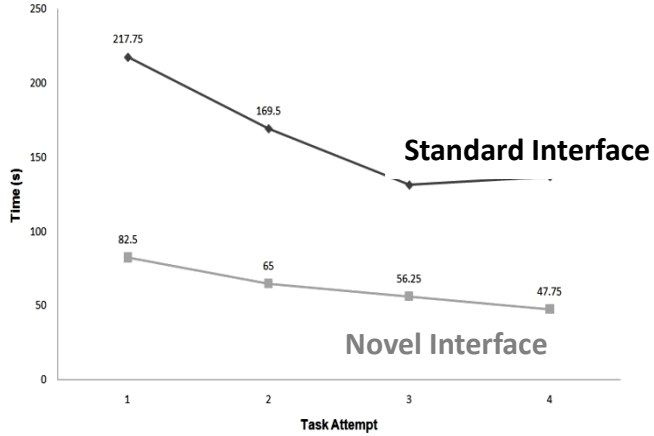
Reduced cognitive load (happy clinicians)



Reduced errors (happy patients)



Reduced time (happy administrators)



Ahmed A, Chandra S, Herasevich V, et al. The effect of two different electronic health record user interfaces on intensive care provider task load, errors of cognition, and performance. Critical Care Medicine 2011;39(7):1626-1634.

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CMS Innovation grant to Mayo Clinic

Developing a patient centered cloud-based CDS solution for ICU

CMS

$16M

3 year study

Cloud-based system: combines centralized data repository with electronic surveillance and quality measurement of care responses

Mayo Clinic, coordinator
AWARE application

Ambient Warning and Response Evaluation

Partners

Philips
Data aggregation, cloud calc and analytics engine

USCIITG
Design and execution of clinical studies

NIH's US Critical Illness and Injury Trials Group

> 12 ICUs
across 4 U.S. States

Expected outcome:
>$80M total savings
over study period

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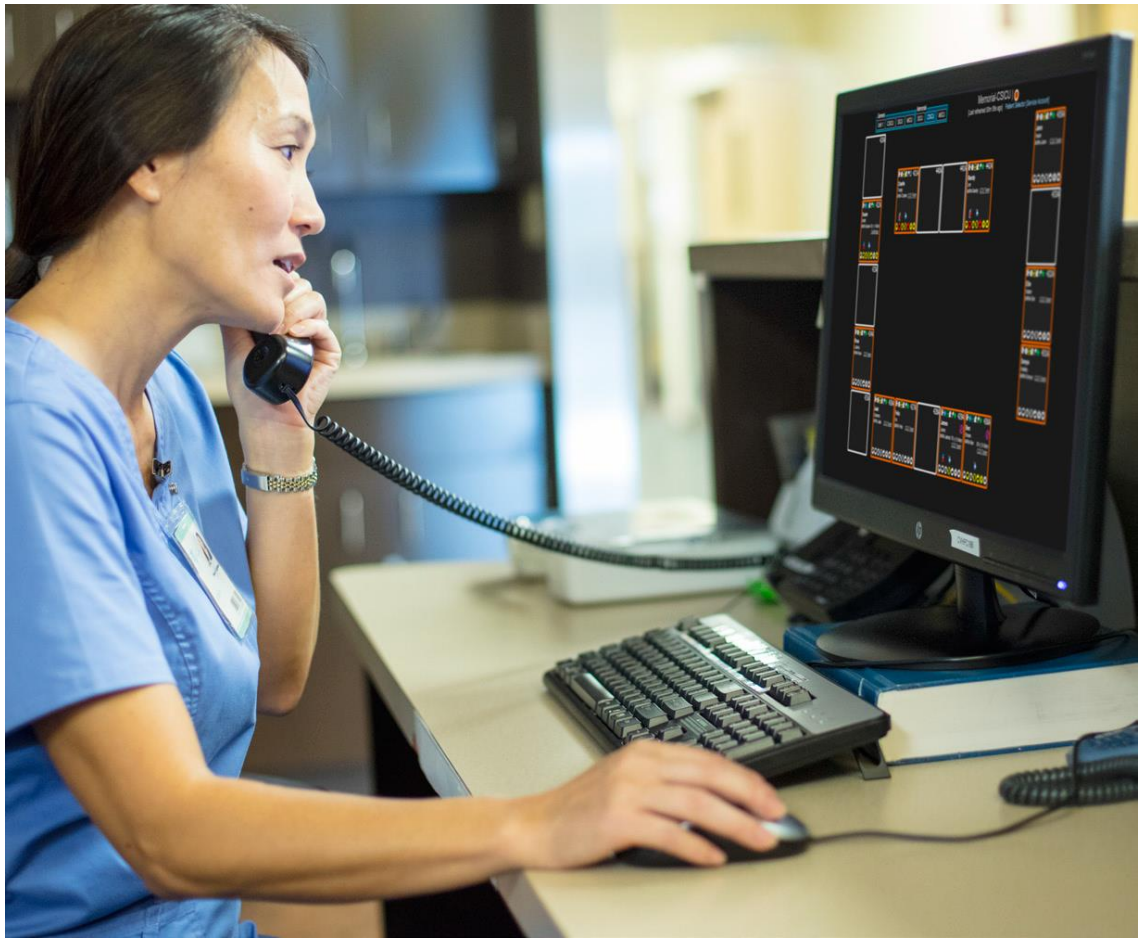
IntelliSpace Console Critical Care

Partnership to commercialize AWARE

- Mayo Clinic receiving the Hospital-Setting Health Care Innovation Award (HCIA) from CMS to study the effect of AWARE in intensive care units (ICUs)
- Mayo Clinic / Ambient Clinical Analytics partnered with Philips to commercialize AWARE as **IntelliSpace Console Critical Care**
- User Interface displays clinical patient data from HIS sources and visually indicates to the clinician actionable clinical data values
- 800+ evidence-based rules (from Mayo Clinic and Philips)



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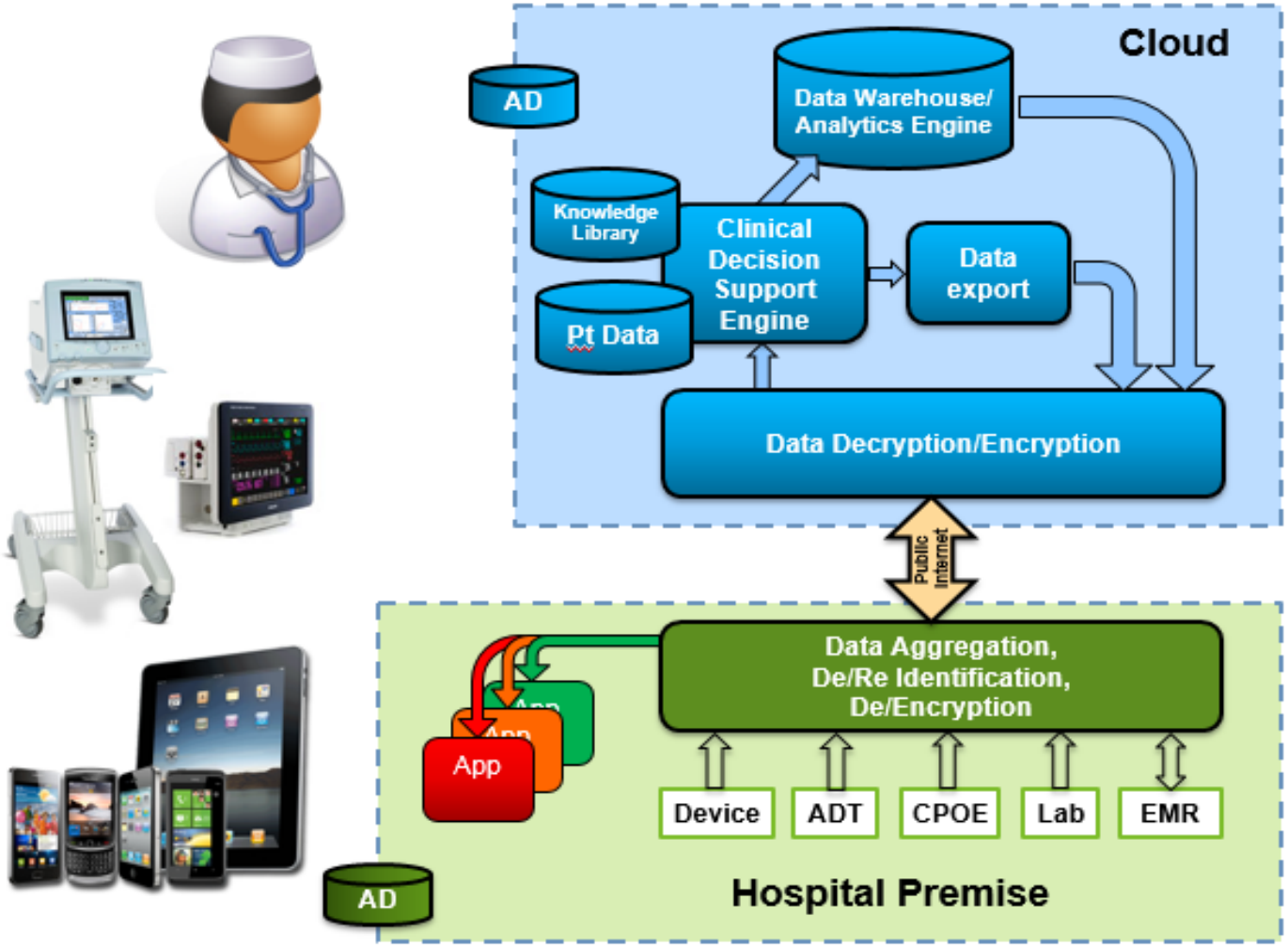
Time-Critical Cloud Based Decision Support and Analytics

Integration with other systems to import data



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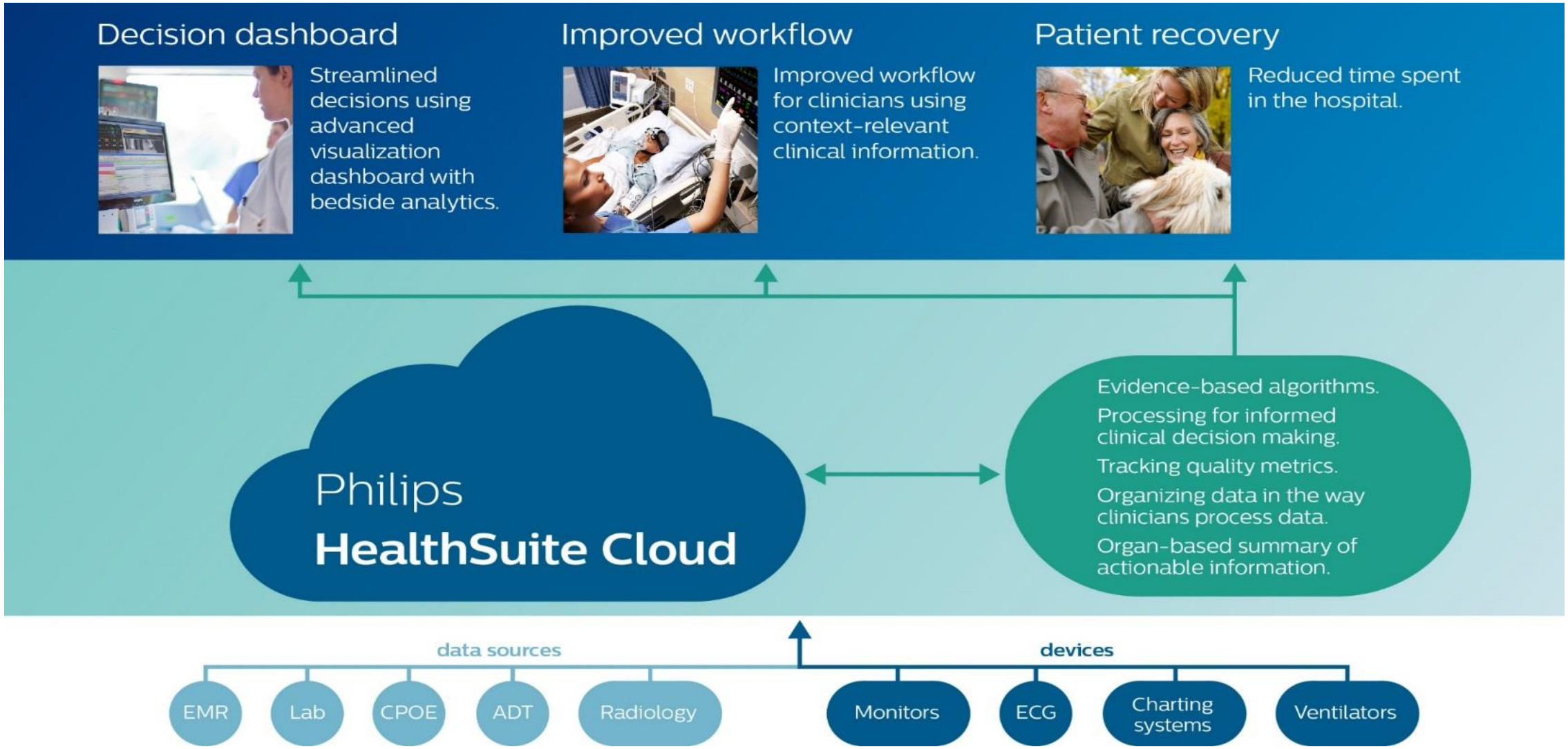
What Challenges Are We Trying To Address?

Focus on making data actionable and easily accessible



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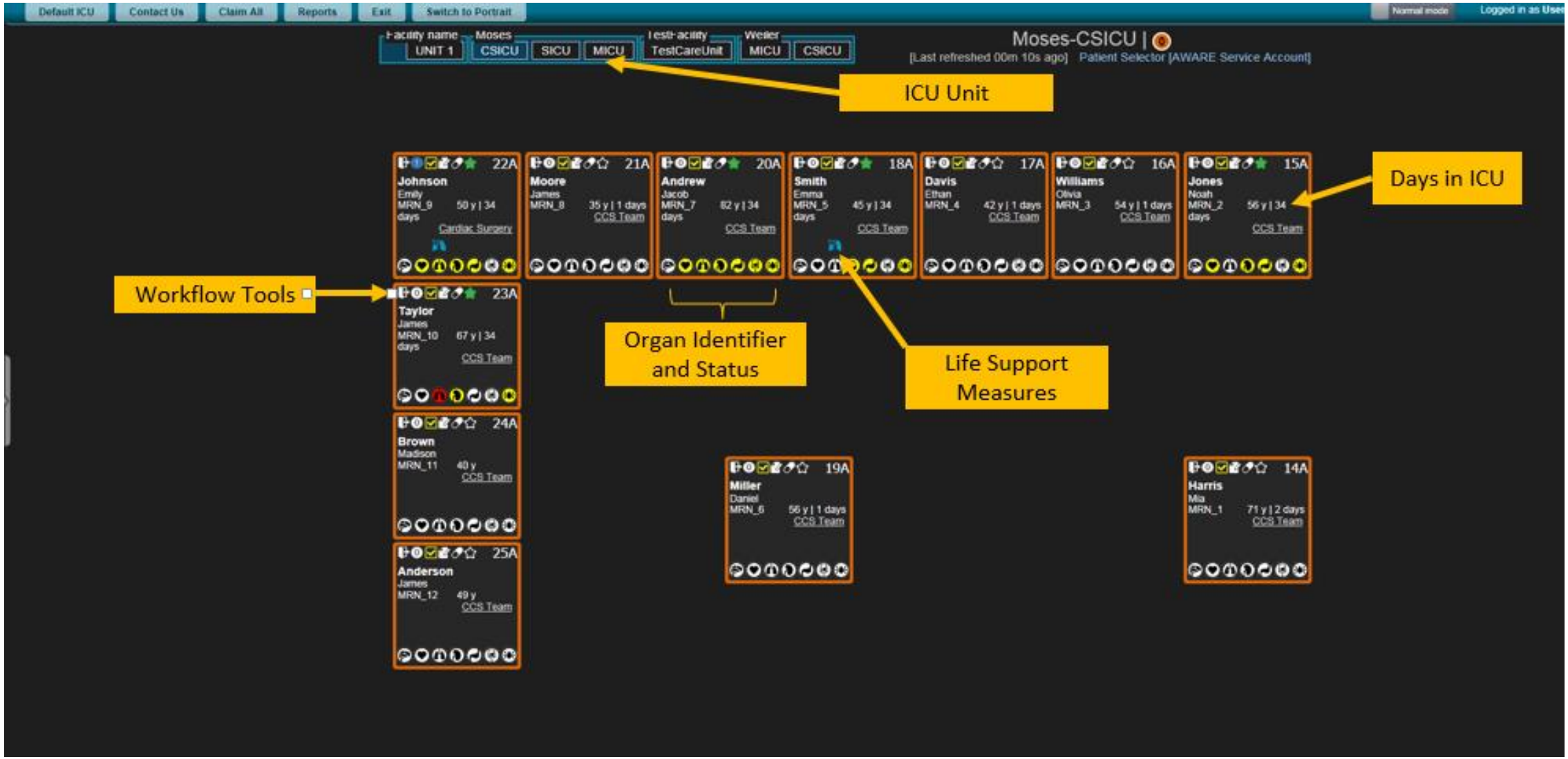
Visual Dashboard Of The Unit

Your unit at a glance: sickest patients, empty rooms, demographic and other information



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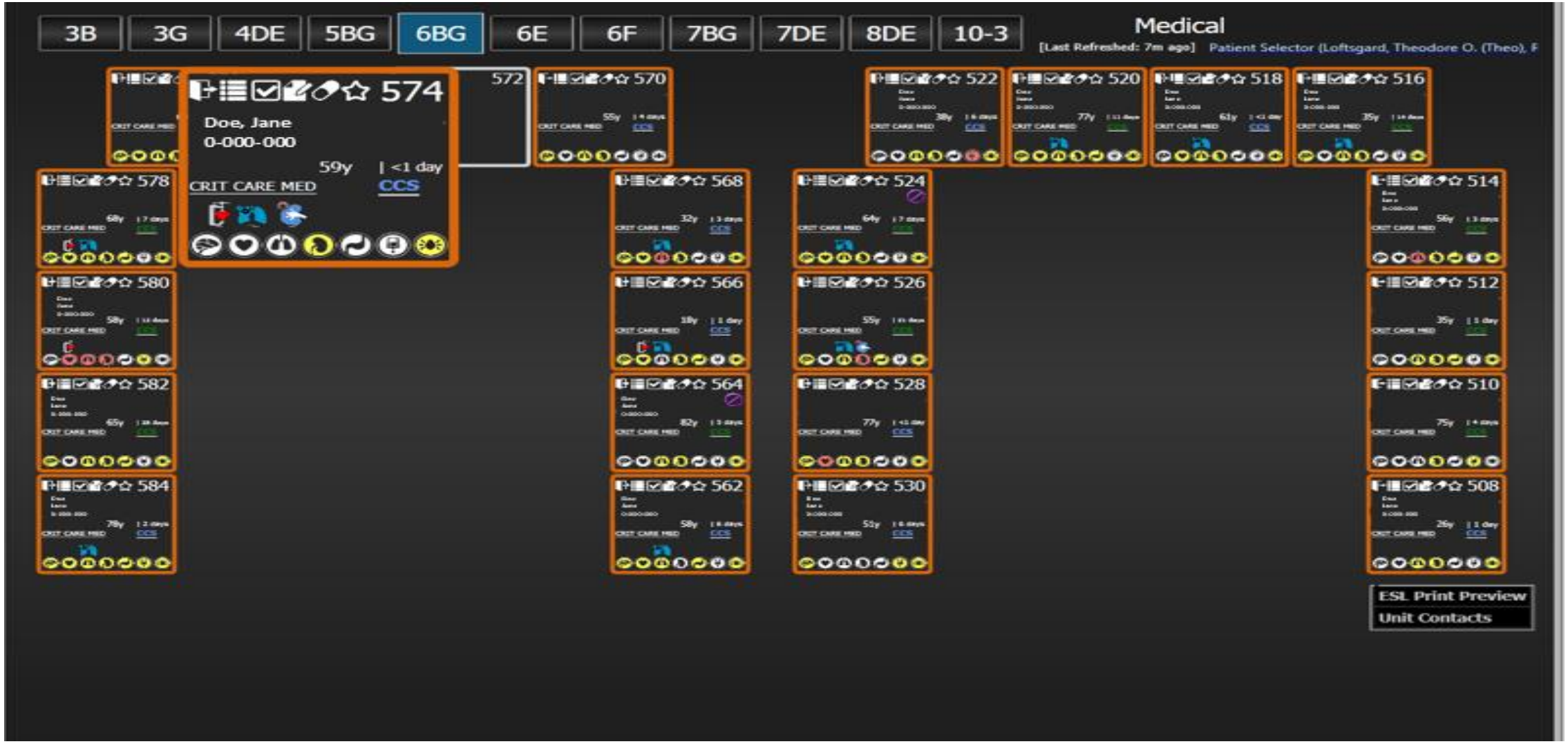
Visual Dashboard Review

Provides standardized prioritization



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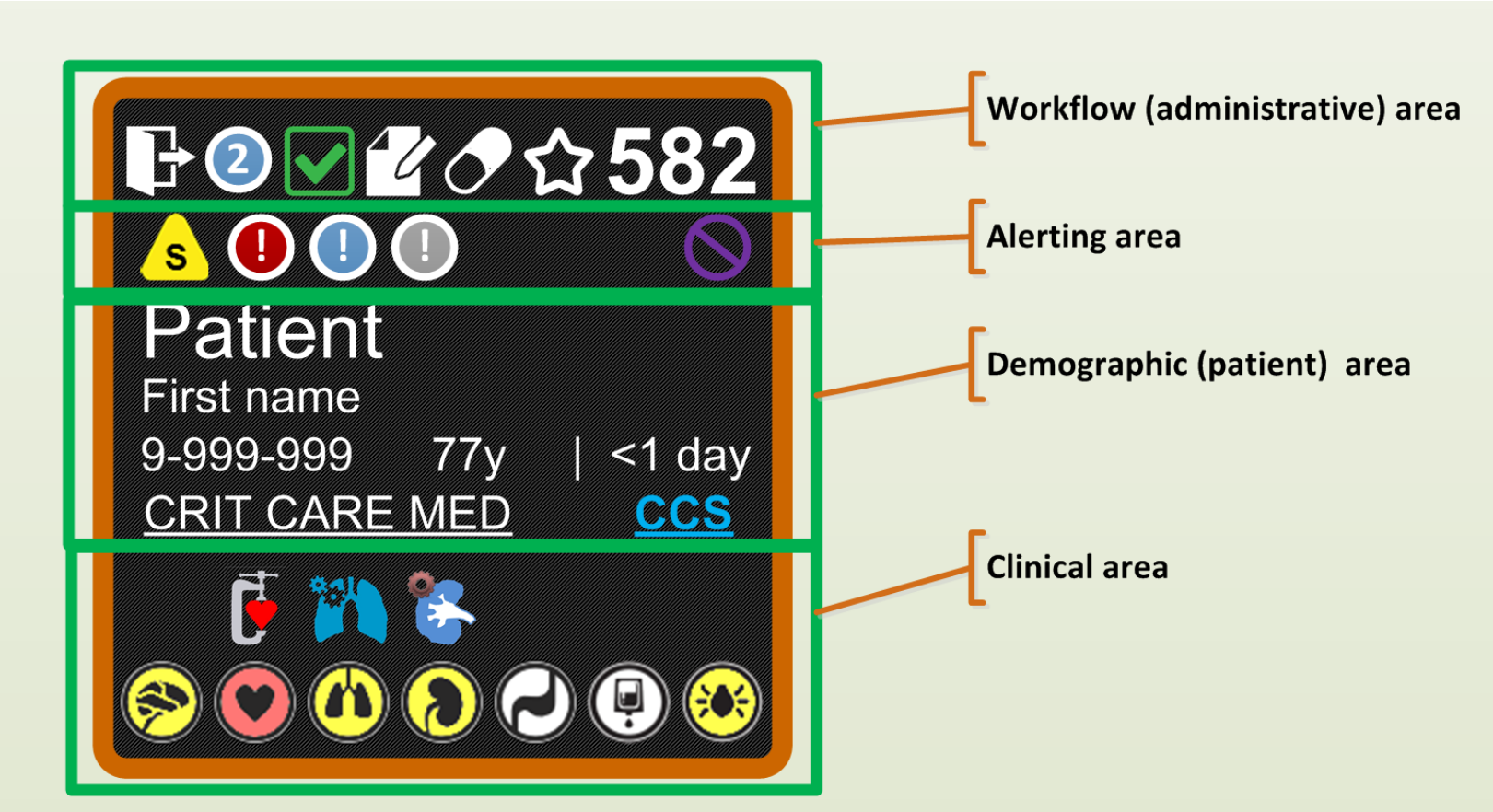
Overview Patient Room

Information grouped together



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Icons And Their Meaning

Color coding assists in prioritization of patients

Organ System Icons

- Central Nervous System
- Cardiovascular System
- Respiratory System
- Renal System
- GI System
- Hematology
- Infectious Disease

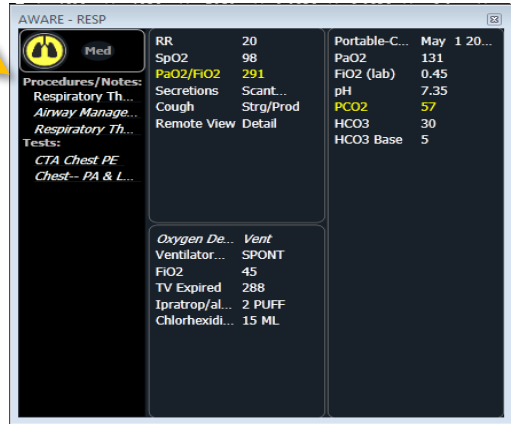
Support Icons

- ECMO
- Vasopressor
- Mechanical Ventilation
- CRRT

Popup, if hover over

pro-BNP (3202)
Troponin T0 (0.25)
Troponin T3 (0.48)
Troponin T6 (0.5)

Clicking on the icons will provide greater detail about the organ system



Drill Down On Individual Patient

Relevant data by organ system

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Rounding Tool/Checklist

Provides consistent format and review process

Their rounding process prior to Aware:

"Before we saw a patient, we would *spend 25-30 minutes* per patient digging through EMR data *at a computer terminal*."

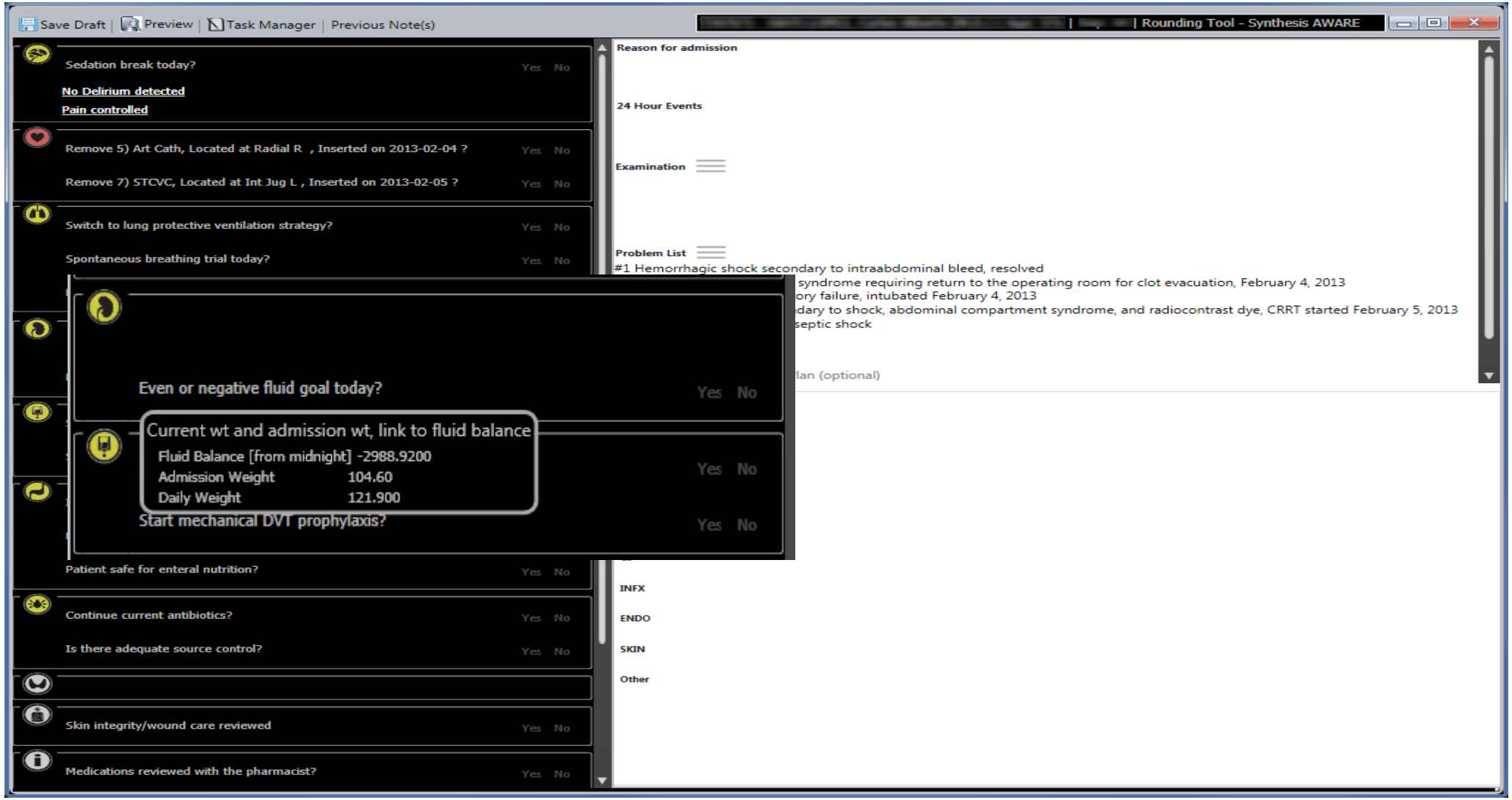
"We would then *write the information* from the computer terminal *on paper* and use that in a bedside meeting, or we would *gather the team around the computer in the backroom and do a virtual round* using the information, taking 15-20 minutes per patient."

"Then we would communicate our thoughts to those on the floor. We could easily *spend 2 to 2 ½ hours* on this, and then another 1 ½ hours communicating that on the floor."

"However, the piece of *information that was relevant* when collected at 7 a.m. had *changed by the time we discussed it* at 11 a.m. and required another round of information gathering, so it wasn't an efficient use of people's time."

Rounding Tool/Checklist

Provides consistent format and review process



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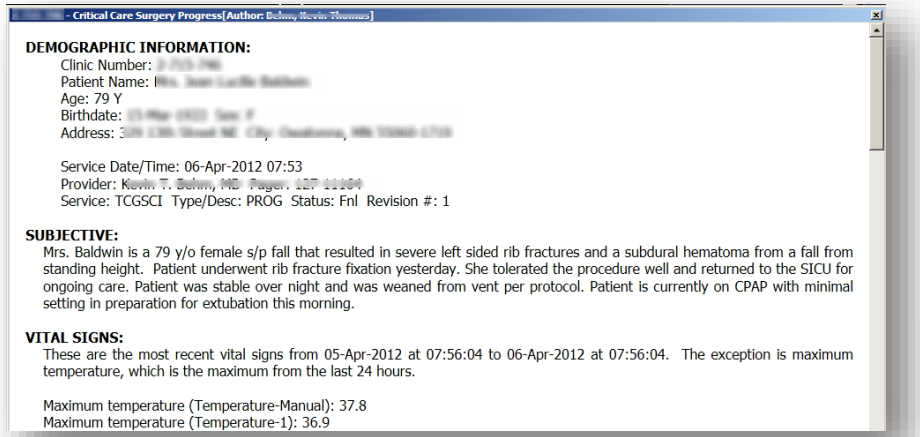
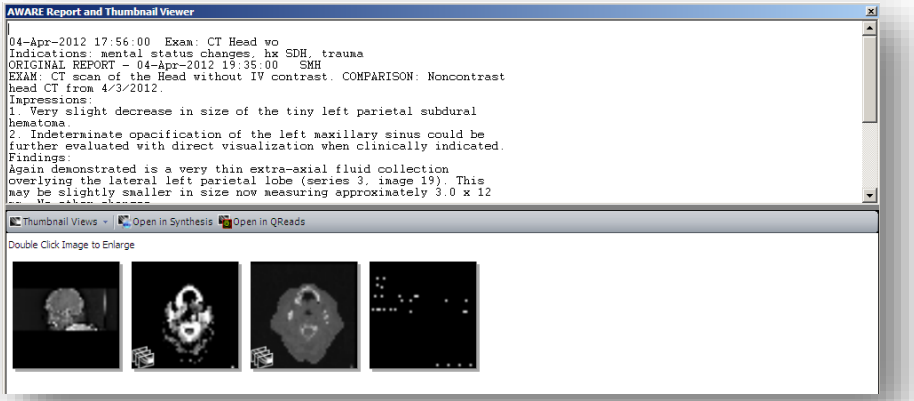
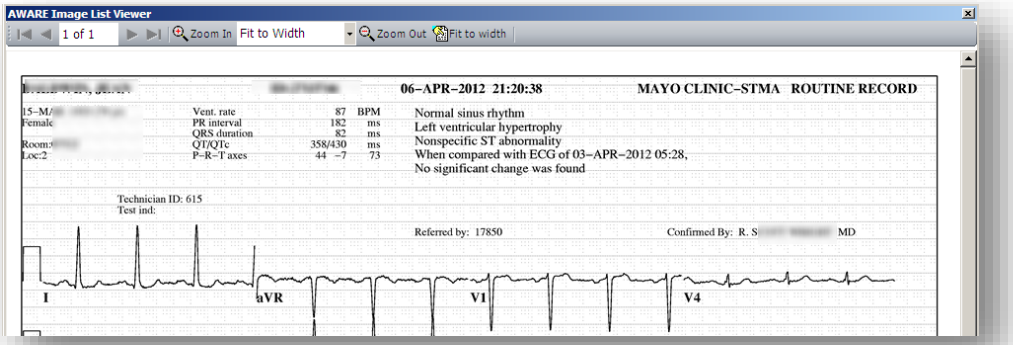
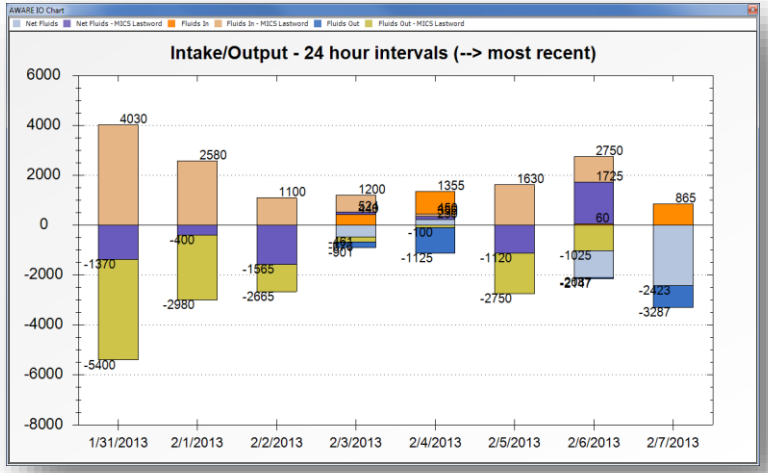
Linkage To Other On Premise Applications

Accessible in one system









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Reporting Options

Provides metrics and improvement opportunities

ON PREMISE

Patient Summary
Census, Unit Status
Console Usage Summary
Console Visit Summary
Patient Visit Summary

CLOUD

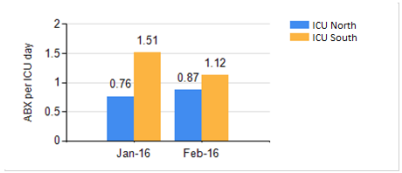
ICU Stay
Time from ED to ICU
Vascular Line Usage
Urinary Catheter Usage
Antibiotics Usage
Red Blood Cell Usage
Mechanical Ventilation Usage
IV Sedative Usage
ICU Adjusted Stay Usage
Lung Protective Ventilation

Sample Reports

Provides metrics and improvement opportunities

Antibiotics Usage Report

Graphical Section



Summary Section

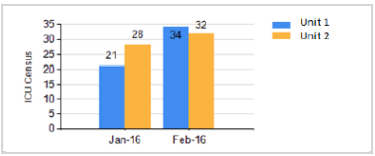
Clinical Unit		Jan-16	Feb-16
ICU North	Total ICU Census	21	34
	Total ICU Days	109.08	107.44
	Count ICU patients with ABX	18	28
	Total ABX Days	83	93
	ABX Days per ICU day	0.76	0.87
ICU South	Total ICU Census	28	32
	Total ICU Days	121.17	129.62
	Count ICU patients with ABX	26	29
	Total ABX Days	183	145
	ABX Days per ICU day	1.51	1.12

Antibiotics Usage Report

Patient Name	Age	Life Time Number	Clinical Unit	ICU Admit Date	ICU D/C Date	Hosp Admit Date	Hosp D/C Date	ABX Order	ABX Order Start	ABX Order Stop	ABX Admin	ABX Days	ICU Days
Doe, John	XX	8977234	ICU_North	2/5/16 8:11 AM	2/11/2016 20:37	2/2/2016 21:15		CEFEPIME HCL/D5W 2 G/50 ML PB IV, 2, IV, Q8AD	2/5/2016 5:19:00 PM	2/12/2016 12:00:00 PM		3	1.38

ICU Stay Report

Graphical Section



Summary Section

Clinical unit		Jan-16	Feb-16
Unit 1	ICU Census	21	34
	ICU Average LOS	5.22	3.17
	ICU Median LOS	4.92	1.96
	n Stay < 12	1	4
	n Stay < 24	3	7
	n Stay > 24	18	27
	ICU Readmit	0	1
	Readmit Rate	0.00	0.03
	Average daily census	10.55	11.75
	ICU Death	2	4
	ICU Death %	9.52 %	11.76 %
	Discharge home	3	5
	Discharge home %	14.3 %	14.7 %
	Discharge LTCH	2	0
	Discharge LTCH %	9.5 %	0 %
	Discharge hospice	0	1
	Discharge hospice %	0 %	2.9 %
	Discharge other	0	2
	Discharge other %	0 %	5.9 %
Unit 2	ICU Census	28	32
	ICU Average LOS	4.35	4.07
	ICU Median LOS	3.21	2.92
	n Stay < 12	2	1
	n Stay < 24	4	4
	n Stay > 24	24	28
	ICU Readmit	6	1
	Readmit Rate	0.21	0.03
	Average daily census	12.45	13.08
	ICU Death	1	0
	ICU Death %	3.57 %	0.00 %
	Discharge home	2	4
	Discharge home %	7.1 %	12.5 %
	Discharge LTCH	3	2
	Discharge LTCH %	10.7 %	6.2 %
	Discharge hospice	0	1
	Discharge hospice %	0 %	3.1 %
	Discharge other	3	0
	Discharge other %	10.7 %	0 %

Note: these are examples from research implementation

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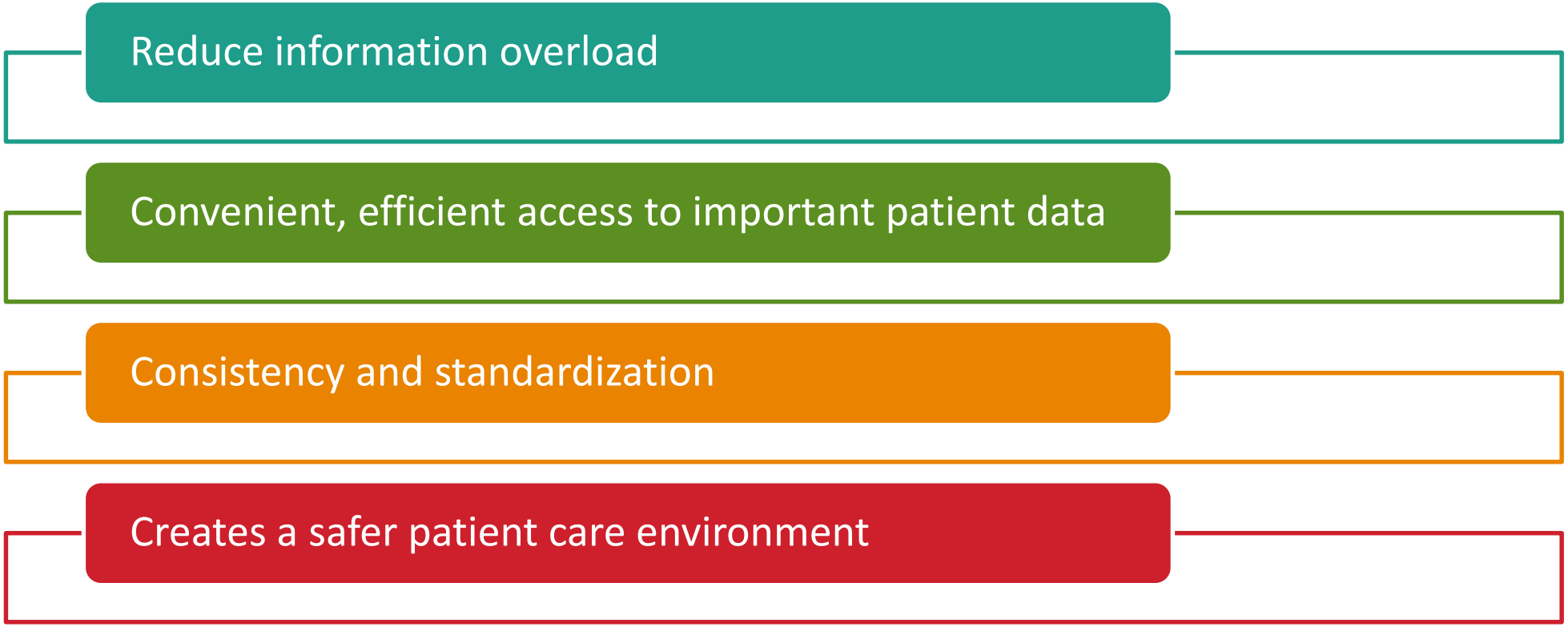
Why Use It?



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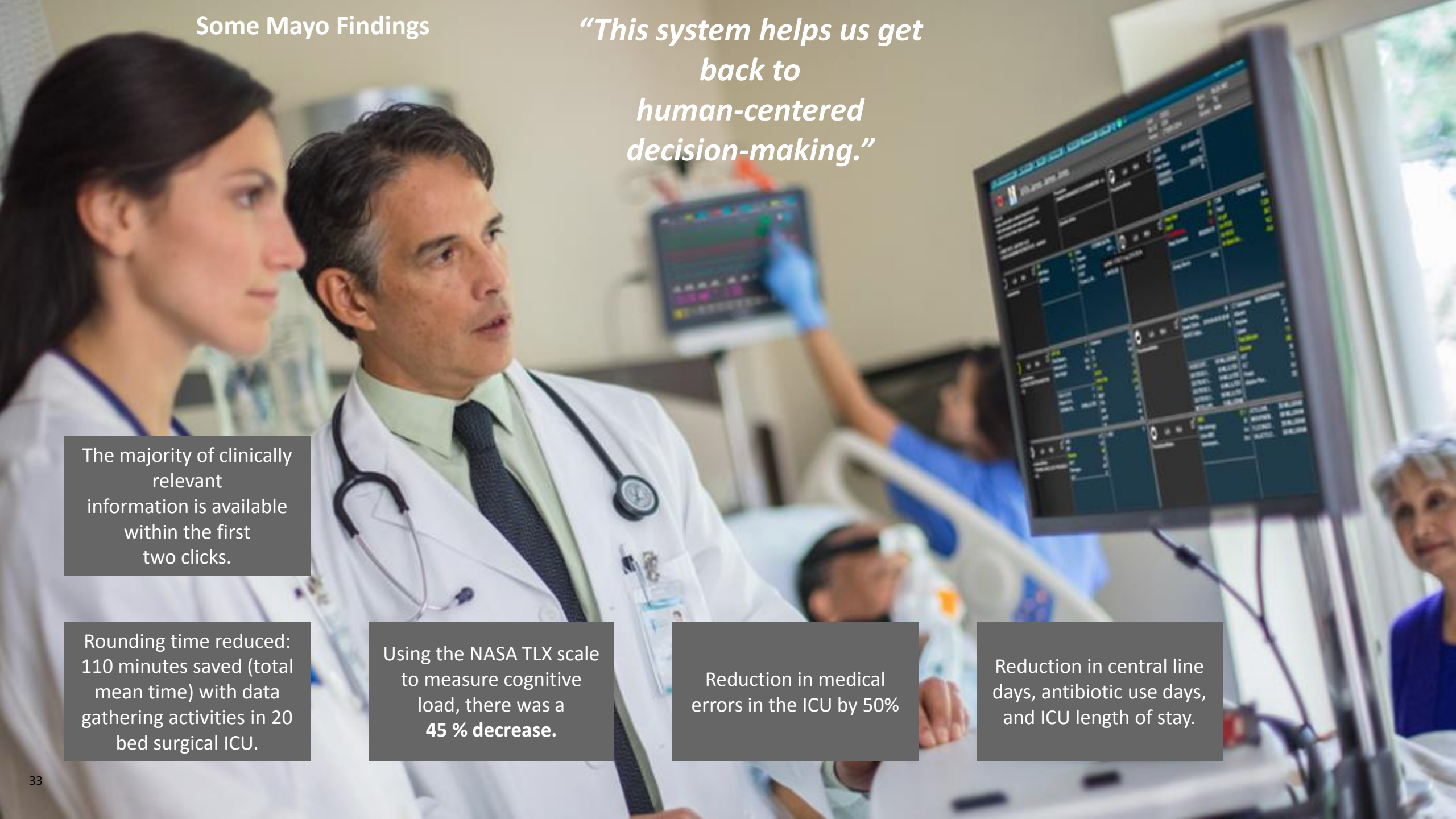
Metrics Assessed

Better Care → Better Health → Lower Cost

Metrics Measured	Metrics Measured	Metrics Evaluated
Adherence to and appropriateness of processes of care	Ventilator free days	Total costs of care (30 days)
Compliance with ventilator bundle & ventilator tidal volume	Cases of ventilator associated events	Cost of index hospitalization
Central line usage	Cases of catheter related blood stream infections	ICU/Hospital Length of Stay
Urinary catheter usage	ICU/Hospital Admissions	Medicare Free Days
Antibiotic usage	ICU/Hospital Readmissions	Resource use: RBC
Continuous IV sedation	ICU/Hospital Mortality	
Provider satisfaction	Discharge Location	
	30-day Mortality	
	1-year Survival	

Some Mayo Findings

"This system helps us get back to human-centered decision-making."



The majority of clinically relevant information is available within the first two clicks.

Rounding time reduced: 110 minutes saved (total mean time) with data gathering activities in 20 bed surgical ICU.

Using the NASA TLX scale to measure cognitive load, there was a **45 % decrease.**

Reduction in medical errors in the ICU by 50%

Reduction in central line days, antibiotic use days, and ICU length of stay.

“There has been a shift from data-gathering and regurgitation to decision-making and patient interaction.”

-Brian Pickering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