What is Trending UP in the Technology and Clinical Automation Space

Darinda Sutton RN-BC, MSN

VP & Chief Nursing Officer – Cerner East

June 15, 2014

Session Objectives

1. Identify 3 key drivers for technology and clinical automation trends for the future.
2. Understand the convergence of Medical Devices and the EMR with the electronic integration of the data from devices into the EMR.
3. Describe the data analytics that can be made available within an EMR to define how much time a bedside care giver spends within the EMR – and how that time is being spent.
4. Describe one use case for Big Data within Health Care.
5. Describe the impact of Population Health management and the connection of the patient in the home from a technology perspective.

3 Drivers of current Technology Trends in Nursing

HITECH

ARRA

Health Care Reform

- Pay for Volume → Pay for VALUE

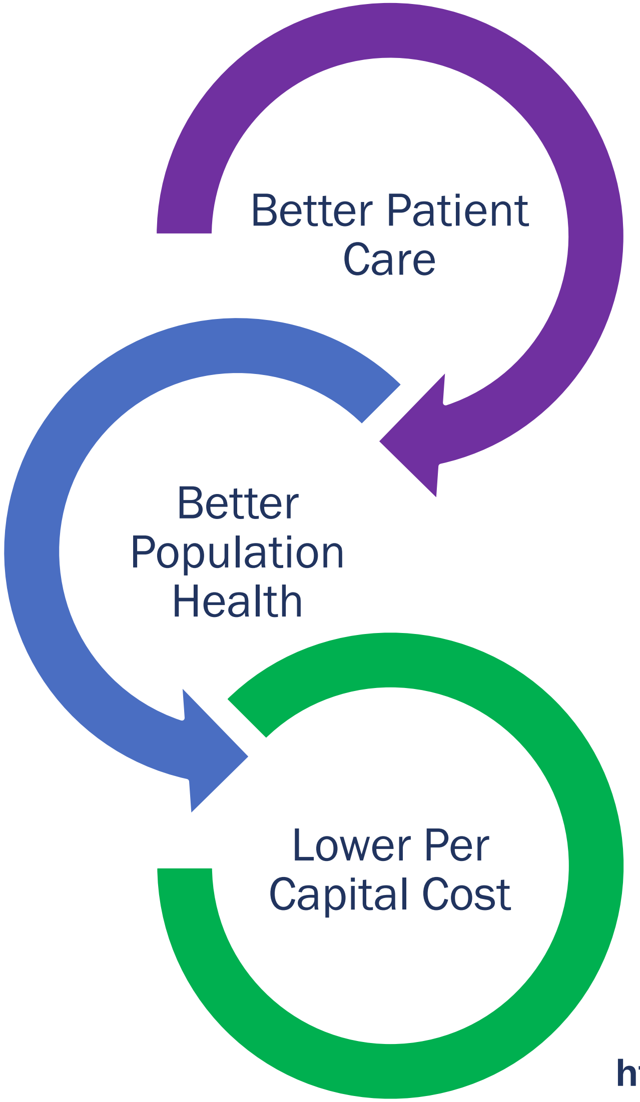
Decreasing Reimbursement Models

- Cost of Nursing as a sector of healthcare
- Doing more with existing or less resources

Population Health

- Accountable for Health and Wellness of "members"
- Connecting the Patient, Family & Community

Overarching Industry Objectives



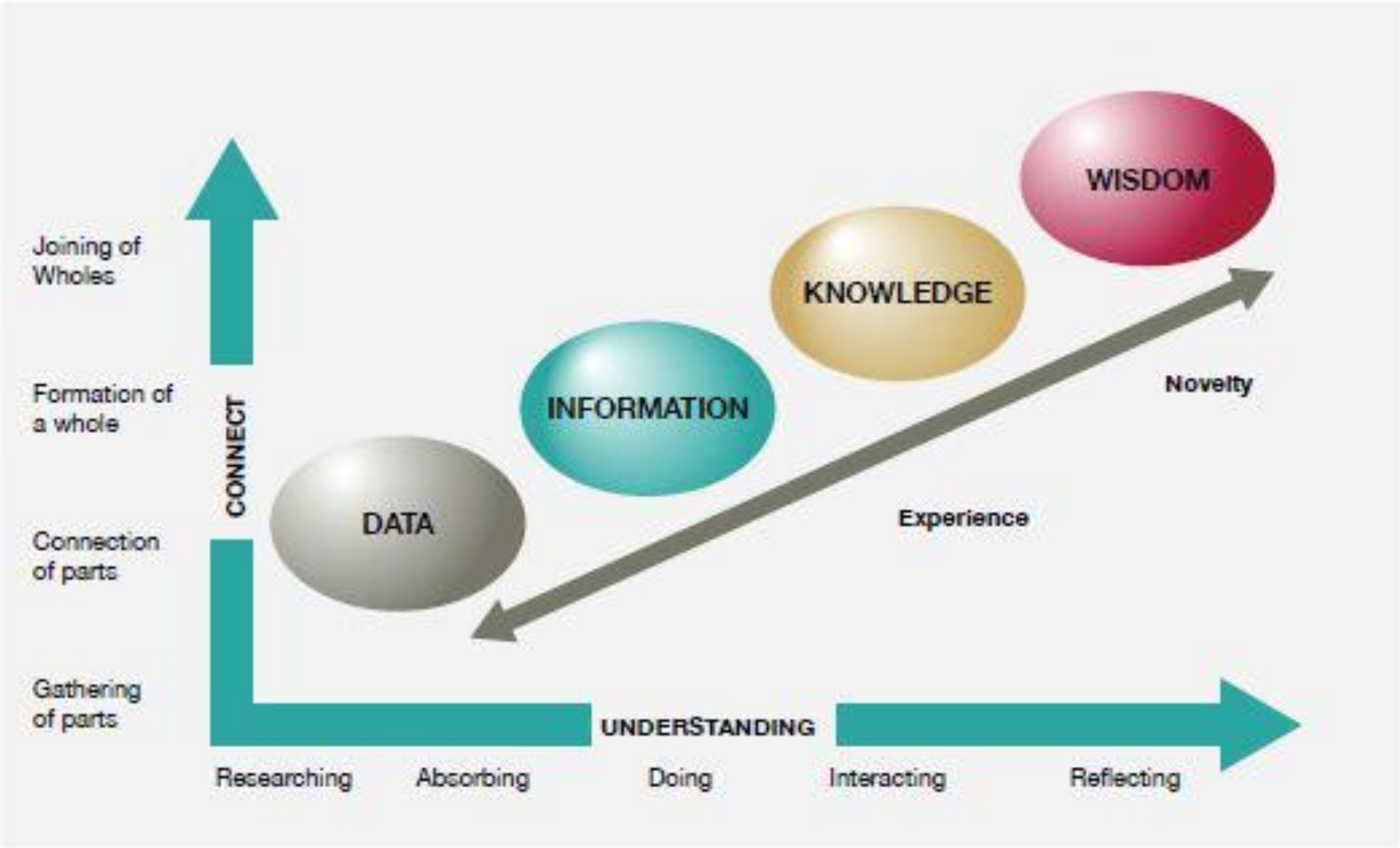
IHI TripleAim

IHI Triple Aim Initiative

Better Care for Individuals, Better Health for Populations, and Lower Per Capita Costs

http://www.ihi.org/Engage/Initiatives/TripleAim/Pages/default.aspx

Data – Information – Knowledge – Wisdom



Nursing Trends

- **Medical Device Integration – [Data]**
  - Bedside or Point of Care Devices
  - Wearable Devices
  - Ingestible Devices
- **Clinical Efficiency/Productivity Analytics – [Information]**
  - Harnessing the EMR for clinician time
    - *Nursing Time spent in the chart*
    - *Physician time spent in EMR*
- **Big Data [Knowledge]**
  - Knowledge Discovery in big data sets
  - Extract previously unknown interesting patterns
- **Population Health Management [Wisdom]**
  - Connecting the Family, Patient, Community

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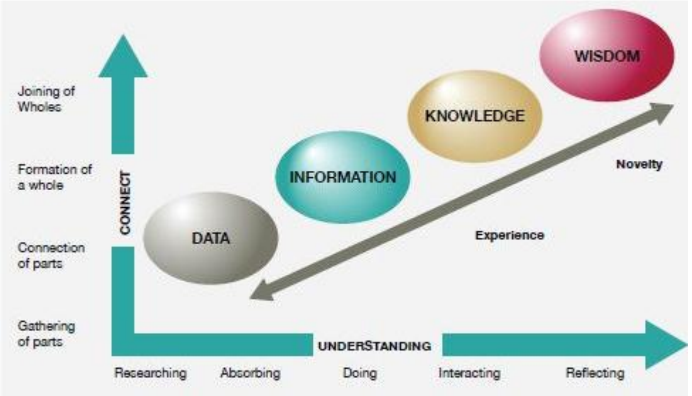
Medical Device Integration



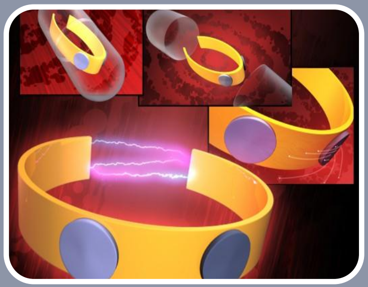
Types of Devices for Data Capture

Bedside or Point of Care

- Monitors
- Beds / Ventilators
- IV Pumps
- Medication Refrigerators

Wearable

- Body Sensors
- Contact Lens/Glasses
- Vests
- Activity/Pedometer



Ingestible / Implantable

- Cameras
- Medication sensors
- Intracranial micro-chips

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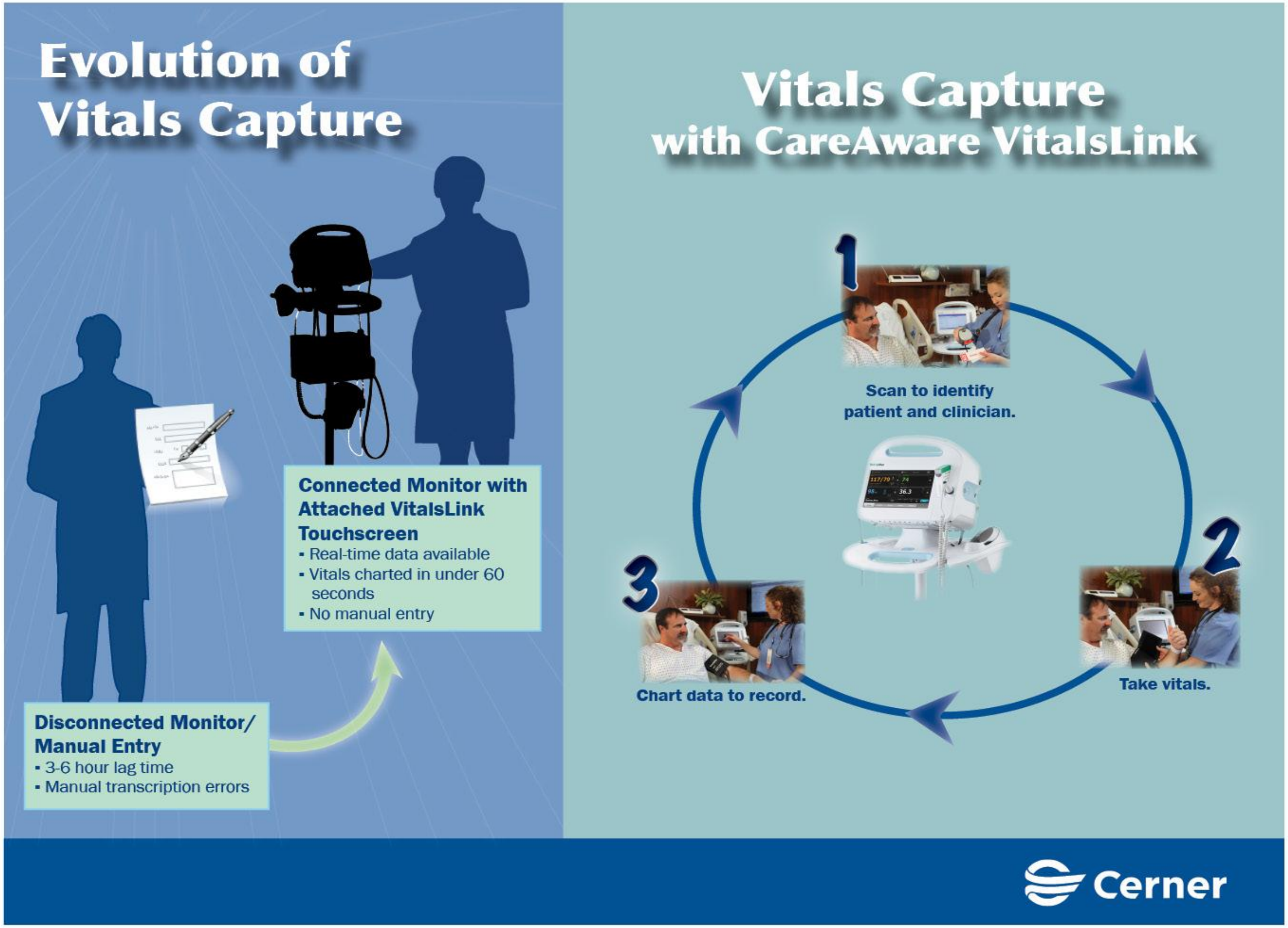
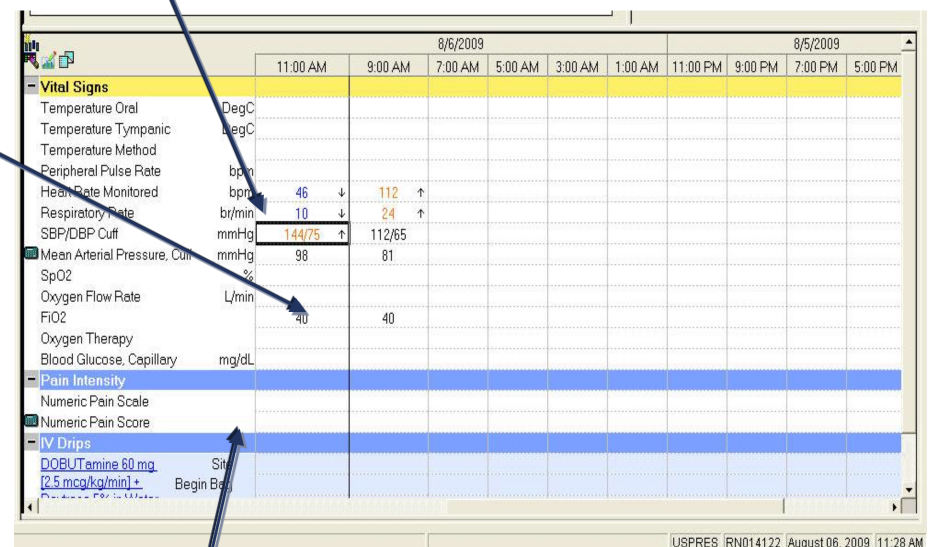
Real-time Vitals Capture

- **Problem: Inefficient data capture, delays in data entry, incorrect data entry**
- **Solution: Automated, real-time capture and charting of patient vital sign data**
- **Results (NCH Healthcare):**
  - **14 minutes saved per clinician per vitals round**
  - **99% improvement in data latency**

Data Collection Timeliness, Access to Information



Documentation using Device Connectivity



		8/6/2009						8/5/2009			
		11:00 AM	9:00 AM	7:00 AM	5:00 AM	3:00 AM	1:00 AM	11:00 PM	9:00 PM	7:00 PM	5:00 PM
Vital Signs											
Temperature Oral	DegC										
Temperature Tympanic	DegC										
Temperature Method											
Peripheral Pulse Rate	bpm										
Heart Rate Monitored	bpm	46 ↓	112 ↑								
Respiratory Rate	br/min	10 ↓	24 ↑								
SBP/DBP Cuff	mmHg	144/75 ↑	112/65								
Mean Arterial Pressure, Cuff	mmHg	98	81								
SpO2	%										
Oxygen Flow Rate	L/min										
FiO2		40	40								
Oxygen Therapy											
Blood Glucose, Capillary	mg/dL										
Pain Intensity											
Numeric Pain Scale											
Numeric Pain Score											
IV Drips											
DOBUTamine 60 mg [2.5 mcg/kg/min] +	Site Begin Bag										

2014 Top Health Technology Hazards - ECRI

1. Alarm hazards
2. Infusion pump medication errors
3. CT radiation exposures in pediatric patients
4. Data integrity failures in EHRs and other health IT systems
5. Occupational radiation hazards in hybrid ORs
6. Inadequate reprocessing of endoscopes and surgical instruments
7. Neglecting change management for networked devices and systems
8. Risks to pediatric patients from "adult" technologies
9. Robotic surgery complications due to insufficient training
10. Retained devices and unretrieved fragments – surgery/procedures

https://www.ecri.org/Forms/Documents/2014_Top_10_Hazards_Executive_Brief.pdf

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Concerns with Smart IV Pumps

- **Over the last five years, the FDA has received reports of 710 patient deaths linked to problems with infusion pumps**
- **There were 87 recalls between 2004 and 2009**
  - 14 of which were prompted by potentially life-threatening issues
- **Key bounce is a major issue**
  - one key press is detected as multiple presses

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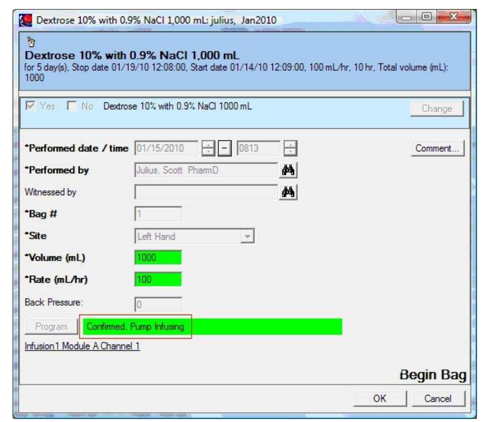
Device Connectivity – Infusion Pumps

1. Scan the patient's wristband

2. Scan the medication

3. Scan the pump

4. Review & Confirm



5. Sign

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Current State of Alarm Management

Clinicians become desensitized, overwhelmed or immune to the sound of an alarm. Fatigued clinicans may:

- Turn down alarm volume
- Turn off alarm
- Adjust alarm settings

These actions can have serious fatal consequences

- **ECRI Institute "Top 10 Technology Hazards" has ranked alarm hazards #1 or #2 for 4 consecutive years.**
- **12% of 2,200 reports in ECRI Institute's Problem Reporting Network (2000-2006) were related to alarms**
- **Search of FDA Maude database using "alarm" and "death" revealed 212 deaths involving physiologic monitor alarms (Jan 2005-Dec 2010)**

85-99%

Of alarm signals don't require clinical intervention

Scope of problem:

100s 1000s → 10,000s alarms/day

TJC – 2014 NPSG on Alarm Management

TJC (The Joint Commission)
NPSG (National Patient Safety Goal)

NPSG .06.01.01 EP1
By July 1, 2014

- **Leaders establish alarm system safety as a hospital priority**
- **Identify the most important alarm signals to manage based on the following:**
  - Input from the medical staff and clinical departments
  - Risk to patients if the alarm signal is not attended to or if it malfunctions
  - Whether specific alarm signals are needed or unnecessarily contribute to alarm noise and alarm fatigue
  - Potential for patient harm based on internal incident history
  - Published best practices and guidelines

Alarm Management Key Dates

- **As of July 1, 2014:**
  - Leaders establish alarm system safety as a hospital priority
- **During 2014:**
  - Identify the most important alarm signals to manage
- **As of January 1, 2016**
  - Establish policies and procedures for managing the alarms
  - Educate staff and licensed independent practitioners about the purpose and proper operation of alarm systems for which they are responsible

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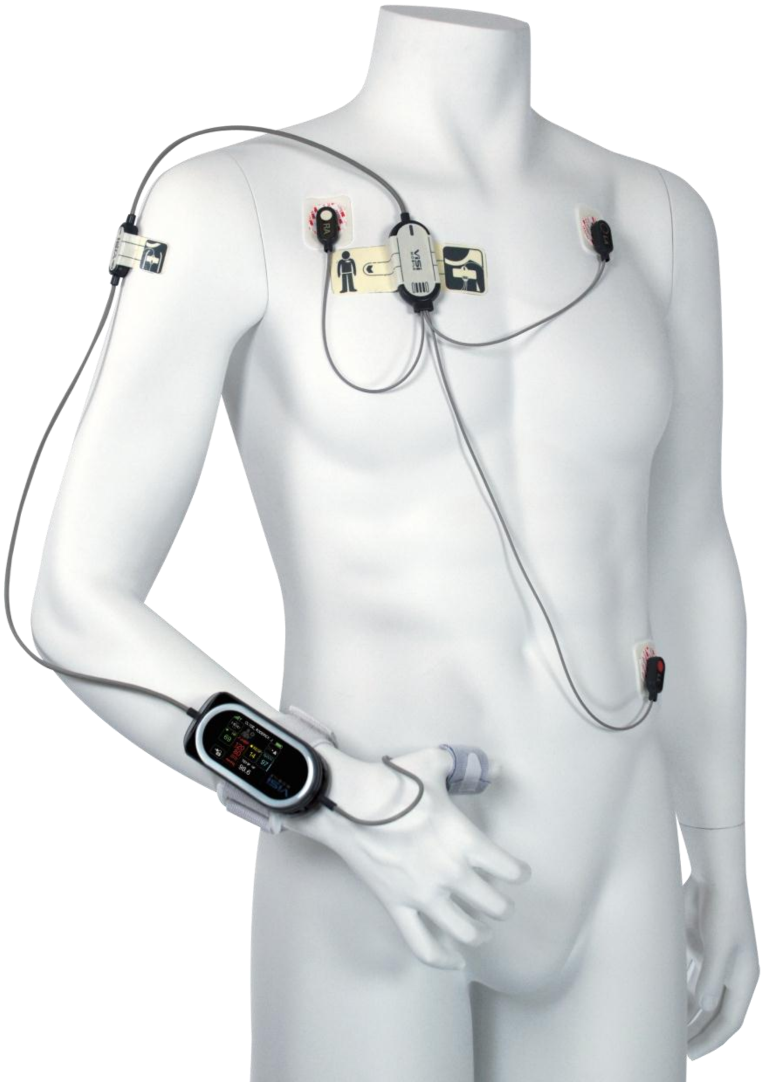
CareAware AlertLink: Alerting Platform

Key Features

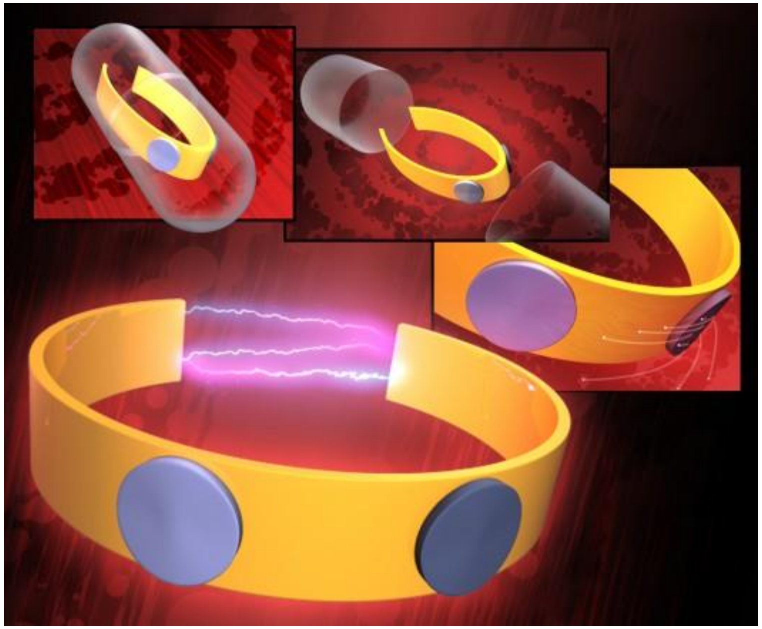
- **Smart Room integration**
- **Single staffing and device assignment capability**
- **EHR Integration**
  - Stat orders, critical results
- **Contextual Alerts**
  - Device + Patient data for optimal context

Wearable: ViSi Mobile™ – Patient-Worn Monitor

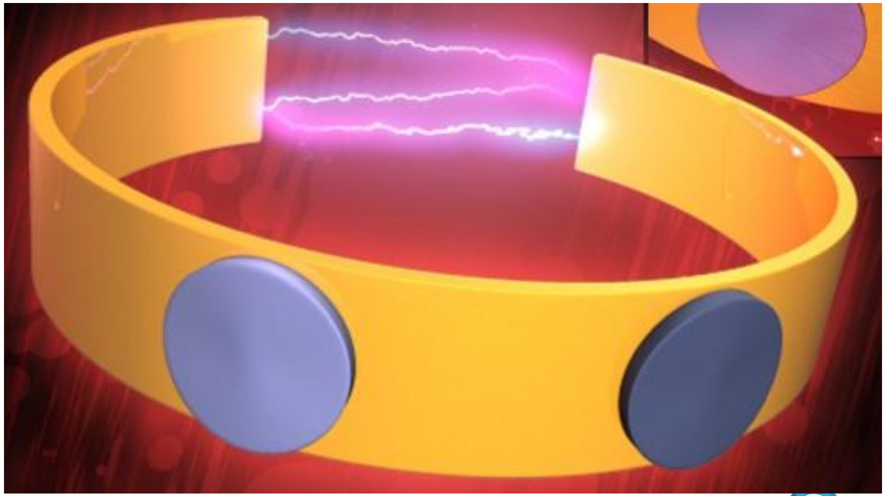


- Continuous vital signs +
  - SpO_2
  - HR/PR
  - ECG (3/5 lead)
  - Respiration
  - Temp (skin)
  - NIBP
  - Continuous non-invasive blood pressure (cNIBP)*
- Motion/Posture*
- Wireless communication

Ingestible: Camera Pills



1. Swallowed by patients and then transmit video from within their bodies.
2. These devices would be folded down and encased within a gelatin capsule, allowing for a timed release at a key point in the gastrointestinal tract.
3. When the capsule dissolved, the polymer would hydrate, thus initiating electrical current flow from the battery, and causing the device to open into its operational form.



- The capsules could be taken daily
- Devices would stay within the patient's digestive system for about 18 to 24 hours
- Functional lifetime would be 1–2 hours

http://www.gizmag.com/edible-medical-electronic-devices/27272/

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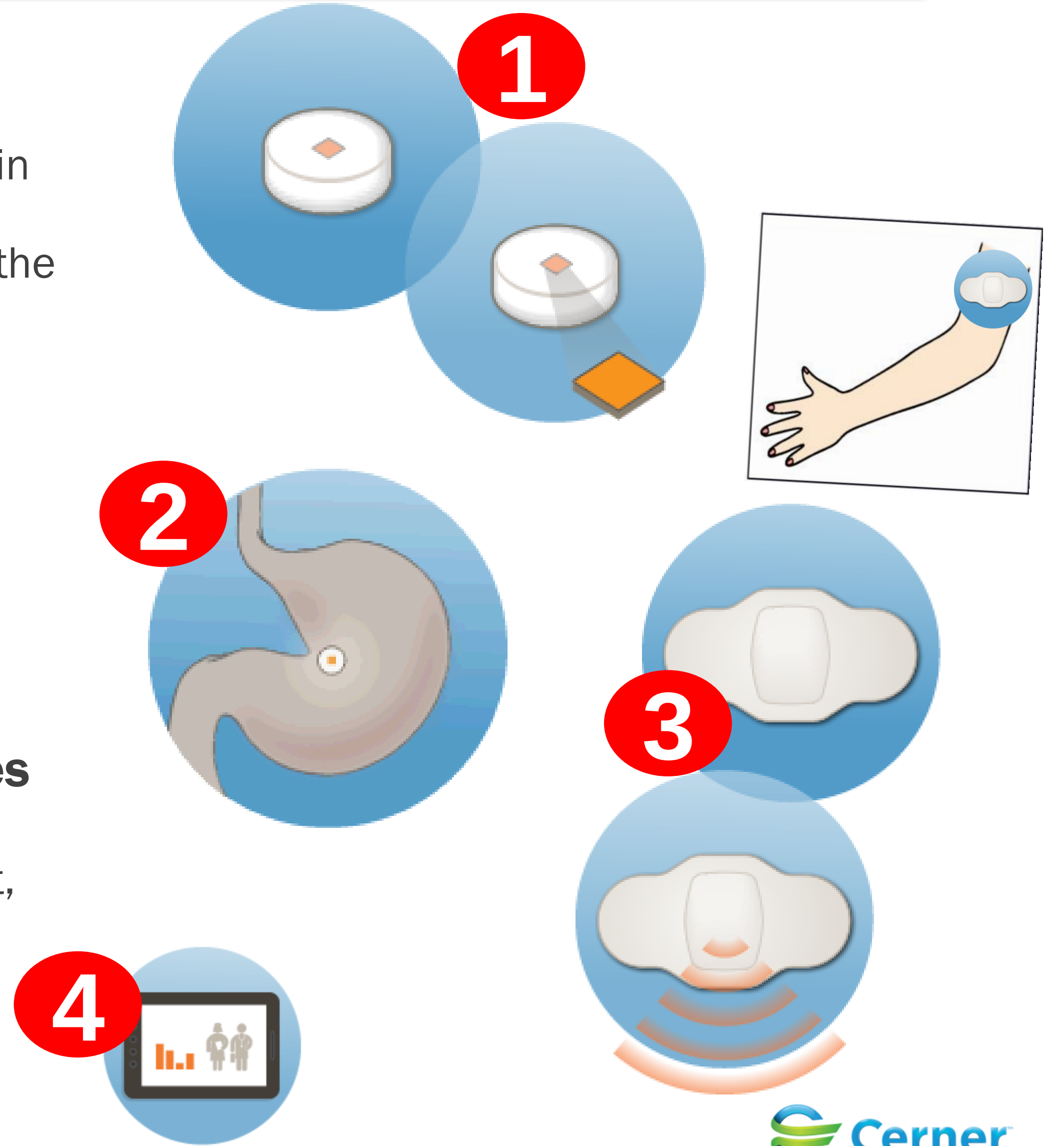
Proteus: How it works

- **The ingestible sensor is technology you swallow.**
  - Made entirely of ingredients found in food and activated upon ingestion.
  - Taken with medications, capturing the exact time of ingestion.
- **Your body powers the ingestible sensor**
  - stomach fluids complete the power source and your body transmits the unique number generated by the sensor.
- **The patch, body-worn and disposable, captures and relays your body's physiologic responses and behaviors.**
  - detects heart rate, activity, and rest, and sends information to mobile device.



http://www.proteus.com/

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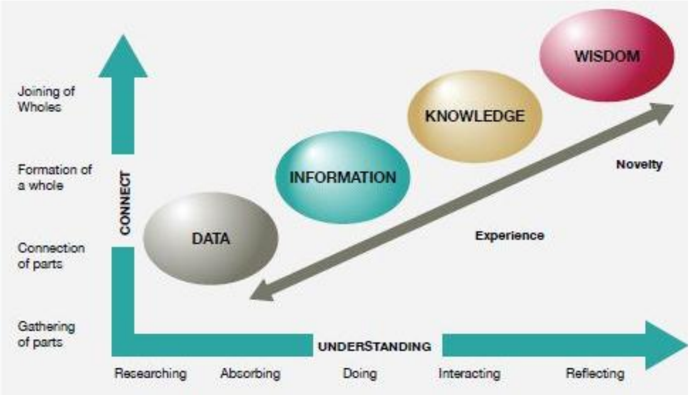
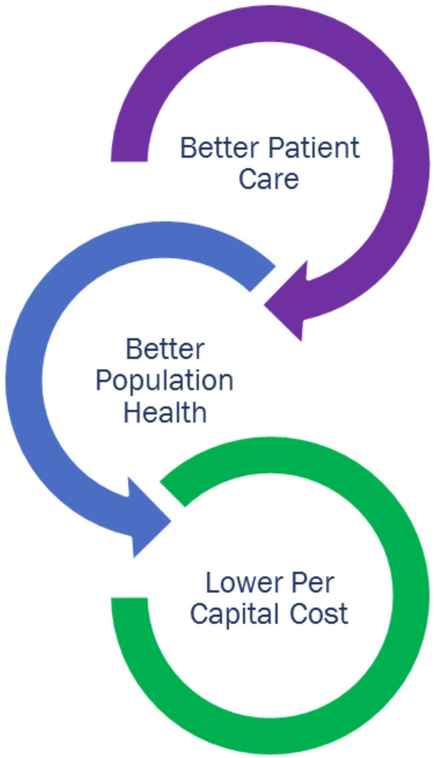
Clinical Efficiency Analytics



Nursing Leadership Challenges

- **How to measure effectiveness and value of Nursing Care?**
- **What are the <u>important</u> contributions by Nursing to quality patient outcomes?**
  - What really makes a difference?
- **How do I quantify what work is being done by Nursing?**
- **How can I make informed decisions on staffing models and care delivery with decreasing operating margin?**
- **How to maintain our professional contribution at the most cost effective price point for the system.**



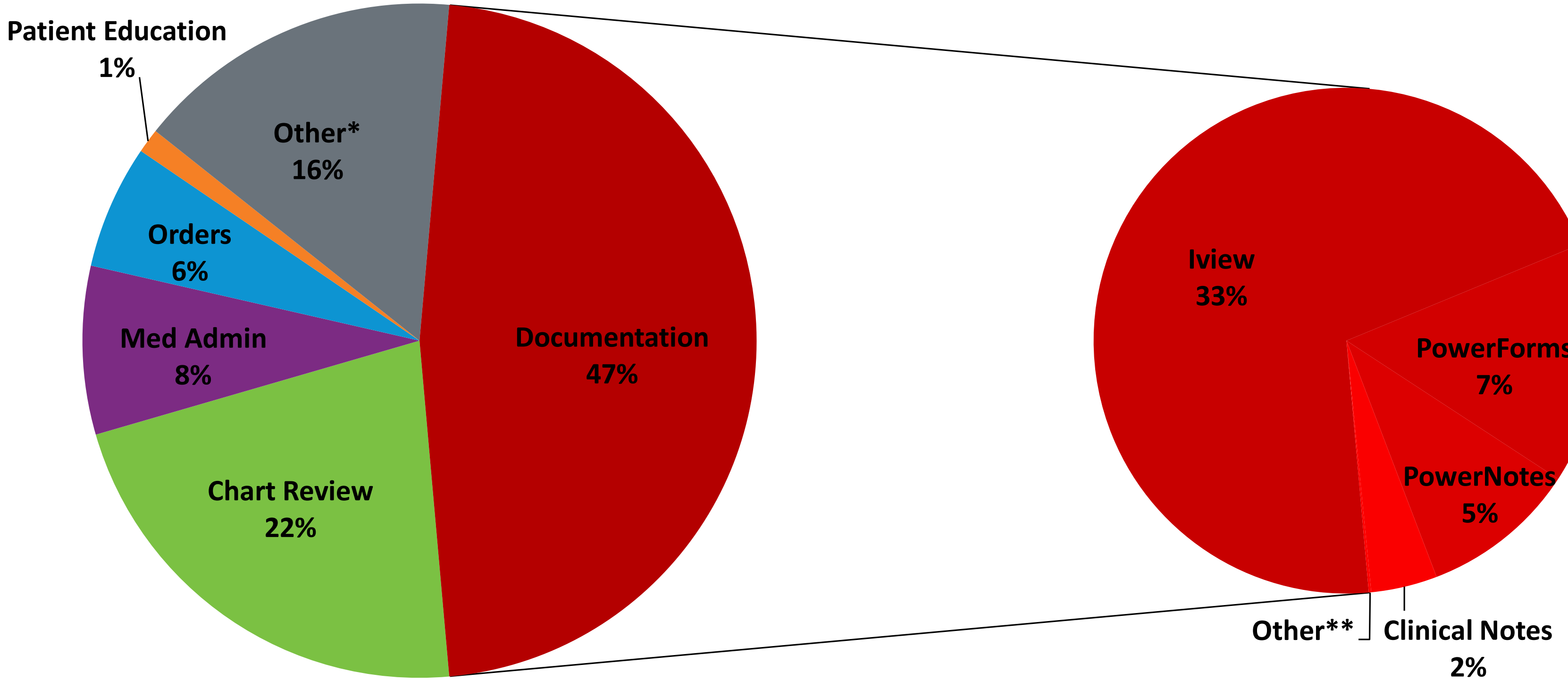
What are nurses really doing?

- **Fragmented, frequently interrupted, in chaotic work environment**
  - Interrupted mid-activity 8 times per every 8 hours *
- **Switch patients every 11 minutes ***
- **Average activity time – 3.1 min/care activity ***
- **Average of 8.1 operational failures per 8 hours ***
  - Missing med
  - Missing supplies
  - Missing order
  - Missing/ broken equipment
- **9 % of time spent on resolving system failures or errors ***
  - Most common was missing medications
- **Direct patient care tasks done in 2:43 minutes chunks**
- **Average 44 minutes overtime**
- **Only 30 % of shift time is in direct patient care****

* Tucker and Spear. Operational Failures and Interruptions in Hospital Nursing. HSR 41:643-662, 2006

** Hendrich A., George V. Random work sampling of Medical Surgical nurses using PDAs. Reported at Health Management Academy, May 20, 2004. Unpublished Data

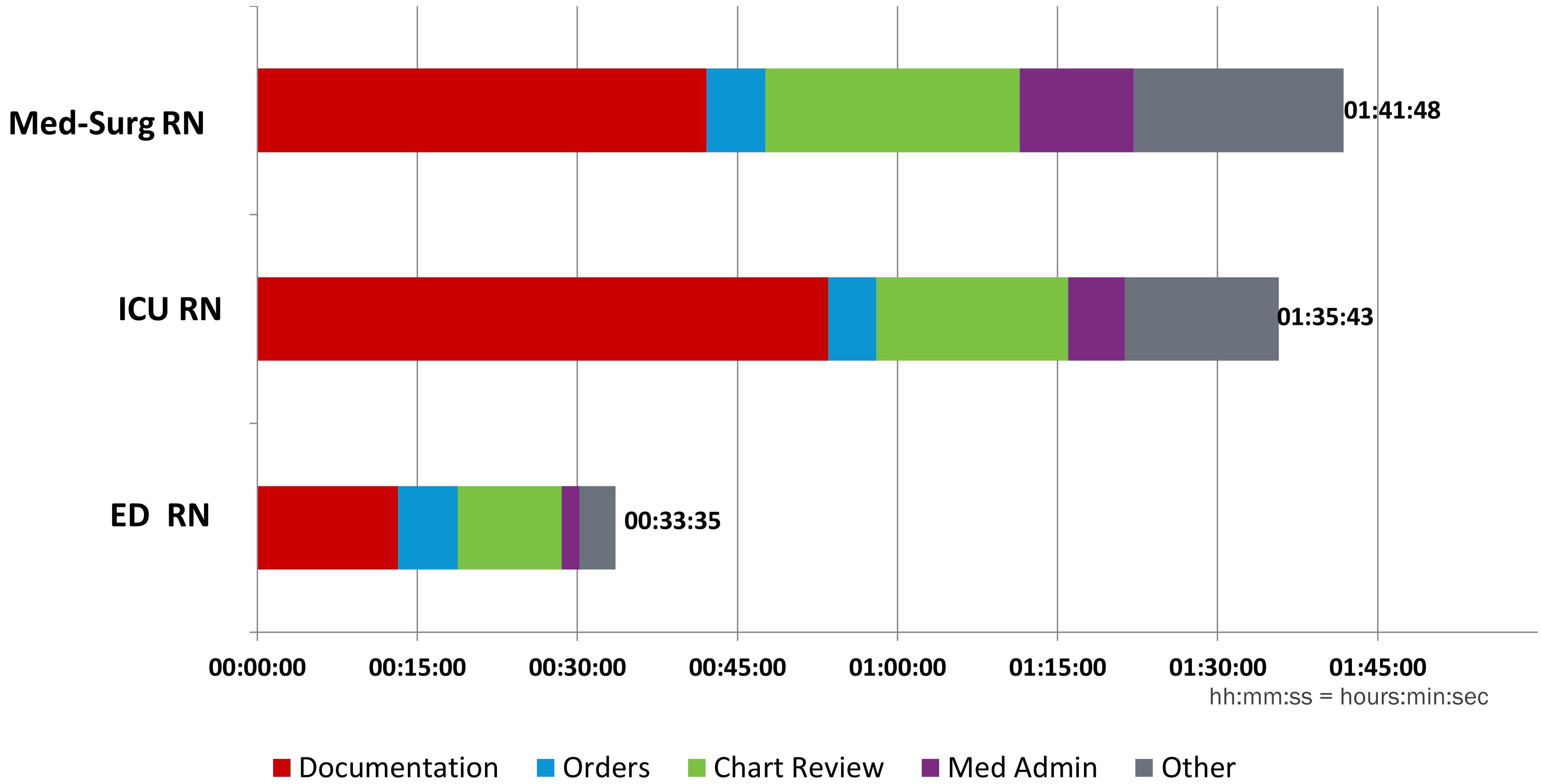
How nurses spend their time in the EMR



- Data for One 24 hr. day, 3 EMR positions
- *Preliminary data – validation of metrics and definitions occurring with 3 early validation partners.*

*Time includes: Alerts, Discharge, Histories, Meds Rec, Problem & Diagnosis, Sign Review, Unmapped
**Time includes: Allergies, BMDI, Unmapped

Average Time Inside Chart per day - Nursing



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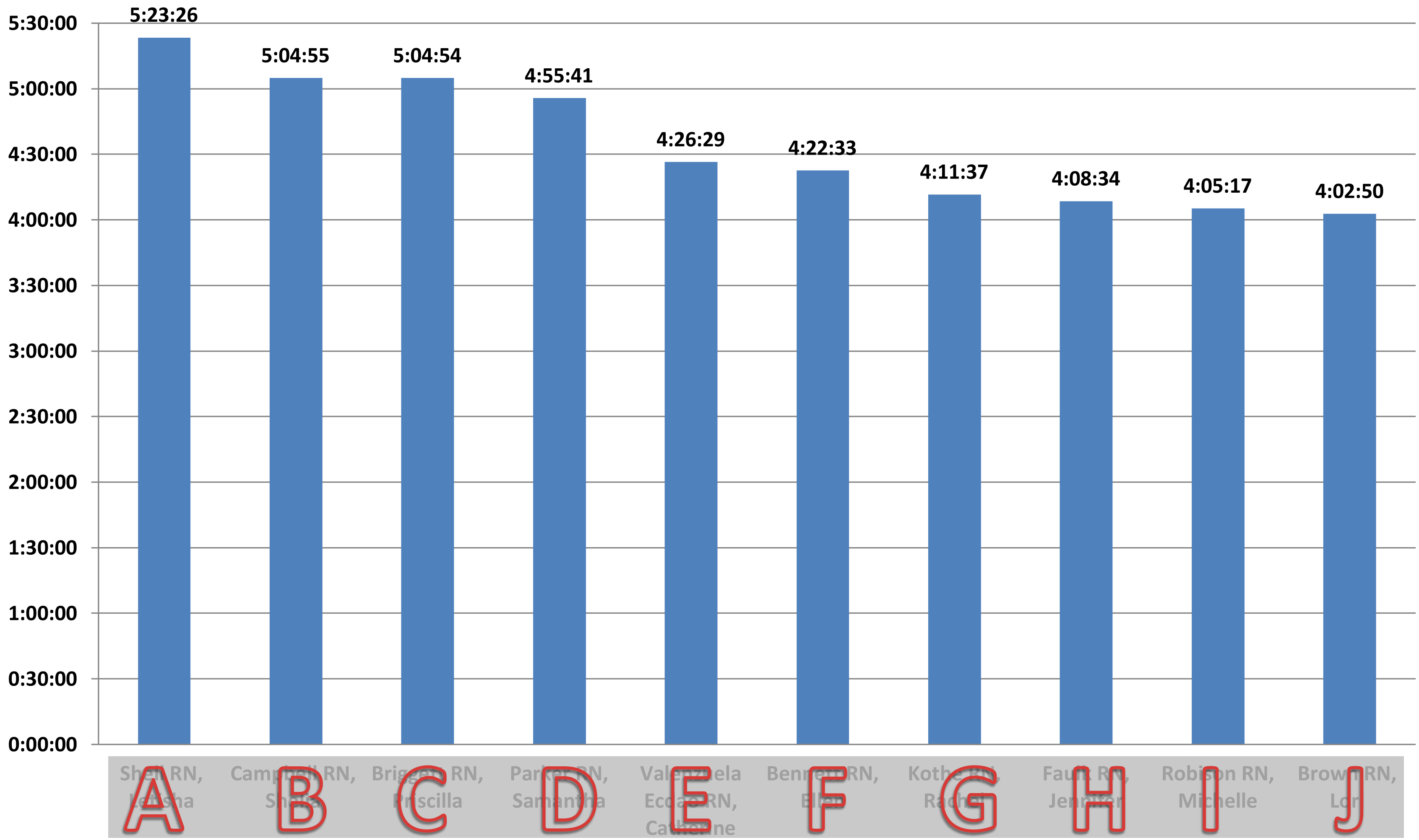
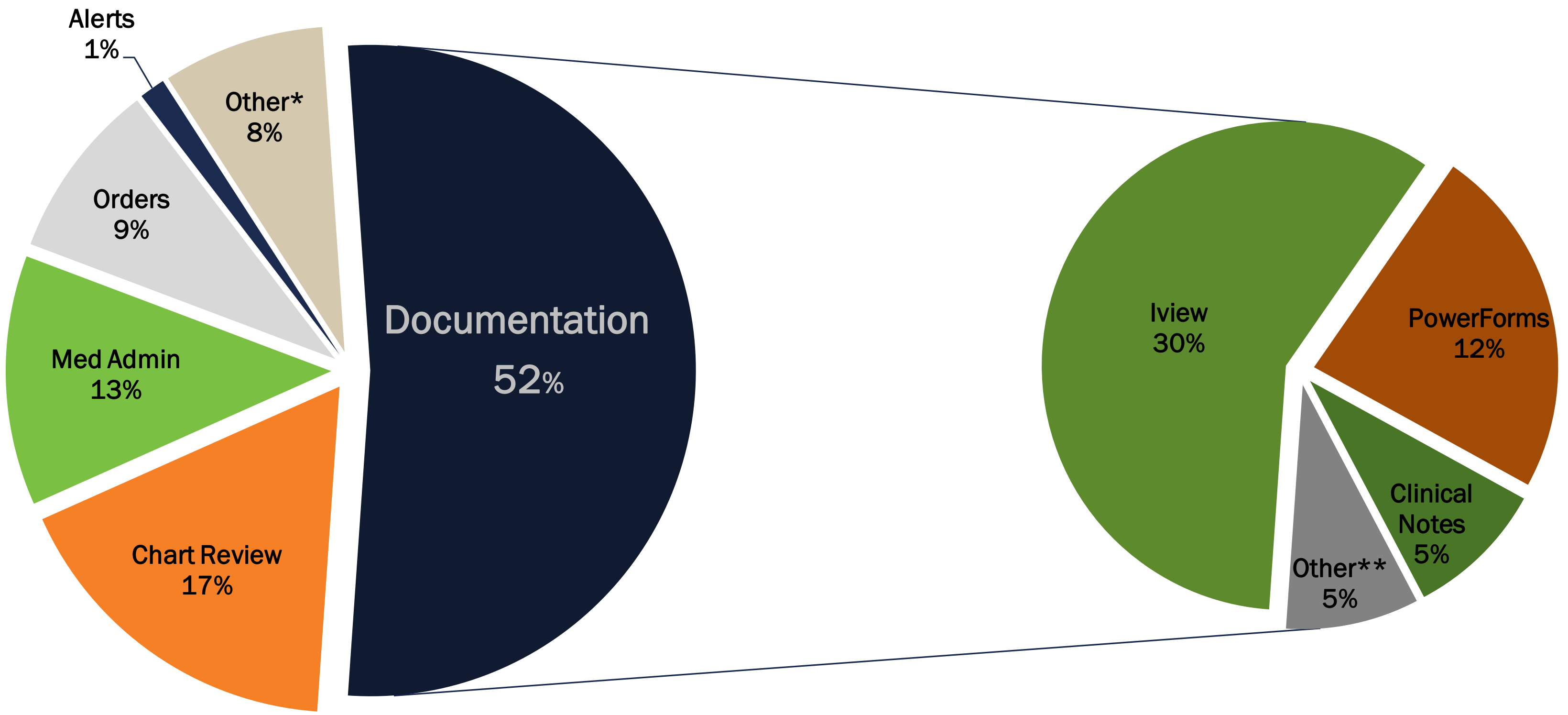
Time INSIDE PATIENT charts per day: RN Position



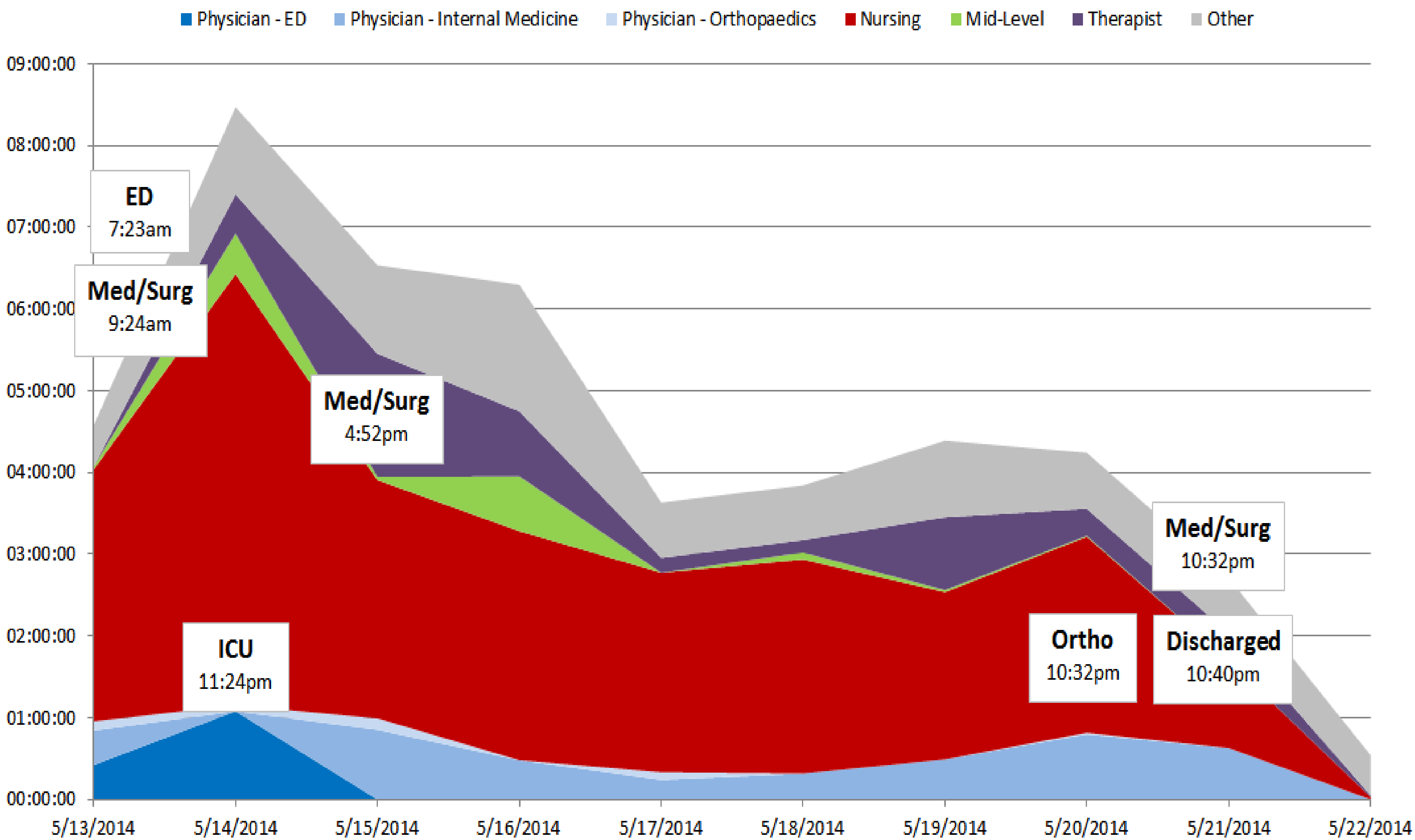
- Data for One 24 hr. day, 3 EMR positions
- *Preliminary data, being validated*

How nurses spend their time in the EMR (inside chart)

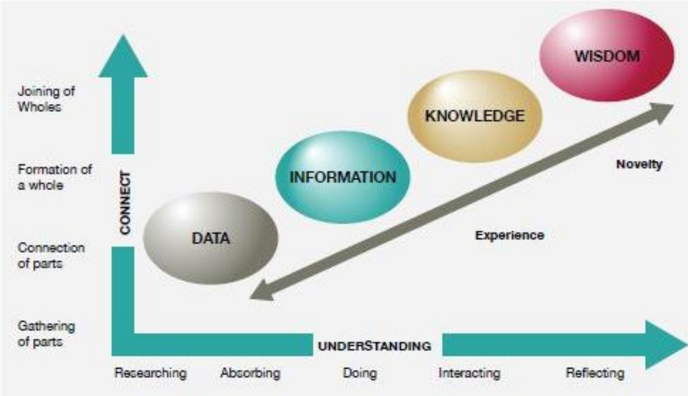


*Time includes: Discharge, Histories, Meds Rec, Patient Education, Problem-Dx, Unmapped
**Time includes: Allergies, BMDI, I&O, PowerNote, Unmapped

Care Team Time in EMR (Single Patient - Hip Fracture)



Nursing – Big Data



Big Data

- = a blanket term for any collection of data sets so large and complex that it becomes difficult to process using on-hand database management tools or traditional data processing applications.

Characteristics of Big Data:

1. • **Volume** (Scale of Data)
2. • **Velocity** (Analysis of Streaming data)
3. • **Variety** (Different forms of data)
4. • **Veracity** (Uncertainty of data)

http://www.ibmbigdatahub.com/infographic/four-vs-big-data

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Pittsburgh Dataworks

- … is a consortium of Pittsburgh-based companies, universities, economic development organizations and local government coming together **to help establish Pittsburgh as a “Big Data Savvy” city** ready to participate in the economic opportunities created by the growth in big data applications and technologies.

PITTSBURGH DATAWORKS

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Health Facts –

- Cerner's de-identified Big Data
- 516 U.S. Cerner clients are participants and contribute data
- Total Patients

Patient Type	Patients	Encounters
Inpatient	9,453,000	12,033,000
Emergency	20,150,000	27,713,000
Outpatient	70,980,000	190,323,000

- Total Clinical Data Elements

Type	Items
Medication Orders	303,856,000
Lab Results	5,022,000,000
Flowsheet items	1,109,000,000

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Example: Drug safety data mining in AMI in-patients

- **AMI patients typically have multiple pre-existing comorbid conditions that must receive treatment during the AMI episode, plus any medications associated with PCI/CABG, hospital-acquired pneumonia or other infectious complication subsequent to coronary revascularization procedure**
- **More than 300 instantiated single-med and multi-med regimens with N > 20**
- **Lots of diabetes, hypertension, depression, lots of other prevalent conditions**
- **Misc. conditions that are not all that uncommon (epilepsy, gout, arthritis, etc.)**
- **Many patients receive more than 10 concomitant medications during hospital admission for AMI (context-specific "polypharmacy")**
  - Extracted 6,699 patients with 'complete' data from Health Facts® with EKG-proven AMI coded as ICD-9 410.xx … restricting to relatively healthy population between 35 and 60 years old who survived at least 72 hours (long enough for exposures to meds; long enough for liver function, kidney function, and other lab tests to show significant acute abnormalities, if they arise)
  - 131 client institutions, admission dates 01-JAN-2008 thru 31-DEC-2010
  - Excluded patients lacking prior encounters or who did not have previous encounters where liver function or kidney function test values were not measured or were not in normal range

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BCPNN screen – In-hospital mortality

- BCPNN: Bayesian Confidence Propagation Neural Network
- BCPNN used to highlight dependencies within a data set.
- Also used routinely for drug adverse reaction relationships
- Mostly agents that prolong the EKG QT interval ➔ fatal arrhythmias

-- OR-

- Agents that augment risk of other organ-system impairments (e.g. NSAIDs)

Medication or Combo or Concomitant Meds	Received Med or Combo (% of total)	Actual Nbr Died (% Rcvd)	Expected Nbr Died	Relative Risk	Act/Exp	p-value**	NNH (# needed to Harm)
Ciprofloxacin	386 (5.8%)	129 (33.4%)	28.3	**5.9**	1.8	< 0.0001	3.1
Amiodarone +Phenytoin	39 (0.6%)	13 (33.3%)	3.7	**5.9**	3.5	< 0.0002	3.6
Ibuprofen +Azithromycin	25 (0.4%)	7 (28.0%)	2.2	**4.9**	3.1	< 0.01	4.5
Ibuprofen +Ciprofloxacin	24 (0.4%)	6 (25.0%)	2.5	**4.4**	2.4	< 0.05	5.2
Valproic acid	53 (0.8%)	12 (22.6%)	4.8	**4.0**	2.5	< 0.004	5.8
Amiodarone +Levofloxacin	277 (4.1%)	49 (17.7%)	26.5	**3.1**	1.8	< 0.0001	8.0
Acetaminophen +Phenytoin	135 (2.0%)	24 (17.8%)	8.5	**3.1**	2.8	< 0.0001	8.1
Phenytoin	158 (2.4%)	27 (17.1%)	9.7	**3.0**	2.8	< 0.0001	8.6
Amiodarone +Azithromycin	65 (1.0%)	9 (13.8%)	4.6	**2.4**	1.9	< 0.05	12.1
Acetaminophen +Azithromycin	277 (4.1%)	31 (11.2%)	18.0	**2.0**	1.7	< 0.003	17.4
Levofloxacin	736 (11.0%)	79 (10.7%)	51.4	**1.9**	1.5	< 0.0001	17.6
Azithromycin	327 (4.9%)	33 (10.1%)	20.8	**1.8**	1.6	< 0.006	21.5
Ondansetron +Ciprofloxacin	245 (3.7%)	24 (9.8%)	16.6	**1.7**	1.4	< 0.0001	23.4
Fluoxetine	131 (2.0%)	11 (8.4%)	4.9	**1.5**	2.2	< 0.02	36.0
Entire cohort	6,699 (100%)	380* (5.7%)	N/A	1.0	N/A	N/A	N/A

BCPNN screen – In-hospital Grade 4 Liver Injury

- Drugs and combos that have known liver toxicity → exacerbated risk in AMI pop
- Drug that is ordinarily low-risk for liver toxicity → significant risk in AMI pop

Medication or Combo or Concomitant Meds	Received Med or Combo (% of total)	Actual Nbr Gr.4 liver inj (% Rcvd)	Expected Nbr Gr. 4 liver inj	Relative Risk	Act/Exp	p-value**	NNH
Ibuprofen +Levofloxacin	58 (0.9%)	9 (15.5%)	3.5	**5.3**	2.5	< 0.02	7.8
Amiodarone +Levofloxacin	277 (4.1%)	35 (12.6%)	18.1	**4.3**	1.9	< 0.0003	9.8
Amiodarone +Ibuprofen	110 (1.6%)	12 (10.9%)	5.8	**3.8**	2.1	< 0.02	12.2
Levofloxacin	736 (11.0%)	54 (7.3%)	35.7	**2.5**	1.5	< 0.001	19.9
Ondansetron +Levofloxacin	439 (6.6%)	32 (7.3%)	20.4	**2.5**	1.6	< 0.01	21.1
Venlafaxine	111 (1.7%)	8 (7.2%)	3.6	**2.5**	2.2	< 0.04	22.7
Entire cohort	6,699 (100%)	192* (2.9%)	N/A	1.0	N/A	N/A	N/A

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Results

- **Discovered 20 important safety signals not previously recognized**
  - Discovered 14 exposures that were associated with statistically significant ($p < 0.05$) increased risk of in-hospital mortality, elevated up to 5.9-fold above the mortality risk experienced by the cohort as a whole
  - Discovered 6 exposures that were associated with up to 5.3-fold increased risk of Grade 4 liver injury while the patients were in-hospital
- **Could become the basis for personalized, refined order-sets and plans of care (for AMI treatment, in this example)**

Datamining in Health Facts

- **Large cohorts in observational data warehouses**
  - STEMI and non-STEMI AMI
  - Mild hypokalemia
  - QT interval frequently in high-normal range
  - Some prevalent variations in DNA Fingerprint
    - *CYP1A2*1C (slow-metabolizer) vs. CPY1A2*1F (rapid-metabolizer) genotypes*
- **Case Scenario**
  - 52 year-old Caucasian male presents with AMI and community-acquired pneumonia, receives PCI with stenting of the LAD coronary artery, and is placed on conventional AMI protocol in CCU. On Day-2 of hospitalization he develops a pattern of intermittent, hemodynamically unstable ventricular tachycardia and is placed on amiodarone.
  - No other organ system abnormalities, and liver and kidney function tests normal. Mild hypokalemia (potassium 3.1 mEq/L). The patient's EKG shows a depressed ST segment and variable T-wave inversion consistent with acute MI,
  - QTc = 475 msec *(normal range between 350-470 msec in adult male).*
  - No known history of long-QT syndrome or sudden cardiac death in the family. No QT-prolonging meds on-board.

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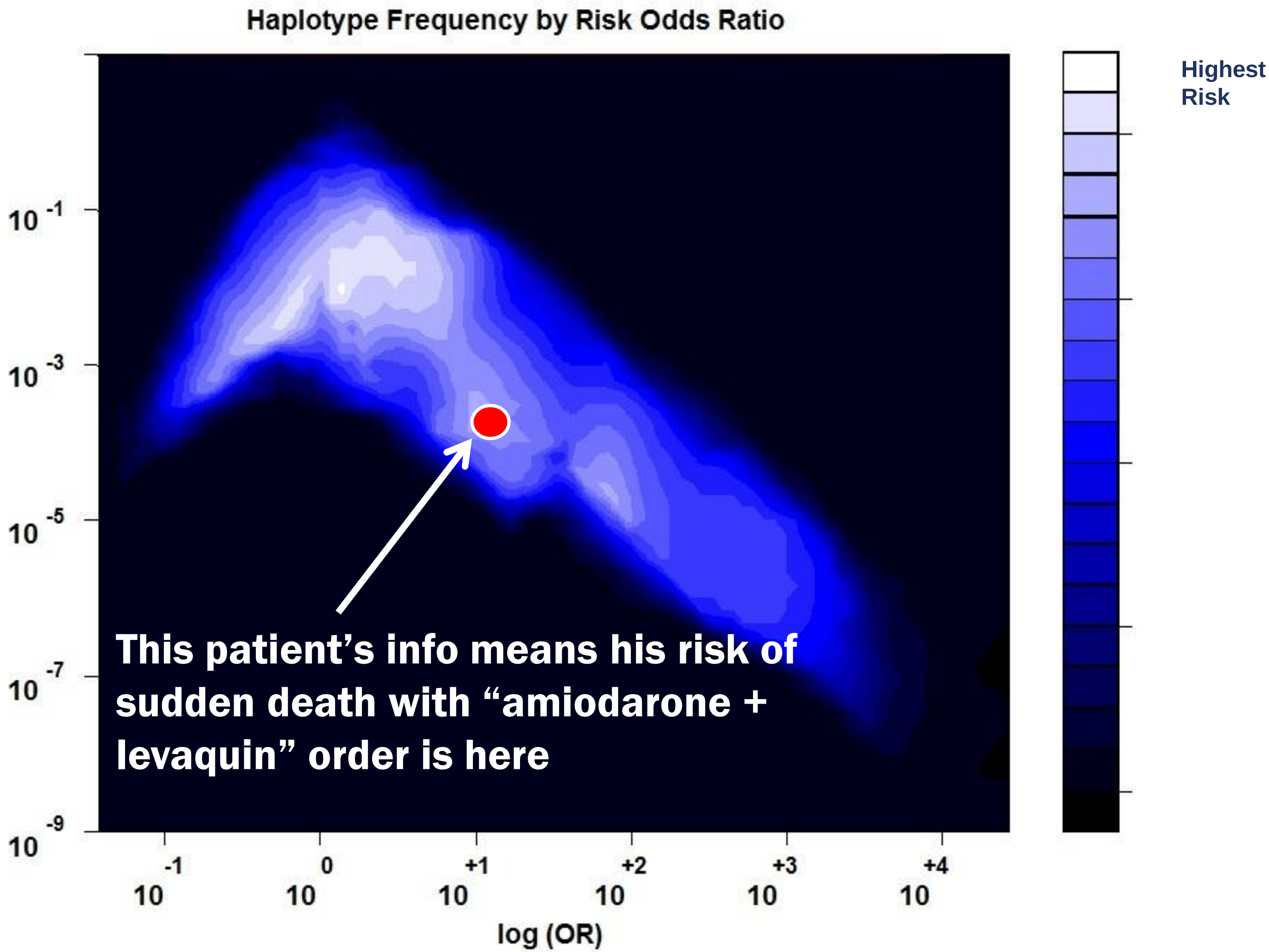
Prevalence of Genotype-Phenotype Vectors



Call to action for Nursing Leaders

- **"little to none of the data nurses currently enter into EHRs can be used in the "big data" analysis"**
  - Keenan, G. (2014). Big Data in Health Care: An Urgent Mandate to CHANGE Nursing EHRs! *Online Journal of Nursing Informatics (OJNI), 18*(1), Available at http://ojni.org/issues/?p=3081
- **Due to the fact that nursing and other clinical the data are not standardized and thus NOT interoperable.**
- **Interoperable data contains data elements that are defined, measured, and retrievable in the exact same format.**
- If nurses are to practice to the full extent of their training, *a recommendation of the IOM's Future of Nursing Report (2010)*, it is essential to have the means to demonstrate the impact of nursing care on patient outcomes linked to the nurse provider type.
  - Generating high quality interoperable big nursing data is not only the first step to participating in big health care data analysis but also MUST be fully controlled by nursing.

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Action Plan – Building Interoperable Nursing Data

- **The most important recommendations of the action plan are to:**
  1. Urgently adopt standardized nursing terminologies (SNTs) at the point of care (ANA recognized) and NIDSEC database standards
  2. Promote institutional and public policies that supports the use, refinement, and expansion of IT standards that enable the documentation and exchange of key nursing data across systems including empowering nurse informaticians to advocate for the integration of SNTs into EHRs.
  3. Create and implement a campaign for rapidly educating nursing students, nurses, faculty, nurse executives, nursing informaticians, and the inter-professional care disciplines on key aspects of nursing informatics;

Shlaefer, B. (2013, Fall/Winter). Leading the effort to unblock big data. *Minnesota Nursing, Informatics and Systems Innovation.* Retrieved January 16, 2014.

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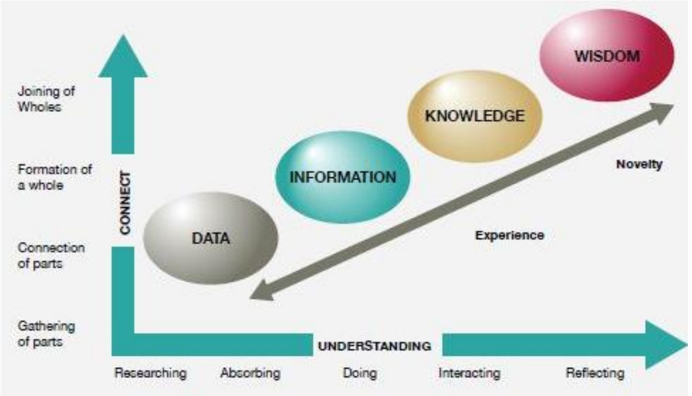
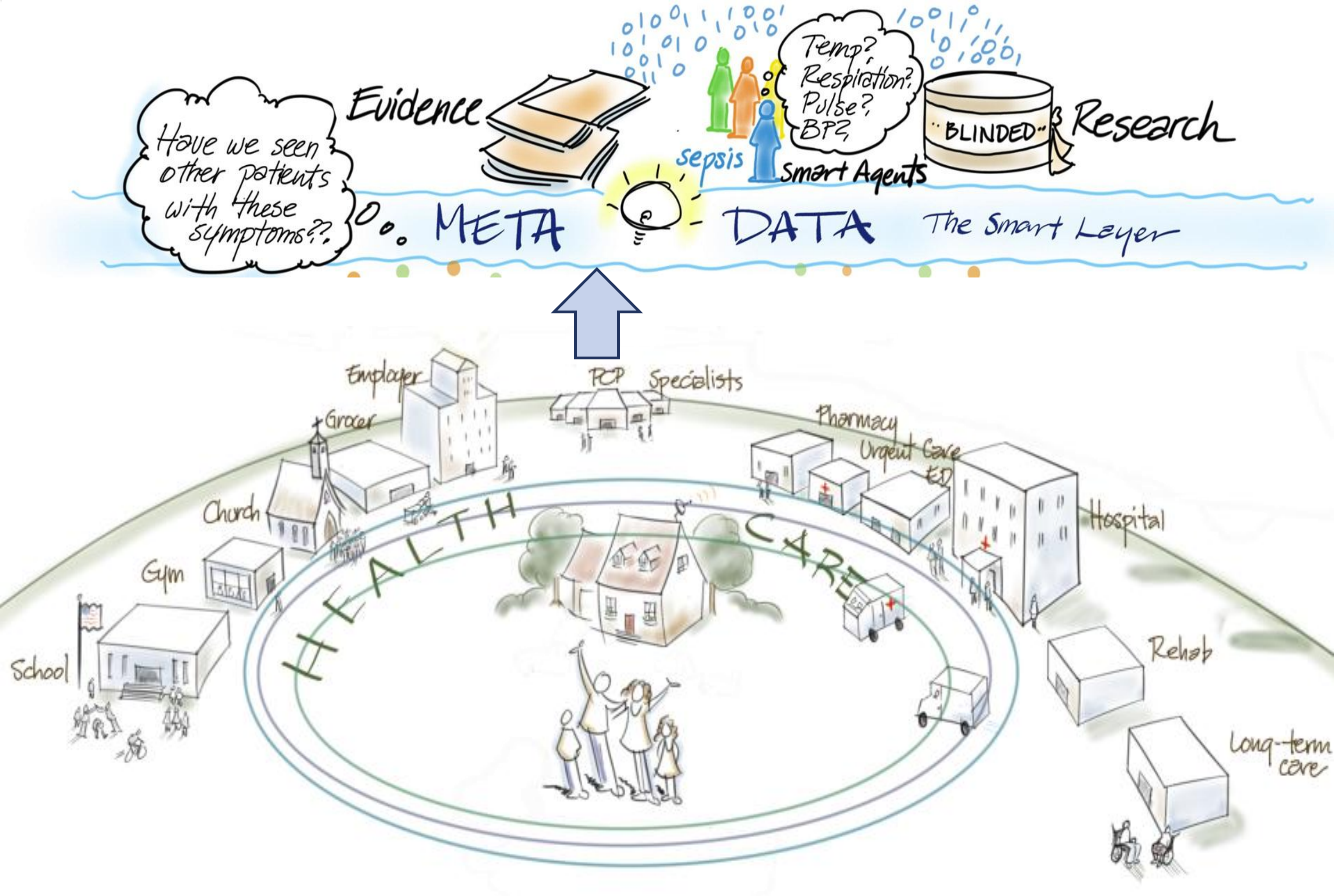
Connecting the Home & Community



Big Data to Manage Population Health – Connecting it all



Growing demand for personal engagement in health

QUALITY

50% Less likely to be readmitted
within 30 days of discharge

70% Less likely to experience a medical error

50% Less likely to suffer health consequence
due to poor communication among providers

AARP Study of Members

MEANINGFUL USE

- ☑ View and download records
- ☑ Secure messaging
- ☑ Reminders sent to patients
- ☑ Patient-specific education
- ☑ Clinical summaries from office visits

PATIENT SATISFACTION

Want to schedule appointments online

Want their lab results online

Want access to their doctors online

Would leave their doctor for one with online access

Intuit Health Survey

Home

Baseline Health Patient Services | Virginia Johnson | Eng. | Sign Out

Health Portal
sponsored by Baseline Health

Health | Wellness | Messaging | Community | Learn | Bill pay

We've noticed an increase in your weight. Please take the time to answer a few questions.

Virginia Johnson

Your Team

- **Dr Larry Thomas** – Medical Home
- **Dr. Julia Harris** – Cardiologist
- **Cindy Miller** – Care Manager
- **Shawn Reynolds** – Church Health Coach
- **Thomas Johnson** – Son

Health Record

- Health profile
- Results
- Documents
- Medications
- Procedures
- Download and sent
- CCD import

Programs

- Heart Failure
- High Blood Pressure
- Wellness

Blogs

Health Library

Your Plan

Please Note: Due to your recent hospitalization, your plan was updated and your son and Team have been notified.

Medications

Take Lasix 40mg every day

Take Lisinopril 10mg every day

Take K-Dur 20mEq every day

Take Baby Aspirin very day

Diet

Eat a low sodium diet

Learn about low-sodium cooking New

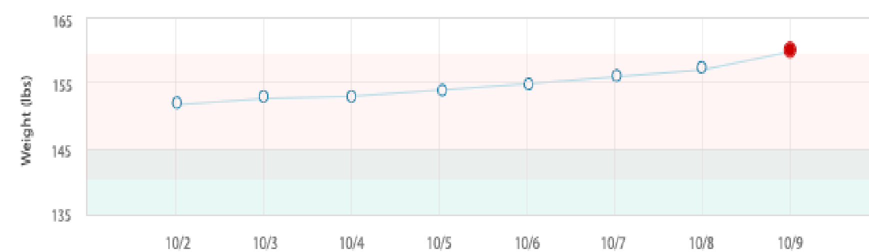
Track your diet for 2 weeks New

Calendar

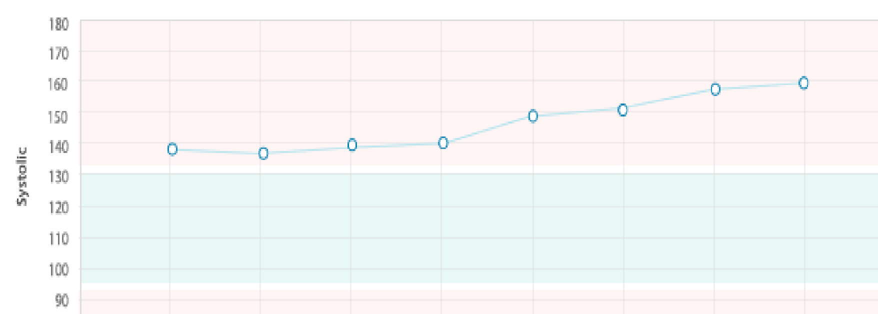
Oct 20, 2013
Hospital Followup

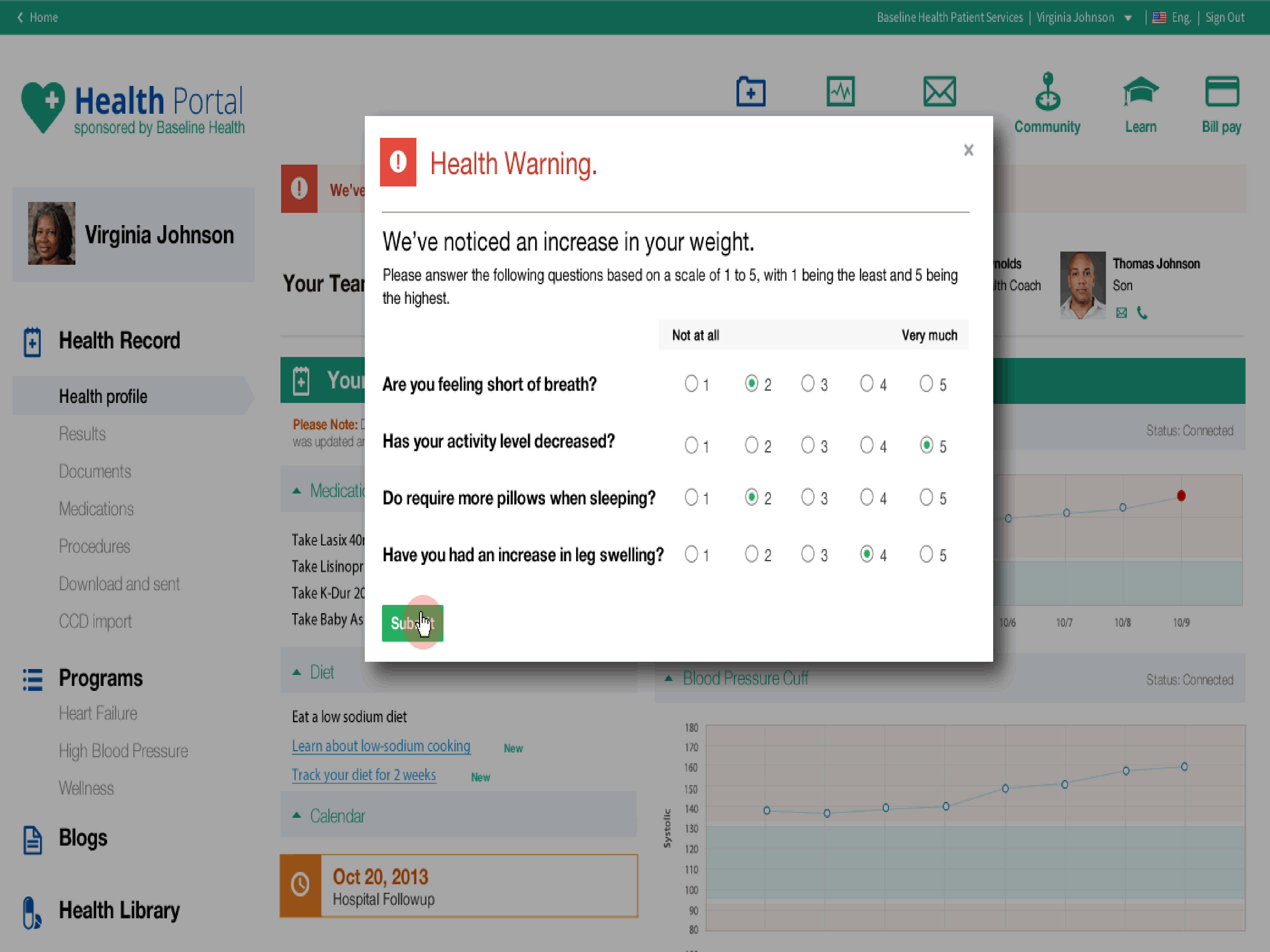
Recent Results

Weight Scale
Status: Connected



Blood Pressure Cuff
Status: Connected




Home
Baseline Health Patient Services | Virginia Johnson | Eng. | Sign Out
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Health Record
Health profile
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Documents
Medications
Procedures
Download and sent
CCD import
Programs
Heart Failure
High Blood Pressure
Wellness
Blogs
Health Library
Health Warning.
We've noticed an increase in your weight.
Please answer the following questions based on a scale of 1 to 5, with 1 being the least and 5 being the highest.
Not at all
Very much
Are you feeling short of breath?
Has your activity level decreased?
Do require more pillows when sleeping?
Have you had an increase in leg swelling?
1 2 3 4 5
Submit
Thomas Johnson
Son
Status: Connected
Eat a low sodium diet
Learn about low-sodium cooking
New
Track your diet for 2 weeks
New
Diet
Calendar
Oct 20, 2013
Hospital Followup
Blood Pressure Cuff
Systolic
10/6
10/7
10/8
10/9

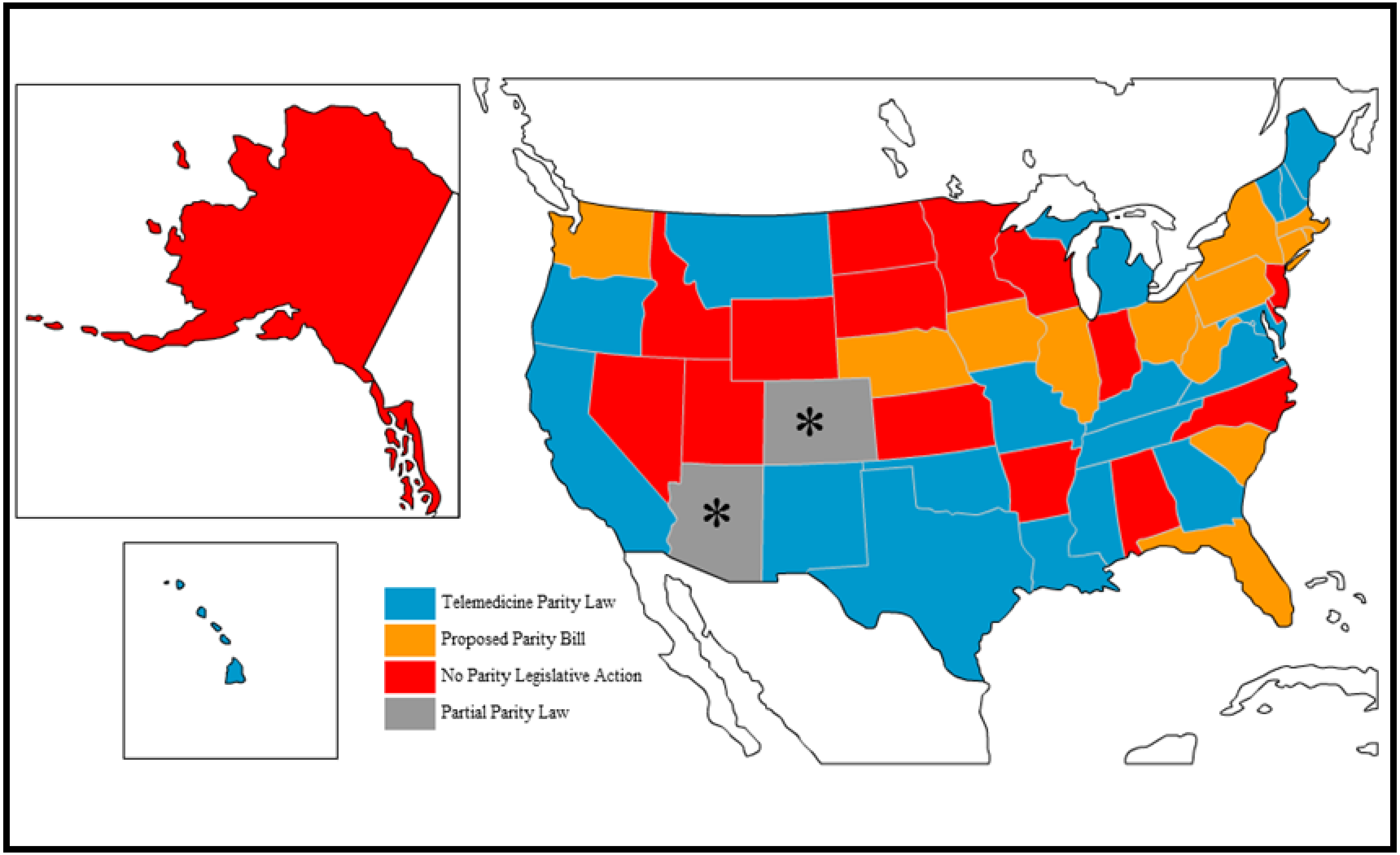
Connecting the Patient at Home

- Home Medical Equipment
- Wireless data exchange with Health and Wellness Portal

Connecting to the Community

- **Telehealth – growing specialty within Nursing and Healthcare.**
- **Telenursing refers to the use of telecommunications and information technology in the provision of nursing services whenever a large physical distance exists between patient and nurse, or between any number of nurses.**
  - *Telehealth nursing may require an additional licensure to practice across state lines.*
  - *In non-federal setting telehealth nurses must have an RN license that complies with both state and federal regulations. In the US, the nurse licensure compact (NLC) allows RN's to practice across compact members' state lines.*

States with Parity Laws for Private Insurance Coverage of Telemedicine (2014)



States with the year of enactment: Arizona (2013)*, California (1996), Colorado (2001)*, Georgia (2006), Hawaii (1999), Kentucky (2000), Louisiana (1995), Maine (2009), Maryland (2012), Michigan (2012), Mississippi (2013), Missouri (2013), Montana (2013), New Hampshire (2009), New Mexico (2013), Oklahoma (1997), Oregon (2009), Tennessee (2014), Texas (1997), Vermont (2012), Virginia (2010) and the District of Columbia (2013)

States with proposed/pending legislation: In 2014, Connecticut, Florida, Illinois, Iowa, Massachusetts, Nebraska, New York, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee (ENACTED), Washington, and West Virginia

**No state-wide coverage. Applies to certain health services and/or rural areas only.*

Leadership Considerations

- **Preparing for patients who are more engaged in their health and wellness.**
- **Preparing clinical workforce for well educated and engaged patients**
- **Care Delivery model changes – Acute care is not the primary location for delivery of care.**
- **Keeping patients our of the hospital is key objective**
  - Then utilizing correct level of care when needed
- **Shifting workforce to continuum of care delivery model**

Cerner

Nursing Leadership Challenges in Integrating new Technology

1. **Balancing the Human Element with Technology**
2. **Balancing Costs and Benefits**
3. **Training a Technology Enabled Nursing Workforce & assuring Ongoing Competency**
4. **Assuring that Technology Use is Ethical**

Huston, C., (May 31, 2013) "The Impact of Emerging Technology on Nursing Care: Warp Speed Ahead" *OJIN: The Online Journal of Issues in Nursing* Vol. 18, No. 2, Manuscript 1.

http://www.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/TableofContents/Vol-18-2013/No2-May-2013/Impact-of-Emerging-Technology.html

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Questions?

darinda.sutton@cerner.com