# EHR Remodeling:
# User (and Patient) Centered Designs

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*2018 Nursing Knowledge:*

*Big Data Science Conference*

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# The Problem

- Nurses - largest group of healthcare professionals; most frequent user of electronic health record (EHR)

- Inadequate documentation design and excessive requirements
- Dissatisfied nurses
- Inaccurate and incomplete records
- Data infrequently used later in patients' care

(Carrington & Effken, 2011; Englebright, Aldrich, & Taylor, 2013; Hebda & Czar, 2013; Hendrich, Chow, Skierczynski, & Lu, 2008; Lee & McElmurry, 2010; Westra et al., 2010; Whittenburg, 2010; Yeung, Lapinsky, Granton, Doran, & Cafazzo, 2012)

# REMODEL: WHAT IS YOUR WHY?

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*Where Caring Meets Excellence*



Gundersen Health System, 2016)

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Systems Architect

# Their Why



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# Outside of our Walls

- Hendrich et al. (2008)
  - 35.3% of time spent on documentation
- Yee et al. (2012)
  - 19% of time spent on documentation
- Sanders et al. (2014)
  - 46% of time spent on documentation
- Yeung, Lapinsky, Granton, Doran, & Cafazzo (2012)
  - vital signs documentation errors reported, rates not listed
- Li & Korniewicz (2013)
  - expected skin/wound photographs found in 22% of records

# Impacting Factors

*Factors impacting nursing documentation and EHR use*

| Individual | Interpersonal | Organizational |
|---|---|---|
| • nurses' perceptions (impacted by education level, age, and time spent documenting)<br>• continued informal use of paper<br>• experience with technology | • teamwork and team communication<br>• privacy concerns<br>• distraction<br>• patient type<br>• shift involved | • location of computers<br>• reliability of computers<br>• software design<br>• documentation requirements<br>• reimbursement |

(Carrington & Effken, 2011; Cornell, Riordan, & Herrin-Griffith, 2010b; Cornell, Gervis, Yates, & Vardaman, 2013; Hripcsak, Vawdrey, Fred, & Bostwick, 2011; Keenan, Yakel, Lopez, Tschannen, & Ford, 2013; Kohle-Ersher, Chatterjee, Osmanbeyoglu, Hochheiser, & Bartos, 2012; Kutney-Lee & Kelly, 2011; Li & Korniewicz, 2013; Petkovsek-Gregorin & Skela-Savic, 2015; Sidebottom et al., 2012; Sockolow et al., 2014; Staggers, Clark, Blaz, & Kapsandoy, 2011; Yeung et al., 2012)

# A Call for Optimization

- AMIA EHR Task Force 2020
  - *Ten recommendations in five areas align with HIMSS directors and Big Data work groups:*
    1. Simplify and speed documentation
    2. Refocus regulation
    3. Increase transparency and streamline certification
    4. Foster innovation
    5. Support person-centered care delivery



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(Delaney et al., 2015; O'Brien et al., 2015; Payne et al., 2015)

# The Need

- *Future of Nursing: Leading Change, Advancing Health*
- User-centered design - opportunity to intervene
- *The Federal Health IT Strategic Plan: 2015-2020*



(Institute of Medicine, 2010; U.S. Department of Health and Human Services, n.d.; Zahabi, 2015)

# Evidence-Based Intervention




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# Practice Question

For inpatient nurses, what is the effect of redesigned electronic admission documentation and clinical decision support tools, in comparison to the current designs, on efficiency, effectiveness, and satisfaction?



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# Guidelines

- National Institute of Standards and Technology Guide to the Processes Approach for Improving the Usability of Electronic Health Records (Schumacher & Lowry, 2010)
- Defining and Testing EMR Usability: Principles and Proposed Methods of EMR Usability Evaluation and Rating (Belden, Grayson, & Barnes, 2009)
- EHR Usability Toolkit: A Background Report on Usability and Electronic Health Records (Johnson et al., 2011)

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# Assessing Usability

- heuristic evaluation
- cognitive walkthrough
- contextual interview (or interrupted task-based testing or observations)
- think-aloud protocol
- remote evaluation
- laboratory testing
- usability questionnaires
- ergonomic evaluations
- functional decomposition (or activity diagrams)
- focus groups
- log files
- chart reviews
- workflow analysis
- scenario based evaluations
- time and motion studies
- key stroke analysis
- eye tracking studies

(Belden et al., 2009; Killman, 2016; Johnson et al., 2011; Page & Schadler, 2014; Rogers, Sockolow, Bowles, Hand, & George, 2013; Schumacher & Lowry, 2010; Staggers, Kobus, & Brown, 2007; Yen & Bakken, 2012; Zahabi et al., 2015)

# Elements of the User Experience

- Accessibility
- Functional Suitability
- Functional Discoverability
- Ease-of-learning
- Ease-of-use
- Ease-of-recall
- Safety
- Subjective Preference

(Killman, 2016)

# Local Background - 2016

**Nursing Survey** *(n=582, inpt RN n = 337)*

- 20 comments about many irrelevant flowsheet rows and lack of data display in EHR
- 32 comments regarding redundancy
- 11 comments about admission documentation

**EPIC Nursing Visit**

- Of 3,068 active rows, 420 accounted for 80% of the documentation
- Inconsistent use of EHR tools
- Desire to efficiently learn information about patients past encounters

# Local Project Aim

- The purpose of this project was to redesign electronic admission profile flowsheet documentation using user-centered design and usability assessments on adult inpatient units.



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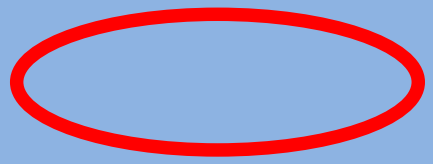
# Pre-Change
# Admission Navigator

- Waiting for EPIC permission to display screenshots

**Form version**



**Flowsheet version**

# Phase 1 - Setting & Scope

September 2016 to March 28, 2017

- Adult inpatient units
  - Surgical-Digestive Care, Medical-Oncology, Orthopaedic, Neuroscience, Cardiopulmonary, Short Stay, Medical-Specialties, Critical Care, Obstetrics, Labor & Delivery, Inpatient Behavioral Health
  - Admissions - 1200 adult & 165 pediatric admissions/month, ~16,000/year
- Inpatient Rehabilitation unit
- Four Critical Access hospitals
- Community Connect hospital

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# Interdisciplinary Impact

| | |
|---|---|
| Patients | Wellness |
| C4 | Physical Therapy |
| Data Service Specialists | Occupational Therapy |
| Hospitalists | Respiratory Therapy |
| Service Excellence | Nutrition Therapy |
| Health Unit Coordinators | Diabetes Education |
| Library & Patient Education | Trauma Services |
| Spiritual Care | Social Services |
| Pain Certified RN | Infection Control |
| | Corporate Learning |

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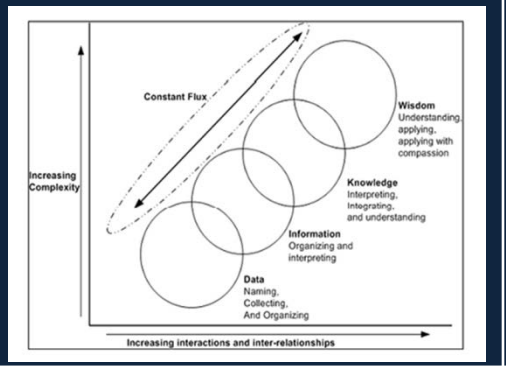
# Project Design

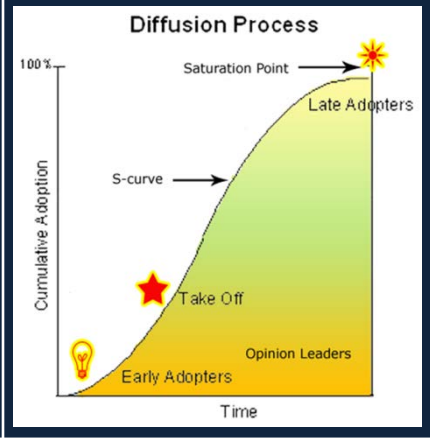
- Pre-test, post-test design
- Comparison of measures before and after the change.
- All adult inpatient units will receive the change together so there will not be a control unit.
- Comparison of outcomes before and after the change with internal data will occur.

# Theoretic Underpinnings

## *A Combination for Success*

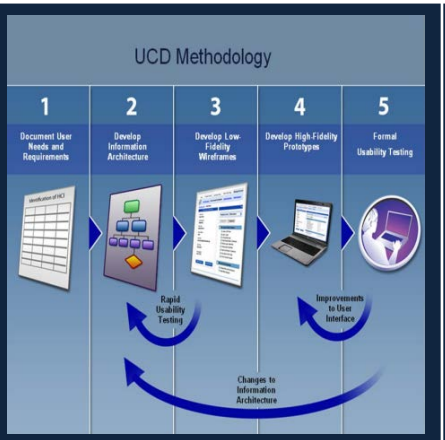
**Data, Information, Knowledge, Wisdom**

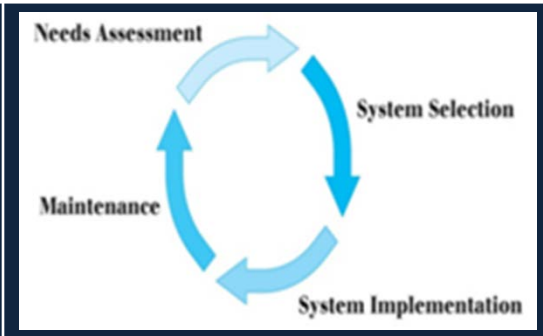



**Diffusion of Innovation**

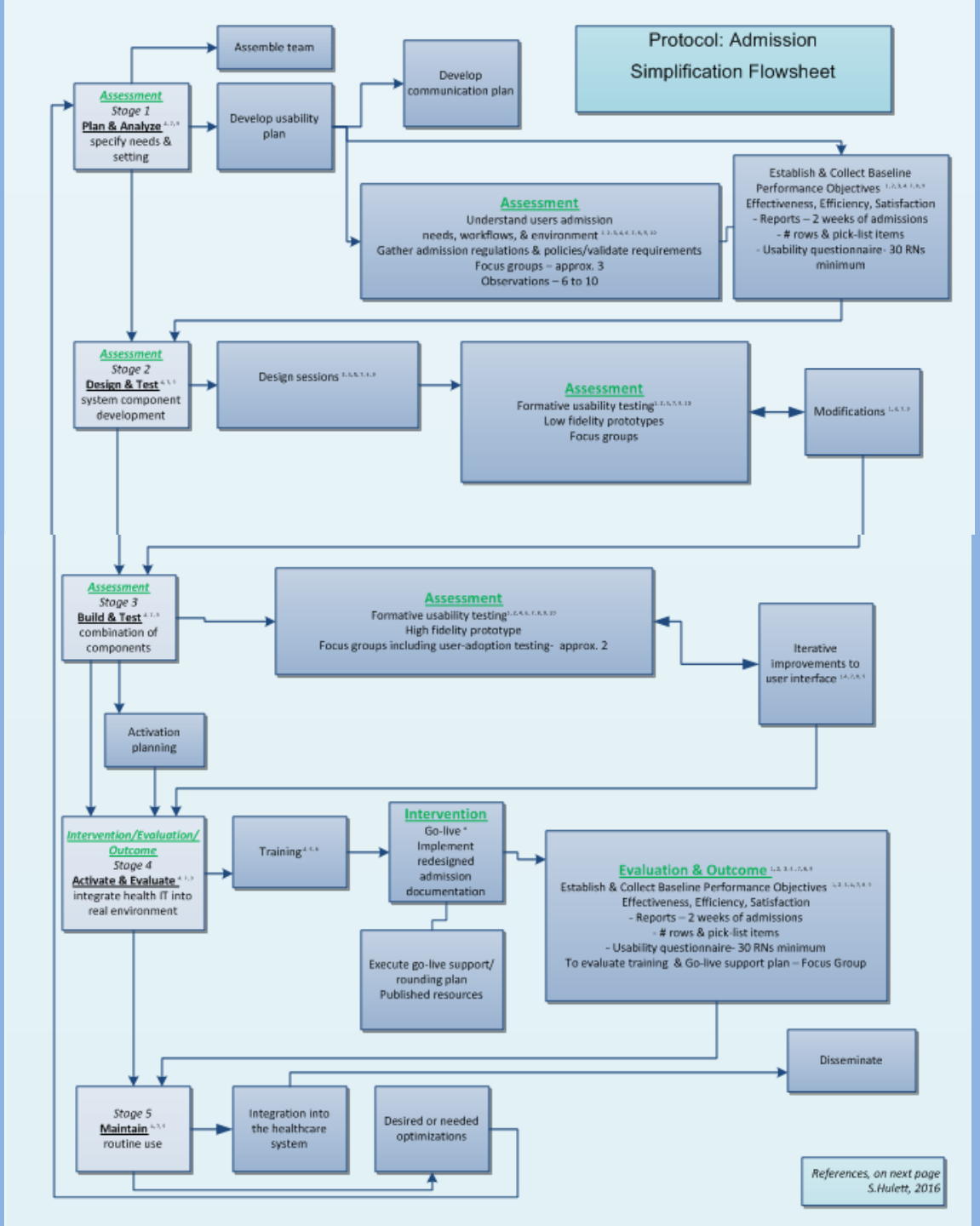
**User-Centered Design**




**System Developmental Life Cycle**

PROTOCOL




Visual owner:
Shannon Hulett

# Project Objectives

- Gather and confirm necessary admission profile assessments
- Conduct usability assessments
- Implement the redesign
- Compare the effectiveness, efficiency, and satisfaction before and after the change

# User (and patient) centered Design

- Mapping organizational policies and regulatory expectations
- Observations, workflow mapping
- Focus group design sessions and usability questionnaires
- Completed documentation review
- Transformation of many sections
- Patient engagement, early and throughout



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# Usability + Lean

## Observation tool: Admission Profile Flowsheet Simplification - 2016

Date: _____ Unit: _____ Observer:_____

Time received report (approx. if exact unknown): _____ Arrival on unit: _____

Time 'Admission' begins, regardless of what part of admission RN starts with: _____

Time 'Admission' ends: _____ Hash marks for each delay in the process: _____

Time Admission Profile begins: _____

Time Admission Profile ends: _____ Hash marks for each delay in the process: _____

Did they use the form version of the Admission Profile in the Admission Navigator? Yes No Some

Did they use the flowsheets version of the Admission Profile? Yes No Some

If flowsheets version did the access via 'Flowsheets' directly or via RLGL? Flowsheets RLGL

Does RN use full Patient Profile? Yes No If yes, time start: _____ end: _____

At what points in the process did they access RLGL? Comments of what they did/what they found?

_____

**Post observation debrief (observer with RN who was observed)**

When RN says she is done with the admission, ask her what she thinks of the profile(s) (designs, form versus flowsheets, picklists, last filed value information/design, RLGL linkage, other)

_____

_____

If we could change anything, what should we change? _____

With upcoming changes, what should we keep? _____

**Post observation reflection (by observer)**

Did they appear to be using the last filed value information? Yes No Some

Did they search in pick-lists more than seemed reasonable/comment of not finding a choice? Yes No Some

Did they answer certain questions without assessing/interviewing the patient? Yes No

If yes, which ones? _____

Did they skip questions? Yes No If yes, which ones? _____

If yes, any ideas as to why? Did they go back to them?

_____

What areas did they seem to stumble/seem frustrated or confused/as if it wasn't meaningful? (may be subtle)_____

Any ideas as to why? _____

What areas did they seem satisfied with and as if the section was meaningful?

_____

Any ideas as to why? _____

What seemed redundant if any areas?_____

Did they ask questions as if they were 'leading' the patient? Yes No Some

If yes or some, which ones? _____

What areas of the Admission Navigator did they not access at all? Any ideas as to why?

_____

_____

**Post observation steps by observer**

After observing, go to patient record and review Admission Profile. Which cells were not documented to for this encounter and any related findings or observer comments (ex. found cell had last filed value but it was from 2015, or answered in TEC at 'x' time, or just you found it blank?

_____

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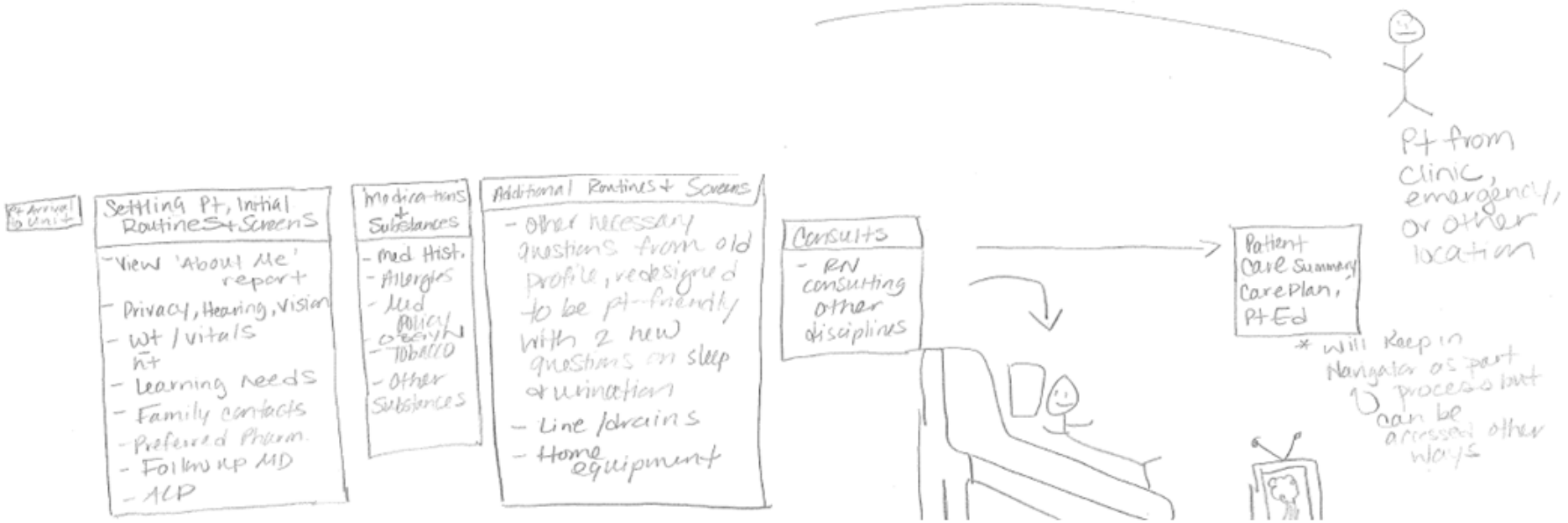
## Value Stream Map:


## Future State Map:



# System Life Cycle
# Focus Group Design Sessions

| | |
|---|---|
| **Stage 1** | **Plan & Analyze –** Specify needs & setting |
| **Stage 2** | **Design & Test –** System component development |
| **Stage 3** | **Build & Test (adopt) –** Combination of components |
| **Stage 4** | **Activate & Evaluate –** Integrate into the real environment |
| **Stage 5** | **Maintain –** Routine use |

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# Patient Centered Design

- Patient focus groups
- Literacy level script consultation to ensure comprehension
- Dress rehearsal

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# Satisfaction

Admission Profile Health Information Technology Usability Evaluation Scale (Health-ITUES)

| Question | Concept | Interaction |
|---|---|---|
| 1. I think the admission navigator has been positive for nursing. | System impact – career mission | User-system-task |
| 2. I think the admission navigator has been positive for the organization. | System impact – organizational level | |
| 3. The admission navigator is an important part of the admission process. | System impact – personal level | |
| 4. Using admission profile makes it easier to gather necessary patient information. | Productiveness | |
| 5. Using the admission profile enables me to gather necessary patient information more quickly. | Productiveness | |
| 6. Using the admission profile makes it more likely that I will gather necessary patient information. | Productiveness | |
| 7. The admission profile is useful for gathering necessary patient information. | General usefulness | |
| 8. I think the admission profile present a more equitable process for gathering necessary patent information. | General usefulness | |
| 9. I am satisfied with the admission profile for gathering necessary patient information. | General satisfaction | |
| 10. I gather necessary patient information in a timely manner with the admission profile. | Performance speed | |
| 11. Using the admission profile increases my productivity in gathering patient information. | Productiveness | |
| 12. I am able to gather necessary patient information whenever I use the admission profile. | Information needs | |
| 13. I am comfortable with my ability to use the admission profile. | Competency | User-system |
| 14. Learning to operate the admission profile was easy for me. | Learnability | |
| 15. It was easy for me to become skillful at using the admission profile. | Competency | |
| 16. I find the admission profile easy to use. | Ease of use | |
| 17. I can always remember how to use the admission profile. | Memorability | |
| 18. The admission profile gives error messages that clearly tell me how to fix problems. | Error prevention | |
| 19. Whenever I make a mistake using the admission profile, I recover easily and quickly. | Error prevention | |
| 20. The information (such as on-screen messages) provided with the admission profile is clear. | Information needs | |

**Scale: Strongly disagree – Disagree – Neutral – Agree – Strongly agree**

Release Day – March 28, 2017

# THE REDESIGN

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# The Redesign

- Confirmed which screens were necessary or in need of further analysis
- Determined appropriate timing of scripted screens
- Eliminated redundancy & non-value added rows
  - respiratory, diabetes, skin, mobility/daily living, discharge destination, care team, spiritual care, chronic pain, homicide
- Designed *About Me* reports



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# The Redesign

- While elimination of nonessential rows was a goal, the main goal was to implement a ***valuable*** set of admission screens in a usable design
  - Added sleep, voiding concerns, and equipment needs

- Four new groups placed in a more patient-centered and nursing workflow aligned sequence
  - Privacy, Hearing, Vision
  - Substance Use
  - Additional Routines & Screens
  - Pre-Admit Home Equipment



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# Clarity & Meaning

| Pre | Post |
| --- | --- |
| Street drug/Medication/ Inhalant Use | Do you use prescription drugs not prescribed for you or street or recreational drugs (such as narcotics, marijuana, meth, or heroin)? |
| Provides primary care for | Are there people or animals that need care while you are in the hospital? If so, we may be able to help. |
| History of Chronic Pain | Has pain in any part of your body lasted for more than 6 months (chronic)? |
| Financial Concerns | Are you worried about money or support that you may need when you go home (such as being unable to afford food or transportation concerns)? If so, we may be able to help. |

# About Me

- Waiting for EPIC permission to display screen shot, if unable will include prototype



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# RESULTS



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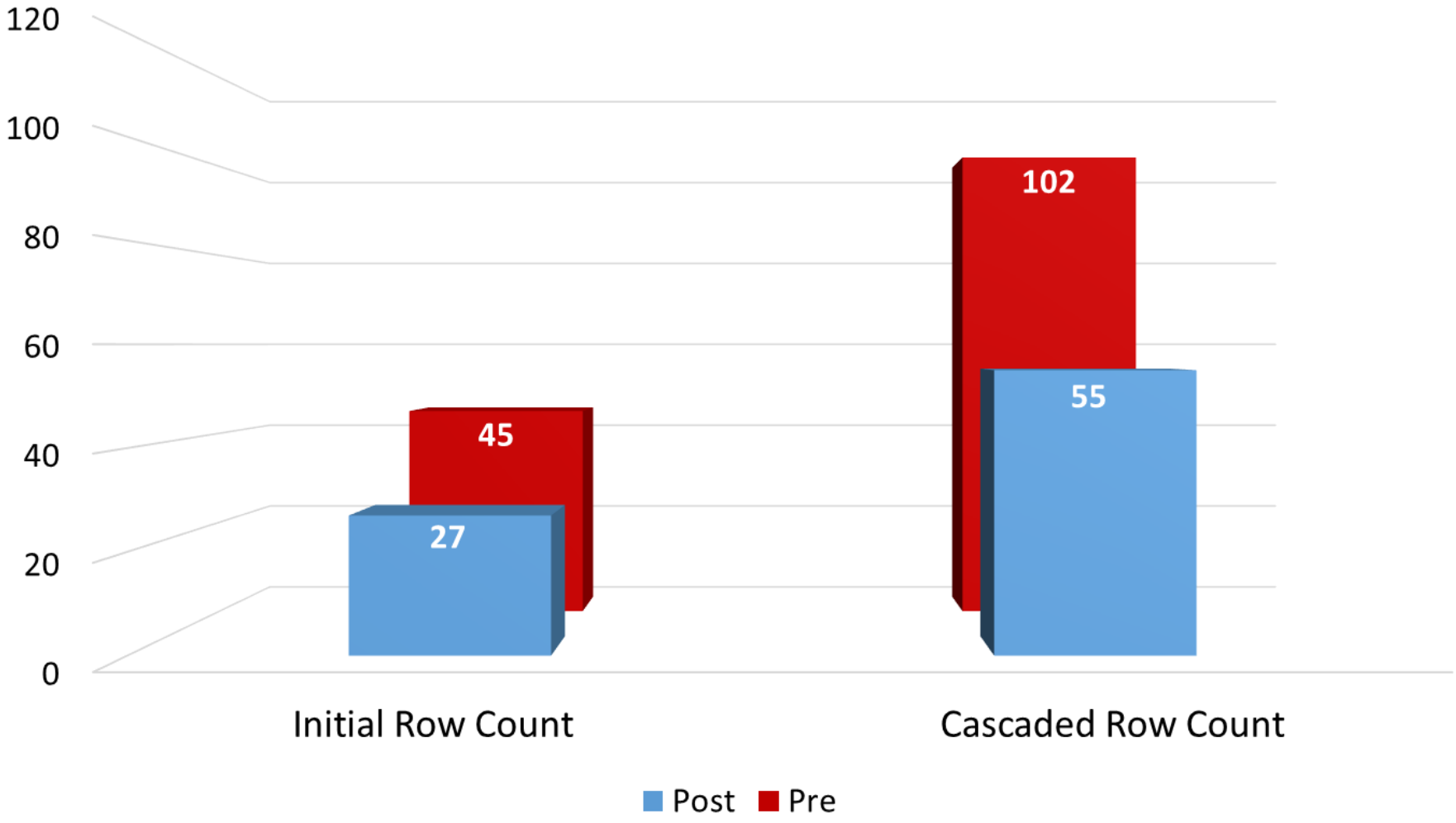
# Efficiency

## Admission Profile

### Decreased Questions/Documentation



# Effectiveness

## *Completed Documentation*

| Month-Year | Total Adult Admissions - La Crosse | # of Rows to be Completed | Low (%) | High (%) | Median % of time question was answered |
|---|---|---|---|---|---|
| July-16 | 1589 | 46 | 7% | 97% | **86%** |
| April-17 | 973 | 27 | 70% | 85% | **83%** |
| May-17 | 1296 | 27 | 67% | 86% | **83%** |
| June-17 | 1211 | 27 | 68% | 85% | **83%** |

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# Satisfaction

*Health Information Technology Usability Evaluation Scale*

| Pre: December 2016, Post: April 2017 Question | Construct | Agree + Strongly Agree | A+SA Percentage Change difference |
|---|---|---|---|
| The admission navigator is an important part of the admission process. | System impact/ personal level | 88% | 3% **increase** |
| The admission profile is useful for gathering necessary patient information. | General Usefulness | 74% | 4% **increase** |
| I find the admission profile easy to use. | Ease of Use | 83% | 21% **increase** |
| Whenever I make a mistake using the admission profile, I recover easily and quickly. | Error Prevention | 62% | 8% **increase** |

# Satisfaction

## *Nursing Comments*

### Satisfactory

- *"Easier to ask than previous questions."*
- *"Like that it's [Privacy, Hearing, Vision section] at the beginning."*
- *"Very helpful in helping complete care plans and future patient care."*
- *"[The About Me] helped to get a snapshot of the patient easier."*

### Neutral/unsatisfactory

- *"Many questions not applicable to young patients who have had months of prenatal care."*

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# Efficiency

## *Time Saved, **cognitive load*

- Initial admission steps
  - Pre: 37 minutes (median)
  - Post: 33 minutes (median)
- 14,400 adult admissions/year with 4 minutes shaved/admission

  = about **2.6 hours per day**/365 days/year of nursing time harvested for other necessary work

  = annual savings of about **$45,000** *(after the 1st yr)*

** impact on pediatric & critical access hospitals not included, so total savings higher than these figures*

# Phase 1 - Results in Summary

- Decrease in rows and pick-list choices
- Increase in documentation completion
- Increase in the continual use of entered data
- Increase in nurse satisfaction
- Improved use of nursing time



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March 29, 2017 to today

# ‘PHASE 2’



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# Release July 17, 2018

- All
  - Admission Navigators, Flowsheets, Required Documentation tool, SBAR Handoff, Discharge Navigators, & various reports
  - ‘Unable’ functionality
  - Policy alignment
  - About Me and Pre-Admit equipment Optimizations



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# Release July 17, 2018

- Adult
  - Various optimizations
  - Population Medicine, crossing the continuum
- Pediatrics
  - Age in EpIC
  - Developmental Delay
  - Abuse
  - Tuberculosis
- Procedural
  - Medical Level of Care
  - Screens versus assessments
  - Various departments navigators, flowsheets

# PHASES 1 & 2: LIST OF SCREENS

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# Always Practicing, Always Learning

- Listen to the ‘why nots’
- Strive to ‘make it useful’
- Increase interdisciplinary testing
- Create detailed measurement plans
- Choose wisely: usability questionnaire
- Be open to change and timeline adjustments
- Explore other areas to replicate the process
- Leverage new structure/processes (C4) to evolve partnerships
- Empower ownership and creativity
- Facilitate professional nursing development

# Back to ‘THE WHY’

- Nursing focused EHR projects are not merely for cutting rows, saving clicks, and shaving time. This work engages nurses as leaders, creates efficiencies ,and knowledge driven care, and can improve the patient experience.

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# WONDERS ALONG THE WAY…

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# Questions?

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