EHR Remodeling: User (and Patient) Centered Designs

Shannon Hulett, DNP, RN, CNL

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June 2018
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

REMODEL: WHAT IS YOUR WHY?
C4 Council Membership

Primary Members

Taylor Rowe
CardioPulmonary

Erin Decker
Surgical/Digestive

Anne Nusse
St. Joseph

Tara Weidner
Inpt. Behav Health

Juliene Sloane
PNICU

Angela Everson
Pediatrics

Kelsey Metz
Medical Cnc

Erica Cook
Critical Care

Mara May
Neuroscience

Barb McCoy
St. Joseph

Martha Helin
Obs & Nursery

Lauren Neet
Procedural

Becky Fruechte
Labor & Delivery

Mandy Juresh
Tri County

Shannon Hulett
Informatics Nurse

Andrea Hauser
Director of Nursing

Teresa Hollnegel
Nurse Educator

Dana Check
CNL

Melissa Miller
Cont. Readiness

Wendi Stitzer
Boscobel

Deb Kelly Palmer

Laura Kloss
Clinical Manager

Lindsey Walker
Quality Nurse

Kari Ranallo
Office Assistant

Dawn Heimer
Nurse Educator

Lori Preston
Adv. Training Consult.

Mary Stibbe
Clinical Informaticist

Tammy Henderson
Clinical Informaticist

Shari Vanderbush
C. Sys. Manager

Heather Richards
Adv. Training Consult.

Kristin Jerome
C. Data Analyst

Dan Roberts
Systems Architect
Their Why
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

<table>
<thead>
<tr>
<th>Individual</th>
<th>Interpersonal</th>
<th>Organizational</th>
</tr>
</thead>
<tbody>
<tr>
<td>nurses’ perceptions (impacted by education level, age, and time spent documenting)</td>
<td>teamwork and team communication</td>
<td>location of computers</td>
</tr>
<tr>
<td>continued informal use of paper</td>
<td>privacy concerns</td>
<td>reliability of computers</td>
</tr>
<tr>
<td>experience with technology</td>
<td>distraction</td>
<td>software design</td>
</tr>
<tr>
<td>patient type</td>
<td>patient type</td>
<td>documentation requirements</td>
</tr>
<tr>
<td>shift involved</td>
<td></td>
<td>reimbursement</td>
</tr>
</tbody>
</table>

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

(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*
Evidence-Based Intervention
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?
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)
## 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 \((n=582, \text{ inpt RN } n = 337)\)

- 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.
• Waiting for EPIC permission to display screenshots
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
<table>
<thead>
<tr>
<th>Patients</th>
<th>Wellness</th>
</tr>
</thead>
<tbody>
<tr>
<td>C4</td>
<td>Physical Therapy</td>
</tr>
<tr>
<td>Data Service Specialists</td>
<td>Occupational Therapy</td>
</tr>
<tr>
<td>Hospitalists</td>
<td>Respiratory Therapy</td>
</tr>
<tr>
<td>Service Excellence</td>
<td>Nutrition Therapy</td>
</tr>
<tr>
<td>Health Unit Coordinators</td>
<td>Diabetes Education</td>
</tr>
<tr>
<td>Library &amp; Patient Education</td>
<td>Trauma Services</td>
</tr>
<tr>
<td>Spiritual Care</td>
<td>Social Services</td>
</tr>
<tr>
<td>Pain Certified RN</td>
<td>Infection Control</td>
</tr>
</tbody>
</table>

**Interdisciplinary Impact**
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

User-Centered Design

Diffusion of Innovation

System Developmental Life Cycle
Protocol: Admission Simplification Flowsheet

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
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, pick lists, 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/seept 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 date but it was from 2015, or answered in TEC at x time, or just you found it blank)
## System Life Cycle

### Focus Group Design Sessions

<table>
<thead>
<tr>
<th>Stage</th>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td><strong>Plan &amp; Analyze</strong> – Specify needs &amp; setting</td>
<td></td>
</tr>
<tr>
<td>Stage 2</td>
<td><strong>Design &amp; Test</strong> – System component development</td>
<td></td>
</tr>
<tr>
<td>Stage 3</td>
<td><strong>Build &amp; Test (adopt)</strong> – Combination of components</td>
<td></td>
</tr>
<tr>
<td>Stage 4</td>
<td><strong>Activate &amp; Evaluate</strong> – Integrate into the real environment</td>
<td></td>
</tr>
<tr>
<td>Stage 5</td>
<td><strong>Maintain</strong> – Routine use</td>
<td></td>
</tr>
</tbody>
</table>
Patient Centered Design

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

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

Scale: Strongly disagree – Disagree – Neutral – Agree – Strongly agree
THE REDESIGN

Release Day – March 28, 2017
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
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
<table>
<thead>
<tr>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street drug/Medication/Inhalant Use</td>
<td>Do you use prescription drugs not prescribed for you or street or recreational drugs (such as narcotics, marijuana, meth, or heroin)?</td>
</tr>
<tr>
<td>Provides primary care for</td>
<td>Are there people or animals that need care while you are in the hospital? If so, we may be able to help.</td>
</tr>
<tr>
<td>History of Chronic Pain</td>
<td>Has pain in any part of your body lasted for more than 6 months (chronic)?</td>
</tr>
<tr>
<td>Financial Concerns</td>
<td>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.</td>
</tr>
</tbody>
</table>
About Me

• Waiting for EPIC permission to display screen shot, if unable will include prototype
RESULTS
Efficiency
Admission Profile
Decreased Questions/Documentation

Initial Row Count

<table>
<thead>
<tr>
<th></th>
<th>Post</th>
<th>Pre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>27</td>
<td>45</td>
</tr>
</tbody>
</table>

Cascaded Row Count

<table>
<thead>
<tr>
<th></th>
<th>Post</th>
<th>Pre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>55</td>
<td>102</td>
</tr>
</tbody>
</table>

Legend: Post - Red, Pre - Blue
# Effectiveness

## Completed Documentation

<table>
<thead>
<tr>
<th>Month-Year</th>
<th>Total Adult Admissions - La Crosse</th>
<th># of Rows to be Completed</th>
<th>Low (%)</th>
<th>High (%)</th>
<th>Median % of time question was answered</th>
</tr>
</thead>
<tbody>
<tr>
<td>July-16</td>
<td>1589</td>
<td>46</td>
<td>7%</td>
<td>97%</td>
<td>86%</td>
</tr>
<tr>
<td>April-17</td>
<td>973</td>
<td>27</td>
<td>70%</td>
<td>85%</td>
<td>83%</td>
</tr>
<tr>
<td>May-17</td>
<td>1296</td>
<td>27</td>
<td>67%</td>
<td>86%</td>
<td>83%</td>
</tr>
<tr>
<td>June-17</td>
<td>1211</td>
<td>27</td>
<td>68%</td>
<td>85%</td>
<td>83%</td>
</tr>
</tbody>
</table>
## Satisfaction

**Health Information Technology Usability Evaluation Scale**

<table>
<thead>
<tr>
<th>Question</th>
<th>Construct</th>
<th>Agree + Strongly Agree</th>
<th>A+SA Percentage Change difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>The admission navigator is an important part of the admission process.</td>
<td>System impact/personal level</td>
<td>88%</td>
<td>3% increase</td>
</tr>
<tr>
<td>The admission profile is useful for gathering necessary patient information.</td>
<td>General Usefulness</td>
<td>74%</td>
<td>4% increase</td>
</tr>
<tr>
<td>I find the admission profile easy to use.</td>
<td>Ease of Use</td>
<td>83%</td>
<td>21% increase</td>
</tr>
<tr>
<td>Whenever I make a mistake using the admission profile, I recover easily and quickly.</td>
<td>Error Prevention</td>
<td>62%</td>
<td>8% increase</td>
</tr>
</tbody>
</table>
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.”
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 1^{st} 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
March 29, 2017 to today

‘PHASE 2’
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
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
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.
WONDERS ALONG THE WAY...
Questions?

Shannon Hulett, DNP, RN, CNL – slhulett@gundersenhealth.org
References


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