

Slippery When Wet:

Cleaning Up the Fluid Administration Order Menu by Combining Principles of Usability Testing and Improvement Science Suvi Neukam, DO1, Charles DeDeaux, MD1 and Renee Segura1

Ouvilleditalli, DO, Charles Debeaux, MD and Reflee Segura

¹ Oregon Health and Sciences University, ² VA Portland Health Care System



INTRODUCTION

Usability Testing:

 A method of quality improvement that assesses the ability of a system to allow its users to carry out tasks <u>safely</u>, <u>effectively</u>, <u>efficiently</u> and <u>enjoyably</u>

Project Objectives:

- Describe the role of usability testing in improving an intravenous fluids (IVF) ordering menu
- Demonstrate that usability testing is a feasible and effective method for residents to engage in quality improvement efforts

PRIOR & REDESIGNED IVF ORDERING MENU

 DEXTROSE SOLUTIONS ONLY
 SODIUM SOLN'S CONT.

 D5W
 1/2 NS @125/HR

 D5 1/2 NS
 NS

 D5 1/2NS @75/HR
 NS @75/HR

 D5 1/2NS @100/HR
 NS @100/HR

 D5 1/2NS @125/HR
 NS @125/HR

 D5 NS
 HYPERTONIC SODIUM CHLOR

 D5 NS @100/HR
 Sodium Chloride 3% *HYPERTONIC

 D5 NS @125/HR
 DEXTROSE WITH KCL

 SODIUM SOLUTIONS ONLY
 Image: NY Potassium Chloride

 Bolus, NS 1000ml
 D5 1/2 NS W/KCL

 Bolus, NS 500ml
 D5 1/2NS W/KCL 20MEQ

Bolus, NS 250ml

1/2 NS @75/HR

1/2 NS @100/HR

Lactated Ringers 500ml Bolus

Lactated Ringers @75ml/hr

Lactated Ringers @100ml/h

Lactated Ringers @125ml/hr

NACL 0.45% (1/2NS

HYPERTONIC SODIUM CHLORIDE 3%
Sodium Chloride 3% *HYPERTONIC* NTE 675ml/day

DEXTROSE WITH KCL

V < Guidelines: IV Potassium Chloride Solutions>>
D5 1/2 NS W/KCL
D5 1/2NS W/KCL 20MEQ
D5 1/2NS W KCL 30MEQ
D5 1/2NS W KCL 40MEQ
D5 NS W/KCL
D5 NS W/KCL
P5 NS W KCL 20MEQ

Potassium REPLACEMENT

<< Potassium Supplementation Menu>>

IV LINE CLEARANCE
Alteplase 2mg IV Line Clearance

SODIUM WITH KCL

✓ < Guidelines: IV Potassium Chloride Solutions>>
1/2 NS W/KCL
1/2 NS W/KCL @75/HR
1/2 NS W/KCL @100/HR
1/2 NS W/KCL @125/HR
NS W/KCL @125/HR
NS W/KCL @100/HR
NS W/KCL @100/HR
NS W/KCL @125/HR
NS W/KCL @125/HR

VITAMIN CONTAINING IV'S
(BANANA BAGS)

✓ < Guidelines: IV Magnesium Solutions>>

✓ < Guidelines: IV Potassium Chloride Solutions>>

Phonebook (Pharmacy)

D5 1/2NS W/VITS AND K+

D5 1/2NS W/VITS/KCL/MAG

BOLUS IVF
If urgent call RN after signing

Lactated Ringers 1000 ml
Lactated Ringers 500 ml

Normal Saline (0.9%) 1000 ml
Normal Saline (0.9%) 500 ml

EDUCATIONAL LINKS:

*IV fluid make up

DEFINITIONS:

* STAT = given within 1 hr

* Intermittent = Bolus

* ROUTINE = given within 2 hrs

1) ongoing maintenance fluids
2) volume/time limited fluids

ISOTONIC
Lactated Ringers @ *** ml/hr
Normal Saline (0.9%) @ *** ml/hr

HYPOTONIC
D5 @ *** cc/hr
D5 1/2 Normal Saline (0.45%) @ *** ml/hr
D5 Normal Saline (0.9%) @ *** ml/hr

1/2 Normal Saline (0.45%) @ *** ml/hr

HYPERTONIC
HIGH RISK MEDICATION
Hypertonic Saline (3%) @ *** ml/hr

CONTINUOUS IVF

**Use this menu for:

CONTINUOUS IVF WITH KC1

STOCKED ON WARD/ICU
+ Only 20mEQ bags are stocked on wards/ICU

D5 1/2 NS (0.45%) w/ 20mEQ KC1 @ *** ml/hr
D5 NS (0.9%) w/ 20mEQ KC1 @ *** ml/hr

1/2 NS (0.45%) w/ 20mEQ KC1 @ *** ml/hr

NOT STOCKED ON WARD (CUSTOM ORDER)
+ 40mEQ is the max in 1L on the wards
+ 80mEQ is the max in 1L in the ICU

D5 1/2 Normal Saline (0.45%) w/ KC1 @ *** ml/hr
D5 Normal Saline (0.9%) w/ KC1 @ *** ml/hr

NS /Folate 1mg/Thiamine 500mg/Mg 2gms @ *** ml/hr

improved clinical efficacy

| 1/2 Normal Saline (0.45%) w/ KCl @ *** ml/hr
| Normal Saline (0.9%) w/ KCl @ *** ml/hr
| Proved to be accessible and required

limited resources

Empowered residents to engage in quality improvement

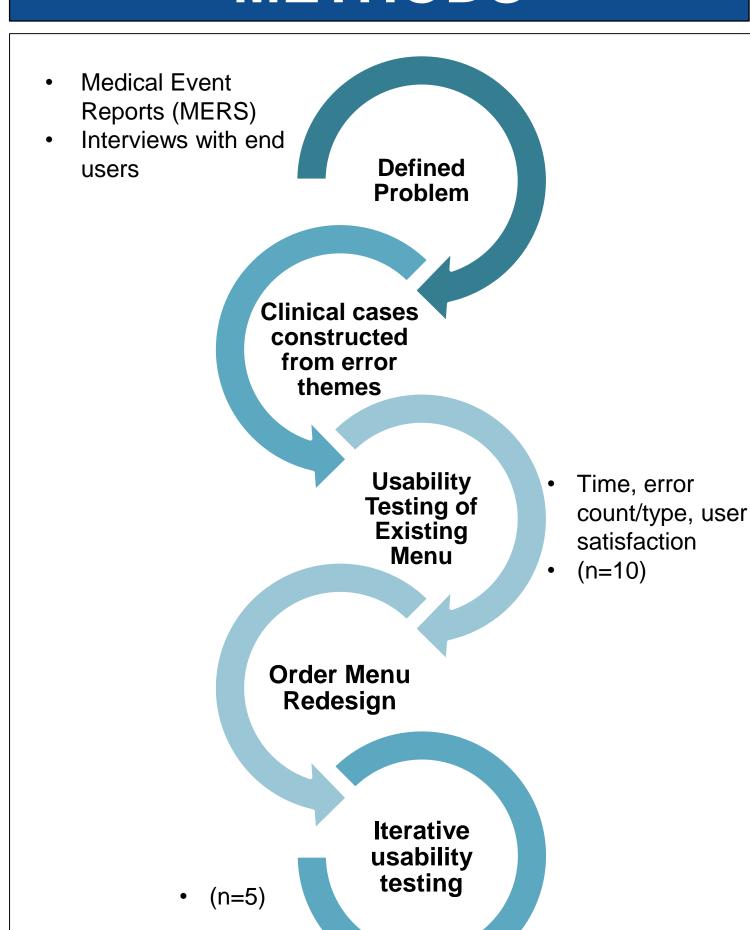
DISCUSSION

Identified sources of error in our current

Guided subsequent redesign of a new

menu with enhanced navigability and

METHODS



IDENTIFIED FLAWS

Error Types

- Slips
- Lapses
- Knowledge Gaps

Design Failure Modes

- Layout Challenges
- Terminology Confusion
- Extraneous
 Information

RESULTS



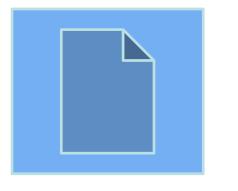
Order Entry Error Rates
40% → 4%



User Satisfaction
3.5 → 4.7
(5 point Likert Scale)



Total Time Investment
30 hours dedicated
resident time



Resource Requirement Minimal

NEXT STEPS

Electronic Menu Construction

Usability Testing

IVF ordering menu

Reassess Error Rate



Iterative
Usability
Testing and
PDSA

LITERATURE REVIEW

Bates, David et al "Ten Commandments for Effective Clinical Decision Support: Making the Practice of Evidence-Based Medicine a Reality" J Am Med Inform Assoc. 2003 Nov-Dec; 10(6): 523–530.

Kushniruk, Andre & Patel, Vimal "Cognitive and Usability Engineering Methods for the Evaluation of Clinical Information Systems" J Biomed Inform. 2004 Feb;37(1):56-76.

Marian, Anil et al "Comparison of Alphabetical versus Categorical Display Format for Medication Order Entry in a Simulated Touch Screen Anesthesia Information Management System: An Experiment in Clinician-Computer Interaction in Anesthesia" BMC Med Inform Decis Mak. 2012; 12:

Russ, Alissa et al "A Rapid Usability Evaluation (RUE) Method for Health Information Technology" AMIA Annu Symp Proc. 2010; 2010: 702–706.

Russ, Alissa et al "Design and Implementation of a Hospital-Based Usability Laboratory: Insights from a Department of Veterans Affairs Laboratory for Health Information Technology" Jt Comm J Qual Patient Saf. 2012 Dec;38(12):531-40.