



## Challenging EHR Designs: Heuristic Evaluation of an eMAR/BCMA System

**HIMSS**  
*transforming health through IT*

HIT USER EXPERIENCE COMMUNITY

# Speaker

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# Today's Presentation

- Discuss challenging areas in health IT design
- Present findings of a research study on an evaluation of an eMAR in a BCMA system
- Analyze implications

Staggers, N., Iribarren, S., Guo, J.-W., & Weir, C. (2015). Evaluation of a BCMA's Electronic Medication Administration record, *Western Journal of Nursing Research*. e-pub ahead of print Jan 18, 2015.

# Funding Acknowledgments

- Department of Veterans Affairs, Veterans Health Administration, Health Services Research and Development Service #CR12-321 (Charlene Weir, PhD).
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# Challenging EHR Designs

- Information synthesis
  - Across patients, areas, systems
  - Single patients
    - Trends
    - What's new with this patient?
    - Within episodes, encounters
    - eMARs

# Information Synthesis

- Electronic Medication Administration Records (eMARs)
  - Complex, interesting
  - Tasks belie the complexity
  - Nurses' decision making

# Background

- eMARs
  - Support medication management by nurses
  - Should support error reduction, improve patient safety, workflow efficiency
  - Poor eMAR usability can result in poor outcomes
- Used by interdisciplinary team members
  - Especially by nurses, respiratory therapy
  - Tasks are distinct for different disciplines





# Background

- BCMA systems with eMARs in over 30% of hospitals, in all 150 of Veterans Administration (VA) hospitals
- Socio-technical issues are common
  - Work-arounds
  - Increases in workflow
- Nurses profoundly affected by eMARs
- Little focus of research or evaluations
- No studies on eMARs in BCMA

# Purpose

- Identify current usability problems in the VA's eMAR/BCMA system
  - Categorize problems using heuristics
- Explore how these might impact nurses' situation awareness

# Methods

- IRB approval
- VA in the western U.S.
  - Offers tertiary care, specialty services
- VA is the largest health system in the U.S.
  - 9 million veterans
  - 80,000 nurses
- BCMA installed in 1995-2000
- Part of the VA's EHR

# Methods

- Heuristic evaluation (plus additions)
  - 8 eMAR tasks and
  - Known screen design guidelines and
  - Technical adequacy
- Situation awareness assessment
  - Perception, comprehension and projection
  - How did identified problems affect SA?

# Methods

- Three evaluators
  - Dual domain experts
  - PhD-prepared nurses
  - Trained in heuristic evaluation
  - Completed previous usability studies
  - One was a BCMA expert with 10 years of experience in BCMA use
- Results verification
  - Two BCMA coordinators

# Procedure

- Completed standardized training
- Used 10 tasks/categories to assess eMAR/BCMA for usability problems
- Created usability problem list
- BCMA site coordinators reviewed the list, clarified issues
- Categorized problems using Zhang, et. al, (2003) list of 14 heuristics
- Rated the severity of usability problems (0-4)

# Results

- Overview – 4 major functions
  - Cover sheet with orders
  - eMAR screen with 3 tabs
    - Scheduled meds (unit dose), IVPB, IVs

# Cover Sheet

Bar Code Medication Administration - v3.0.70.65 - Patient Context is Joined

File View Reports Due List Tools Help

Missing Dose Medication Log Medication Admin History Allergies CPRS Med Order **Flag**

SSN = [REDACTED]  
 DOB = [REDACTED] (80)  
 Height = 163cm, Weight = 77.96kg  
 Location = MICU 3-AA

Order Mode:  Inpatient  Clinic

Virtual Due List Parameters: Start Time: 04/04@1300 Stop Time: 04/04@1700

Schedule Types:  Continuous  On-Call  PRN  One-Time

**ALLERGIES: No allergies on file ADRs: ipratropium**

View: Medication Overview  Display Gridlines

**Active [22 Orders]**

+	VDL...	Status	Ver	Ty...	Wit	Medication	Dosage, Route	Schedule	Next Action	Special Instructions	Order Start Date	Order Stop Date
	UD	Active	SJI	P		ACETAMINOPH 325-HYDROCOD...	1 (ONE) TABLE...	Q4H PRN		PAIN *NOT MORE THAN ...	03/29@0635	07/07@2400
	UD	Active	CLB	P		ALOH-MG0H-SIMTH XTRA STR...	15 MILLILITERS...	TID PRN		indigestion/gas	03/30@0905	07/08@2400
	UD	Active	SJI	C		ASPIRIN 81MG TAB,EC	81MG, ORAL	QDAY	DUE 04/05@0900		03/29@0244	07/07@2400
	UD	Active	CLB	C		ATORVASTATIN CALCIUM 80MG...	80MG, ORAL	QPM	DUE 04/04@2100		03/30@1200	07/07@2400
	UD	Active	CLB	C		CLOPIDOGREL BISULFATE 75M...	75MG, ORAL	QDAY	DUE 04/05@0900		03/29@1119	07/07@2400
	UD	Active	CLB	C		DOCUSATE NA 50MG/SENNOSI...	TWO (2) TABLE...	BID W/FOOD	DUE 04/04@1700	constipation	03/30@0801	07/08@2400
	UD	Active	SJI	C		FERROUS SULFATE 325MG TAB	325MG, ORAL	QAM W/FOOD	DUE 04/05@0700		03/29@0628	07/07@2400
	UD	Active	SJI	P		FLUNISOLIDE 0.025% 200D INHL...	1 SPRAY, IN EA...	BID PRN		Rhinitis symptoms	03/29@0628	07/07@2400
	IVP/...	Active	EHH	C		FUROSEMIDE 10MG/ML INJ,SOLN	80MG/8ML, IV ...	TID	DUE 04/04@2100		04/04@1120	07/13@2400
	UD	Active	SJI	P		GUAFENESIN 200MG TAB	400MG, ORAL	Q4H PRN		for cough	03/30@2353	04/29@2400
	UD	Active	EHH	C		HEPARIN NA 5,000 UNIT/0.5ML...	5000 UNITS, S...	Q8H	DUE 04/04@2100		04/04@1152	05/04@2400
	UD	Active	SJI	C		INSULIN,ASPART 100UN/ML VI...	PER PROTOCO...	QID-INSULIN	DUE 04/04@1700	BS: <140=none*140-179=1...	03/29@0628	07/07@2400
	UD	Active	LMM	C		INSULIN,GLARGINE,HMN 100 U...	10 UNITS {0.1 ...	QHS	DUE 04/04@2100		04/02@0927	07/11@2400
	UD	Active	LMM	C		LEVALBUTEROL HCL 0.21MG/M...	0.63MG/3ML, I...	Q6H-RT	DUE 04/04@2000	COPD WITH TACHYCAR...	04/02@1223	04/05@2400
							Action By TJC 04/04@1432 TJC 04/04@0828 JDD 04/04@0211 MGF 04/03@20...	Action GIVEN GIVEN GIVEN GIVEN				
	IV	Active	LMM			MILRINONE LACT 0.2MG/ML-DE...	TITRATE, INTR...			please start at 0.2 mcg/kg/...	04/01@0901	05/02@2400
	UD	Active	SJI	C		MOMETASONE FURDATE 220M...	TWO (2) PUFFS...	QHS-RT	DUE 04/04@2200		03/29@0117	07/07@2400
	UD	Active	SJI	C		OMEPRAZOLE 20MG CAP,EC	20MG, ORAL	BID AC	DUE 04/04@1630		03/29@0117	07/07@2400
	UD	Active	SJI	C		OXYGEN 100% GAS	NASAL CANNU...	QAM	DUE 04/05@0900	Adjust to maintain SPO2 ab...	03/29@0031	07/07@2400
	UD	Active	EHH	C		POTASSIUM CHLORIDE 10MEQ ...	40MEQ, ORAL	QDAY	DUE 04/05@0900		04/04@1120	07/13@2400
	UD	Active	SJI	C		RANITIDINE HCL 150MG TAB	300MG, ORAL	QHS	DUE 04/04@2100		03/29@0117	07/07@2400
	UD	Active	SJI	P		SIMETHICONE 80MG TAB,CHE...	80MG, ORAL	BID PRN		gas/bloating	03/29@1906	07/07@2400
	UD	Active	LMM	C		WARFARIN NA 7.5MG TAB	7.5MG, ORAL	QHS	DUE 04/04@2100		04/03@1141	07/12@2400

**Future [0 Orders]**

**Expired/DC'd [3 Orders]**

+	VDL...	Status	Ver	Ty...	Wit	Medication	Dosage, Route	Schedule	Next Action	Special Instructions	Order Start Date	Order Stop Date
	UD	Expired	CJS	O		CYCLOBENZAPRINE HCL 5MG ...	5MG, ORAL	ONCE			04/03@2206	04/03@2217
	IV	Disco...	CLB			FUROSEMIDE LV INJ,SOLN	2 ml/hr, INTRAV...			CONC: 5 MG/ML run at 10 ...	03/30@1132	04/04@1120
	UD	Expired	EHH	O		POTASSIUM CHLORIDE 10MEQ ...	40MEQ, ORAL	ONCE			04/04@0758	04/04@0851

Cover Sheet  Unit Dose  IVP/IVPB  IV

Scanner Status: **Not Ready** Enable Scanner

Meds on Patient: **Infusing IVs**

BCMA Clinical Reminders: Count 0 Activity PRN Effectiveness

IRIBARREN,SARAH JO SALT LAKE CITY HCS Server Time: 4/4/2014 15:54

3:54 PM 4/4/2014



# eMAR

Bar Code Medication Administration - v3.0.70.65 - Patient Context is Joined

File View Reports Due List Tools Help

Missing Dose Medication Log Medication Admin History Allergies CPRS Med Order **Flag**

SSN = [REDACTED]  
 DOB = [REDACTED] (80)  
 Height = 163cm, Weight = 77.96kg  
 Location = MICU 3-AA

Order Mode:  Inpatient  Clinic  
 Virtual Due List Parameters: Start Time: 04/04@1300 Stop Time: 04/04@1700  
 Schedule Types:  Continuous  On-Call  PRN  One-Time

**ALLERGIES: No allergies on file ADRs: ipratropium**

Stat...	Ver	Hsm	T...	Wit	Active Medication	Dosage	Route	Admin Time	Last Action	Last Site
	SJI		P		ACETAMINOPH 325-HYDROCODONE 10MG (...) ACETAMINOPHEN 325-HYDROCODONE 10... <b>PAIN *NOT MORE THAN 4GM (APAP) PER DAY*</b>	1 (ONE) TABLET, Q4H PRN	ORAL		GIVEN: 4/4/2014@0229	
	SJI		C		INSULIN ASPART 100UN/ML VIAL 10ML INJ INSULIN ASPART 100 UNIT/ML INJ 10ML VI... <b>B5: &lt;140=none*140-179=1 Unit*180-219=2 Units*220-259=3 Units*260-299=4 Units*300-339=5 Units*340-379=6 Units*380-419=7 Units*420-459=8 Units* &gt;460=9 Units</b>	PER PROTOCOL, QID-INSULIN	SUBCUTAN...	04/04@1700	GIVEN: 4/4/2014@1211	abdomen, right lower quad
	SJI		P		SIMETHICONE 80MG TAB,CHEWABLE SIMETHICONE 80MG CHEW TAB <b>gas/bloating</b>	80MG, BID PRN	ORAL		GIVEN: 3/29/2014@2014	
	CLB		P		ALOH-MGDH-SIMTH XTRA STRENGTH UD S... ALOH/MGDH/SIMTH XTRA STRNTH SUS... <b>indigestion/gas</b>	15 MILLILITERS, TID PRN	ORAL		GIVEN: 4/3/2014@0916	
	CLB		C		DOCUSATE NA 50MG/SENNOSIDES 8.6MG T... DOCUSATE NA 50MG/SENNOSIDES 8.6MG ... <b>constipation</b>	TWO (2) TABLETS, BID W/FOOD	ORAL	04/04@1700	GIVEN: 4/4/2014@0643	
	SJI		P		GUAIFENESIN 200MG TAB GUAIFENESIN 200MG TAB <b>for cough</b>	400MG, Q4H PRN	ORAL		REFUSED: 3/30/2014@2322	
G	LMM		C		LEVALBUTEROL HCL 0.21MG/ML 3ML SOLN... LEVALBUTEROL HCL 0.21MG/ML INHL SOL... <b>COPD WITH TACHYCARDIA</b>	0.63MG/3ML, Q6H-RT	INHALATION	04/04@1400	GIVEN: 4/4/2014@1432	
G	EHH		C		HEPARIN NA 5,000 UNIT/0.5ML SYR INJ.SOLN HEPARIN NA 5,000 UNIT/0.5ML INJ SYR	5000 UNITS, Q8H	SUBCUTAN...	04/04@1300	GIVEN: 4/4/2014@1211	abdomen, left upper
	SJI		P		FLUNISOLIDE 0.025% 200D INHL.NASAL FLUNISOLIDE 0.025% 200D NASAL INH SPR... <b>Rhinitis symptoms</b>	1 SPRAY, BID PRN	IN EACH NOSTRIL		GIVEN: 3/17/2014@0916	
	SJI		C		OMEPRAZOLE 20MG CAP.EC OMEPRAZOLE 20MG EC CAP	20MG, BID AC	ORAL	04/04@1630	GIVEN: 4/4/2014@0643	

Cover Sheet  Unit Dose  IVP/IVPB  IV

Scanner Status: **Ready**

Meds on Patient **Infusing IVs**

BCMA Clinical Reminders	
Count	Activity
0	PRN Effectiveness

3:42 PM 4/4/2014

# Results

- 99 usability problems
- 440 Heuristic violations
  - Most in “match with the real word” category
- 80% of problems in these tasks
  - Prepare medications
  - Administer and chart medications
  - Screen design principles
- Example: Preparing medications

# eMAR – Match Example

Bar Code Medication Administration - v3.0.70.65 - Patient Context is Joined

File View Reports Due List Tools Help

Missing Dose Medication Log Medication Admin History Allergies CPRS Med Order **Flag**

SSN = [REDACTED]  
 DOB = [REDACTED] (80)  
 Height = 183cm, Weight = 77.96kg  
 Location = MICU 3-AA

Order Mode:  Inpatient  Clinic

Virtual Due List Parameters:  
 Start Time: 04/04@1300 Stop Time: 04/04@1700

Schedule Types:  
 Continuous  On-Call  
 PRN  One-Time

**ALLERGIES: No allergies on file ADRs: ipratropium**

Stat...	Ver	Hsm	T...	Wit	Active Medication	Dosage	Route	Admin Time	Last Action	Last Site
	SJI		P		ACETAMINOPH 325-HYDROCODONE 10MG (...) ACETAMINOPHEN 325-HYDROCODONE 10... <b>PAIN *NOT MORE THAN 4GM (APAP) PER DAY*</b>	1 (ONE) TABLET, Q4H PRN	ORAL		GIVEN: 4/4/2014@0229	
	SJI		C		INSULIN ASPART 100UN/ML VIAL 10ML INJ INSULIN ASPART 100 UNIT/ML INJ 10ML VI... <b>BS: &lt;140=none*140-179=1 Unit*180-219=2 Units*220-259=3 Units* 260-299=4 Units*300-339=5 Units*340-379=6 Units* 380-419=7 Units*420-459=8 Units* &gt;460=9 Units</b>	PER PROTOCOL, QID-INSULIN	SUBCUTAN...	04/04@1700	GIVEN: 4/4/2014@1211	abdomen, right lower quad
	SJI		P		SIMETHICONE 80MG TAB,CHEWABLE SIMETHICONE 80MG CHEW TAB <b>gas/bloating</b>	80MG, BID PRN	ORAL		GIVEN: 3/29/2014@2014	
	CLB		P		ALOH-MGDH-SIMTH XTRA STRENGTH UD S... ALOH-MGDH/SIMTH XTRA STRNGTH SUS... <b>indigestion/gas</b>	15 MILLILITERS, TID PRN	ORAL		GIVEN: 4/3/2014@0916	
	CLB		C		DOCUSATE NA 50MG/SENNOSIDES 8.6MG T... DOCUSATE NA 50MG/SENNOSIDES 8.6MG ... <b>constipation</b>	TWO (2) TABLETS, BID W/FOOD	ORAL	04/04@1700	GIVEN: 4/4/2014@0643	
	SJI		P		GUAIFENESIN 200MG TAB GUAIFENESIN 200MG TAB <b>for cough</b>	400MG, Q4H PRN	ORAL		REFUSED: 3/30/2014@2322	
G	LMM		C		LEVALBUTEROL HCL 0.21MG/ML 3ML SOLN,... LEVALBUTEROL HCL 0.21MG/ML INHL SOL... <b>COPD WITH TACHYCARDIA</b>	0.63MG/3ML, Q6H-RT	INHALATION	04/04@1400	GIVEN: 4/4/2014@1432	
G	EHH		C		HEPARIN NA 5,000 UNIT/0.5ML SYR INJ.SOLN HEPARIN NA 5,000 UNIT/0.5ML INJ SYR	5000 UNITS, Q8H	SUBCUTAN...	04/04@1300	GIVEN: 4/4/2014@1211	abdomen, left upper
	SJI		P		FLUNISOLIDE 0.025% 200D INHL,NASAL FLUNISOLIDE 0.025% 200D NASAL INH SPR... <b>Rhinitis symptoms</b>	1 SPRAY, BID PRN	IN EACH NOSTRIL		GIVEN: 3/17/2014@0916	
	SJI		C		OMEPRAZOLE 20MG CAP,EC OMEPRAZOLE 20MG EC CAP	20MG, BID AC	ORAL	04/04@1630	GIVEN: 4/4/2014@0643	

Cover Sheet  Unit Dose  IVP/IVPB  IV

Scanner Status: **Ready**

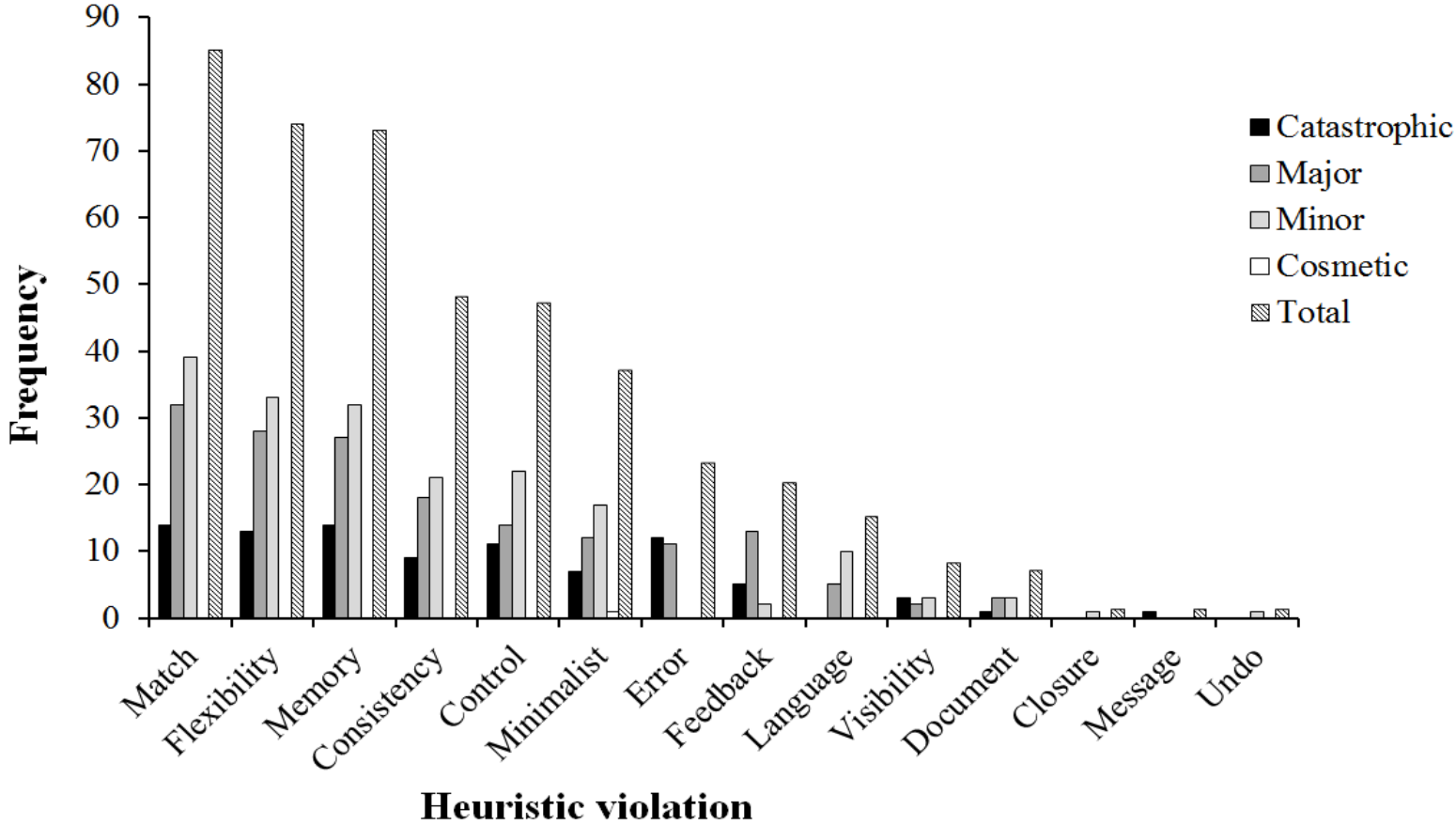
Meds on Patient: **Infusing IVs**

BCMA Clinical Reminders

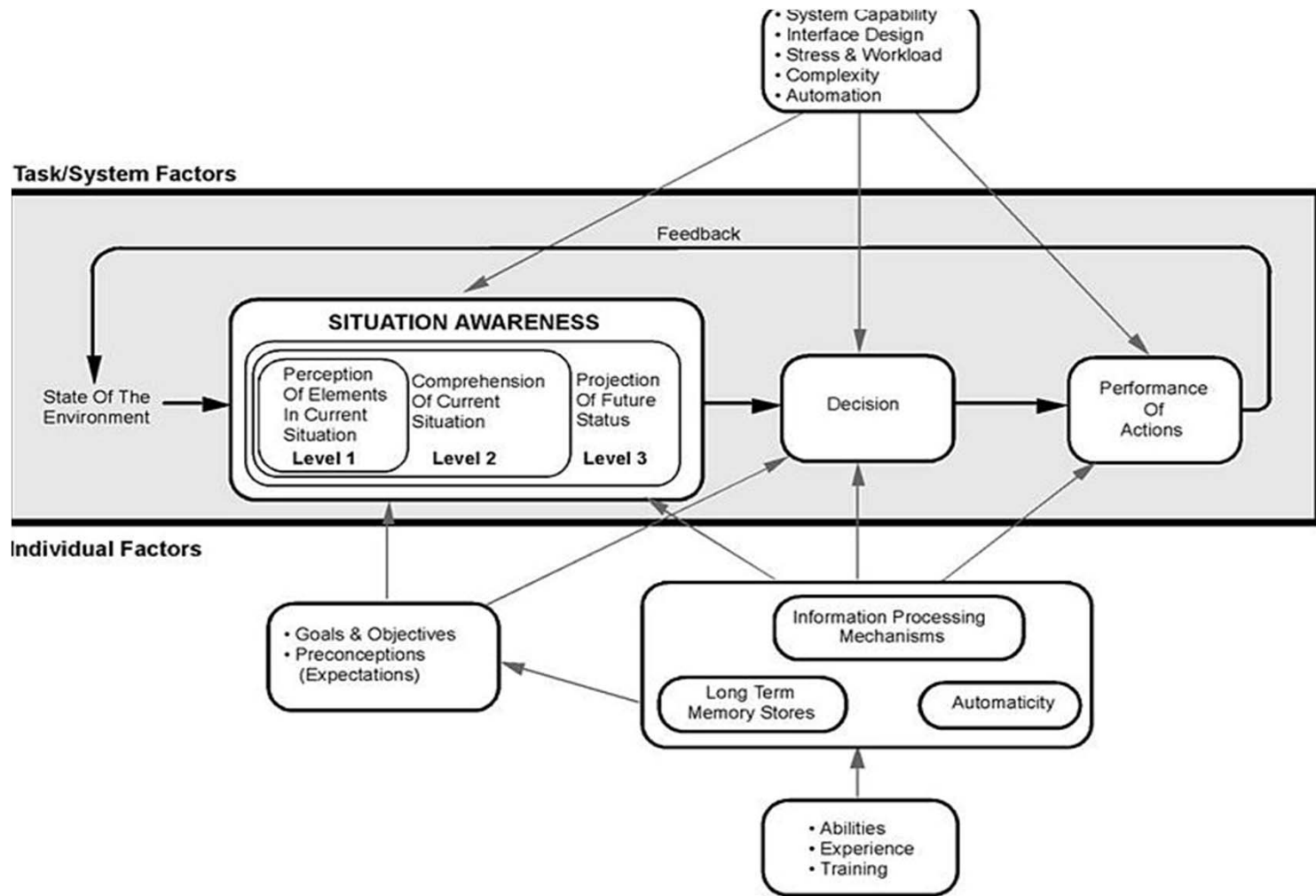
Count	Activity
0	PRN Effectiveness

3:42 PM  
4/4/2014

# Heuristic Violations and Severity



# Situation Awareness



# Situation Awareness Levels

- Overall: Information necessary to make appropriate decisions and take appropriate actions
- Level 1 Perception
  - Users' awareness of the state of the system and activities
- Level 2 Comprehension
  - Users understand the meaning of the elements in the situation through integrating information
- Level 3 Projection
  - Users anticipate future events, consequences

# Situation Awareness

- Level 1 - Perception
  - Basic screen design issues
  - Perceiving what is due, what has been administered, what was missed, what is needed for medication preparation
    - Toggling through the 4 screens, memorizing what is needed
    - Special case: missed meds

# Basic Screen Design

- List of meds is in no particular order
- Non-intuitive terms  
Stat=status  
Ver=verified  
Hsm=hospital supplied medication  
T=type  
Wit=witness
- Sliding scale order is jumbled
- Truncated words
- Nearly duplicate information, different format
- Inconsistent case (sometimes all caps or lower case) and non-meaningful color
- Have to memorize terms  
G=Given  
P=PRN  
C=Continuous
- All caps, slows "at a glance" detection and comprehension
- Medication information separated into four tabs

Bar Code Medication Administration - v3.0.70.65 - Patient Context is Joined

File View Reports Due List Tools Help

Missing Dose Medication Log Medication Admin History Allergies CPRS Med Order **Flag**

First name, Last name (Gender)  
SSN = [REDACTED]  
DOB = mm/dd/yyyy (Age)  
Height = 153cm, Weight = 77.96kg  
Location = MICU (Sdz)

Order Mode:  Inpatient  Clinic

Virtual Due List Parameters: Start Time: 04/04@1300 Stop Time: 04/04@1700

Schedule Types:  Continuous  On-Call  ERN  One-Time

**ALLERGIES: No allergies on file ADRS: ipratropium**

Stat	Ver	Hsm	T	Wit	Active Medication	Dosage	Route	Admin Time	Last Action	Last Site
SJI			P		ACETAMINOPH 325-HYDROCODONE 10MG (...) ACETAMINOPHEN 325-HYDROCODONE 10... PAIR "NOT MORE THAN 4GM (APAP) PER DAY"	1 (ONE) TABLET, Q4H PRN	ORAL		GIVEN: 4/4/2014@0229	
SJI			C		INSULIN ASPART 100U/ML VIAL 10ML V... INSULIN ASPART 100 UNIT/ML INJ 10ML V... BS: <140-none*140-179-1 Unit*180-219-2 Units*220-259-3 Units* 260-299-4 Units*300-339-5 Units*340-379-6 Units* 480-9 Units	PER PROTOCOL QID-INSULIN	SUBCUTAN...	04/04@1700	GIVEN: 4/4/2014@1211	abdomen, right lower quad
SJI					SIMETHICONE 80MG TAB CHEWABLE SIMETHICONE 80MG CHEW TAB gas/bloating	80MG, BID PRN	ORAL		GIVEN: 3/29/2014@2014	
CLB			P		ACURBICIN 100MG XTRA STRENGTH UD S... ACURBICIN/SIMTH XTRA STRNTH SUS... indigestion/gas	15 MILLILITERS, TID PRN	ORAL		GIVEN: 4/3/2014@0916	
CLB			C		DUCUSATE NA 50MG/SENNOSIDES 8.6MG T... DUCUSATE NA 50MG/SENNOSIDES 8.6MG ... constipation	TWO (2) TABLETS, BID W/FOOD	ORAL	04/04@1700	GIVEN: 4/4/2014@0643	
SJI			P		AMPEPESIN 200MG TAB GLAIFENESIN 200MG TAB for cough	400MG, Q4H PRN	ORAL		REFUSED: 3/30/2014@2322	
G	LMM		C		LEVABETEROL HCL 0.21MG/ML 3ML SOLN... LEVABUTEROL HCL 0.21MG/ML INHL SOL... COPD WITH TACHYCARDIA	0.63MG/3ML, Q6H-RT	INHALATION	04/04@1400	GIVEN: 4/4/2014@1432	
G	EHH		C		HEPARIN NA 5,000 UNIT/0.5ML SYR INJ SOLN HEPARIN NA 5,000 UNIT/0.5ML INJ SYR	5000 UNITS, Q8H	SUBCUTAN...	04/04@1300	GIVEN: 4/4/2014@1211	abdomen, left upper
SJI			P		FLUNISOLIDE 0.025% 2000 INHL NASAL FLUNISOLIDE 0.025% 2000 NASAL INH SPR...	1 SPRAY, BID PRN	IN EACH NOSTRIL		GIVEN: 3/17/2014@0916	
SJI			C		Rhinitis symptoms OMEPRAZOLE 20MG CAP, EC OMEPRAZOLE 20MG EC CAP	20MG, BID AC	ORAL	04/04@1630	GIVEN: 4/4/2014@0643	

Cover Sheet  Unit Dose  IVP/IVPB  IV

Scanner Status: **Ready** Enable Scanner

Meds on Patient **Influsing IVs**

Count: 0 Activity: PRN Effectiveness

BCMA Clinical Reminders

Green color (highlighted cells)

Red text (all caps)

Unused blank space

Vague PRN effectiveness reminder



# Situation Awareness

- Level 1 - Perception
  - Basic screen design issues
  - Perceiving what is due, what has been administered, what was missed, what is needed for medication preparation
    - Toggling through the 4 screens, memorizing what is needed
    - Special case: missed meds

# eMAR – Missed Meds

Bar Code Medication Administration - v3.0.70.65 - Patient Context is Joined

File View Reports Due List Tools Help

Missing Dose Medication Log Medication Admin History Allergies CPRS Med Order **Flag**

SSN = ██████████ (MALE)  
 DOB = ██████████ (80)  
 Height = 163cm, Weight = 77.96kg  
 Location = MICU 3-AA

Order Mode:  Inpatient  Clinic

Virtual Due List Parameters: Start Time: 04/04@1300 Stop Time: 04/04@1700

Schedule Types:  Continuous  On-Call  PRN  One-Time

**ALLERGIES: No allergies on file ADRs: ipratropium**

Stat...	Ver	Hsm	T...	Wit	Active Medication	Dosage	Route	Admin Time	Last Action	Last Site
	SJI		C		OMEPRazole					
	CLB		C		DOCUSATE					
	SJI		C		INSULIN, ASPART					
G	LMM		C		LEVALBUTEROL					
G	EHH		C		HEPARIN					
	SJI		P		SIMETHICON					
	CLB		P		ALOH-MAG					
	SJI		P		GUAIFENESIN					
	SJI		P		FLUNISOLIDE					
	SJI		P		ACETAMINOPHEN					

**Patient Missed Medications**

MISSED MEDICATIONS REPORT for Apr 04, 2014@07:00 to Apr 04, 2014@20:00  
 Run Date: APR 04, 2014@16:29  
 Include Inpatient Orders Only  
 Order Status(es): Active / DC'd / Expired  
 Admin Status(es): Missing Dose / Held / Refused  
 Include Comments/Reasons

Patient: PALMIERI, LOUIS MICHAEL SSN: 131-26-3480 DOB: APR 6, 1933 (80)  
 Sex: MALE Ht/Wt: 163cm/77kg Ward: MICU Rm: 3-AA  
 Dx: SOB Last Mvmt: MAR 29, 2014@00:21:45 Type: ADMISSION

ADR: IPRATROPIUM

Allergies: No Allergies on file.

Order Status	Ver	Admin Date/Time	Medication	Order Stop Date
Active	SJI	04/04/2014@1630	OMEPRazole 20MG CAP, EC	07/07/2014@2400
Active	CLB	04/04/2014@1700	DOCUSATE NA 50MG/SENNOSIDES 8.6MG TAB	07/08/2014@2400
Active	SJI	04/04/2014@1700	INSULIN, ASPART 100UN/ML VIAL 10ML INJ	07/07/2014@2400
Active	LMM	04/04/2014@2000	LEVALBUTEROL HCL 0.21MG/ML 3ML SOLN, INHL	04/05/2014@2400

PALMIERI, LOUIS MICHAEL 131-26-3480 Ward: MICU Room-Bed: 3-AA

Report 1 of 1 [Print] [Next] [Cancel]

Cover Sheet  Unit Dose  IVP/IVPB  IV

Scanner Status: **Not Ready** [Enable Scanner]

Meds on Patient: **Infusing IVs**

BCMA Clinical Reminders: Count: 0 Activity: PRN Effectiveness

Running Report... IRIBARREN, SARAH JO SALT LAKE CITY HCS Server Time: 4/4/2014 16:30

4:30 PM 4/4/2014

# Situation Awareness

- Level 1 - Perception
  - Basic screen design issues
  - What is due, administered, missed
    - Toggling through the 4 screens, memorizing needed
    - Special case: missed meds
- Level 2 - Comprehension
  - Meaning of changes
  - Getting the “big picture”
  - Lack of integration
- Level 3 - Projection

# Implications

- High level of usability problems
  - Surprising technical issues
- Problems impact situation awareness, patient safety and nurses' efficiency
- The design does not match the way that nurses think and work
- Improvements needed
  - Full picture of medications
  - Medications needing verification
  - Missed meds

# User Interface Redesign

- Screen design principles are known
- Should be a “no brainer” part of design
- Need to understand cognitive tasks before design
- Vendor scan at HIMSS
  - No one vendor solves known issues with eMARs
  - New solutions could greatly impact effectiveness and efficiencies of nurses

# Crucial Info Related to the Task

Bar Code Medication Administration - v3.0.70.65 - Patient Context is Joined

File View Reports Due List Tools Help

Missing Dose Medication Log Medication Admin History Allergies CPRS Med Order **Flag**

SSN = [REDACTED]  
 DOB = [REDACTED] (80)  
 Height = 163cm, Weight = 77.96kg  
 Location = MICU 3-AA

Order Mode:  Inpatient  Clinic

Virtual Due List Parameters: Start Time: 04/04@1300 Stop Time: 04/04@1700

Schedule Types:  Continuous  On-Call  PRN  One-Time

**ALLERGIES: No allergies on file ADRs: ipratropium**

Stat...	Ver	Hsm	T...	Wit	Active Medication	Dosage	Route	Admin Time	Last Action	Last Site
	SJI		P		ACETAMINOPHEN 325-HYDROCODONE 10MG (...) ACETAMINOPHEN 325-HYDROCODONE 10... <b>PAIN *NOT MORE THAN 4GM (APAP) PER DAY*</b>	1 (ONE) TABLET, Q4H PRN	ORAL		GIVEN: 4/4/2014@0229	
	SJI		C		INSULIN ASPART 100UN/ML VIAL 10ML INJ INSULIN ASPART 100 UNIT/ML INJ 10ML VI... <b>B5: &lt;140=none*140-179=1 Unit*180-219=2 Units*220-259=3 Units*260-299=4 Units*300-339=5 Units*340-379=6 Units*380-419=7 Units*420-459=8 Units* &gt;460=9 Units</b>	PER PROTOCOL, QID-INSULIN	SUBCUTAN...	04/04@1700	GIVEN: 4/4/2014@1211	abdomen, right lower quad
	SJI		P		SIMETHICONE 80MG TAB,CHEWABLE SIMETHICONE 80MG CHEW TAB <b>gas/bloating</b>	80MG, BID PRN	ORAL		GIVEN: 3/29/2014@2014	
	CLB		P		ALOH-MGDH-SIMTH XTRA STRENGTH UD S... ALOH/MGDH/SIMTH XTRA STRENGTH SUS... <b>indigestion/gas</b>	15 MILLILITERS, TID PRN	ORAL		GIVEN: 4/3/2014@0916	
	CLB		C		DOCUSATE NA 50MG/SENNOSIDES 8.6MG T... DOCUSATE NA 50MG/SENNOSIDES 8.6MG ... <b>constipation</b>	TWO (2) TABLETS, BID W/FOOD	ORAL	04/04@1700	GIVEN: 4/4/2014@0643	
	SJI		P		GUAIFENESIN 200MG TAB GUAIFENESIN 200MG TAB <b>for cough</b>	400MG, Q4H PRN	ORAL		REFUSED: 3/30/2014@2322	
G	LMM		C		LEVALBUTEROL HCL 0.21MG/ML 3ML SOLN... LEVALBUTEROL HCL 0.21MG/ML INHL SOL... <b>COPD WITH TACHYCARDIA</b>	0.63MG/3ML, Q6H-RT	INHALATION	04/04@1400	GIVEN: 4/4/2014@1432	
G	EHH		C		HEPARIN NA 5,000 UNIT/0.5ML SYR INJ,SOLN HEPARIN NA 5,000 UNIT/0.5ML INJ SYR	5000 UNITS, Q8H	SUBCUTAN...	04/04@1300	GIVEN: 4/4/2014@1211	abdomen, left upper
	SJI		P		FLUNISOLIDE 0.025% 200D INHL,NASAL FLUNISOLIDE 0.025% 200D NASAL INH SPR... <b>Rhinitis symptoms</b>	1 SPRAY, BID PRN	IN EACH NOSTRIL		GIVEN: 3/17/2014@0916	
	SJI		C		OMEPRAZOLE 20MG CAP,EC OMEPRAZOLE 20MG EC CAP	20MG, BID AC	ORAL	04/04@1630	GIVEN: 4/4/2014@0643	

Cover Sheet  Unit Dose  IVP/IVPB  IV

Scanner Status: **Ready**

Meds on Patient **Infusing IVs**

BCMA Clinical Reminders	
Count	Activity
0	PRN Effectiveness

3:42 PM 4/4/2014

# Modified Methods

- Modified HE worked
  - Dual domain experts
  - Adding unique categories
  - Verification with clinical experts (BCMA coordinators, clinical staff nurses)
- Found more serious issues
  - Past criticism of the method
- Recommend evaluators consider these modified methods

# Conclusions

- Methods can be used in other settings, for other systems
  - Most helpful for BCMA coordinators to review
- Technical issues were surprising
  - 30-60 minute downtime x 2 each day
  - Lack of interoperability
- Current cognitive burden is great
  - Resources needed to compensate
- Situation awareness is impaired
- Solutions are possible!



# Request for Case Studies/Stories

Nurses are uniquely qualified to provide valuable insight into improving the usability of healthcare technology and care delivery processes. The HIMSS HIT User Experience Community & Committee is looking for real world stories or case studies regarding nurses' interactions with technology, software applications, point-of-care devices, and care delivery processes that have prevented the efficient and or effective delivery of care, may have resulted in creating errors, or are simply “difficult to use.” We are also looking for success stories in which usability issues were identified, and how you, your team, or others worked to solve them.

**We are collecting these stories/case studies to help us better hear the voice of nursing on usability. We will use select stories as examples of usability issues in nursing. Any identifying data will be removed.**

Please submit your story or case study, highlighting key details in a maximum of 700 words.

Just log onto:

<https://surveys.himss.org/checkbox/Survey.aspx?s=0b34c8cb932349a8859c28359cbacfc7>.

Questions? Write to [janerhunt@comcast.net](mailto:janerhunt@comcast.net) or [nancystaggers@sisna.com](mailto:nancystaggers@sisna.com)

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