BaylorScott&White HEALTH

Partnering for Success: Informatics and Human Factors Engineers

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Background

- 2012 National Database of Nursing Quality Indicators (NDNQI©) demonstrated a significant decline in nurse satisfaction, despite steady nurse to patient ratios of 5:1 for med/surg units and 2:1 for ICUs
- In particular, nurses' ratings fell significantly on:
  - Job enjoyment
  - Staffing
  - Perceptions of the environment
- Indicated that nurses felt more burdened than in previous years.
- Human factors was asked to assemble and lead a multidisciplinary team, utilizing a systems engineering framework, to identify solutions
- Two pilot units at Baylor University Medical Center (BUMC) were selected
- Goal was to win back time and reduce nurses' workload in order to allow more time for direct patient care activities with minimal threats to patient safety

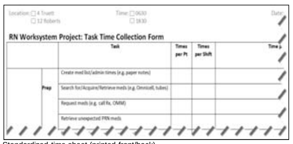
Project Overview

- 1 Med/Surg unit & 1 ICU were selected as pilot sites to:
  - Map nurse medication administration workflow
  - Quantify baseline nurse workflow & workload via **observation**
  - Identify barriers to nursing efficiency & contributors to workload via a human factors and systems engineering framework
  - Implement targeted interventions following PDCA rapid cycle improvement methodology
  - Assess efficiency gains & workload reductions via **observation**
- Interventions focused on:
  - Optimizing medication preparation workflow
  - Improving supply management & work efficiencies
  - Reducing interruptions and distractions for nurses

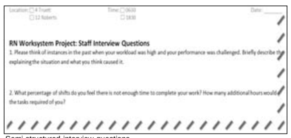
Methodology

- Methods utilized & taught to team members
  - Contextual Inquiry
  - Ethnographic Observation
    - Weekday & Weekend
    - 0630 – 0930 & 1830 - 2130
  - Semi-Structured Interviews
  - Surveys
- Baseline
  - 12 observations (36hrs total)
    - Med/Surg: 6 observations (3 @ 0630 & 3 @ 1830)
    - ICU: 6 observations (all @ 0630)
- Improvement Assessment
  - 10 observations (30hrs total)
    - Med/Surg: 4 observations completed (2 @ 0630 & 2 @ 1830)
    - ICU: 6 observations completed (4 @ 0630 & 2 @1830)

- A standardized data collection form was created & utilized to identify primary contributors to nursing inefficiency & workload to prioritize interventions
  - Identified tasks were timed via direct observation (bottom left)
  - Semi-structured interview questions guided interaction with frontline staff (bottom right)
- Tasks that occurred the most frequently, occupied the most time each shift and were identified as pain points via semi-structured interviews were targeted for improvement.



Standardized time sheet (printed front/back)

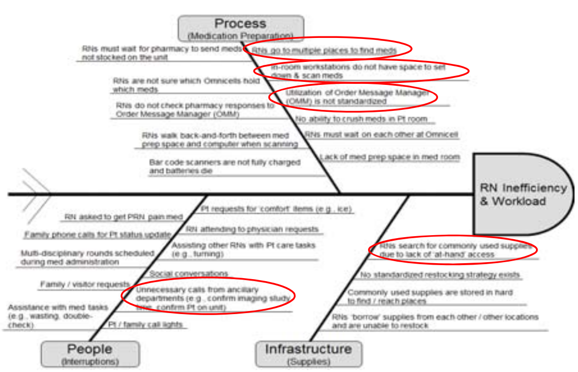


Semi-structured interview questions

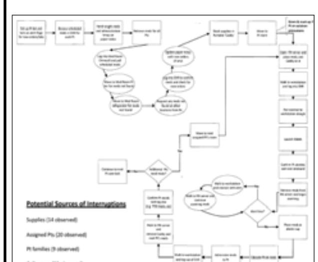
Measures

- Process Measures
  - Tasks identified via observation & interviews as bottlenecks to efficiency for:
    - Medication preparation / administration
    - Supply Management
    - Interruptions / distractions
  - Time that nurses spend to complete tasks collected via direct observation
- Outcome Measures
  - Calculated number of times per shift nurses complete the timed tasks
  - Calculated mean time spent on each task per nurse per shift
  - Difference in time spent on tasks before – after interventions to assess improvement
- Balancing Measures
  - Comparison of nurses' subjective ratings on the occurrences of interruptions before – after interventions (survey)

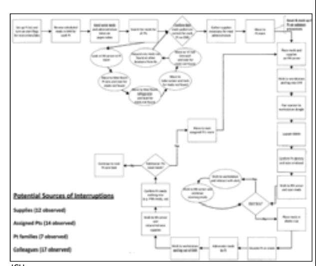
Identified Issues



Medication Administration Workflow Mapping



Med/Surg



ICU

Med/Surg Efficiency Barriers

RNs spend almost **3.5 hours per shift** dealing with: supply & medication issues, interruptions, infrastructure issues, and pt / visitor requests

Supplies

RNs spend 1:08 on average per shift on supply issues

- Preparing caddys
- Searching for meds
- Searching for routine supplies
- Waiting on meds not stocked
- Waiting on access to meds / supplies

Assigned pts

RNs spend 2:06 on average per shift on interruptions from assigned pts

- Checking for new orders
- PRN meds
- Hourly pain meds
- Pt care activities (e.g. vitals, toileting, etc)

Colleague, pt family, and outside interruptions

RNs spend :54 on average per shift on interruptions from other sources

- Requests for information
- Requests for MDs
- Requests for conveniences (e.g. water, linens)
- Assist other RNs with pt care tasks
- Rounding MDs
- Social
- Assistance with pt care tasks
- Assistance with meds (e.g. wasting)
- Waiting

*estimated totals derived from observation data and assume a 5:1 Pt to RN ratio

ICU Efficiency Barriers

RNs spend almost **7 hours per shift** dealing with: supply & medication issues, interruptions, infrastructure issues, and pt / visitor requests

Supplies

RNs spend 1:15 on average per shift on supply issues

- Searching for meds in 4 locations
- Searching for routine supplies
- Waiting on meds not stocked
- Waiting on access to meds / supplies

Assigned pts

RNs spend 2:00 on average per shift on interruptions from assigned pt

- Checking for new orders
- PRN meds
- Hourly pain meds
- Pt care activities (e.g. vitals, toileting, etc)

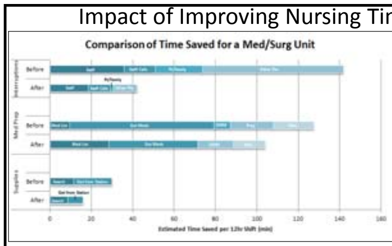
Colleague, pt family, and outside interruptions

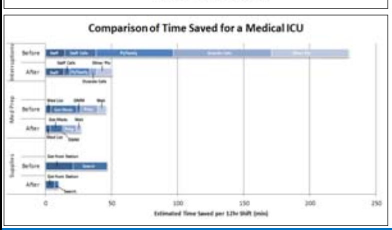
RNs spend 3:58 on average per shift on interruptions from other sources

- Requests for information
- Requests for MDs
- Requests for conveniences (e.g. water, linens)
- Assist other RNs with pt care tasks
- Rounding MDs
- Social
- Assistance with pt care tasks
- Assistance with meds (e.g. wasting)
- Waiting on colleagues

*estimated totals derived from observation data and assume a 2:1 Pt to RN ratio

Impact of Improving Nursing Time in BUMC Pilot





Tools to Reduce Interruptions

- Unit secretary probing questions & checklist
- PCT checklist
- Ancillary departments education packet
- Pt Safety Zone: protected time during med admin

Tools for Meds Prep

- Pharmacy collaboration checklist
- Tip sheet for Order Message Manager (OMM) to track frequency of missing meds

Tools for Supply Management

- Checklist for supply retrieval disruptions (e.g., glove boxes, syringes)
- Tip sheet work efficiency (e.g., using a portable caddy for supplies)

Summary RN Efficiency Improvement

Med/Surg Total Estimated Time Saved

Total Time Saved (min)	159.82	
% of Time Saved (per shift)	22.20%	
Summary Chart	Time Saved	% of Total Savings
Med Prep	34.50	21.59%
Supply Management	13.03	8.78%
Shift Change	12.45	7.79%
Interruptions	99.84	62.47%
Computer Issues	N/A	N/A

ICU Total Estimated Time Saved

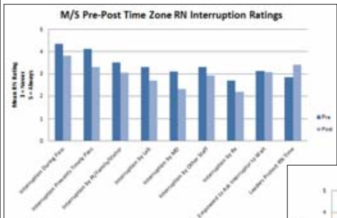
Total Time Saved (min)	248.68	
% of Time Saved (per shift)	34.54%	
Summary Chart	Time Saved	% of Total Savings
Med Prep	16.76	7.60%
Supply Management	37	14.88%
Shift Change	14.08	5.66%
Interruptions	178.7	71.86%
Computer Issues	N/A	N/A

Combined Estimated Total Savings

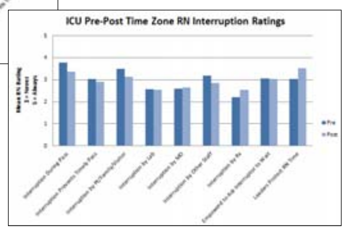
Time
408.50min

*Estimates based on one RN for one 12hr shift

Nurses' Subjective Ratings of Interruptions



- Nurses surveyed were not found to have a dramatic shift in their ratings of the occurrence of interruptions
- Time won back was back-filled with tasks required to care for their patients
- Prevented acknowledgment of the reduction in interruptions



Summary of Pilot Accomplishments

- Improvement to
  - RN efficiency
    - Medication retrieval & administration
    - Searching for supplies
    - Interruptions
  - Infrastructure
    - ICU medication room
  - Supply management
- Project team education on human factors principles & approaches to safety
- Engagement of multiple stakeholders for collaboration on improvement strategies

Implications to the Enterprise

- Detailed mapping of multiple RN workflows
  - Medication administration with KBMA
  - Initial documentation strategies
  - Supply needs
- Quantitative, objective measurement of current RN workflows
  - Estimates of RN time spent on tasks each shift & associated salary costs
- Improved understanding of RN workflow challenges
  - Comprehensive understanding of KBMA & anticipated barriers
  - Insights into efficiency barriers
  - Assessment of interruptions & distractions on workflow
  - Input on intervention strategies
- Identification of RN efficiency barriers
  - Interruptions & distractions
  - Infrastructure
  - Supply management
  - EHR design & usability
- **Creation of an easy to use Toolkit**

Spread

- In order to facilitate spread to other units and facilities, the interventions that achieved marked improvements were packaged into a usable toolkit:
  - Allows units to pick and choose which interventions will work on their unit & ensures the implementation of interventions is possible via tools (e.g., checklists)
- Toolkit spread throughout BUMC via presentation to the Nurse Managers Meeting
- Enterprise meeting presentations (e.g., Patient Safety Committee)
- Abstract submitted to the 2014 American Medical Informatics Association Annual Conference in Washington, D.C.
- Toolkit shared with:
  - Additional units within BUMC
  - Facilities throughout the enterprise: Baylor All Saints, Baylor Carrolton & Baylor Heart and Vascular Hospital

Human Factors Enterprise Vision of Nursing Efficiency: Four Areas of Focus

RN Efficiency

Value of RN Work
- Policy & guidelines for standardization of EHR nursing documentation
- Policy & guidelines for RN workload management (e.g. supporting CPOE, teamwork, non direct care activities, etc)

Technology
- Analytics to assess RN workload
- Mobile access to information, medication scanning and EHR documentation
- EHR optimization via user-centric design principles
- Infrastructure support of IT & EHR system performance

Workflow
- Reduction of RN interruptions during medication administration, documentation & supply needs
- Improvement of workflow via better 'tools'
- Creating the ideal inpatient / medication rooms and units to support improved RN workflow

Competence
- EHR skill development and strategies
- Human factors of efficiency at all levels of leadership
- Best practices of construction/acquisition to increase efficiency
- Problem solving to enhance nursing worksystem

Project Team

- System Leadership
  - Rosemary Luquire
  - Don Kennerly
  - Jan Compton
  - Donna Montgomery
- BUMC Leadership
  - Claudia Wilder
  - Rita Fowler
  - Lynn Randolph
  - Toni Johnson-Akers
- Nursing
  - Caton Cadigan
- IRNs
  - Cortney Dalcour
  - Abigail Cartagena
  - Sandra Squires
  - Tiana Williams
  - Jason Jeffers
  - Ruby Relos
  - Rachel Jackson
  - Shameka Butler
- Unit Managers:
  - 12R: Penny Quinn
  - 4T: Carol Crenshaw
- Patient Safety
  - Cindy Cassity
  - Richard Gilder
  - Adam Probst
  - Yan Xiao
- Ancillary Departments
  - Pharmacy: Kirk Starr & Angela Straza
  - IV Services: Melinda Belcher & Kelly Crayton
  - Radiology: Curt Bush & Melinda Hirshouer
- Unit educators
  - 4T: Jessica Strasen
  - 12R: Loan Do
- Informatics
  - Cindy Wohlgemuth
- BIS
  - Chris Matta

Problems we are trying to solve

- Nursing has multiple workflows that require different devices; the desire is consolidation to one device.
  - Barcode medication administration
  - Breast milk scanning
  - Specimen labeling
  - Blood Administration scanning
  - Communications-texting, phone calls, reminders and alerts
- Unintended consequences have been experienced at BUMC since the replacement of the legacy BCMA to Allscripts.
  - Purposeful planning and implementation science strategies utilized
  - Workflow study estimates **26 minutes has been added** to each shift per nurse.
  - KBMA video

Objectives for Discovery

- To consolidate the number of devices used by nursing to one
- To provide nursing with a tool to increase efficiencies in workflow
- Meet Meaningful Stage 2 Standards (10/1/14)-use of technology to support med administration

Solution Comparison see Appendix***

	PSS	Allscripts	Motorola	Epic	Spectralink
Medication Administration	✔	✔ P1 of 3 available 4/1/14	X Future	✔ Epic Customer Only	X Scanner only
PPID • Blood Admin • Specimen Collection • Breast Milk Scanning	✔ ✔ ✔	X	X	✔ ✔	X
Secured Communications • **Text Msg** • **Voice** • **Integration with Nurse Call** *Recommended by Telecom	✔ ✔ X middleware part of application	✔ ✔ X middleware not part of application	*✔ ✔ X X **Future**	X **Future**	*✔ *✔ *✔
Other Clinical Documentation • **Task List (reminders)**	✔	X **Future**	X	X **Future**	X

Recommendations

- BCMA deployments using Code (scanner-only) at remaining hospitals and re-evaluate market progression at each Wave.
  - The purchase of devices-laptops, carts and other handheld devices are not currently budgeted in some sites (utilize MU dollars to support).
- Approval of Nursing Mobility Project (IS, Telecom, Infrastructure, Informatics Resources needed). Additional exploration needed to understand potential pilots.
  - Consider using Motorola or SpectraLink device as part of Wave 2 & 3
  - Consider piloting Allscripts mobility solution in Wave 3.
  - In a separate project, pilot Patient Safe Solutions at BUMC.
  - Capital dollars need to be spent on investment of infrastructure (mobile carts, re-config of environment).
  - Purchase Motorola or SpectraLink device, use them as a communication device and scanner in pilot phase.

Proposed Timeline

Group	Facility	Proposed Date
1	McKinney	May 24
1	Carrollton	May 24
1	Irving	May 24
2	Denton	June 28
2	Waxahachie	June 28
2	AllSaints	June 28
3	Baylor Plano	August 9
3	Plano Heart	August 9
3	Grapevine	August 9
4	BHVH	September 20
4	BSH	September 20
4	OCH	September 20

Considerations:
- Using current vendor or dumb scanner
- Kickoff meeting for first wave occurs on 2/10
- Final deployment will depend on the following elements:
  - Technical Assessment
  - Nursing Assessment
  - Pharmacy Assessment
  - Facility Deliverables
  - Geographical Locations
  - Approval of Nursing Mobility Project (Capacity Issues)

Notes:
- Reducing the Critical Path (Hardware Purchase) for Wave 1 only effects Wave 1. All subsequent implementation are dependent on the conclusion of the Planning Phase, not Execution .

Appendix: Partnering for Success

KBMA Implementation Infrastructure Readiness Assessment Checklist

Instructions:

The Baylor Health Care System KBMA Implementation Readiness Assessment Checklist is comprised of 3 sections of concerns: inpatient rooms, medication rooms, and workstation on wheels (WoWs). In order to better assess the readiness of your facility's infrastructure for go-live, we ask that you complete this checklist for each care area where KBMA will be utilized (one checklist per care area).

Scoring:

For each 'Yes' response, a point is given. There are no points awarded for a 'No' response. In order to calculate a score for each section, simply total all 'Yes' responses and fill in the associated 'Score' cells. The total number of 'Yes' values can be summed to create a global score when all sections are complete. The maximum score is 15 (the maximum score for each section is 5); with a higher score indicating a more thorough KBMA infrastructure assessment.

Facility:
Area of Care:

KBMA Implementation Infrastructure Readiness Assessment Checklist	Yes	No
Inpatient Rooms (for workstations installed at the bedside)		
Has *every unit* been evaluated for an installation location individually, including isolation rooms, accounting input devices (e.g. dongle, mouse, keyboard)?		
Have mock-up KBMA workstations been evaluated in the different identified locations and use scenarios evaluated (e.g. facing the Pt, avoiding family/visitors, etc)?		
Has the ergonomic adjustability of the KBMA workstation been considered?		
Does the area immediately surrounding the KBMA workstation contain adequate space for users to spread out and scan, prepare (e.g. crush), and sort medications?		
Have alternative computers been secured for situations in which the primary KBMA workstation is broken or malfunctioning?		
	Score: ____	
Medication Rooms		
Has the workflow of how nurses retrieve medications been mapped and evaluated?		
Was the option of profiling the Omnicells evaluated?		
Is there a process for storing medications that are not profiled in the Omnicell?		
Is a computer workstation readily available and located next to the Omnicell?		
Has the storage and charging processes of the KBMA scanners been evaluated?		
	Score: ____	
Workstation on Wheels (WoWs)		
Has the need for a WoW, environmental considerations (e.g. door width, in-room space, carpet halls, etc), and *all* Wow : staff ratios been evaluated (i.e. RN and RT)?		
Have the WoW requirements *of each unit* been evaluated (e.g. battery charging stations, extra batteries, WoW storage, network connectivity, etc)?		
Have infection control issues (e.g. disinfecting the device) been evaluated?		
Do the WoWs have adequate space for medication preparation (e.g. crush), administration (e.g. scanning), and storage (e.g. lockable drawers)?		
	Score: ____	
	Global Score: out of 15	

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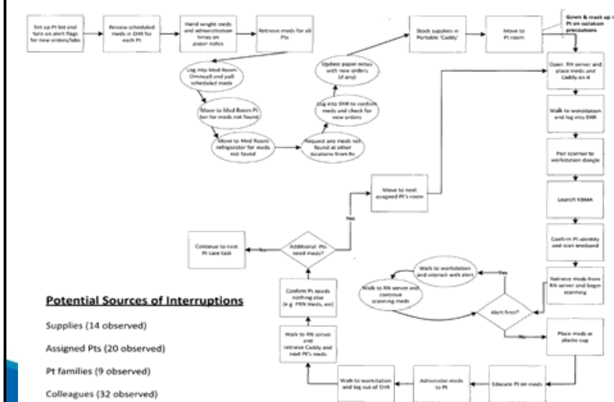
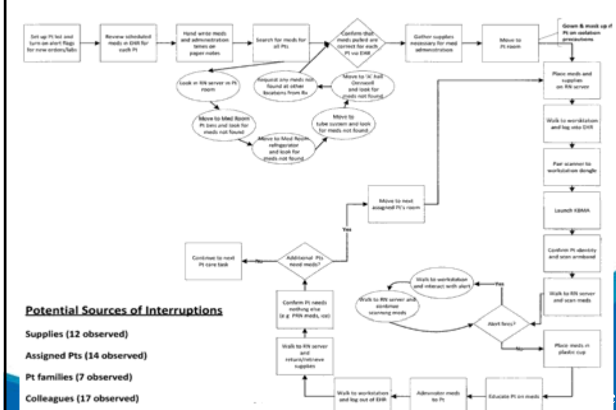
Appendix A: Med/Surg Med Admin Workflow & Interruptions



Appendix B: ICU Med Admin Workflow & Interruptions

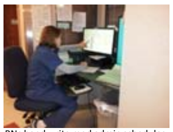


DRAFT for Discussion

Appendix C: Human Factors Learning Points

- Importance of observing
  - Observe, not assume barriers to RN workflow efficiency
  - Objectively measure current RN workload
  - Evaluate interventions and impact to RN workload
- Interruption and memory burden to address work arounds
  - RNs make use of paper processes to address memory burden
  - Utilization of paper as an artifact from
    - Cumbersome processes
    - Sub-optimal tools (e.g. EHR)
    - Interruptions / distractions while completing work

Appendix D: Exampled Inefficient Work System



RNs hand write med admin schedules from EHR (4T)

RNs perform report on hallway RN servers due to lack of space in room (12R)

RNs create their own 'Caddy' to keep needed supplies at hand (12R)

RNs avoid hallway mounted workstations due to ergonomics issues (12R)

Omnicell issues: broken bins and missing labels are not fixed due to RN's lack of free time (4T)

Appendix E: Interventions Literature Summary

Implementation of an 'Interruption-Free Zone'

- Identify a time period where RNs cannot be interrupted unless emergent[1,4]
  - Charge RN to cover calls via routing of phones[1]
  - Identify a set time where pt families can call for updates[4]
  - Night shift RNs to call designated pt family member to update overnight status
  - Unit secretary to address pt & visitor requests (e.g. call lights)[1,4]
- Interdisciplinary team to design and implement initiatives[4,5]
  - Increase safety of med administration
  - Allow for first round of documentation to be completed (e.g. first shift assessment)
- Education of interruptions and medication errors, the motivation for the intervention, and the time period / protocols to:
  - Frontline staff (e.g. RNs, MD, RT)[1,2,3,4]
  - Ancillary staff (e.g. lab, radiology)[4]
  - pts and visitors (e.g. family, friends)[4]
- Utilize signage to inform pts and visitors of intervention[1,5]
- Guidelines for reducing unit and pt room noise levels[4,5]

Appendix F: Interventions Literature Summary

Supply Interventions

- Medications:
  - Techs round prior to scheduled morning admin time to place all meds in a single location (4T RN server and 12R med room bins)[1]
  - Ensure the medications requested most frequently from each unit are stocked regularly[1]
  - Standardize Omnicell stocking[5]
- Supply Stocking strategies:
  - 4 Truett night shift techs to fully stock RN servers in a standardized process with:
    - Medication administration supplies (e.g. pill crusher, paper cups, syringes, etc)[1]
    - Routine supplies (gloves, linens, tubing, alcohol swabs, gauze, etc)[1]
  - 12 Roberts night shift techs to fully stock RN caddys in a standardized process[1]

KBMA & Infrastructure Interventions

- Select one room on 4 Truett and relocate the wall-mounted workstation next to the RN server to improve interactions with computer[3]

References

1. Relihan, E., O'Brien, V., O'Hara, S., & Silke, B. (2010). The impact of a set of interventions to reduce interruptions and distractions to nurses during medication administration. *Quality and Safety in Healthcare*, *19*, e52.
2. Bennet, J. (2010). Effects of interruptions to nurses during medication administration. *Nursing Management*, *16*(*9*), 22-23.
3. Koppel, R., Wetterneck, T., Telles, J.L., & Karsh, B. (2008). Workarounds to barcode medication administration systems: their occurrences, causes, and threats to patient safety. *Journal of the American Medical Informatics Association*, *15*(*4*), 408-423.
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5. Pape, T. M., Guerra, D.M., Muzquiz, M., et al., (2005). Innovative approaches to reducing nurses' distractions during medication administration. *The Journal of Continuing Education in Nursing*, *36*(*3*), 108-116.