



Evaluating the impact of technology on clinician workload time-motion methodologies

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Presentation Objectives

- Understand the major rationale and considerations for performing time-motion studies
 - Lisa Newmark

- Application of time motion study principles to study the workflow impact of barcode medication administration on nurses
 - Eric Poon, MD MPH

Background: Why evaluate time impact?

- Information technology (IT) can improve patient care and reduce medical errors
- Pressure to do more in less time
- Concern that IT takes longer to use is an adoption barrier
- Assessments of how such systems alter clinician time utilization is a critical part of evaluation

Application of Time-Motion Studies

- Evaluates clinician time utilization
- An observer times and identifies the subject's activities
 - Records each activity in a succinct manner
 - Continuous observation
- Gold standard
 - Evaluates reality rather than a simulation
 - Accounts for fleeting activities and frequent change of tasks

Designing a Time-Motion Study

- Build a task list specific to the workflow of users being evaluated
 - Visible to observer without prompting
 - Group tasks into analysis categories
- Develop a collection form
 - Provides for standardization during data capturing
 - Minimize observer errors
 - Passive observation
- Observer training
 - Pilot observations
 - Application training
- Consent process
 - Clinicians
 - Patients
- Study Design
 - Before and after study vs. RCT

Analysis Plan (1)

- Power calculation
 - Calculate the number of observation sessions needed to answer primary question
 - Feasibility
- Unit of analysis
 - Time per patient
 - Proportion of time
- Outcome measures
 - Total time spent per patient
 - Proportion of time spent

Analysis Plan (2)

- Covariates/Potential confounders
 - Observation factors
 - Observer
 - Time of day
 - Clinician factors
 - Years in practice
 - Computer literacy
 - Clinic/Specialty/Type of unit
 - Environmental factors
 - # of patients cared for
 - Computer setup
- Statistical methods to account for repeated measures

Evaluating the Impact of Barcode Medication Administration (BCMA) Technology on Nursing Workflow

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Study Objectives

- Use data to help other institutions plan for upcoming BCMA technology implementation
 - Quantify the impact of BCMA on proportion of time nurses spent on medication administration
 - Evaluate the impact of BCMA on other nursing activities

Study Site – Brigham and Women's Hospital

- 735-bed tertiary academic medical hospital in Boston, MA
- Gradual rollout by unit of home-grown BCMA solution
 - Heavy end-user involvement in design
 - Multidisciplinary approach to facilitate integration of CPOE, pharmacy system and bedside scanning technology
 - Large investment in training during rollout

Methods

- Direct observation by trained observers
 - 2-hours direct observation sessions before and after BCMA technology implementation
 - Balance of different types of units and time of day
- Iterative development of task list before data collection
 - Pilot
- Analytical strategies
 - Primary outcome: average proportion of time observed nurse spends on medication administration
 - Wilcoxon Ranked Sum Test: Pre vs. Post BCMA
 - Multivariable linear regression with GEE: Control for unit type, time of day, number of patients under RN care, repeated measurement on same nurses
 - Secondary outcomes: average proportion of time RN spends:
 - In the presence of patient
 - On personal time
 - On inefficient tasks (e.g. waiting, looking for MAR)

Data Collection Instrument

Microsoft Access - [TblSession]

File Edit View Insert Format Records Tools Window Help

Type a question for help

MS Sans Serif 8 B I U

Session ID: 1
 Nurse ID: 1
 Date: 4/1/2004
 Observer ID: EF
 Pod: 4D
 Session Type: pilot 1
 # Observed Assts.:
 #Treatment Pts: 4
 Comment:
 Session StartTime: 7:29:53 AM
 Session EndTime: 10:22:16 AM
 Barcode

Start Session
 End Session

| ObservationID | Start Time | End Time | Comment |
|---------------|------------|------------|---------|
| 25 | 2:26:32 PM | 7:42:34 AM | Assist |

Start Observation End Observation

Med Admin Non Med Admin

MAR Usage

- Look for MAR
- Transcribe MD order to MAR
- Review MAR for patient info
- Document in MAR
- Wash scanner
- Set up scanning equipment
- Scanning patient ID
- Scanning employee ID
- Scanning medication
- Create MAR notes
- Document on MAR notes
- Waiting for computer to operate
- Searching on eMAR

Communication with Pharmacy

- Med not available
- Med not listed on Omnicell - nonrenewal
- Med needs to be obtained to be given stat

Communication with Physician

- Med order not in BICS
- RN/RPh believes order contains error
- Clarify med order
- Discuss previously administered meds
- Communicate about new med orders

Look up Drug Info

- Book
- Clamshell
- Computer

Obtaining Medication

- Omnicell
- Medcart
- Refrigerator
- Pneumatic Chute
- Medication Preparation

Bedside Medication Administration

- Observer not in room, med admin
- Obtain liquids for pt to take meds
- Find pt when meds are due
- Check name band
- Make name band when necessary
- Explain meds to pt
- Wash hands
- Don gloves/gown
- Check vitals prior to administration
- Document vitals prior to administration
- Observe pt taking oral meds
- Inject meds
- Asses IV site
- Flush IV site
- Connect tubing
- Program pump
- Flush IV after med has infused
- Change IV bags
- Look for flowsheet to document meds
- Document meds on flowsheet
- Pt monitoring
- Other

Record: 1 of 62

Session

File Edit View Insert Format Records Tools Window Help

Type a question for help

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| ObservationID | Start Time | End Time | Comment |
|---------------|------------|------------|-------------|
| 26 | 2:26:32 PM | 7:42:34 AM | Assist Flag |

Start Observation End Observation

Med Admin Non Med Admin

Communication

- Patients and families
- Other RNs
- Physicians/PAs
- IV therapist
- Pharmacy
- PCAs, assistant personnel
- Unit Coordinator
- Dietary Nutrition
- Housekeepers
- Escort Service
- Phlebotomist
- OT/PT
- Care coordination
- Blood bank
- Admitting office
- Skilled nursing facility/VNA
- Observe MD speaking with patient

Physical Care of Patients

- Assess assigned pts
- Personal care
- Wash hands
- Don gloves/gown
- Dressings
- Treatments
- Turning
- Ambulating
- Phlebotomy
- Transfers
- Bedmaking
- Prepare pts/equipment for treatment
- Pt teaching
- Assist MD w/ bedside procedures
- Discharge activities

Computer

- Look up pt data
- Shift Check
- Transcribe/review MD orders
- Enter pt care referral
- Enter pt discharge instructions
- Paging
- Enter Quadramed
- Email
- Look up diagnosis teaching info
- Print pt teaching tools

Paper-Based Documentation

- Patient care in medical record
- Patient data on flowsheet
- Order transcription on kardex/sec list

Looking for

- Medical records
- Pt flowsheet
- Pt equipment
- Pts and families
- MDs
- Available computer terminal
- Another RN

Misc

- Observer not in room, no med admin
- Travel
- Move furniture for room changes
- Look up pt locations for visitors
- Triaging between pts
- Code blue
- Personal time
- Other
- Observer resting

Record: 1 of 62

Results*

- 232 2-hour observations sessions
 - 2/2005 to 10/2005
 - Equal number done on pre-BCMA and post-BCMA units.
- Primary Outcome: Proportion of time spent on medication administration did not change after BCMA implementation (Wilcoxon Ranked-sum test, $p=0.18$; Adjusted for confounders and repeated measures, $p=0.22$)
 - 26.5% pre-BCMA
 - 24.5% post-BCMA
- Secondary Outcomes:
 - Proportion of time spent on personal activities
 - 2.4% pre-BCMA -> 4.9% post-BCMA ($p<0.001$)
 - Proportion of time spent on inefficient activities
 - 10.8% pre-BCMA -> 7.3% post-BCMA ($p<0.001$)
 - Proportion of time spent in presence of patient:
 - 26.1% pre-BCMA -> 31.3% post-BCMA ($p=0.002$)

Conclusions

- A well-designed and fully-supported BCMA system did not increase the proportion of time nurses spend on medication administration.
- The system may have streamlined inefficient tasks, possibly allow nurses to have more personal time.
- The technology does not appear to compromise the amount of time nurses spend with patients.

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