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 utlization
- 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
    - # if 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

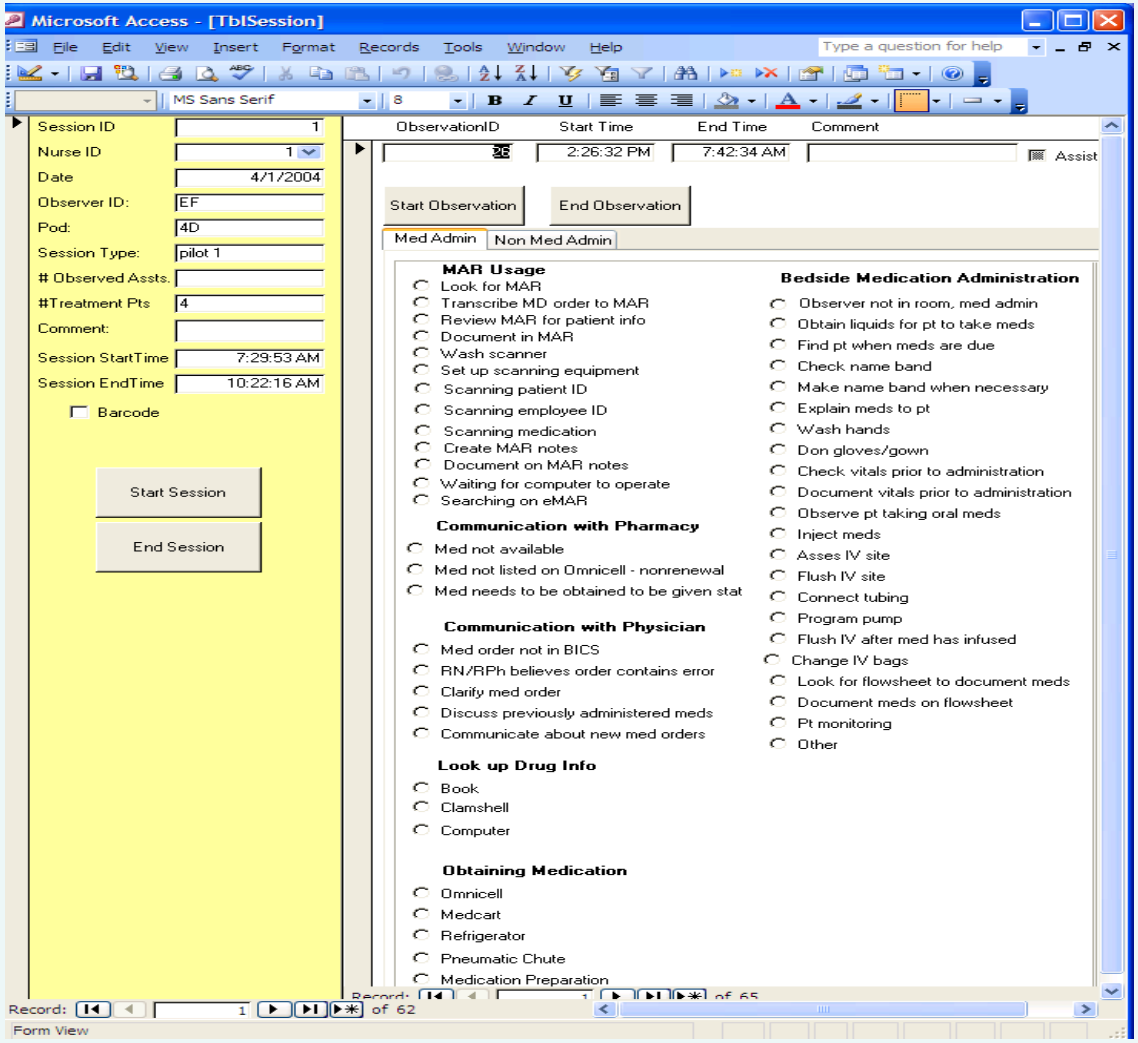
Study Site – Brigham and Women's Hospital

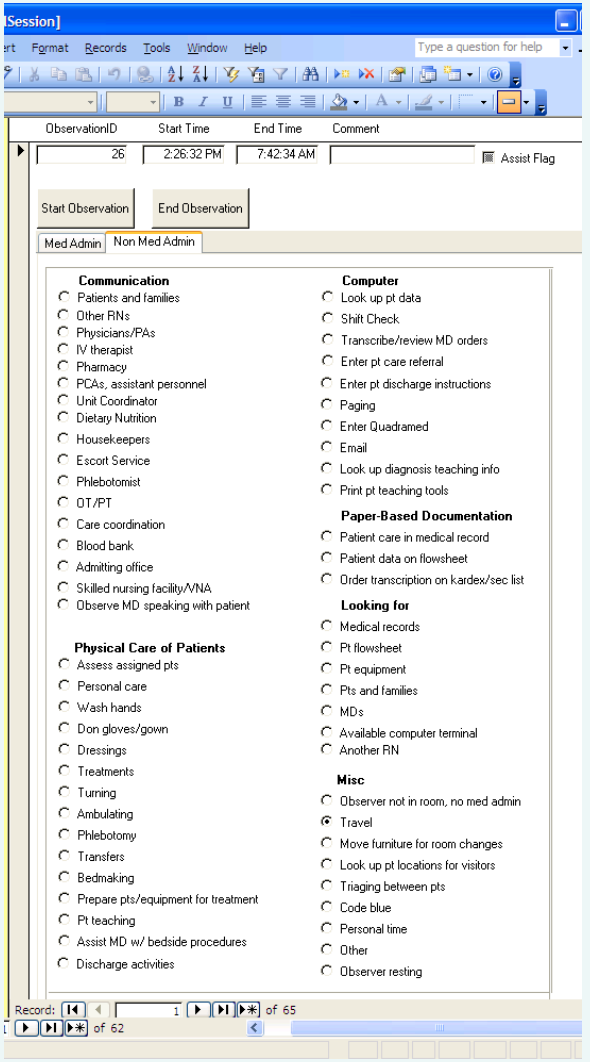
- 735-bed tertiary academic medical hospital in Boston, MA
- Gradual rollout by unit of home-grown BCMA solution
  - Heavy end-user involvement in design
  - Multidisciplinary approach to facilitate integration of CPOE, pharmacy system and bedside scanning technology
  - Large investment in training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





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)

*Note: Preliminary unpublished results – Not for citation or reproduction

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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