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Patient Safety Research Introductory Course
Session 6

Evaluating Impact After Implementation

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Overview

- To improve patient safety, it is also important to *evaluate* the effectiveness of solutions in real-life settings in terms of their impact, acceptability and affordability. In this session, several methods for evaluation will be introduced.

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Components

1. What are Donabedian's 3 elements to assess quality of care?

a. Cost, competency, culture
b. Costly, common, controversial
c. Structure, process, outcome
d. Effectiveness, efficiency, equity

2. Which of the following is an example of a process evaluation?

a. Measuring if doctors clean their hands before visiting a patient
b. Recording the cost effectiveness of reducing medication errors
c. Surveying nurses about the safety climate in their unit
d. None of the above

3. What evidence might convince hospital managers to invest in safety?

a. An intervention increases safety and does not increase expenses
b. A few steps can improve safety in several areas
c. An intervention improves safety and decreases hospital length of stay
d. All of the above

4. How can we know if we have learned from a mistake?

a. Measure the presence of a policy or program
b. Test staff knowledge about a policy or program
c. Observe directly if staff use a policy or program appropriately
d. All of the above

5. Which of the following are important aspects of safety culture

a. Teamwork
b. Ability to speak up about concerns
c. Leader's attitudes about safety
d. All of the above

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Introduction
How do you know if care is safer?

- Frequency of harm
- Prevalence of appropriate care
- Changes in practice in response to learning
- Improvements in safety culture

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Assessing the Quality of Care (Donabedian)

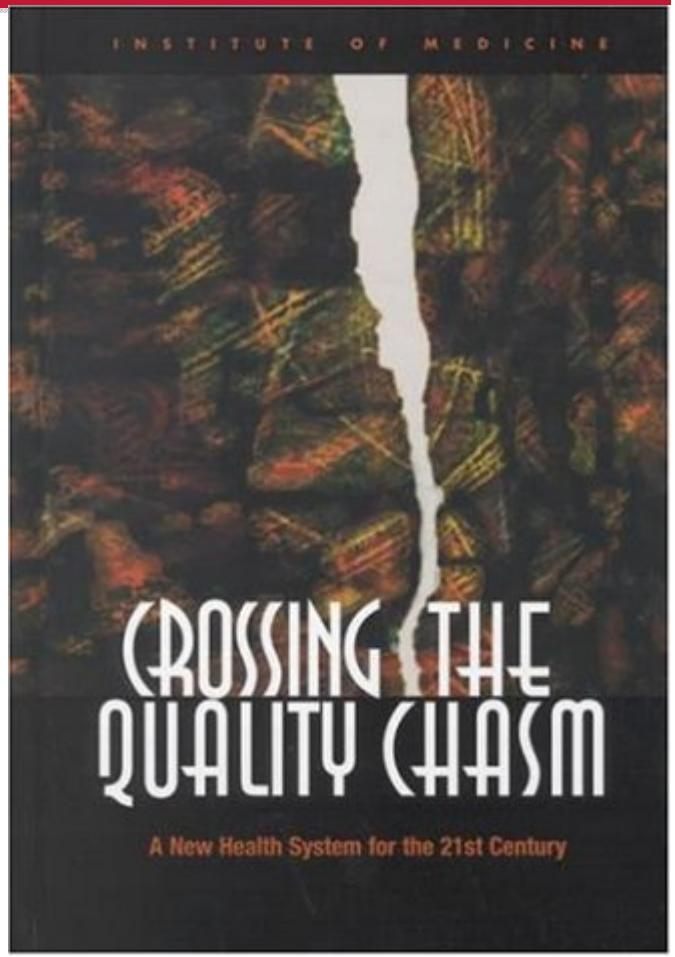
Structure Process Outcome

CONTEXT = SAFETY CULTURE

Domains of Quality

- Safety
- Effectiveness
- Patient centeredness
- Efficiency
- Timeliness
- Equitable

IOM Crossing the Quality Chasm



Outcomes from Different Perspectives

- Clinical Perspective
- Patient Perspective
  - Subjective health status
  - Quality of life
  - Satisfaction
- Societal Perspective
  - Utilization
  - Cost

Safety Measures

- Harm (outcome)
- Appropriate care (process, explicitly defined)
- Learning
- Safety culture

Examples

- Measuring appropriate care processes – clean care is safer care
- Measuring learning – audit of actions taken
- Measuring safety culture
- Prospective study: 6 month long cohort study for cost analysis (Bates)
- Cross-sectional study: Case control study – cost identification (Khan)

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First Global Patient Safety Challenge

Clean Care is Safer Care

- WHO Guidelines for Hand Hygiene in Health Care

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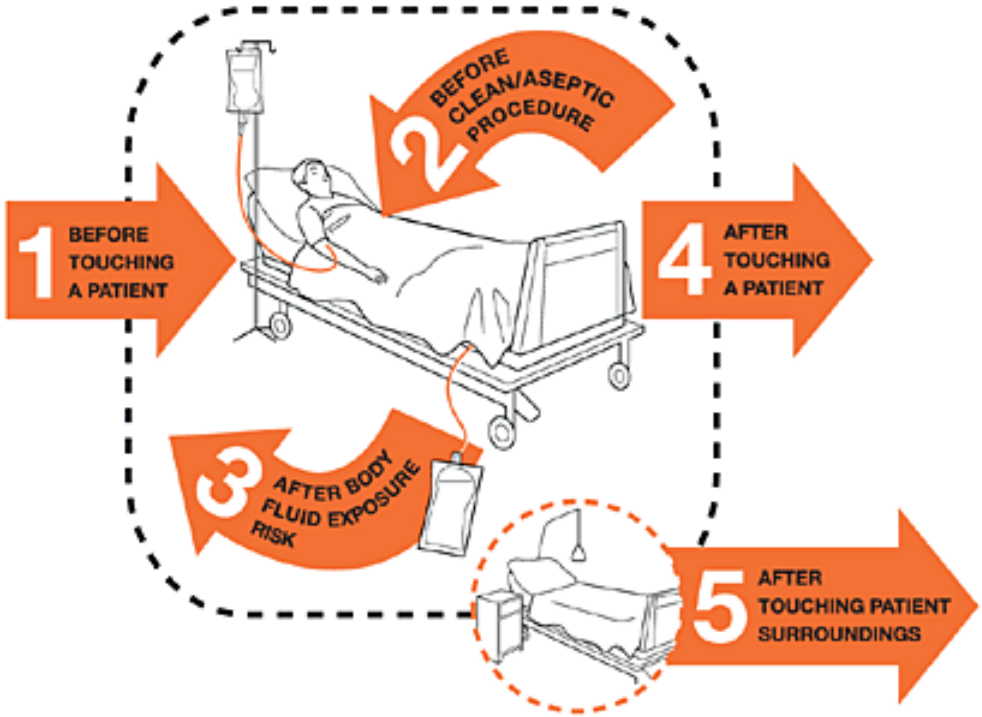
5 Moments for Hand Hygiene



Evaluation

- Process
  - Direct observation
    - *Proportion of appropriate hand hygiene per total number of hand hygiene opportunities*
  - Indirect Measurement
    - *Volume of alcohol-based hand rub used*
- Outcome
  - Incidence of healthcare acquired infections

Have we learned from mistakes?

- Measure **presence** of policy or program
- Staff **knowledge** of policy or program (testing)
- Appropriate **use** of policy or program (direct observation)

Have we created safe culture

- Annual assessment of culture of safety
- Evaluates staffs attitudes regarding safety and teamwork
- Safety Attitudes Questionnaire

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SAQ Teamwork and Safety Climate Survey

Disagree Strongly	Disagree Slightly	Neutral	Agree Slightly	Agree Strongly

- …it is difficult to speak up if I perceive a problem with patient care
- …physicians and nurses work together well as a well coordinated team
- Medical errors are handled appropriately here

Cost Outcomes

- Cost identification
- Cost effectiveness
  - QALYs
  - DALYs
- Cost benefit

DW, Spell N, Cullen DJ, et al. The costs of adverse events in hospitalized patients. JAMA 1997;277:307-11

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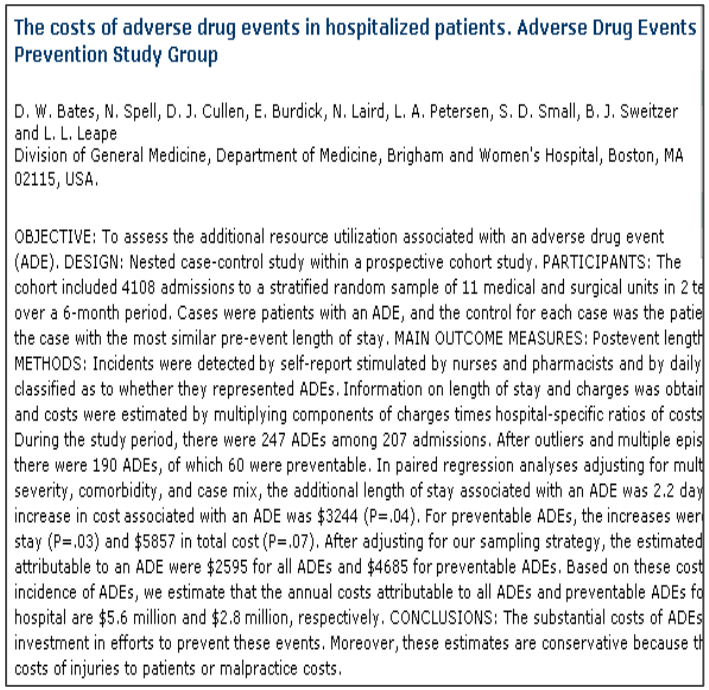

The costs of adverse drug events in hospitalized patients. Adverse Drug Events Prevention Study Group

D. W. Bates, N. Spell, D. J. Cullen, E. Burdick, N. Laird, L. A. Petersen, S. D. Small, B. J. Sweitzer and L. L. Leape
Division of General Medicine, Department of Medicine, Brigham and Women's Hospital, Boston, MA 02115, USA.

OBJECTIVE: To assess the additional resource utilization associated with an adverse drug event (ADE). DESIGN: Nested case-control study within a prospective cohort study. PARTICIPANTS: The cohort included 4108 admissions to a stratified random sample of 11 medical and surgical units in 2 te over a 6-month period. Cases were patients with an ADE, and the control for each case was the patie the case with the most similar pre-event length of stay. MAIN OUTCOME MEASURES: Postevent length METHODS: Incidents were detected by self-report stimulated by nurses and pharmacists and by daily classified as to whether they represented ADEs. Information on length of stay and charges was obtair and costs were estimated by multiplying components of charges times hospital-specific ratios of costs During the study period, there were 247 ADEs among 207 admissions. After outliers and multiple epis there were 190 ADEs, of which 60 were preventable. In paired regression analyses adjusting for mult severity, comorbidity, and case mix, the additional length of stay associated with an ADE was 2.2 day increase in cost associated with an ADE was $3244 (P=.04). For preventable ADEs, the increases wer stay (P=.03) and $5857 in total cost (P=.07). After adjusting for our sampling strategy, the estimated attributable to an ADE were $2595 for all ADEs and $4685 for preventable ADEs. Based on these cost incidence of ADEs, we estimate that the annual costs attributable to all ADEs and preventable ADEs fo hospital are $5.6 million and $2.8 million, respectively. CONCLUSIONS: The substantial costs of ADEs investment in efforts to prevent these events. Moreover, these estimates are conservative because th costs of injuries to patients or malpractice costs.

Study Rationale

- Adverse drug events common: 0.7% of hospitalized patients
- Hospital leaders skeptical about financial impact
- Wanted to justify investing in interventions to reduce ADE

Objective

- To assess the additional resource utilization associated with an adverse drug event
- Research questions:
  - What is the post-event length of stay caused by an ADE?
  - What is the total cost of resource utilization during the additional length of stay?
  - Are potential quality improvement efforts toward reducing the incidence of ADEs cost-effective?

Study Design

- Cost analysis using a nested controlled study within a prospective cohort study
  - Incidents detected by self-report by nurses and pharmacists and chart review and classified if reporting an ADE
  - Data on length of stay and charges obtained from billing data and estimated costs targeted for analysis

Study Population and Setting

- Brigham and Women's Hospital (726 beds) and Massachusetts General Hospital (846 beds) USA
- Population:
  - 4,108 admissions to a stratified random sample of 11 medical and surgical units over a six-month period
  - Within this population, there were 247 adverse drug events
  - Of these, 190 examined to calculate the cost of adverse drug events

Methods: Data Collection

- Three methods of data collection:
  - Passive data collection: nurses and pharmacists reported incidents
  - Active data collection: nurse investigators solicited information from personnel regarding ADEs twice daily
  - Chart review: nurse investigators reviewed charts daily
- Types of data collected:
  - Patient data: demographics, primary insurer and impact of adverse drug event during hospitalization
  - Outcome variables: length of stay and total charges

Key Findings

- Incidence of ADEs was 6.0% (247 out of 4108 patients)
  - 28% preventable
  - 57% judged significant
  - 30% judged serious
  - 12% judged life-threatening
  - 1% fatal
- Length of stay increased by 2.2 days for all ADEs and 4.6 days for preventable ADEs
- Total costs increased by $3244 for all ADEs and $5857 for preventable ADEs (Estimated $5.6 million / year)

Conclusion

- Hospitals can justify devoting additional resources to develop systems that reduce the number of preventable ADEs
  - Improves patient care AND reduces ADE-related expenses
- Research feasible any time a group is collecting primary data about adverse events AND has access to cost or resource utilization data

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Khan MM, Celik Y. Cost of nosocomial infection in Turkey: an estimate based on the university hospital data. Health Services Management Research, 2001, 14:49–54

- Link to Abstract (HTML)

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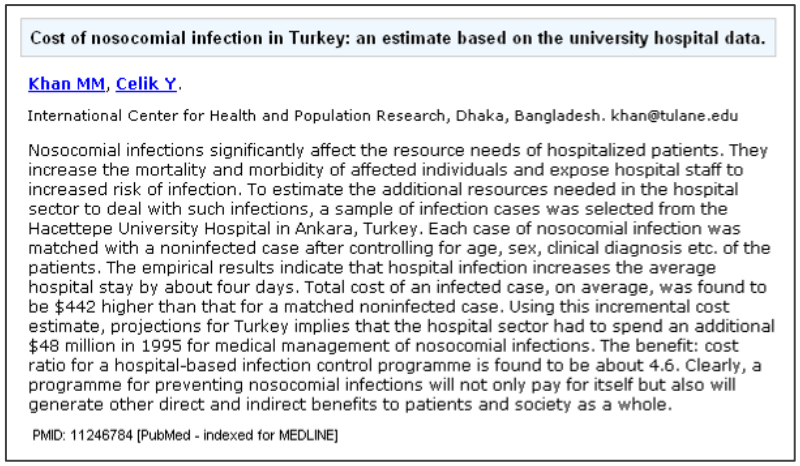

Cost of nosocomial infection in Turkey: an estimate based on the university hospital data.

Khan MM, Celik Y.

International Center for Health and Population Research, Dhaka, Bangladesh. khan@tulane.edu

Nosocomial infections significantly affect the resource needs of hospitalized patients. They increase the mortality and morbidity of affected individuals and expose hospital staff to increased risk of infection. To estimate the additional resources needed in the hospital sector to deal with such infections, a sample of infection cases was selected from the Hacettepe University Hospital in Ankara, Turkey. Each case of nosocomial infection was matched with a noninfected case after controlling for age, sex, clinical diagnosis etc. of the patients. The empirical results indicate that hospital infection increases the average hospital stay by about four days. Total cost of an infected case, on average, was found to be $442 higher than that for a matched noninfected case. Using this incremental cost estimate, projections for Turkey implies that the hospital sector had to spend an additional $48 million in 1995 for medical management of nosocomial infections. The benefit: cost ratio for a hospital-based infection control programme is found to be about 4.6. Clearly, a programme for preventing nosocomial infections will not only pay for itself but also will generate other direct and indirect benefits to patients and society as a whole.

PMID: 11246784 [PubMed - indexed for MEDLINE]

Cost of nosocomial infection in Turkey: an estimate based on the university hospital data

M. Mahmud Khan and Y. Celik

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Introduction

Study Design and Objectives

- Case control study / cost identification analysis
  - Costs of nosocomial infections were estimated through chart reviews of patients found to have had such infections
  - Costs compared to the medical costs of matched control patients
- Objective:
  - To estimate the potential cost savings that could be achieved through the control of nosocomial infection among hospitalized patients in Turkey

Methods: Study Population and Setting

- Setting: Hacettepe University Hospital in Ankara, Turkey
  - 1994, 871 beds, 18,000 admissions
  - Population: all patients admitted from March to May 1994
  - 82 cases selected based on presence of infection and adequate data in hospital records (quantity of services, supplies and drugs used)
  - Using the matching variables, only 56 cases of nosocomial infections matched with 56 non-infected hospitalized cases (control)
  - Cost estimates based on 51 cases (5 cases dropped due to missing cost data)

Methods: Data Collection

- Patient information obtained from detailed records kept by the infection control clinic kept during this three-month period
- A control case-match approach was adopted to compare cases of nosocomial infections with non-infected cases
  - Matching variables included age, sex, intensive care unit and principal diagnosis
  - Diagnosis and age were grouped into broad categories due to matching limitations

Methods: Data collection (2)

- Costs associated with hospital-acquired infection estimated from patient bills or charges
  - Since patients often required to buy drugs from the market, costs estimated from the prescribed drugs listed in the medical record
  - To minimize price variability, study evaluated all prescribed drugs at a fixed price: average price of specific drugs over the period of July 1994 to February 1995
- Cost and resource use by categories were estimated from patient files
  - Categories included cost of hospital bed, medical procedures, laboratory and radiology tests, antibiotics and other supplies

Results: Key Findings

- 78 nosocomial infections identified in 56 patients
  - Urinary tract infection was by far the most common type of infection, accounting for one third of all nosocomial infections
  - Nearly one third of patients experienced more than one infection

Table 1 *Distribution of nosocomial infection by types of infection among hospital patients in Hacettepe University Hospital, Turkey*

Infection type	Number of cases	Percentage of total
One infection only	38	67.8
Urinary tract	19	33.9
Respiratory tract	8	14.3
Bacteraemia	4	7.1
Surgical wound	3	5.4
Skin	2	3.6
Others	2	3.6
Multiple infections	16	28.6
Urinary tract and respiratory tract	2	3.5
Urinary tract and others	8	14.3
Other multiple infections	6	16.7
Unknown infections	2	3.6
Total	56	100.0

Reproduced with permission from Khan MM, Celik Y. Cost of nosocomial infection in Turkey: an estimate based on the university hospital data. Health Services Management Research, 2001, 14:49–54

Results – Cost analysis

- Average length of stay for an infected patient (21.4 days) four days longer than for a non-infected patient (17.5 days)
- On average, total cost of stay for an infected case ($2243) was 22% higher, and for multiple infected case ($3395) was 72% higher, than for a non-infected case ($1977)

Conclusion: Main Points

- Substantial potential cost savings from the control of nosocomial infection in Turkey are quite substantial
  - Hospital administrators should emphasize prevention of multiple infections because of higher cost and resource utilization
  - Due to high prevalence, significant benefit could be achieved by reducing urinary track infections
- About 75% of nosocomial infections cases could be prevented by adopting simple steps in the hospital setting
  - Promote regular reporting of infection cases and in service training for infection control measures

Author Reflections: Lessons and Advice

- Would this research be feasible and applicable in developing countries?
  - "Yes. However, every country and its health system have their own characteristics. Please keep this fact in mind."
- What message do you have for future researchers from developing countries?
  - "In developing countries, patient's files are not updated and some patients may have multiple files. It is important to make sure that the patient files are accurate."

Author Reflections: Overcoming Barriers

- Involving multiple stakeholders
  - "This type of study is extremely sensitive, especially to hospital administrators and the health care providers. Try to get them involved in all stages of the study and seek their advice and suggestions."
- Demonstrating the value of research
  - "One of the most crucial hurdles was convincing the hospital management and infection control commitee that the research would be useful in demonstrating the benefits of controlling nosocomial infections and that it should not be viewed as an effort to measure the quality of care provided by the hospital."

Summary

- Can evaluate impact of interventions in terms of outcomes or processes and the underlying culture
- Need to engage healthcare workers in selection/ development of measures to evaluate safety and success of interventions
- Organizations should identify a few useful measures to be collected systematically

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References

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http://www.who.int/patientsafety/research/strengthening_capacity/classics/en/index.html

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Interactive

- Participants will review the questions from safety culture survey, and discuss the climate and importance of specific elements within their organizations

Questions?

Thank You

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