

The logo for the Society for Health Systems (SHS) features the letters 'SHS' in a bold, green, sans-serif font. The letters are set against a white rectangular background that has a subtle drop shadow, making it stand out from the dark blue background of the slide.

Society for Health Systems

Industrial Engineers in Health Care

**Institute of Industrial Engineers
Society for Health Systems**

2001 Annual Conference

A smaller version of the SHS logo, consisting of the letters 'SHS' in a bold, black, sans-serif font, enclosed within a white rectangular box with a thin black border.



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Panelists

- **Robert Luttmann, RLA**
 - Brigham & Women's Hospital (Boston), Alcoa Inc.
- **John Elliot, HCA**
 - Productivity management at HCA
- **Courtney McEvoy & Ellen Braun**
 - IE at Banner Health System
- **James Benneyan, Northeastern University**
 - Harvard Community Health Plan, Institute for Healthcare Improvement





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Organizations Using IEs

- **Hospitals**
- **HMO's**
- **Physician offices**
- **Long-term care facilities**
- **Outpatient clinics**
- **Insurance organizations**
- **Government or regional agencies**





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Departments Using IEs

- **System Engineering**
- **Management Engineering**
- **CQI, TQM**
- **Information systems**
- **Facilities management**
- **others**



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IE Healthcare History

Some Key Studies

1918: **Time studies of surgery & delays** (Gilberth)

1920-40: **Basic process & capacity analysis**

1945: **'Management engineering' & nursing** (Gilberth)

1959: **Queueing and scheduling** (Smalley, others)

1965: **Clinical information systems** (Kennedy et al)

1965: **Hospital inventory optimization** (Reed, Stanley)

1965-66: **Simulation, queueing of patient waits**
(Nuffield Report; Fetter, Thompson)

1972: **Nurse scheduling (b & b) algorithms** (Warner)





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IE Healthcare History

Some Key Studies

- 1970-72: **Perishable inventory, blood banks** (Pierskalla)
- 1973: **Opportunity costs & hospital inventory** (Duncan)
- 1972-73: **Simulation planning models** (Rising)
- 1974: **Regional planning OR models** (Shuman, Wolfe)
- 1967-82: **Diagnosis-related groups** (DRGs)
- 1979: **Forecasting bed needs** (Griffith)
- 1980: **Cancer screening analysis & optimization** (Eddy)
- 1988: **Total quality management** (Berwick, Bataldan)





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Common Projects Today

- **Data analysis, benchmarking**
- **Cost analysis, reduction**
- **Process & quality improvement**
- **Simulation & flow analysis**
- **Patient, staff, & appointment scheduling**
- **Space planning, layout, utilization**
- **Information systems**





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IE/HC Research Topics

Academic Experiences

- **Statistical quality control research**
- **Patient safety reliability models**
- **Cancer screening optimization (who, when?)**
- **Access & waits**
- **Scheduling algorithms**
- **Regional planning capacity models**
- **Transplant allocation models**





Why This Matters

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Hospital-acquired infections:

- 2 million NSI per year, \$3,000/episode
- 8.7 million additional hospital days, 20,000 deaths/year

Adverse drug events:

- 770,000 to 2 million per year
- \$4.2 billion annually

Medical errors and caregiver-induced injury:

- 98,000 deaths/year, 770,000 - 2 million patient injuries/yr
- \$17 - \$29 billion dollars

**More US deaths/year than for traffic accidents,
breast cancer, & AIDS.**





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Cancer Screening

Cervical Cancer

- 55-60 million Pap smears annually (US)
- \$275M spent annually (US) on Pap smear screens
- Billions annually on cervical cancer treatment
- Accuracy of screening process between 60-90%
- 1.5% pathologists involved in lawsuits for false-negatives
- Recent settlements: \$3.5M, \$6.3M, criminal charges

**Situation is worse for breast cancer,
colorectal cancer, and prostate cancer**





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Quality Control Methods

“Many leading approaches to quality improvement in hospitals are based on the principles of W.E. Deming. These include use of statistical measures to determine whether improvement in quality has been achieved. These measures should include nosocomial infection rates.”

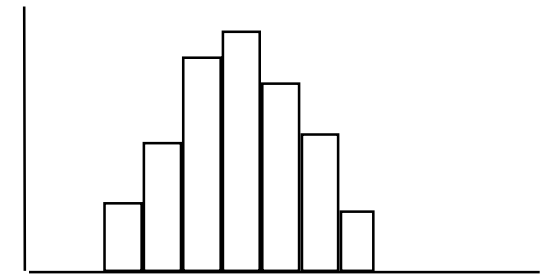
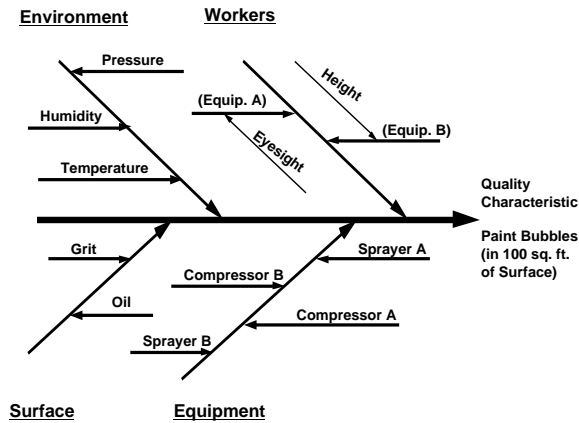
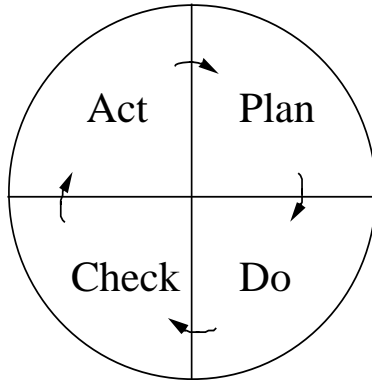
Center for Disease Control

“An understanding of statistical quality control, including SPC, and variation is essential... Control charts are especially helpful in comparing performance with historical patterns & assessing variation & stability.”

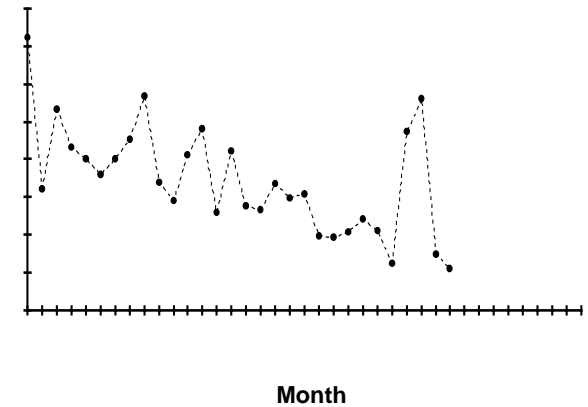
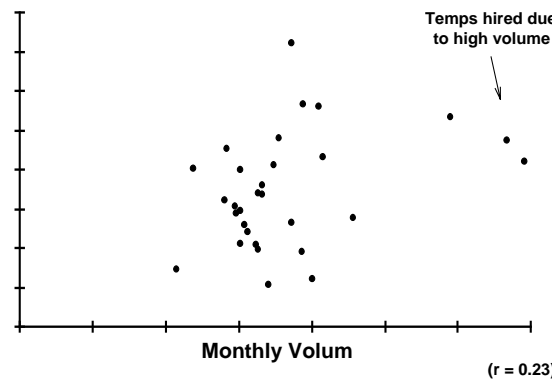
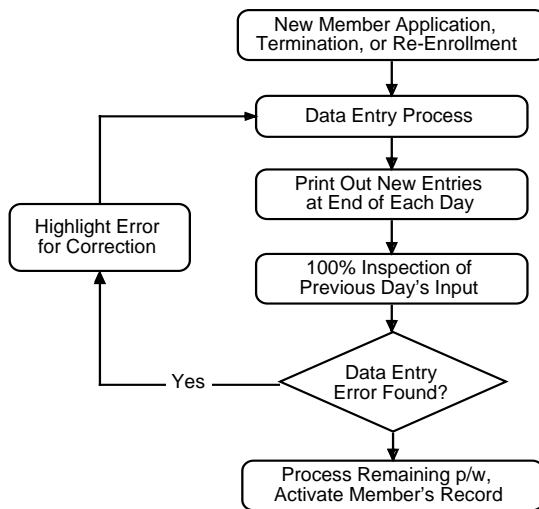
Joint Commission



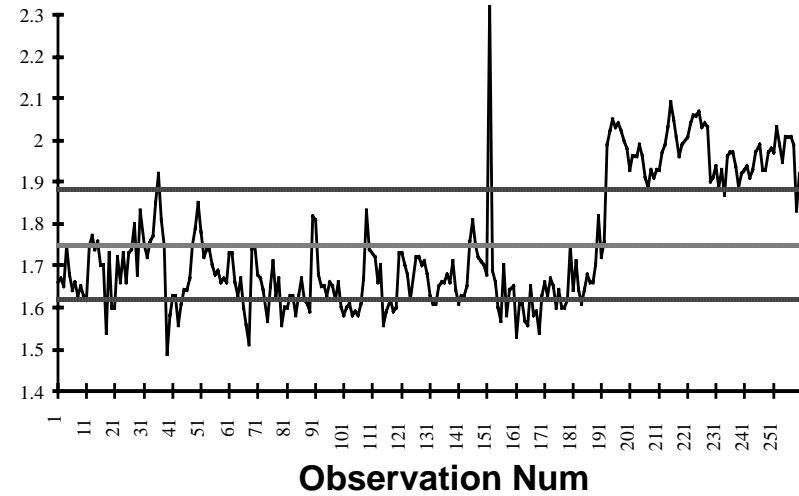
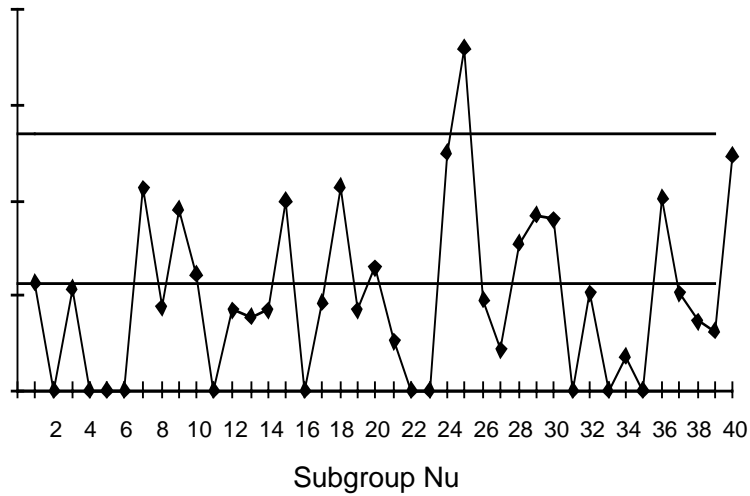
Use of Simple CQI Tools



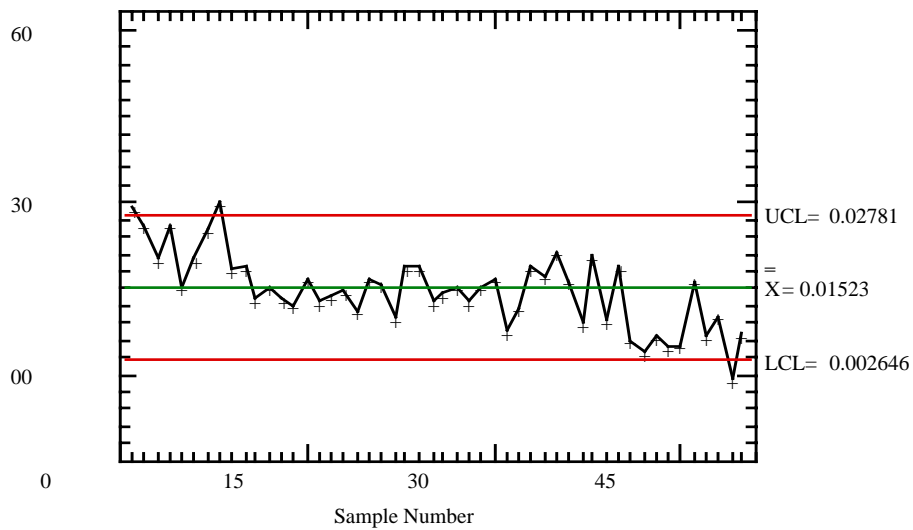
Number of Errors per Week



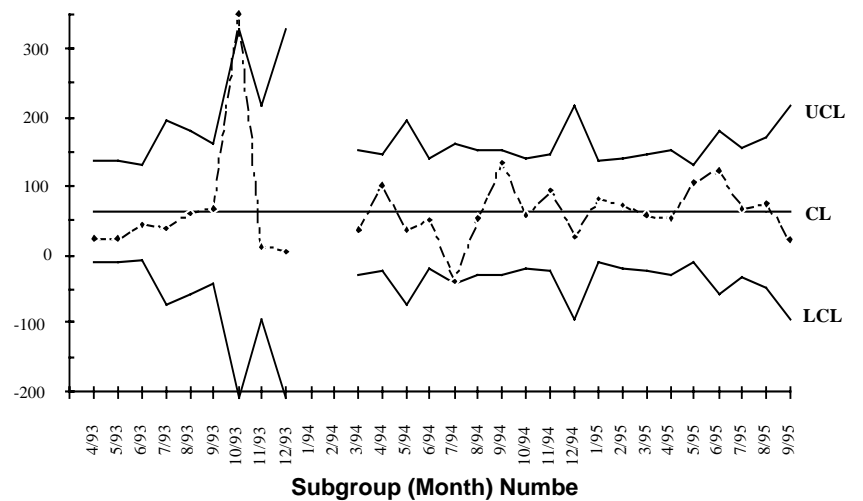
Use of SPC Charts



X-bar Chart for C5



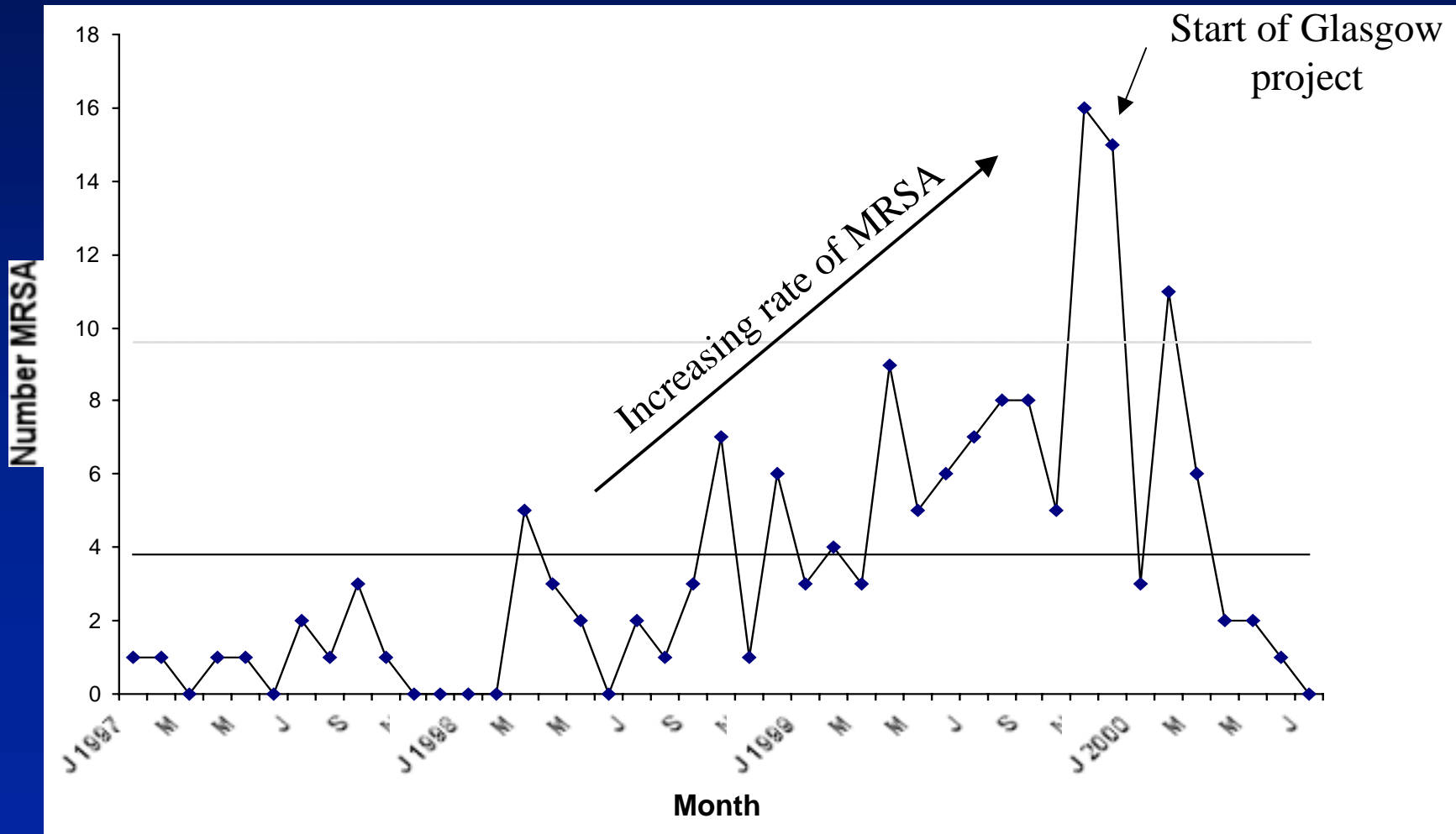
Trial X-bar Control Char





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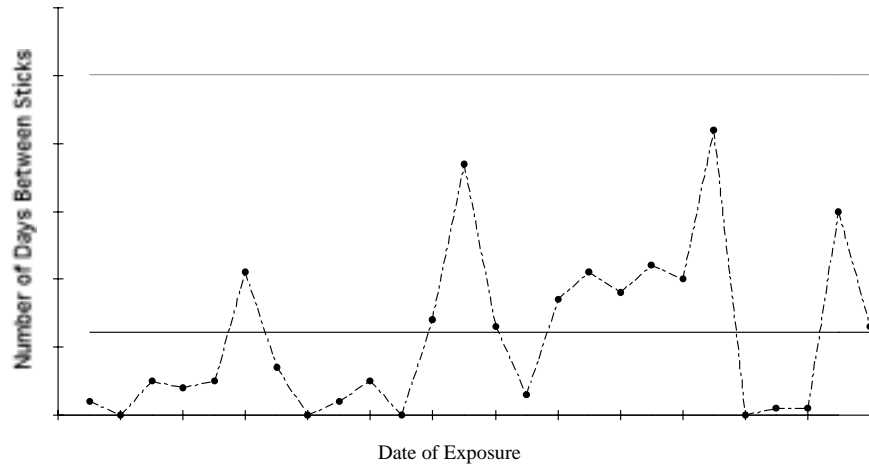
Methicillin-resistant *staph Aureus* SPC



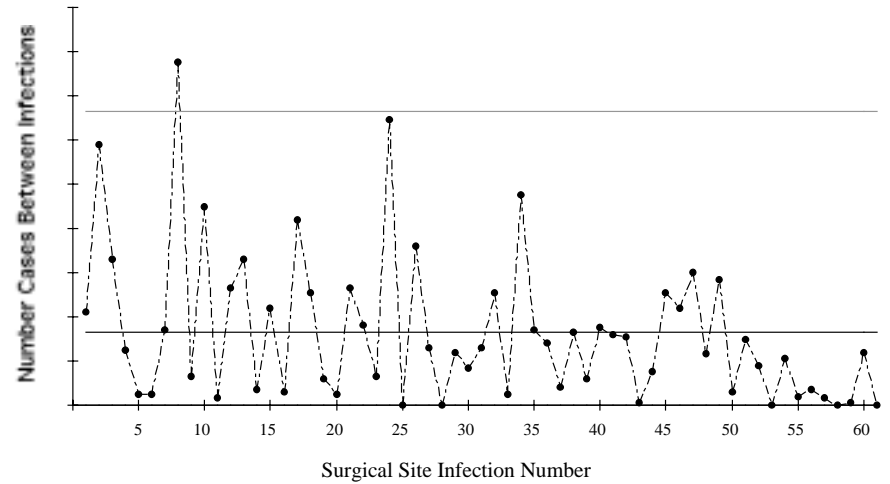


Other SPC Examples

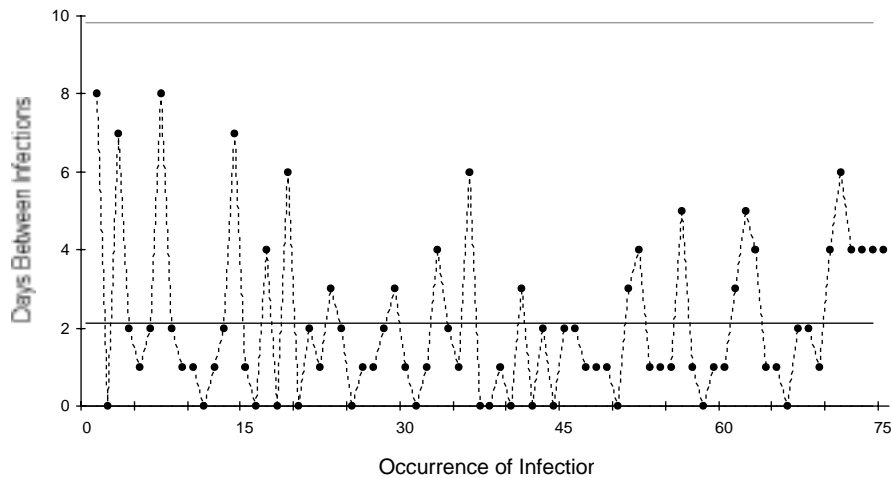
Number Days Between Needle Sticks



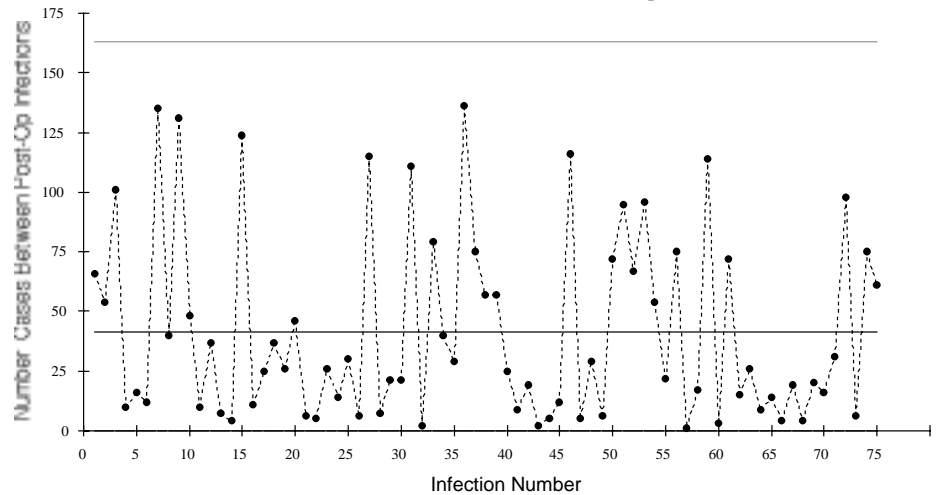
Procedures Between Surgical Site Infections



Days Between *C. dif.* Infections



Number CABGs Between Post-Op Infections





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For Further Info

- **IIE Society for Health Systems (SHS)**
<http://shs.iienet.org/>
- **Coop jobs or internships**
- **HIMSS** (www.himss.org)
- **ASQC HCD** (www.healthcare.org/)
- **INFORMS** (www.trinity.edu/aholder/HealthApp/)
- www.coe.neu.edu/~benneyan/healthcare





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