



E-ISSN: 2616-3470
P-ISSN: 2616-3462
© Surgery Science
www.surgeryscience.com
2018; 2(3): 22-24
Received: 20-05-2018
Accepted: 23-06-2018

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Approach to hospital acquired infection after spine surgery: A multimodal study perspective

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Abstract

Hospital acquired infection is responsible for long hospital stays, increased cost, and mortality. Multimodal studies have focussed on 5 causative factors- urinary catheters, vascular lines, pulmonary functions, surgical procedures and hand hygiene as the main incriminating factors of hospital acquired infections and their means of control to reduce them. This monograph discusses the history of asepsis, the 5 basic causes, the solutions and guidelines proposed by different studies and authors to reduce hospital acquired infections. It was a retrospective observational study done at Level-3 surgical ICU at tertiary referral hospital.

Keywords: Nosocomial infection; five causes; multimodal studies; asepsis; guidelines

Introduction

Postoperative hospital acquired infection after spine surgery especially those proceeding more than 6 hours increases the morbidity of the patient and the cost of healthcare. Despite the development of prophylactic antibiotics and advances in surgical technique and postoperative care, general and wound infection continues to compromise patient outcome after spinal surgery. The incidence of infection depends on duration of operation, duration of mechanical ventilation, elective versus emergency surgery, type of anaesthesia, American Society of Anesthesiologists (ASA) physical status, Acute Physiology and Chronic Health Evaluation (APACHE) II score, Glasgow Coma Score (GCS), and outcome. This review analyses the modes of prevention of nosocomial infection after spinal surgeries. Asepsis is the state of being free from disease-causing micro-organisms. It often refers to those practices used to promote or induce an operative field in surgery or medicine free from infection. Ayliffe *et al.* (2000) suggested that there were two types of asepsis: medical and surgical. Medical or clean asepsis reduced the number of organisms; surgical or sterile asepsis included procedures to eliminate micro-organisms from an area and is practiced in operating theaters and treatment areas. (Crow 1989). In an operating room, it is the role of the scrub nurse or surgical technologist to set up and maintain the sterile field. ^[1, 2]

Present strategies of control

Study on the Efficacy of Nosocomial Infection Control (SENIC) ^[3] (Fig-1) emphasized-

- 1 infection control nurse per 110 beds;
- 1 hospital epidemiologist per 1000 beds;
- organized surveillance for nosocomial infections;
- feedback of nosocomial infection rates.

With effective infection control strategies as emphasised above, the nosocomial infections reduced by 50%.

35-50% of all healthcare-associated infections are associated with only 5 patient care practices

- Use and care of urinary catheters
- Use and care of vascular access lines
- Therapy and support of pulmonary functions
- Surveillance of surgical procedures
- Hand hygiene and standard precautions

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A) Urinary tract infection (UTI)

Causes about 40% of hospital-acquired infections. 25% of inpatients are catheterized which leads to increased morbidity and costs [5]. For Prevention of Catheter-Associated Urinary Tract Infection (CA-UTI)-Two main principles are followed-avoid unnecessary catheterization and limit its duration.

The main indications for the use of indwelling urinary catheters are

- Perioperative use for selected surgical procedures
- Urine output monitoring in critically ill patients
- Management of acute urinary retention and urinary obstruction
- Assistance in pressure ulcer healing for incontinent residents

21 to 50 percent of urinary catheters not indicated. There is no significant difference between a latex and silicone catheter.

A multimodal intervention study by Stefan F. *et al* showed that there was a decrease of 60% of UTI following the multimodal intervention, less catheters were placed in operating rooms and less UTI related antibiotic consumption.

B) Use and care of vascular access lines

Multimodal intervention strategies reduced catheter-associated bloodstream infections: hand hygiene, maximal sterile barrier precaution at insertion moment, skin antisepsis with alcohol-based chlorhexidine-containing products, subclavian access as the preferred insertion site, daily review of line necessity, standardized catheter care using a non-touch technique, Chlorhexidine impregnated sponges and less frequent dressing changes.

Table 1: Efficacy of multimodal intervention strategies by various authors:

	Baseline	Intervention
Eggimann (20)	3.1/1000 catheter-days	1.2/1000 catheter-days
Pronovost (18)	7.7/1000 catheter-days	1.4/1000 catheter-days
Zingg (21)	3.1/1000 catheter-days	1.1/1000 catheter-days
Timsit (22)	1.4/1000 catheter-days	0.6/1000 catheter days

C) Therapy and support of pulmonary functions

The risk factors for Ventilator-Associated Pneumonia (VAP) are:

Patient related and Device related

Device related factors are invasive ventilation, duration, reintubation, medication, prior antibiotic treatment, sedation Patient related factors are age, burns, coma, lung disease, immunosuppression, malnutrition, blunt trauma.

ATS Guidelines 2005 says to stringently follow the following to prevent VAP

- Staff education, hand hygiene, isolation precautions,
- Surveillance of infection and resistance with timely feedback,
- Maintain adequate staffs,
- Serial audit,
- Avoid intubation and reintubation,
- Prefer non-invasive ventilation,
- Prefer orotracheal intubation & orogastric tubes,
- Continuous subglottic aspiration,
- Maintain a cuff pressure > 20 cm H₂O,
- Avoid entering of contaminate condensate into

tube/nebulizer,

- Use sedation and weaning protocols to reduce duration,
- Use daily interruption of sedation and avoid paralytic agents,
- Oral chlorhexidine application reduces VAP in one study but is not recommended for general use.
- Selective decontamination of the digestive tract (SDD) reduces the incidence of VAP & helps to contain MDR (Multiple Drug Resistance) outbreaks.
- SDD is not recommended for routine use.
- Prior systemic antibiotics helps to reduce VAP in selected patient groups but increases MDR.
- 24-hour AB prophylaxis helps in one study but is not recommended for routine use.
- To prevent aspiration body position should be-
- Semirecumbent position (30 - 45°) especially when receiving enteral feeding.
- Enteral nutrition is preferred over parenteral because of translocation risk.
- Stress bleeding, transfusion, hyperglycemia, tend towards more VAP but with increased gastric bleeding may be controlled with Sucralfate and/or H₂ blockers.
- Prudent transfusion especially PRBC (Packed Red Blood Cell) leukocyte cell. Intensive insulin therapy to keep glucose 80 - 110 mg/dl.

D) Experience with surgical procedures

Risk factors in SSI are classified as

I) Patient-related (intrinsic)

- Reduce the inoculum of bacteria at the surgical site.
- Control serum blood glucose; reduce HbA1C levels to <7% before surgery if possible
- Maintain the postoperative blood glucose level at less than 200 mg/dL
- Discourage smoking because nicotine delays wound healing.

II) Pre-operative

- Hair removal should be done in OR.
- Surgical scrubbing with a mixture of Chlorhexidine and 10%Povidone Iodine. - Skin preparation with 10% Povidone Iodine solution.
- Antimicrobial prophylaxis within 1 hour of incision to maximize tissue concentration.
- Antibiotic prophylaxis should be stopped within 24 hours after the procedure or 48 hours after cardiac surgery to decrease selection of antibiotic resistance, contain costs, and limit adverse events.

III) Operative- Good surgical technique reduces the risk of SSI viz.

- Gentle traction and handling of tissues,
- Effective hemostasis,
- Removal of devitalized tissues,
- Obliteration of dead spaces,
- Irrigation of tissues with saline during long procedures,
- Use of fine, non-absorbed monofilament suture material,
- wound closure without tension,
- Adherence to principles of asepsis.

In a cohort control study comprising timely antibiotic prophylaxis, strict glycaemia control, no shaving SSI was 1.5% vs. 3.5% in controls.

E) Hand hygiene and standard precautions

Alcohol-based hand rub should be used as standard. Before and after any patient contact, after glove use, in between different body site care. Pittet D *et al.* [4] in a study published in Lancet

showed a considerable reduction in SSI following hand disinfection vs hand washing. Similarly nosocomial infections per 100 admissions fell by 50% by hand disinfection.

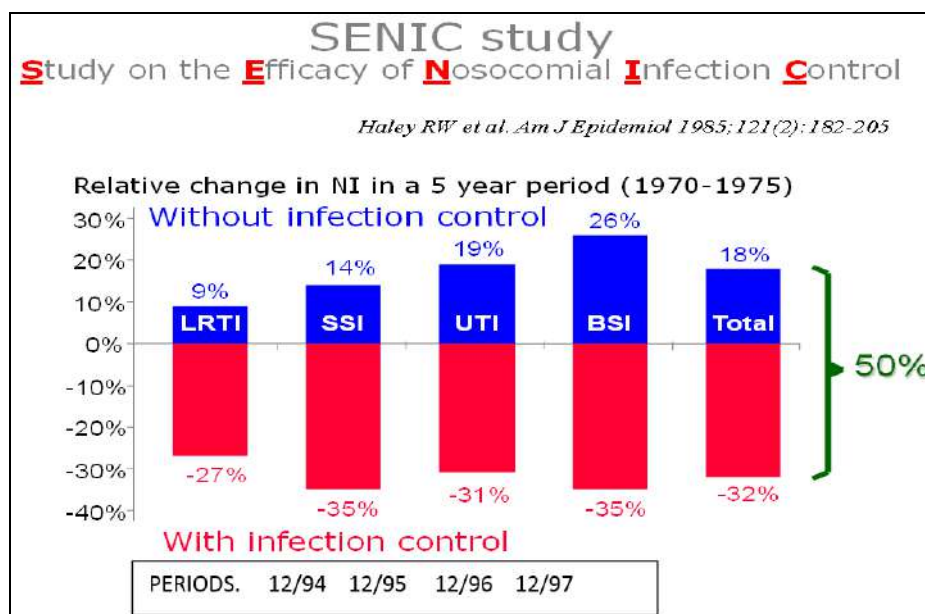


Fig 1: Control in Nosocomial Infection as per SENIC

Conclusion

Infection Control and Quality Healthcare in the New Millenium is a Multidisciplinary team approach inclusive of state/central epidemiology programme coordinating with international surveillance systems which will give a long term patient safety and promotion.

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