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Review Article

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Surgical Site Infections

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Background

Surgical site infections are caused by bacteria that get in through incisions made during surgery. They threaten the lives of millions of patients each year and contribute to the spread of antibiotic resistance. Surgical site infection (SSI) rates are used extensively by hospitals as a basis for quality improvement. A 30-day post-discharge SSI as per CDC definitions of SSI should be consider in order to have a valid data inside the hospital Surgical site infections are not just a problem for poor countries. In the United States, they contribute to patients spending more than 400 000 extra days in hospital at a cost of an additional US$ 10 billion per year., An SSI develops in 2% to 5% of patients undergoing surgical procedures each year in the United States which mean 500,000 and 750,000 SSIs occur annually, Institute of Healthcare Improvement has estimated that 40-60% of all SSIs are preventable. Mean attributable costs for SSI were $25,546 in a recent analysis of published studies on SSI costs, however, among the many measures to prevent SSI, only some are based on strong evidence we need to provide best practice recommendations for SSI management and prevention in hospitals and community care.

Healthcare-associated infections (HAIs) are infections that patients acquire during the course of receiving treatment for other conditions within a healthcare setting.

Healthcare-associated infections are one of the top ten leading causes of death in the United States, at any given time; about 1 in every 25 patients has an infection related to their hospital care

Estimated Annual Hospital Cost of HAI by Site of Infection

Major Site of Infection	Total infections	Hospital Cost per Infection (2002 $)	Total annual hospital cost (in millions $)	Deaths Per year
Surgical Site Infection	290,485	$25,546	7,421	13,088
Central line associated-Bloodstream Infection	248,678	$36,441	9,062	30,665
Ventilator-associated Pneumonia	250,205	$9,969	2,494	35,967
Catheter associated-Urinary Tract Infection	561,667	$1,006	565	8,205

Categories of Cost*		
Direct Hospital Costs	Fixed Costs	Buildings Utilities Equipment/Technology Labor (laundry, environmental control, administration)
	Variable Cost:	Medications Food Consultations Treatments Procedures Devices Testing (laboratory and radiographic) Supplies
Indirect Costs	Lost/Wages Diminished worker productivity on the job Short term and long term morbidity Mortality Income lost by family members Forgone leisure time Time spent by family/friends for hospital visits, travel costs, home care	
Intangible Cost	Psychological Costs (i.e., anxiety, grief, disability, job loss) Pain and suffering Change in social functioning/daily activities	

*Adapted from Haddix AC and Shaffer PA. Cost-effectiveness analysis. In Prevention Effectiveness: A Guide to Decision Analysis and Economic Evaluation. Oxford University Press, 1996.

Skin is the Source Incision site colonization is a major risk factor for CR-BSI and SSI:

The #1 cause of CR-BSI &SSIs in clean and clean-contaminated surgeries is skin microorganisms and 80% of resident and transient skin flora resides in the first 5 epidermal layers, which required efficient way to prep the skin.

The “ideal” antimicrobial agent for skin should have the following properties:

- Broad spectrum
- Rapid bactericidal activity
- Persistence or residual properties on the skin
- Effective in the presence of organic matter
- Non-irritating or have low allergic and/or toxic responses
- None or minimal systemic absorption

Surgical site infection is an infection that occurs within 30 days after the operation and involves only skin and subcutaneous tissue of the incision or 90-days follow-up period for deep or organ/space infections if implant is in place

Has at least one of the following

- purulent drainage with or without laboratory confirmation from incision
- Organisms isolated from an aseptically obtained culture of fluid or tissue
- incision is deliberately opened by surgeon when patient had symptom of infection (pain or tenderness, localized swelling, redness, abscess)
- Diagnosis of l incision SSI made by a surgeon or attending

physician.

SSI Overview USA DATA

An SSI develops in 2% to 5% of patients undergoing surgical procedures each year in the United States.1 500,000 and 750,000 SSIs occur annually12, 13

Institute of Healthcare Improvement has estimated that 40-60% of all SSIs are preventable.2

Mean attributable costs for SSI were $25,546 in a recent analysis of published studies on SSI costs.14

SSI cost the US health care system a several $ billions per year.

In October 2008, the cost of preventable SSIs will no longer be covered by Medicare.

SSI is the most frequent cause (20%) of unplanned readmissions after surgery.

Estimated additional 11 days of hospitalization for each SSI per patient

For an SSI the date of event is the date when the first element used to meet the SSI infection criterion occurs for the first time during the surveillance period, where day one is the Day of surgery

Organisms Causing SSI Staphylococcus aureus	30.0%
Coagulase-negative staphylococci	13.7%
Enterococcus spp.	11.2%
Escherichia coli	9.6%
Pseudomonas aeruginosa	5.6%
Enterobacter spp	4.2%
Klebsiella pneumoniae	3.0%
Candida spp.	2.0%
Klebsiella oxytoca	0.7%
Acinetobacter baumannii	0.6%

What current Guidelines say about skin prep

Canadian Guidelines

Recommendation

"The antiseptic of choice for surgical skin preparation should be alcohol based chlorhexidine antiseptic solutions instead of povidone-iodine. Following application of chlorhexidine-alcohol skin prep solution, surgical teams should allow several minutes for the skin prep to dry prior to first incision. To maximize its efficacy, CHG-alcohol skin prep should not be washed off for at least 6 hours following surgery.

High Impact Intervention NHS

Skin preparation

Patient's skin has been prepared with 2% chlorhexidine gluconate in 70% isopropyl alcohol solution and allowed to air dry17. (If the patient has a sensitivity povidone-iodine application is used).

Preventing Surgical Site Infections Key Recommendations for Practice the royal college of physician in Ireland

Intra-operative

Use 2% chlorhexidine gluconate in 70% isopropyl alcohol solution for skin preparation (if the patient is sensitive/allergic, use povidone-iodine) (1A)

Conclusion

The weight of evidence suggests that chlorhexidine-alcohol should replace povidone-iodine as the standard for preoperative surgical scrubs."

Other point to reduce SSI

Educate of healthcare professionals involved in surgical procedures.

Educate the patient and his or her family as appropriate about SSI prevention.

Surveillance was first recognized as an important tool in reducing rates of infection in the 1980s

Ensure that measurement strategies follow evidence-based guidelines.

Provide SSI rate data and prevention outcome measures to key stakeholders.

Administer antimicrobial agents for prophylaxis. (–Right agent, right dose, right timing, right duration) and redose

When hair removal is necessary, use clippers or depilatories.

Maintain normothermia immediately following colorectal surgery.

Control blood glucose during the immediate postoperative period for cardiac surgery patients.

Preoperatively, use chlorhexidine gluconate 2% and isopropyl alcohol solution as skin antiseptic preparation, and allow appropriate drying time per product guidelines [1-18].

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