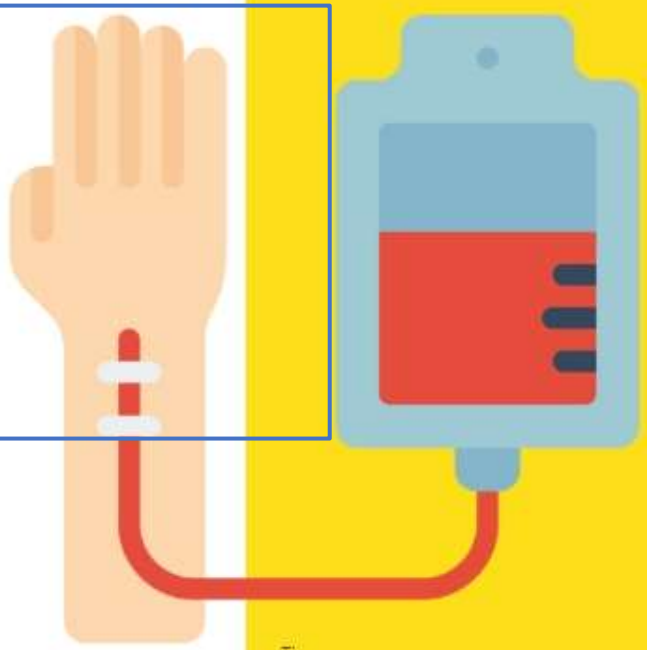
Epidemiologia, fattori di rischio e strategie prevenzione Infezioni Sito Sternale



Ornella Campanella

Consigliere ANIPIO
Infermiera Specialista Rischio Infettivo
IRCCS ISMETT Palermo

Perché occuparsi di SSI?

Le Surgical Site Infection (SSI) rappresentano una seria complicanza relativa agli interventi chirurgici con un enorme impatto su:

- Morbosità
- Mortalità (3%)
- Aumento dei costi (3,3 Miliardi $ annui, + 1 Milione $ di costi sociali
- Rischio di interventi chirurgici aggiuntivi
- Prolungamento della degenza ospedaliera*

Dato NHSN su tutte le 16.147 SSI annue, tasso 1,9%
CDC- Surgical Site Infection Event, 2019

Non fanno parte del pacchetto

INFEZIONE

Negli *States* le chiamano «le big four»

Infezioni delle vie urinarie

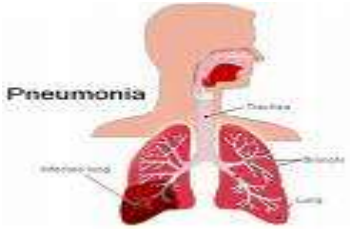
da catetere

non da catetere

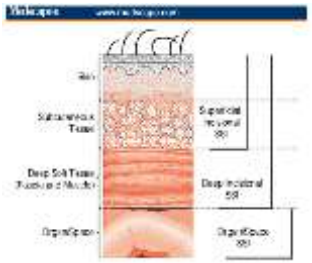
Polmoniti

pazienti intubati e ventilati

pazienti non intubati



Infezioni sito chirurgico



Infezioni del torrente ematico

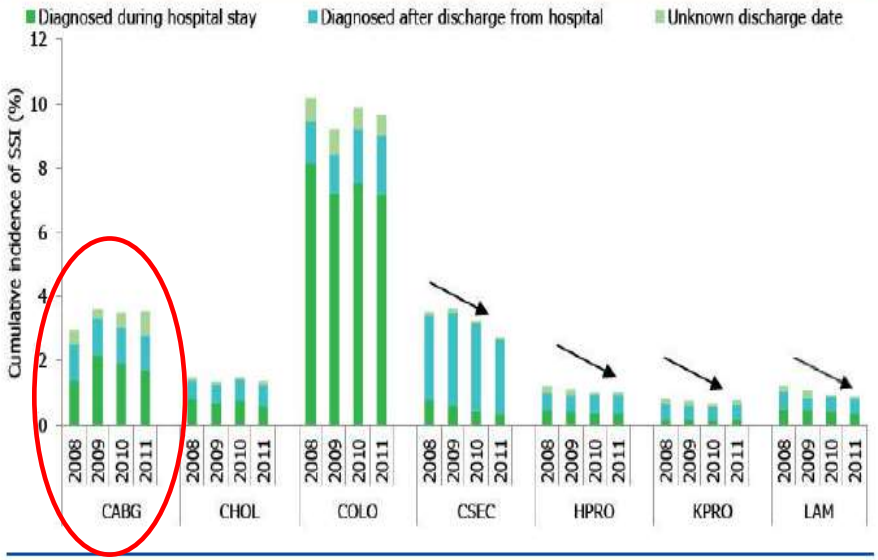
da accesso vascolare

da traslocazione batterica

da infusioni contaminate

Alcuni dati epidemiologici

Figure 3.1.1. Cumulative incidence for SSI by year and type of procedure: European Union/European Economic Area countries, 2008–2011



ECDC 2013

Table 3.1.2. Summary of SSI rates in different countries

Country (reference)	SSI rate (%) (95% CI [when provided])	Year*	Measurement used	Study design
USA *(5, 15)*	0.9 17% decrease in SSI related to the 10 selected procedures (2014 compared to 2008)	2014	Cumulative incidence (episodes per 100 operations)	NHSN data (incidence design)
European Union *(6)*	9.5 (COLO) 3.5 (CABG) 2.9 (CSEC) 1.4 (CHOL) 1.0 (HPRO) 0.8 (LAM) 0.75 (KPRO)	2010–2011	Cumulative incidence (episodes per 100 operations)	ECDC HAI SSI protocol *(21)*

Country (reference)	SSI rate (%) (95% CI [when provided])	Year*	Measurement used	Study design
Republic of Korea *(35, 37)*	Overall: 2.1 Gastrectomy: 3.1 (522/16 918) Total hip arthroplasty: 2.0 (157/7656)	2010–2011 2008–2012	Cumulative incidence (episodes per 100 operations)	National surgical site infection surveillance system – incidence design
Uruguay *(42)*	Appendectomy: 3.2 Cardiac surgery: 2.5 Cholecystectomy: 6.2 COLO: 15.4	2014	Cumulative incidence (episodes per 100 operations)	National nosocomial infection surveillance system
Chile *(43)*	Coronary bypass surgery: 3.1 Hip joint replacement: 1.9	2013		National HAI infection surveillance system

WHO 2016

Quindi la sorveglianza

il problema non esiste

Senza sorveglianza, nessuna soluzione

Public health implications

Surveillance is a key component in the prevention of healthcare-associated infections and an important tool for monitoring the effectiveness of prevention and control measures

Appena pubblicato

SURVEILLANCE REPORT

Healthcare-associated infections: surgical site infections

Annual Epidemiological Report for 2017

Surveillance report

10 Oct 2019

Publication series: Annual Epidemiological Report on Communicable Diseases in Europe

Time period covered: 1 January 2017 - 31 December 2017

Cosa dice il report ECDC?

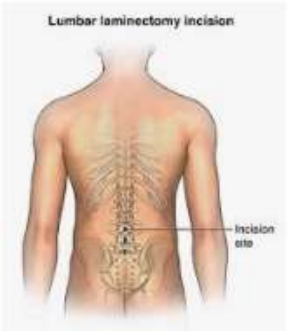
-SSI sono ancora tra le più **frequenti**

- Il tasso di SSI varia dallo **0,5% al 10,1%** in base al tipo di chirurgia

- Dal 2014 al 2017, si è osservato un **incremento** significativo non solo nella chirurgia tradizionale ma anche in quella laparoscopica

9 Procedure Chirurgiche osservate

- CABG
- CHOL (open & lap)
- COLO (open & lap)
- CSEC
- HPRO
- KPRO
- LAM



Interventi molto diversi tra loro…

I 3 fattori di Rischio

1) Durata dell'intervento

2) Classe di contaminazione

(pulito, pulito-contaminato, contaminato, sporco)

3) ASA SCORE (rischio Anestesiologico da 1 a 5)

Quanti e quali partecipanti

Figure 1. Participation in the surveillance of surgical site infections (SSIs), EU/EEA, 2017

Country/network	Number of reporting hospitals	CABG
Austria	32	428
Estonia	2	139
Finland	12	
France	339	1 365
Germany	541	12 738
Hungary	33	362
Italy	94	978
Lithuania	23	547
Netherlands	80	1 932
Norway	61	1 523
Portugal	51	38
Slovakia	5	
UK–England	316	6 311
UK–Northern Ireland	10	
UK–Wales	12	
Subtotal	**1 611**	**26 361**

Alcuni dati epidemiologici

Table 2. Characteristics of patients by type of surgical procedure, patient-based data, EU/EEA, 2017

Characteristics	CABG (n=26 361)	Laparoscopic CHOL (n=50 296)	Open CHOL (n=5 407)	Laparoscopic COLO (n=13 195)	Open COLO (n=22 619)	CSEC (n=87 488)	HPRO (n=225 720)	KPRO (n=167 963)	LAM (n=23 950)
Sex ratio (male:female)	4.3	0.5	0.8	1.0	1.1	0	0.6	0.7	1.1
Median age (years)	69	55	65	68	70	32	72	70	56
Post-operative in-hospital case fatality (%)	1.8	0.2	2.1	1.6	5.2	0	1.4	0.1	0.2
Contaminated or dirty operations (%)	8.4	16.0	27.8	25.4	35.0	7.2	0.8	0.5	3.7
Median duration of operation (minutes)	205	57	81	145	137	38	70	75	82
Median length of post-operative stay (days)	9	3	6	7	10	5	6	5	4
Urgent operations (%)	7.2	17.5	22.2	8.6	25.1	49.7	9.8	0.3	3.7
Antibiotic prophylaxis (%)	99.1	44.1	65.9	86.9	82.7	86.0	97.3	98.3	87.7

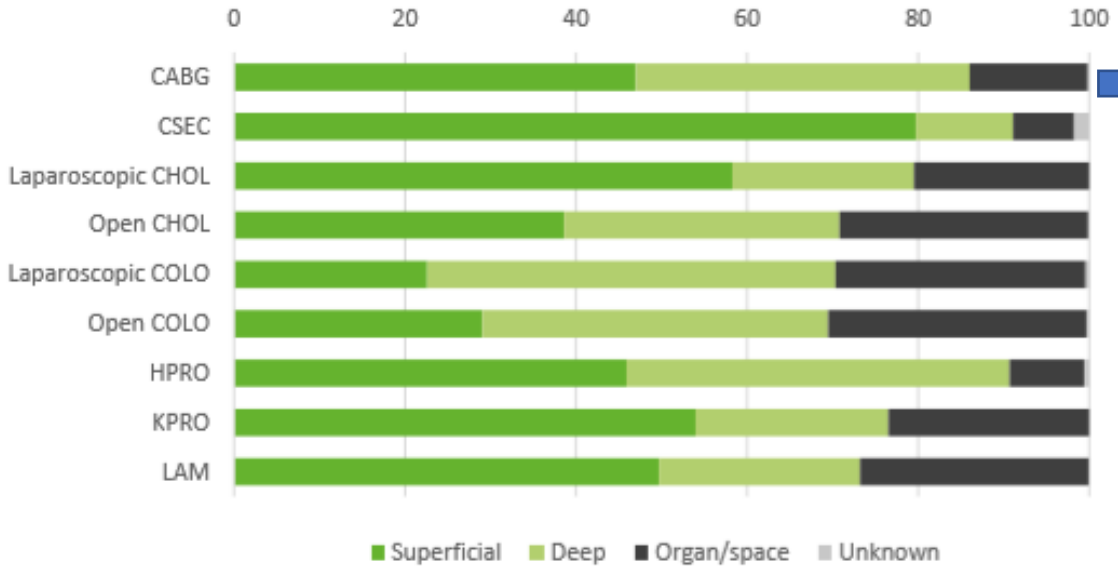
Cosa è cambiato?

Type of surgical procedure	Percentage of SSIs per 100 operations [intercountry range]
CABG	2.6 [0.0-5.5]
Laparoscopic CHOL*	1.5 [0.4-3.1]
Open CHOL*	3.9 [1.1-10.9]
Laparoscopic COLO*	6.4 [0.0-12.5]
Open COLO*	10.1 [4.1-16.9]
CSEC	1.8 [0.5-5.3]
HPRO	1.0 [0.4-2.2]
KPRO	0.5 [0.2-2.7]
LAM	0.8 [0.2-2.7]

Table A2.1. Percentage of SSIs and incidence density graft operations by country, EU/EEA, 2017

Country	No. of operations	No. of SSIs (1)	Percentage of SSIs per 100 operations [95% CI] (2)
Patient-based data			
Austria	428	12	2.8 [1.4-4.9]
Estonia	139	5	3.6 [1.2-8.4]
France	1 365	47	3.4 [2.5-4.6]
Germany	12 738	344	2.7 [2.4-3.0]
Hungary	362	8	2.2 [1.0-4.4]
Italy	978	23	2.4 [1.5-3.5]
Lithuania	547	30	5.5 [3.7-7.8]
Netherlands	1 932	19	1.0 [0.6-1.5]
Norway	1 523	53	3.5 [2.6-4.6]
Portugal	38	0	0.0 [0.0-9.7]
UK–England	6 311	140	2.2 [1.9-2.6]
EU/EEA	**26 361**	**681**	**2.6 [2.4-2.8]**

Figure 2. Types of SSI by type of surgical procedure, EU/EEA, 2017



Profonde 53%!

SSI vs SWI

Negli ultimi decenni, oltre alle raccomandazioni delle più recenti e autorevoli Linee Guida internazionali, le strategie di prevenzione delle SWI evidenziano elementi e interventi molto peculiari.

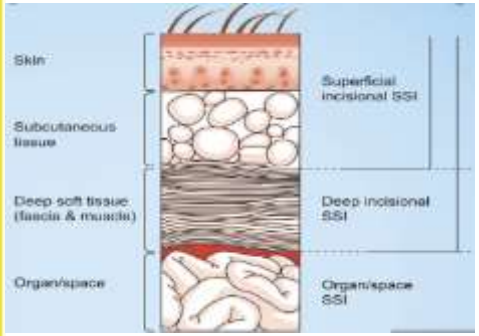
Molti dei quali **non applicati** nella pratica clinica in molti contesti sanitari

R.J. Vos et al. Prevention of deep sternal wound infection in cardiac surgery: a literature review. The Journal of Hospital Infection 2018

Le Infezioni Sito Steri

Presentano caratteristiche anator
rischio molto peculiari

Perché e come le classifichiamo?



Superficiale entro 30 giorni
Profonda entro 90 giorni
Mediastinite entro 90 giorn

Procedure-associated Module
SSI

Table 2. Surveillance Periods for SSI Following Selected NHSN Operative Procedure Categories. Day 1 = the date of the procedure.

30-day Surveillance			
Category	**Operative Procedure**	**Category**	**Operative Procedure**
AAA	Abdominal aortic aneurysm repair	LAM	Laminectomy
AMP	Limb amputation	LTP	Liver transplant
APPY	Appendix surgery	NECK	Neck surgery
AVSD	Shunt for dialysis	NEPH	Kidney surgery
BILI	Bile duct, liver or pancreatic surgery	OVRY	Ovarian surgery
CEA	Carotid endarterectomy	PRST	Prostate surgery
CHOL	Gallbladder surgery	REC	Rectal surgery
COLO	Colon surgery	SB	Small bowel surgery
CSEC	Cesarean section	SPLE	Spleen surgery
GAST	Gastric surgery	THOR	Thoracic surgery
HTP	Heart transplant	THYR	Thyroid and/or parathyroid surgery
HYST	Abdominal hysterectomy	VHYS	Vaginal hysterectomy
KTP	Kidney transplant	XLAP	Exploratory laparotomy
90-day Surveillance			
Category	**Operative Procedure**		
BRST	Breast surgery		
CARD	Cardiac surgery		
CBGB	Coronary artery bypass graft with both chest and donor site incisions		
CBGC	Coronary artery bypass graft with chest incision only		
CRAN	Craniotomy		
FUSN	Spinal fusion		

A SSWI involves only the skin, subcutaneous tissue, and/or pectoralis fascia. There is no bony involvement.

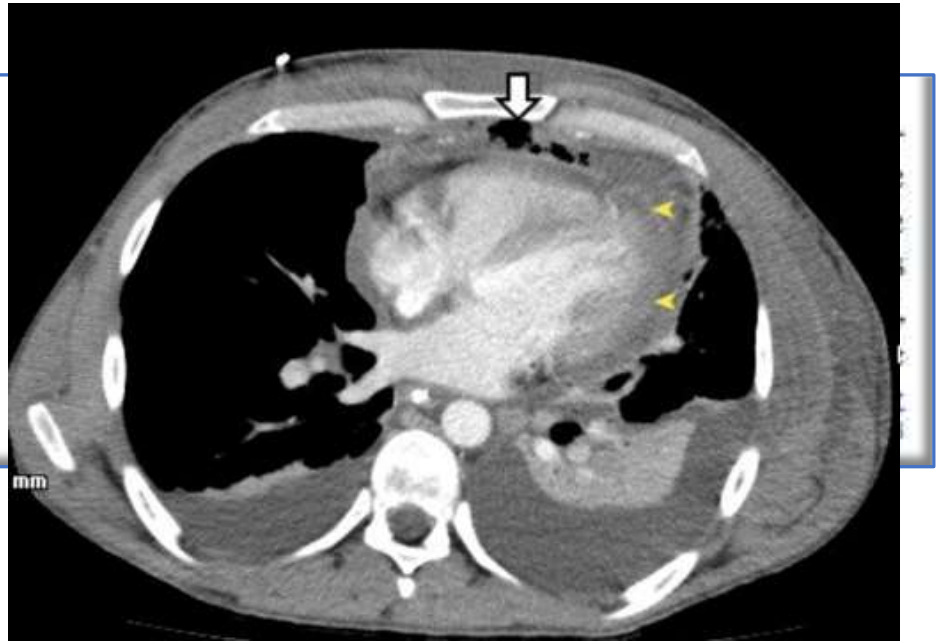
Table 1. Surgical Site Infection Criteria

Criterion	Surgical Site Infection (SSI)
	Superficial incisional SSI Must meet the following criteria:
	Date of event occurs within 30 days after any NHSN operative procedure (where day 1 = the procedure date) **AND** involves only skin and subcutaneous tissue of the incision **AND** patient has at least ***one*** of the following: a. purulent drainage from the superficial incision. b. organism(s) identified from an aseptically-obtained specimen from the superficial incision or subcutaneous tissue by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (for example, not Active Surveillance Culture/Testing (ASC/AST)). c. superficial incision that is deliberately opened by a surgeon, attending physician* or other designee and culture or non-culture based testing of the superficial incision or subcutaneous tissue is not performed **AND** patient has at least one of the following signs or symptoms: localized pain or tenderness; localized swelling; erythema; or heat. d. diagnosis of a superficial incisional SSI by the surgeon, attending physician* or other designee. * The term attending physician for the purposes of application of the NHSN SSI criteria may be interpreted to mean the surgeon(s), infectious disease, other physician on the case, emergency physician, or physician's designee (nurse practitioner or physician's assistant).

Procedure-associated Module
SSI

	Deep incisional SSI Must meet the following criteria:
	The date of event occurs within 30 or 90 days after the NHSN operative procedure (where day 1 = the procedure date) according to the list in Table 2 **AND** involves deep soft tissues of the incision (for example, fascial and muscle layers) **AND** patient has at least ***one*** of the following: a. purulent drainage from the deep incision. b. a deep incision that spontaneously dehisces, or is deliberately opened or aspirated by a surgeon, attending physician* or other designee **AND** organism(s) identified from the deep soft tissues of the incision by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (for example, not Active Surveillance Culture/Testing (ASC/AST)) or culture or non-culture based microbiologic testing method is not performed. A culture or non-culture based test from the deep soft tissues of the incision that has a negative finding does not meet this criterion. **AND** patient has at least ***one*** of the following signs or symptoms: fever (>38°C); localized pain or tenderness. c. an abscess or other evidence of infection involving the deep incision that is detected on gross anatomical or histopathologic exam, or imaging test. * The term attending physician for the purposes of application of the NHSN SSI criteria may be interpreted to mean the surgeon(s), infectious disease, other physician on the case, emergency physician, or physician's designee (nurse practitioner or physician's assistant).
Comments	There are two specific types of deep incisional SSIs: 1. Deep Incisional Primary (DIP) – a deep incisional SSI that is identified in a primary incision in a patient that has had an operation with one or more incisions (for example, C-section incision or chest incision for CBGB) 2. Deep Incisional Secondary (DIS) – a deep incisional SSI that is identified in the secondary incision in a patient that has had an operation with more than one incision (for example, donor site incision for CBGB)

Organo-Spazio - Mediastiniti



JAMA Surgery | Special Communication

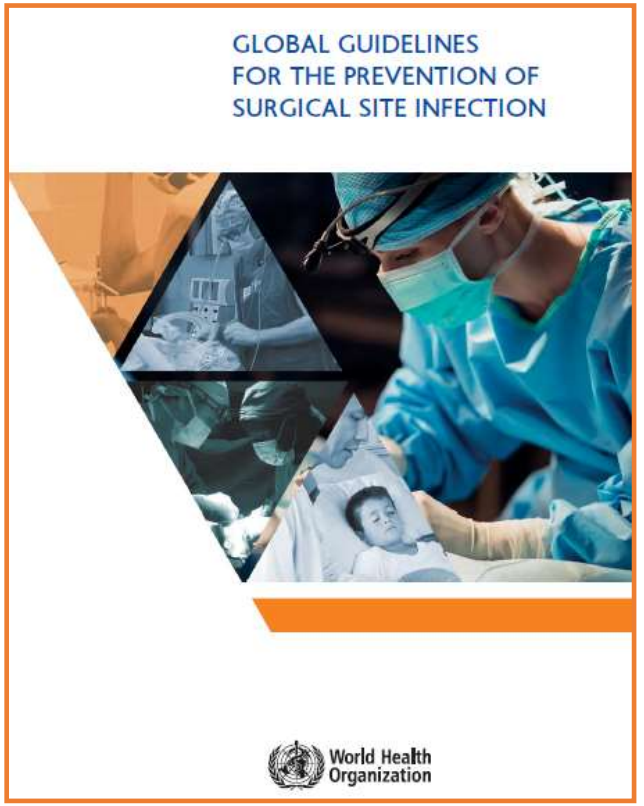
Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017

Sandra I. Berrios-Torres, MD; Craig A. Umscheid, MD, MSCE; Dale W. Bratzler, DO, MPH; Brian Leas, MA, MS; Erin C. Stone, MA; Rachel R. Kelz, MD, MSCE; Caroline E. Reinke, MD, MSHP; Sherry Morgan, RN, MLS, PhD; Joseph S. Solomkin, MD; John E. Mazuski, MD, PhD; E. Patchen Dellinger, MD; Kamal M. F. Itani, MD; Elie F. Berbari, MD; John Segreti, MD; Javad Parvizi, MD; Joan Blanchard, MSS, BSN, RN, CNOR, CIC; George Allen, PhD, CIC, CNOR; Jan A. J. W. Kluytmans, MD; Rodney Donlan, PhD; William P. Schecter, MD; for the Healthcare Infection Control Practices Advisory Committee


CHICAGO JOURNALS

SHEA
The Society for Healthcare Epidemiology of America

Strategies to Prevent Surgical Site Infections in Acute Care Hospitals: 2014 Update
Author(s): Deverick J. Anderson, MD, MPH; Kelly Podgorny, DNP, MS, RN; Sandra I. Berrios-Torres, MD; Dale W. Bratzler, DO, MPH; E. Patchen Dellinger, MD; Linda Greene, RN, MPS, CIC; Ann-Christine Nyquist, MD, MSPH; Lisa Saiman, MD, MPH; Deborah S. Yokoe, MD, MPH; Lisa L. Maragakis, MD, MPH; Keith S. Kaye, MD, MPH
Source: *Infection Control and Hospital Epidemiology*, Vol. 35, No. 6 (June 2014), pp. 605-627
Published by: The University of Chicago Press on behalf of The Society for Healthcare Epidemiology of America
Stable URL: http://www.jstor.org/stable/10.1086/676022
Accessed: 30/06/2014 04:59



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Surgical site infections: prevention and treatment

NICE guideline [NG125] Published date: April 2019

Ma in cardiochirurgia?

EXPERT CONSENSUS REVIEW: PERIOPERATIVE MANAGEMENT

Prevention and management of sternal wound infections

Harold L. Lazar, MD,[a] Thomas Vander Salm, MD,[b] Richard Engelman, MD,[c] Dennis Orgill, MD,[d] and Steven Gordon, MD[e]

From the Divisions of [a]Cardiac Surgery, Boston Medical Center; [b]Cardiac Surgery, Massachusetts General Hospital; [c]Cardiac Surgery, Baystate Medical Center, Springfield; [d]Plastic Surgery, Brigham and Women's Hospital, Boston, Mass; and [e]Infectious Diseases, The Cleveland Clinic, Cleveland, Ohio.

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Address for reprints: Harold L. Lazar, MD, Division of Cardiac Surgery, Boston Medical Center, 88 East Newton St, B402, Boston, MA 02118 (E-mail: [illegible]).
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0022-5223/$36.00

http://dx.doi.org/10.1016/j.jtcvs.2016.01.060

Prevention of deep sternal wound infection in cardiac surgery: a literature review

R.J. Vos[a,b,*], B.P. Van Putte[a,b], G.T.L. Kloppenburg[a]

The Journal of Thoracic and Cardiovascular Surgery • October 2016

Fattori di rischio: eziologia multifattoriale

- Guarigione dell'osso (osteopenia, malnutrizione)
- Diabete (scompensato), immunosoppressione
- Pregressa deiscenza ferita
- Reintervento
- Tecnica chirurgica o inadeguato accostamento margini cutanei
- Tecniche di emostasi
- Prolungato intervento chirurgico
- Utilizzo della mammaria (By-pass)
- Fumo
- Obesità
- Politrasfusioni
- Sanguinamento postoperatorio
- Macromastia
- BPCO

Eziologia

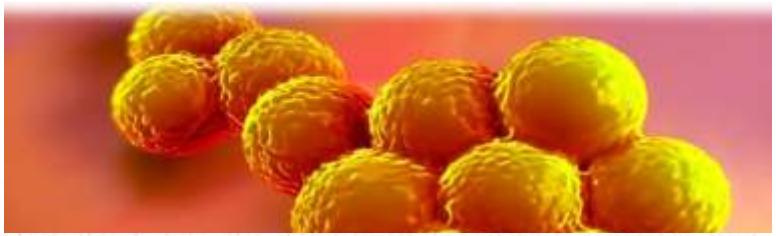
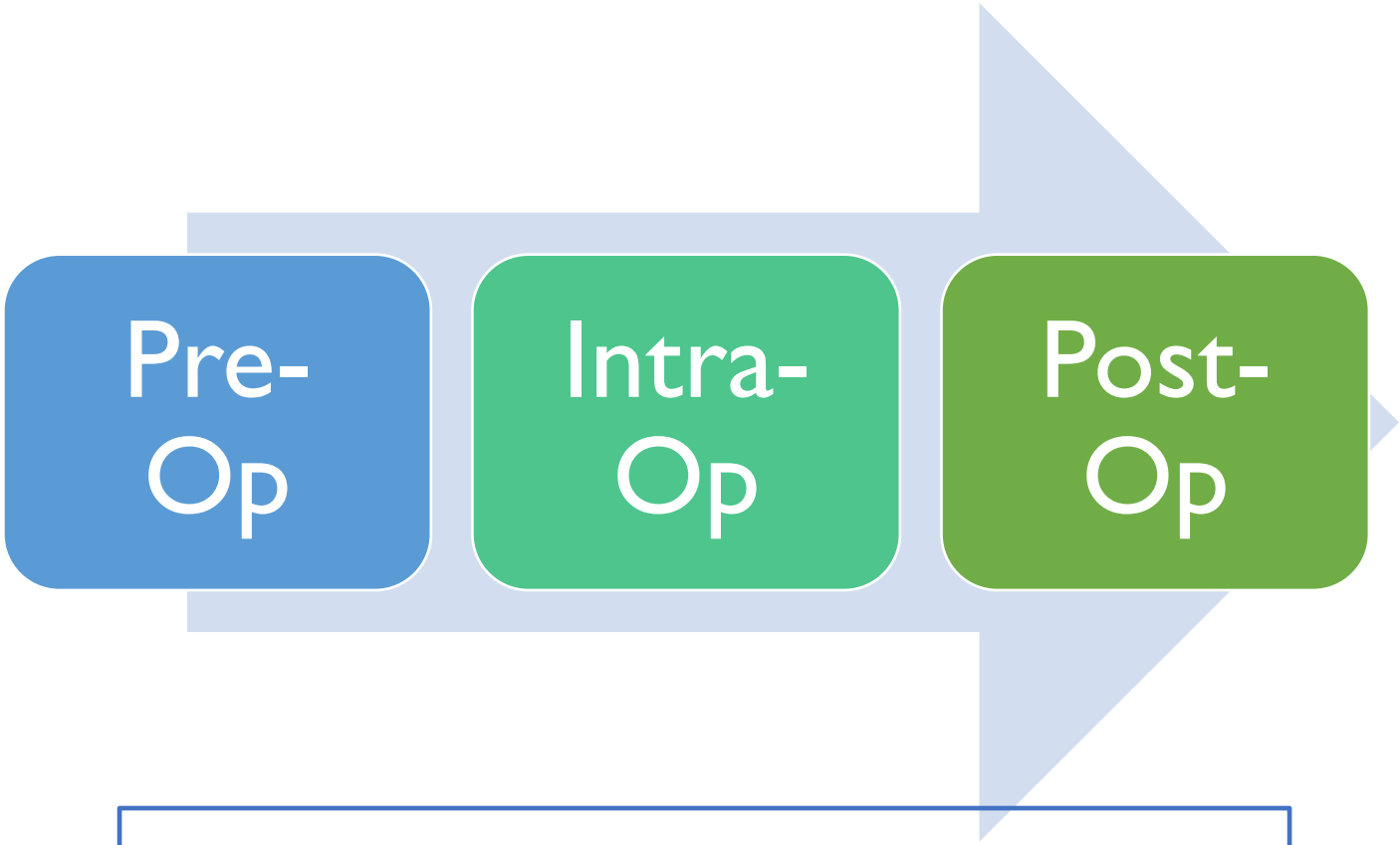


Table 4. Percentages of microorganisms identified in SSIs by type of surgical procedure, pooled data from 10 EU/EEA countries, 2017 (n=4 727)

Microorganisms	CABG (n=269)	Laparoscopic CHOL (n=151)	Open CHOL (n=65)	Laparoscopic COLO (n=378)	Open COLO (n=1 146)	CSEC (n=592)	HPRO (n=1 409)	KPRO (n=581)	LAM (n=136)	Total (n=4 727)
Gram-negative non-fermentative bacilli	9.3	4.0	0	6.6	11.2	3.9	5.0	2.1	6.6	6.3
Acinetobacter species	1.1	0	0	0.3	0.2	0.2	0.4	0	0	0.3
Haemophilus species	0	0	0	0	0	0.3	0	0	0	0
Pseudomonas aeruginosa	6.7	3.3	0	5.8	8.8	1.0	3.6	1.9	6.6	4.7
Pseudomonadaceae family, other	1.1	0	0	0	1.8	1.2	0.9	0.2	0	1.0
Stenotrophomonas maltophilia	0	0.7	0	0	0	0.2	0	0	0	0
Other gram-negative non-fermentative bacilli	0.4	0	0	0.5	0.3	1.0	0.1	0	0	0.3
Anaerobes	0.7	9.3	1.5	8.7	4.4	13.5	2.9	3.1	5.1	5.2
Bacteroides species	0	1.3	1.5	6.9	3.2	1.2	0.2	0.3	0	1.7
Other anaerobes	0.7	8.0	0	1.9	1.1	12.3	2.7	2.8	5.1	3.6
Other bacteria	1.9	8.7	4.6	4.5	3.0	1.4	0.8	1.7	0.7	2.2
Fungi, parasites	2.6	0.7	4.6	2.1	2.7	1.5	0.5	0.2	2.2	1.5
Candida species	2.2	0.7	4.6	2.1	2.7	1.2	0.5	0	2.2	1.4
Other fungi or parasites	0.4	0	0	0	0	0.3	0	0.2	0	0.1
Serratia species	3.7	0.7	1.5	0.3	0.8	0.3	1.5	1.5	0.7	1.2
Other Enterobacteriaceae	3.7	1.3	3.1	1.3	4.7	1.2	1.0	1.5	1.5	2.2

Rivediamo il percorso clinico dei pazienti



Dove si gioca la partita?

Pre-op (Ruolo attivo del paziente)

Arrivare all'intervento nelle migliori condizioni possibili

- ✓ Smettere di fumare
- ✓ Perdere peso
- ✓ Esercizi respiratori (se BPCO)
- ✓ Controllo Glicemia
- ✓ Controllo cavo orale

Il tampone nasale, perché?

Eseguito per la ricerca di *Staphylococcus aureus,* un batterio molto comune in moltissime persone in tutto il mondo (circa 1 su 5) e vive sulla cute o nelle narici. Non causa nessun tipo di problema, solo in alcuni casi può provocare alcuni tipi di infezioni come quelle della ferita chirurgica, la polmonite o altre infezioni della pelle.

Se positivo? →

Mupirocina 3 volte die x 5 gg
Doccia quotidiana con sapone e CHG

Quali evidenze?

WHO 2016

Table 4.2.1. **Recommendations on screening and decolonization of *S. aureus* according to available guidelines and bundles**

Guidelines (year issued)	Recommendations on screening and decolonizations of S. aureus
SHEA/IDSA (2014) *(34)*	Screen for *S. aureus* (**MSSA and MRSA**) and decolonize surgical patients for high-risk procedures, including some orthopaedic and cardiothoracic procedures.
NICE (2008) *(36)*	Do not use nasal decontamination with topical antimicrobial agents aimed at eliminating *S. aureus* routinely to reduce the risk of SSI.
Institute for Healthcare Improvement: hip and knee arthroplasty (2012) *(35)*	Screen for *S. aureus*. If positive, decolonize 3 days before surgery with nasal mupirocin and CHG soap for 5 days in total for both **MSSA and MRSA**.
Health Protection Scotland bundle (2013) *(37)*	Screen for **MRSA** based on clinical risk assessment.
UK High impact intervention bundle (2011) *(38)*	Screen for **MRSA**: follow local guideline. Screen and decolonize prior to surgery, if found positive.

Lazar et al 2016

PREOPERATIVE PREVENTION
Screening for Nasal Carriers of *Staphylococcus*

- All cardiac surgery patients should have nasal swabs or polymerase chain reaction (PCR) testing, if available, before surgery.

Class I Recommendation; Level of Evidence = A.

Nasal Disinfectants

- Routine mupirocin administration is recommended for all cardiac surgery procedures in the absence of PCR testing or nasal cultures positive for staphylococcal colonization.

Class I Recommendation; Level of Evidence = A.

NICE 2019

Nasal decolonisation

1.2.2 Consider nasal mupirocin in combination with a chlorhexidine body wash before procedures in which *Staphylococcus aureus* is a likely cause of a surgical site infection. This should be locally determined and take into account:

- the type of procedure
- individual patient risk factors
- the increased risk of side effects in preterm infants (see recommendation 1.3.8)
- the potential impact of infection. [2019]

Doccia pre-operatoria

WHO 2016

Table 4.1.1. **Recommendations on preoperative bathing according to available guidelines**

Guidelines (year issued)	Recommendations on preoperative bathing and related time of administration
SHEA/IDSA practice recommendation (2014) *(9)*	Unresolved issue.
NICE (2008 and 2013 update) *(10, 11)*	Bathing is recommended to reduce the microbial load, but not necessarily SSI. Soap should be used. The use of antiseptic soap to prevent SSI is inconclusive.
Health Protection Scotland bundle (2013) *(12)*	Ensure that the patient has showered (or bathed/washed if unable to shower) using plain soap on day of or day before surgery.
The Royal College of Physicians of Ireland (2012) *(13)*	Bathing with soap is recommended on the day of or before the procedure.
US Institute of Healthcare Improvement bundle for hip and knee arthroplasty (2012) *(14)*	Preoperative bathing with CHG soap is recommended for at least 3 days before surgery.
UK High impact intervention bundle (2011) *(15)*	Patient showering (or bathing/washing if unable to shower) is recommended preoperatively using soap.

SHEA: Society for Healthcare Epidemiology of America; IDSA: Infectious Diseases Society of America; NICE: National Institute for Health and Care Excellence; UK: United Kingdom.

Preoperative Bathing

- Presurgical bathing with chlorhexidine may be helpful in reducing skin bacterial counts.

Class IIb Recommendation; Level of Evidence = B.

Lazar et al. 2016

8A.1. Advise patients to shower or bathe (full body) with soap (antimicrobial or nonantimicrobial) or an antiseptic agent on at least the night before the operative day. (Category IB–strong recommendation; accepted practice.)

CDC 2017

NICE 2019

1.2 Preoperative phase

Preoperative showering

1.2.1 Advise patients to shower or have a bath (or help patients to shower, bath or bed bath) using soap, either the day before, or on the day of, surgery. [2008]

Tricotomia

Table 4.6.1. **Recommendations on hair removal according to available guidelines**

Guidelines (date issued)	Recommendations on hair removal
SHEA/IDSA (2014) *(6)*	Hair should not be removed at the operative site unless the presence of hair will interfere with the operation. Do not use razors. If hair removal is necessary, remove hair outside the operating room using clippers or a depilatory agent.
NICE (2013) *(7)*	Evidence for preoperative hair removal in reducing SSI rates is insufficient. Razors should not be used for hair removal because they increase the risk of SSI. If hair has to be removed, use electric clippers with a single-use head on the day of surgery as clipping may be associated with a reduced rate of SSI.
The Royal College of Physicians of Ireland (2012) *(4)*	Avoid hair removal. If hair must be removed, then use single-patient use clippers and not razors.
USA Institute for Healthcare Improvement: surgical site infection (2012) *(5)*	Avoid hair removal. If removal is necessary, remove outside the operating room using a single-patient use clipper.
Health Protection Scotland bundle (2013) *(3)*	Avoid hair removal. If removal is necessary, use a single-patient use clipper.
UK High impact intervention bundle (2011) *(8)*	If hair removal is required, use clippers with a disposable head and timed as close as possible to the operating procedure.

WHO 2016

Hair removal	1. Does hair removal affect the incidence of SSI? 2. What method and timing of hair removal is associated with the reduction of SSI?	The panel recommends that in patients undergoing any surgical procedure, hair should either **not** be removed or, if absolutely necessary, it should be removed only with a clipper. Shaving is strongly discouraged at all times, whether preoperatively or in the OR.	Strong	Moderate

NICE 2019

Hair removal

1.2.4 Do not use hair removal routinely to reduce the risk of surgical site infection. **[2008]**

1.2.5 If hair has to be removed, use electric clippers with a single-use head on the day of surgery. Do not use razors for hair removal, because they increase the risk of surgical site infection. **[2008]**

Malnutrizione

Hypoalbuminemia and Poor Nutritional Status

- Preoperative hypoalbuminemia is associated with an increased risk for sternal wound infections and should be corrected before surgery if possible.

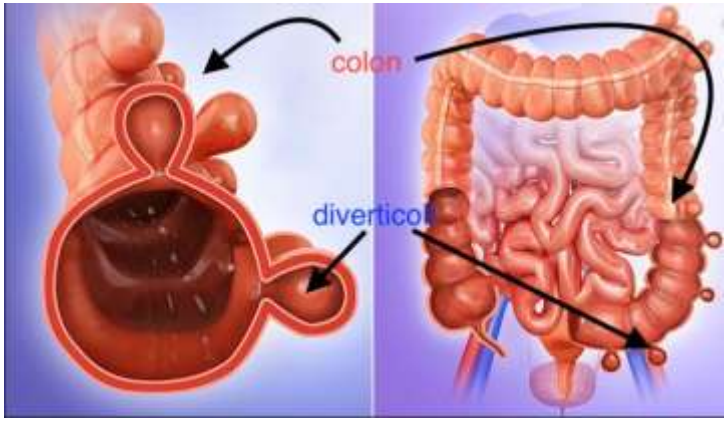
Class I Recommendation; Level of Evidence = B.

Patients with preoperative hypoalbuminemia (<3.0 g/mL) are more likely to develop DSWI following cardiac surgery.[25]

Lazar et al. 2016

Nutrizione Enterale per 7/10 gg,
più raccomandazioni dietetiche
Se intervento può essere differito

Trattare le infezioni



Remote Infections

- All distant, extrathoracic infections should be treated before cardiac surgical procedures.

Class I Recommendation; Level of the Evidence = C.

Infections at a site remote from the surgical wound have been linked to a 3- to 5-fold increase in wound infections.[34] Whenever possible, in nonemergent cases, it is advisable to identify and treat all infections remote from the surgical site before surgery and postpone surgery in patients who are clinically stable until the infection has resolved.[35,36]

Controllo glicemico

Preoperative Glycemic Control

- Optimizing glycemic control is recommended in patients with increased HbA1c levels (>7.5) and serum glucose levels >200 mg/dL before any cardiac surgery procedure.

Class I Recommendation; Level of the Evidence = B.

Efforts should be made to optimize glucose control before surgery because this has been associated with an increased incidence of DSWI.[37] In those patients who require urgent or emergent surgery in whom serum glucose levels are persistently >180 mg/dL, intravenous insulin infusions are the most effective method to rapidly achieve glycemic control. These infusions should be continued in the intra- and postoperative periods if necessary to maintain serum glucose levels <180 mg/dL.[38]

Glycemic Control

- Continuous insulin infusion should be initiated to maintain serum glucose level <180 mg/dL.

Class I Recommendation; Level of the Evidence = A.

Studies have shown that increased glucose levels (>200 mg/dL) in the intraoperative period is an independent risk factor for postoperative sternal wound infections.[47-49]

- Continuous insulin infusion should be initiated in the ICU for at least 24 hours to maintain serum glucose level <180 mg/dL.

Class I Recommendation; Level of Evidence = A.

Lazar et al 2016

Pre-Op → Intra-Op → Post-Op

CDC 2017

Glycemic Control

3A.1. Implement perioperative glycemic control and use blood glucose target levels less than 200 mg/dL in patients with and without diabetes. (Category IA-strong recommendation; high to moderate-quality evidence.)

Smettere di fumare

Smoking Cessation

- Smoking cessation and aggressive pulmonary toilet should be performed in patients who are active smokers and those with chronic obstructive pulmonary disease.

  Class I Recommendation; Level of Evidence = B.

It is recommended that, whenever possible, smoking cessation be initiated for at least 30 days before surgery.[35,36]

Lazar et al 2016

Profilassi antibiotica

Preoperative Antibiotics

- A cephalosporin, either cefazolin or cefuroxime, should be given intravenously within 60 minutes before the skin incision and be continued for no longer than 48 hours.

  Class I Recommendation; Level of Evidence = A.

  Weight-based dosing is recommended and redosing is indicated for procedures >4 hours.

- Vancomycin is reserved for patients with a history of type 1 allergic reactions to β-lactam agents or in cases where MRSA is a special concern.

  Class IIa Recommendation; Level of Evidence = B.

Lazar et al. 2016

Table 4.4.1. **Recommendations on SAP according to available guidelines**

Guidelines (date issued)	Recommendations on SAP and the related time of administration
SHEA/IDSA (2014) *(8)*	Administer only when indicated, within 1 hour before incision with superior efficiency between 0 and 30 minutes prior to incision compared with administration between 30 and 60 minutes.
NICE (2013) *(11)*	Single dose of antibiotic intravenously on starting anaesthesia. Prophylaxis should be given earlier for operations in which a tourniquet is used, that is, after rather than before tourniquet inflation.
ASHSP (2013) *(4)*	Administration of the first dose of the antimicrobial beginning within 60 minutes before surgical incision is recommended. Administration of vancomycin and fluoroquinolones should begin within 120 minutes before surgical incision because of the prolonged infusion times required for these drugs.
The Royal College of Physicians of Ireland (2012) *(9)*	At induction (within 60 minutes prior to incision surgery). If a tourniquet is to be applied, a 15-minute period is required between the end of antibiotic administration and tourniquet application. Single dose, except if blood loss (›1.5 L in adults or 25 mL/kg in children) and prolonged surgical procedures (4 hours).
USA Institute of Health Improvement: surgical site infection (2012) *(12)*	Within 60 minutes prior to incision. Discontinue within 24 hours (48 hours for cardiac patients).
Health Protection Scotland bundle (2013) *(10)*	Within 60 minutes prior to incision. Follow SIGN104 guideline.
UK High impact intervention care bundle (2011) *(13)*	Appropriate antibiotics administered within 60 minutes prior to incision and only repeated if there is excessive blood loss, a prolonged surgical procedure or during prosthetic surgery.

Antisepsi cutanea

Table 4.7.1. **Recommendations on surgical site skin preparation according to available guidelines**

Guidelines (date issued)	Recommendations on surgical site skin preparation
SHEA/IDSA (2014) *(6)*	Wash and clean skin around the incision site. Use a dual agent skin preparation containing alcohol, unless contraindications exist.
NICE (2013) *(7)*	PVP-I or CHG, although alcohol-based solutions may be more effective than aqueous solutions. The most effective antiseptic for skin preparation before surgical incision remains uncertain.
The Royal College of Physicians of Ireland (2012) *(8)*	CHG 2% in isopropyl 70% alcohol solution; PVP-I with alcohol for patients who are allergic to CHG.
USA Institute for Healthcare Improvement: hip and knee arthroplasty (2012) *(9)*	Combining either an iodophor or CHG with alcohol is better than PVP-I alone.
Health Protection Scotland bundle (October 2013) *(10)*	CHG 2% in isopropyl 70% alcohol solution; PVP-I with alcohol for patients who are allergic to CHG.
UK High impact intervention bundle (2011) *(11)*	CHG 2% in isopropyl 70% alcohol solution; PVP-I with alcohol for patients who are allergic to CHG.

Surgical site preparation	Should alcohol-based antiseptic solutions or aqueous solutions be used for skin preparation in surgical patients and, more specifically, should CHG or PVP-I solutions be used?	The panel recommends alcohol-based antiseptic solutions based on CHG for surgical site skin preparation in patients undergoing surgical procedures.	Strong	Low to moderate

WHO 2016

8B. Perform intraoperative skin preparation with an alcohol-based antiseptic agent unless contraindicated. (Category IA–strong recommendation; high-quality evidence.)

CDC 2017

Antiseptic skin preparation

1.3.7 Prepare the skin at the surgical site immediately before incision using an antiseptic preparation. **[2019]**

1.3.8 Be aware of the risks of using skin antiseptics in babies, in particular the risk of severe chemical injuries with the use of chlorhexidine (both alcohol-based and aqueous solutions) in preterm babies. **[2019]**

1.3.9 When deciding which antiseptic skin preparation to use, options may include those in table 1. **[2019]**

Table 1 Options for antiseptic skin preparation

When	Choice of antiseptic skin preparation
First choice unless contraindicated or the surgical site is next to a mucous membrane	Alcohol-based solution of chlorhexidine[1]
If the surgical site is next to a mucous membrane	Aqueous solution of chlorhexidine[2]
If chlorhexidine is contraindicated	Alcohol-based solution of povidone-iodine[3]
If both an alcohol-based solution and chlorhexidine are unsuitable	Aqueous solution of povidone-iodine[4]

NICE 2019

Le mani dell'equipe chirurgica

The WHO *guidelines on hand hygiene in health care (1)* (Table 4.9.1) recommend to keeping nails short and to remove all jewellery, artificial nails or nail polish before surgical hand preparation.

Hand jewellery, artificial nails and nail polish

1.2.10 The operating team should remove hand jewellery before operations. **[2008]**

1.2.11 The operating team should remove artificial nails and nail polish before operations. **[2008]**

Table 4.9.1. **Summary of recommendations on surgical hand preparation according to available guidelines**

Guidelines (date issued)	Recommendations on surgical hand preparation
WHO *Guidelines on hand hygiene in health care* (2009) *(1)*	• Surgical hand antisepsis should be performed using either a suitable antimicrobial soap or suitable ABHR, preferably with a product ensuring sustained activity, before donning sterile gloves. • If the quality of water is not assured in the OR, surgical hand antisepsis using an ABHR is recommended before donning sterile gloves when performing surgical procedures. • When performing surgical hand antisepsis using an antimicrobial soap, scrub hands and forearms for the length of time recommended by the manufacturer, typically 2–5 minutes. Long scrub times (for example, 10 minutes) are not necessary. • When using an alcohol-based surgical handrub product with sustained activity, follow the manufacturer's instructions for application times. Apply the product to dry hands only. Do not combine surgical handscrub and surgical handrub with alcohol-based products sequentially. • When using an ABHR, use a sufficient amount of the product to keep hands and forearms wet with the handrub throughout the surgical hand preparation procedure. • After application of the ABHR as recommended, allow hands and forearms to dry thoroughly before donning sterile gloves.
SHEA/IDSA (2014) *(9)*	• Use an appropriate antiseptic agent to perform preoperative surgical scrub, scrubbing the hands and forearms for 2–5 minutes for most products.
NICE (2008 and 2013) *(10,11)*	• The operating team should wash their hands prior to the first operation on the list using an aqueous antiseptic surgical solution and ensure that hands and nails are visibly clean, with a single-use brush or pick for the nails. • Before subsequent operations, hands should be washed using either using an ABHR or an antiseptic surgical solution. • If hands are soiled, they should be washed again with an antiseptic surgical solution. • The revised version of this guideline published in 2013 repeats the same surgical hand preparation recommendation with the addition of ensuring the removal of any hand jewellery, artificial nails and nail polish before starting surgical hand decontamination.

La tecnica chirurgica

Intraoperative Surgical Techniques

- Closing the sternum with a figure-of-eight technique may be preferable to prevent sternal dehiscence and wound infections, particularly in high-risk patients.

Class IIb Recommendation; Level of Evidence = B.

Bone Wax

- Bone wax is not recommended for application to the cut edges of the sternum.

Class III Recommendation; Level of Evidence = B.

RETAINED BLOOD

There are several other important postoperative factors that can contribute to an increased incidence of sternal wound infections and should be avoided. Retained blood coagulum is an excellent culture medium, therefore every attempt should be made to achieve hemostasis to avoid a return to the operating room for bleeding complications, which have been associated with an increased risk of wound infections.[83]

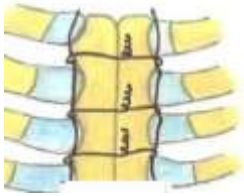
Topical Antibiotics

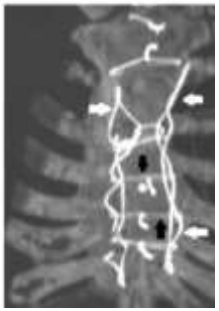
- Topical antibiotics should be applied to the cut edges of the sternum on opening and before closing all cardiac surgical procedures involving a sternotomy.

Class I Recommendation; Level of Evidence = B.

Lazar et al. 2016

Stainless-Steel Wire Sutures:
Robicsek Weave





8C. Application of a microbial sealant immediately after intraoperative skin preparation is not necessary for the prevention of SSI. (Category II–weak recommendation; low-quality evidence suggesting a trade-off between clinical benefits and harms.)

CDC 2017

Wound irrigation and intracavity lavage

1.3.16 Do not use wound irrigation to reduce the risk of surgical site infection. [2008]

1.3.17 Do not use intracavity lavage to reduce the risk of surgical site infection. [2008]

Antiseptics and antibiotics before wound closure

1.3.18 Only apply an antiseptic or antibiotic to the wound before closure as part of a clinical research trial. [2019]

1.3.19 Consider using gentamicin-collagen implants in cardiac surgery. [2019]

NICE 2019

Ossigenazione

Perioperative oxygenation	How safe and effective is the perioperative use of an increased fraction of inspired oxygen in reducing the risk of SSI?	The panel recommends that adult patients undergoing general anaesthesia with endotracheal intubation for surgical procedures should receive an 80% fraction of inspired oxygen intraoperatively and, if feasible, in the immediate postoperative period for 2-6 hours to reduce the risk of SSI.	Strong	Moderate

WHO 2016

6B. For patients with normal pulmonary function undergoing general anesthesia with endotracheal intubation, administer increased FIO_2 during surgery and after extubation in the immediate postoperative period. To optimize tissue oxygen delivery, maintain perioperative normothermia and adequate volume replacement. (Category IA–strong recommendation; moderate-quality evidence.)

CDC 2017

Teleria e camici

Drapes and gowns	1. Is there a difference in SSI rates depending on the use of disposable non-woven drapes and gowns or reusable woven drapes and gowns? 1.1. Is there a difference in SSI rates depending on the use of disposable non-woven or reusable woven drapes? 1.2. Is there a difference in SSI rates depending on the use of disposable non-woven or reusable woven gowns?	The panel suggests that either sterile, disposable non-woven or sterile, reusable woven drapes and gowns can be used during surgical operations for the purpose of preventing SSI. No specific evidence was retrieved to answer to questions 1.1 and 1.2.	Conditional	Moderate to very low
	2. Does the use of disposable, adhesive, incise drapes reduce the risk of SSI?	The panel suggests **not** to use plastic adhesive incise drapes with or without antimicrobial properties for the purpose of preventing SSI.	Conditional	Low to very low

WHO 2016

8D. The use of plastic adhesive drapes with or without antimicrobial properties is not necessary for the prevention of SSI. (Category II–weak recommendation; high to moderate-quality evidence suggesting a trade-off between clinical benefits and harms.)

CDC 2017

E ancora…

Prolungare antibiotico se drenaggio?

Antimicrobial prophylaxis in the presence of a drain and optimal timing for wound drain removal	1. In the presence of drains, does prolonged antibiotic prophylaxis prevent SSI?	The panel suggests that preoperative antibiotic prophylaxis should **not** be continued in the presence of a wound drain for the purpose of preventing SSI.	Conditional	Low
	2. When using drains, how long should they be kept in place to minimize SSI as a complication?	The panel suggests removing the wound drain when clinically indicated. No evidence was found to allow making a recommendation on the optimal timing of wound drain removal for the purpose of preventing SSI.	Conditional	Very low

NO!

Irrigazione campo con iodio per prevenire SSI?

Wound irrigation and intracavity lavage

1.3.16 Do not use wound irrigation to reduce the risk of surgical site infection. **[2008]**

1.3.17 Do not use intracavity lavage to reduce the risk of surgical site infection. **[2008]**

NO!

weak recommendation; moderate-quality evidence suggesting a trade-off between clinical benefits and harms.)

Igiene ambientale

Box 3.3.1. General principles for environmental cleaning

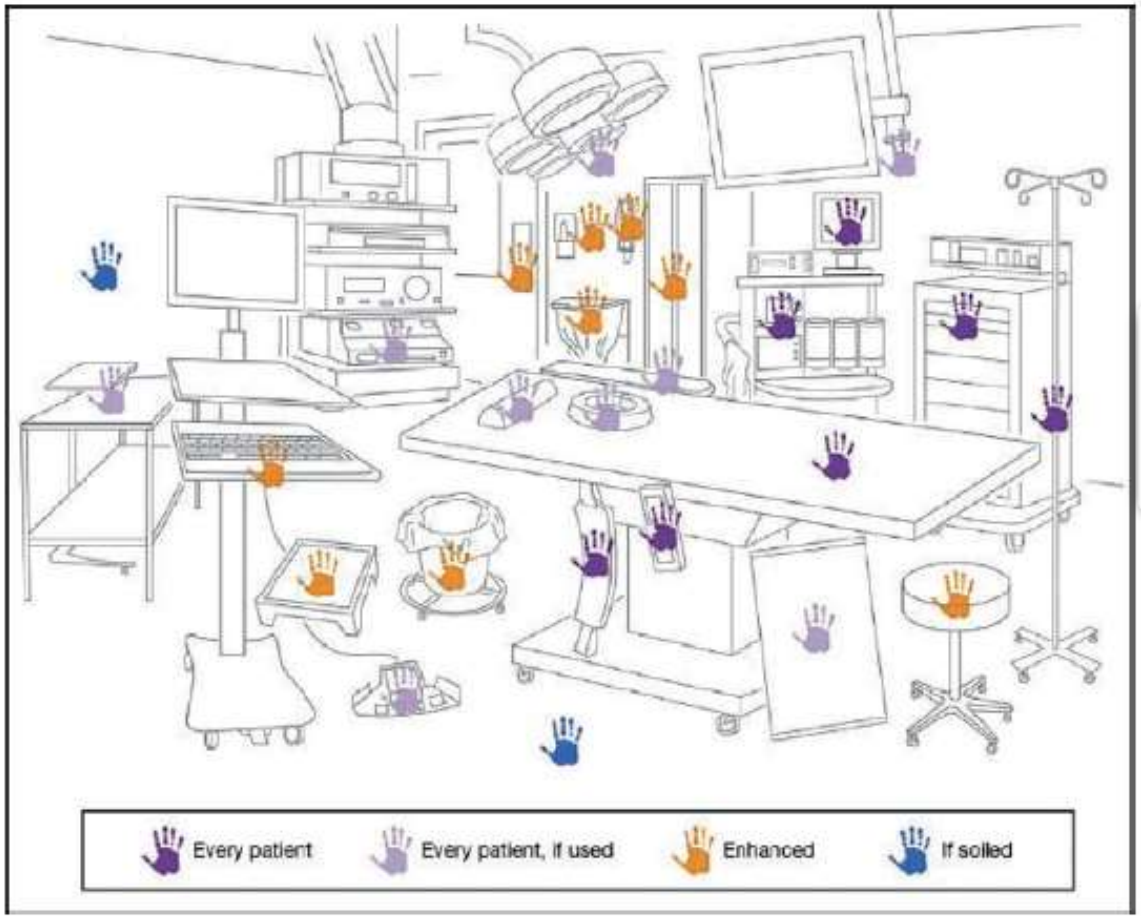
- Cleaning is an essential first step prior to any disinfection process to remove dirt, debris and other materials.
- The use of a neutral detergent solution is essential for effective cleaning. It removes dirt while improving the quality of cleaning by preventing the build-up of biofilms and thus increasing the effectiveness of chemical disinfectants.
- If disinfectants are used, they must be prepared and diluted according to the manufacturer's instructions. Too high and/or too low concentrations reduce the effectiveness of disinfectants. In addition, high concentrations of disinfectant may damage surfaces.
- Cleaning should always start from the least soiled areas (cleanest) first to the most soiled areas (dirtiest) last and from higher levels to lower levels so that debris may fall on the floor and is cleaned last *(4)*.
- Detergent and/or disinfectant solutions must be discarded after each use.
- Avoid cleaning methods that produce mists or aerosols or disperse dust, for example dry sweeping (brooms, etc.), dry mopping, spraying or dusting.
- Routine bacteriological monitoring to assess the effectiveness of environmental cleaning is not required, but may be useful to establish the potential source of an outbreak and/or for educational purposes *(5)*.

Table 3.3.1. **Cleaning requirements for various surface types in ORs**

Surface type	Definition	Cleaning requirement
High hand-touch surface	Any surface with frequent contact with hands.	Requires special attention and more frequent cleaning. After thorough cleaning, consider the use of appropriate disinfectants to decontaminate these surfaces.
Minimal touch surface (floors, walls, ceilings, window sills, etc.)	Minimal contact with hands. Not in close contact with the patient or his/her immediate surroundings.	Requires cleaning on a regular basis with *detergent only* or when soiling or spills occur. Also required following patient discharge from the health care setting.
Administrative and office areas	No patient contact.	Require normal domestic cleaning with *detergent only*.
Toilet area	–	Clean toilet areas at least twice daily and as needed.
Medical and other equipment	–	Require cleaning according to written protocols (for example, daily, weekly, after each patient use, etc.). This should include the use of appropriate personal protective equipment, cleaning methods conforming to the type/s of surface and cleaning schedules, etc. Schedules and procedures should be consistent and updated on a regular basis and education and training must be provided to all cleaning staff. Please refer to the manufacturer's instructions for medical equipment to ensure that the item is not damaged by the use of disinfectants.
Surface contaminated with blood and body fluids	Any areas that are visibly contaminated with blood or other potentially infectious materials.	Requires prompt cleaning and disinfection (see below).

Sanificazione in sala: come e quando?

Figure 3.3.1. **Example of cleaning frequencies in preoperative and postoperative care areas**



Revisione Protocolli
Pulizia e disinfezione
(terminale e intermedia)

La partita si gioca solo in sala?

Quale medicazione scegliere?

2D. Randomized controlled trial evidence suggested uncertain trade-offs between the benefits and harms regarding antimicrobial dressings applied to surgical incisions after primary closure in the operating room for the prevention of SSI. (No recommendation/ unresolved issue.)

No, si gioca anche dopo

Gestione della ferita e della medicazione

1.4 Postoperative phase

Changing dressings

1.4.1 Use an aseptic non-touch technique for changing or removing surgical wound dressings. [2008]

Postoperative cleansing

1.4.2 Use sterile saline for wound cleansing up to 48 hours after surgery. [2008]

1.4.3 Advise patients that they may shower safely 48 hours after surgery. [2008]

1.4.4 Use tap water for wound cleansing after 48 hours if the surgical wound has separated or has been surgically opened to drain pus. [2008]

Topical antimicrobial agents for wound healing by primary intention

1.4.5 Do not use topical antimicrobial agents for surgical wounds that are healing by primary intention to reduce the risk of surgical site infection. [2008]

NPWT should be initiated whenever possible in patients in whom delayed sternal closure is anticipated following DSWI.

Class IIa Recommendation; Level of Evidence = B.

- Use of dilute povidone-iodine irrigation for the treatment of DSWI in mediastinitis should be avoided.

Class III Recommendation; Level of Evidence = B.

No Iodio

Salina o antisettico??

Conclusion

The decision whether or not to cleanse a wound depends on the type of wound and the condition of the wound bed. If a wound requires cleansing simply so the health professional can better see the wound bed or remove debris, potable tap water will be the most appropriate solution. However, if the health professional suspects that a biofilm may be present or if the wound appears to have a high bacterial load, the timely application of a topical antiseptic solution for a limited period may prevent the wound from developing an infection.

Key points

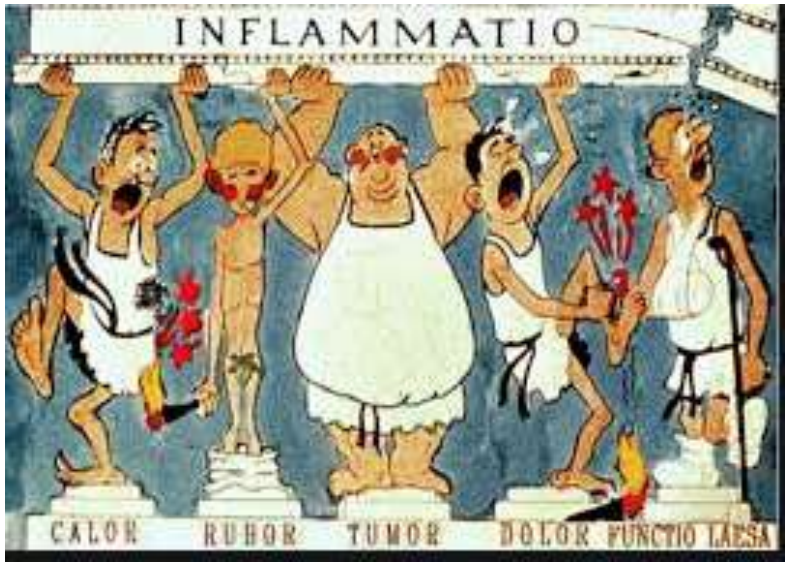
- Wounds are often cleansed without proper consideration of whether this is necessary
- Wound cleansing can interrupt the healing process by damaging new tissue or reducing the temperature of the wound bed
- Potable tap water is as safe and effective as normal saline for wound cleansing, although saline should be used on post operative wounds
- Antiseptic solutions are increasingly used to cleanse wounds showing signs of critical colonisation and when the presence of a biofilm is suspected

Eseguire il tampone di ferita?

A Zig-Zag

Levine

Tampone positivo ≠ Infezione



Le ferite parlano da sole, basta guardarle e annusarle

Conclusioni e *key messages:*

- Le SWI sono ancora un rilevante *[illegible]ma* di salute
- Indispensabile **conos[illegible]gia** locale
- Appro[illegible]**linare**
- Valu[illegible]
- Num[illegible]domizzati
- Inizia[illegible]ndazioni più **ro[illegible]**
- Grand[illegible]d economico delle SWI richiede [illegible]elle **LG specifiche** per la Cardiochirurgia