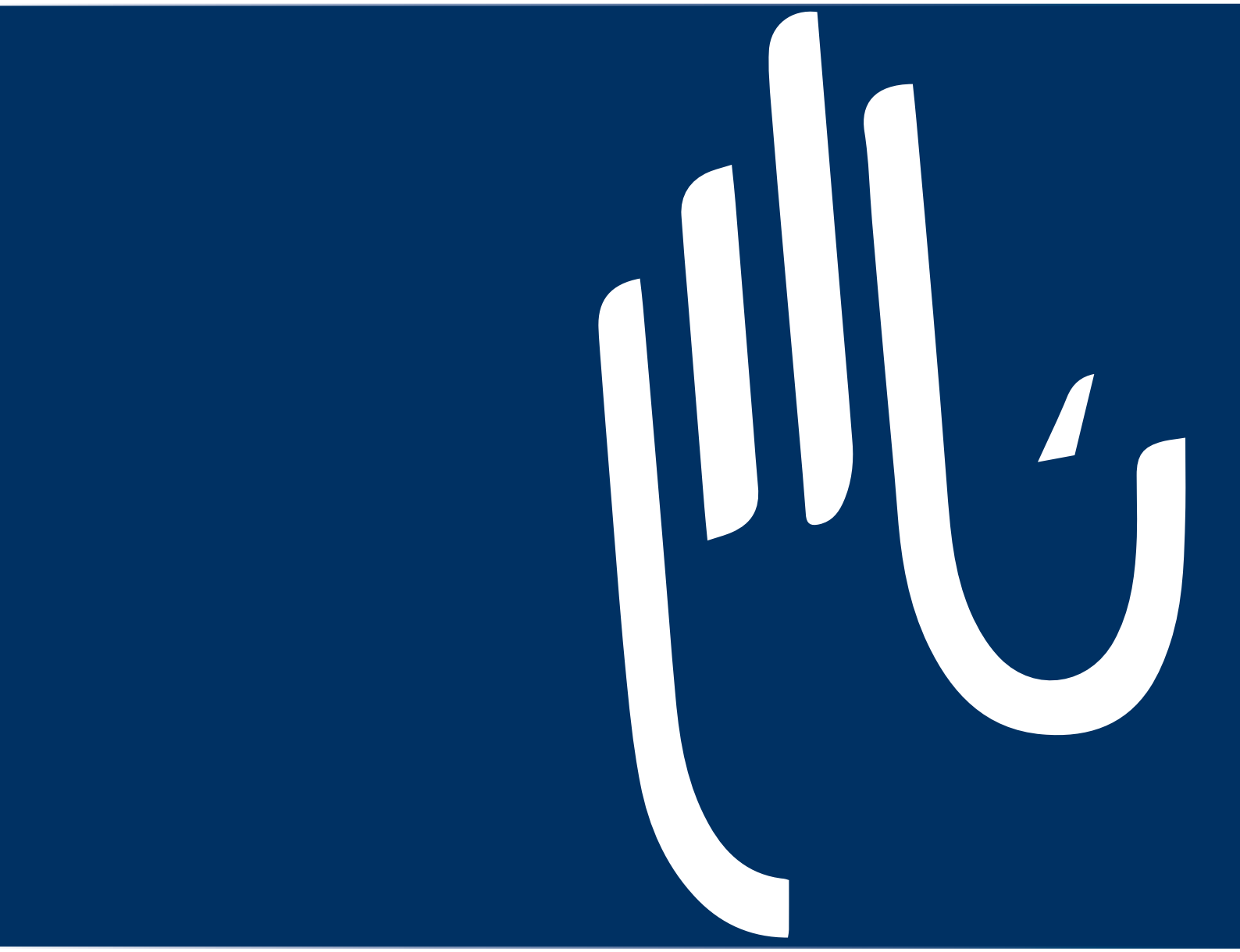
Collection of Practical Guides of Wounds of the Servizo Galego de Saúde

Practical Guide for the Acute Surgical Wound. Guide No. 6



XUNTA DE GALICIA

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CONSELLERÍA DE SANIDADE

COLLECTION OF PRACTICAL GUIDES OF WOUNDS OF THE SERVIZO GALEGO DE SAÚDE

PRACTICAL GUIDE FOR THE ACUTE SURGICAL WOUND

Guide No. 6

Xunta de Galicia
Consellería de Sanidade
Servizo Galego de Saúde
Dirección Xeral de Asistencia Sanitaria
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COLLECTION OF PRACTICAL GUIDES OF WOUNDS OF THE SERVIZO GALEGO DE SAÚDE

— No. 1 Pressure Ulcers

— No. 2 Ulcers of the Lower Limb

— No. 3 Ulcers of the Diabetic Foot

— No. 4 Neoplastic Skin Lesions

— No. 5 Burn Injuries

— **NO. 6 ACUTE SURGICAL WOUND**

— No. 7 Skin Lesions Associated with Moisture

— No. 8 Traumatic Wounds

Úlceras Fóra!
Servizo Galego de Saúde

Úlceras Fóra Programme. Servizo Galego de Saúde (Sergas), 2016

PRESENTATION

Everyone knows that the approach to ulcers and wounds implies a health problem of great magnitude due to the extra financial cost it means for sustainability of the health system, due to the loss of quality of life in patients, due to the impact that it has on their families and carers, and also by the workload and clinical variability that their care represents for healthcare professionals.

From the Servizo Galego de Saúde (Sergas), and more intensively from the General Sub-Directorate for Care Management and Organisational Innovation through the Health Care Integration Department, there is an awareness of the importance and impact of a proper management of the prevention and treatment of this type of lesions; so for several years we have been working to improve the structure, resources and conditions required, to try to normalise and systematise the care activity arising from this care process.

Through the **Úlceras Fóra Programme** the reference framework to develop and establish strategic lines in the approach of everything related to ulcers and wounds, one of the basic objectives proposed was to set common care criteria (to identify the risk, assess the lesions, establish preventive measures, establish treatments, use of products, monitoring, registration, etc.) which allow us to move towards the standardisation of criteria and a corresponding reduction in the clinical variability for this type of lesions.

That is why this **Collection of Practical Guides for Wounds from the Servizo Galego de Saúde**, describes the effort and enthusiasm of many professionals (doctors and nurses) to improve their clinical practice in the care and comprehensive approach to patients affected by ulcers and wounds, or at risk of suffering them, in order to incorporate the best available evidence to achieve an improvement in the patient's quality of care and safety.

Jorge Aboal Viñas
General Director of the Health Assistance Department
Servizo Galego de Saúde

PREFACE

This Practice Guide was developed with the participation of health professionals in primary care and hospital care of the Servizo Galego de Saúde (Sergas) and reviewed by expert professionals and scientific institutions at national level, under the coordination of the General Sub-Directorate for Care Management and Organisational Innovation and Direction of Sanitary Assistance of Sergas.

The recommendations for clinical practice based on evidence that are included in this guide are of a general nature and therefore do not define a single course of conduct to be followed in a procedure or treatment for the integral care that is intended to be carried out. Any amendment or variation of the recommendations set forth herein, shall be based on clinical judgement (internal evidence) of the health care professional who applies them and the best clinical practices of the time; as well as the specific needs and preferences of each patient in particular; the resources available at the time of the sanitary attention and in the regulations established by the institution or health centre where they are intended to be applied.

DISSEMINATION AND IMPLEMENTATION

The dissemination and implementation strategy of this practical guide; as well as, of the entire Collection of Practical Guides on Wounds of Sergas, shall be co-ordinated through the Technical Management of the Úlceras Fora Programme; that is to say, by the Health Care Integration Department, of the General Sub-Directorate General for Care Management and Organisational Innovation, of Sergas.

The diffusion process entails a ceremonial presentation at the Consellería de Sanidade of the Xunta de Galicia, the official presentation in all public institutions in the Sergas Healthcare Network, the dissemination of an official statement to the media, its disclosure in scientific events and dissemination on the Internet through the official website of Sergas.

VALIDITY AND UPDATE

The guide should be reviewed after 3 years from the date of its publication. Its updating can be performed before the end of this period if any of the recommendations of evidence modify its categorisation which may lead to a clinical risk of safety for the patient and / or affect the quality of care.

DECLARATION OF CONFLICTS OF INTEREST AND EDITORIAL INDEPENDENCE

The authors of this practical guide declare to have made an effort to ensure that the information contained herein is complete and up to date, and state that they have not been influenced by conflicts of interest that could change the results or contents during the preparation stage and its development. Likewise, the authors of the guide assume responsibility for the content expressed, which includes evidence and recommendations.

The editors of the Collection of Practical Guides for Wounds of the Servizo Galego de Saúde (Sergas) declare that there is editorial independence regarding the decisions taken by the technical management and the coordinators of the working group.

ASSESSMENT AND CLASSIFICATION OF THE EVIDENCE

The scientific evidence and recommendations set forth in this Practical Guide were the result of the assessment and analysis of the sources of information consulted as bibliographic reference (clinical practice guides, guides based on the best evidence, other documents based on evidence, systematic reviews and original articles); the critical reading method and consensus by nominal group between authors and panel of experts was used to prepare it.

The classification of the level of evidence and grading of the recommendations has been maintained while respecting the original source consulted and the scale of evidence that has been used. The method that CENETEC (National Centre of Technological Excellence in Health) of Mexico in the development of their clinical practice guidelines (GPC) has been used for this:

- Classify with the symbol **[E]** that evidence which is published in any GPC, followed by its alphanumeric classification (quality of the study, if it is referenced) and bibliographic citation.
- Categorise with the symbol **[R]** those recommendations identified by any GPC, followed by their strength of recommendation (by A-B-C-D levels, in descending order according to clinical importance, or by their grading in high-moderate-low evidence).
- Identify with the symbol **[GP]** those actions and / or activities considered as good practices, which are not referenced or supported by any GPC, but that appear in other documents based on the evidence (guides to good clinical practice, clinical pathways, protocols based on evidence, etc.) and whose evidence has been obtained through systematic reviews, meta-analyses, clinical trials, etc.

The scales on the level of evidence and degree of recommendations that are described in the contents of this practical guide can be consulted through the bibliographic sources referenced in the summary table of recommendations / evidence.

PRACTICAL GUIDE FOR THE ACUTE SURGICAL WOUND

PRACTICAL GUIDE No. 6

Collection of Practical Guides for Wounds from the Servizo Galego de Saúde

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- **Colegio Oficial de Enfermería de A Coruña**
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HOW TO QUOTE THE DOCUMENT

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02 INTRODUCTION

2.1. JUSTIFICATION

The approach to chronic ulcers and wounds implies a health problem of great magnitude due to the extra financial cost it means for the health systems, due to the loss of quality of life in patients, due to the impact that it has on their families and carers (which in many cases have to take on the prevention and caring), and also by the workload that their care represents for healthcare professionals. Therefore, the decision-making regarding its approach requires taking into account several alternatives from a variety of information sources (clinical data, professional experience, preferences of the patient, scientific evidence, protocols, guides, etc.) which in turn causes a considerable variability of decisions based on the time, the information available and the person who decides. This gives rise to a great disparity in the performance of the professionals in techniques, tests, and diagnostic skills, clinical judgement and decision-making when facing the same problem or patient and even in a same professional in relation to patients with the same clinical and pathology.

This *Practical Guide for the Acute Surgical Wound* (Practical Guide No. 6) is integrated into the Collection of Practical Guides of Wounds of the Servizo Galego de Saúde (Sergas); in accordance with the strategies and lines of action promoted through the Úlceras Fóra Programme coordinated by the General Sub-Directorate for Care Management and Organisational Innovation. In turn, such a Collection is aligned in line with strategy No. 10 (Improving Clinical Practice), of the Quality Plan for the National Health System 2010, as well as, with Sergas Strategy 2014: Public health at the service of patients.

This guide is therefore meant as a synthesis of the best interventions and preventive or therapeutic practices available for the care of patients with an acute surgical wound, especially after clean or little contaminated surgery; according to the clinical practice based on the most current evidence.

2.2. SCOPE AND OBJECTIVES

The scope of the guide is addressed to the people affected, informal carers and all health professionals with direct or indirect responsibility for the integral approach of acute sugical wound in any of the three health care levels in the Community of Galicia: Primary Health Care, Hospital Care and Socio-Health Care.

The aim of the Guide is to provide guidelines and / or standardised criteria to serve as a reference to identify risk factors, perform specific actions of prevention, detection, referral and treatment, which acute surgical wound pose as a health problem. The aim is to contribute to the welfare of people, reduce the variability of treatments and professional uncertainty, reduce the prevalence and incidence of this health problem in society, as well as achieve greater optimisation in the management of human and economic resources available from the Galician health and socio-health care system based on the recommendations of practice based on evidence and; to attain a

few quality care indicators for the care and safety of patients that shall allow for greater efficiency of the process between the different care levels.

2.3. QUESTIONS TO BE ANSWERED BY THIS PRACTICAL GUIDE

- What is and how is a surgical wound defined?
- What is its cause?
- What type are they and how are they classified?
- What are the most frequent locations?
- How do you assess the risk of infection of the surgical wound?
- What measures must be implemented for a proper healing?
- What treatments and/or therapeutic measures are most appropriate?
- What complications can occur?
- What prevention recommendations are the most indicated?
- What treatment recommendations are the best?
- What therapeutic guidelines and health education should patients, informal carers and professionals follow to facilitate their healing?

03 DEFINITION

An acute surgical wound involves the disruption of the skin integrity, carried out in the environment of asepsis, with therapeutic and/or repairing aims, conducted by healthcare staff, in urgent or scheduled acts **(figure 1)**.

Figure 1. Example of a surgical wound (incision and stoma)

A **surgical site infection** (SSI) is defined as an infection that occurs during the 30 days after an operation (or within one year if an implant was required) and that affects skin or subcutaneous tissue, deep soft tissues of the incision or to any organ or structure handled during the intervention.[1]

04 EPIDEMIOLOGY

According to the report from the National Health System, of the Ministry of Health and Consumer Affairs (2010),[2] around 4.4 million surgical interventions are performed in Spain per year, of which more than 1 million are under the regime of major outpatient surgery.

The EPINE study, Study of Prevalence of Nosocomial Infections in Spain, (2011 edition), 3 sets a percentage of 6.4 % of surgical site infections with respect to the total of infections acquired during the hospitalisation process.

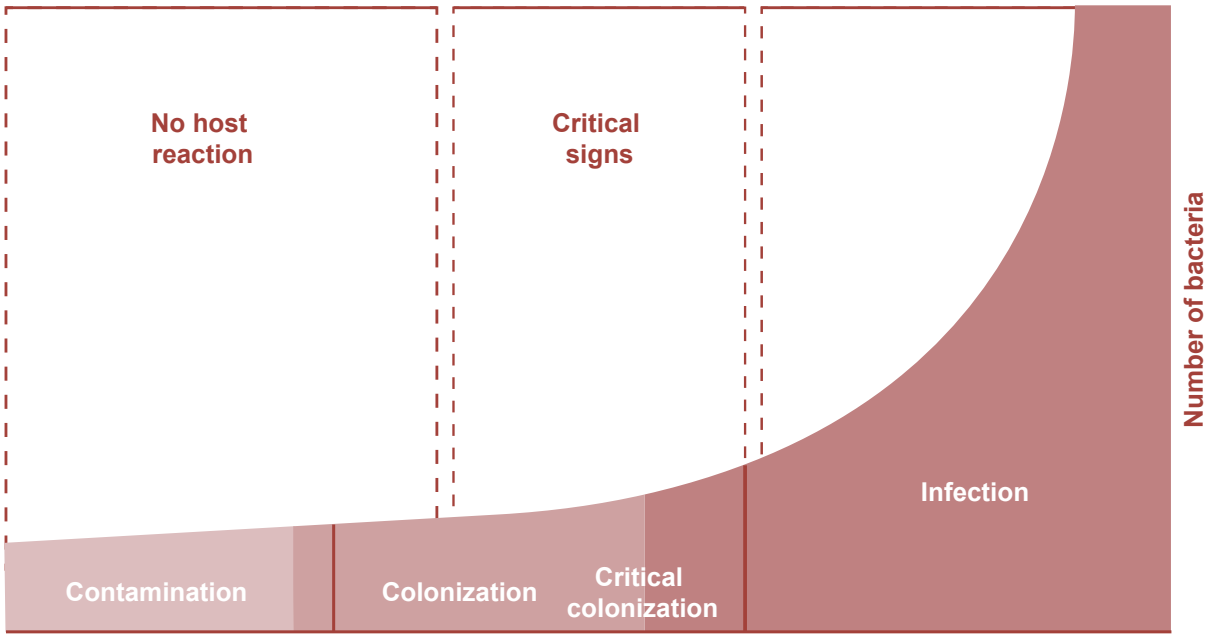
According to the ENEAS study, National Study on the Adverse Effects linked to hospitalisation of 2005,[4] 84 % of surgical site infections could be avoidable, and this means 7.8 % of adverse effects associated with hospital admission.

05 CLASSIFICATION

Most of the acute surgical wounds present quick healing without complications. Certain predisposing factors of the patient or the type of surgery can condition delays in healing, dehiscence's and infection of the wound. The proliferation of bacterial species in the surgical site may result in:

- **Contamination**: The presence of micro-organisms in the wound that is not capable of overcoming the host defences. The presence of micro-organisms is transitory and does not imply delay in healing.
- **Colonisation:** The proliferation of micro-organisms takes place without involving damage to the host or triggering an infection.
- **Critical colonisation**: There is a delay in the healing of a wound which may involve a disproportionate growth of micro-organisms even without data of microbiological infection. It is therefore an intermediate stage between colonisation and when infection of the wound appears.
- **Infección**: Micro-organisms are multiplied, grow and invade the tissues causing injury and cellular immune reactions, so that the healing of the wound is interrupted.

5.1. PROLIFERATION OF MICRO-ORGANISMS ACCORDING TO THE NUMBER OF BACTERIA



5.2. THE SURGICAL WOUND CLASSIFICATION ACCORDING TO THE DEGREE OF BACTERIAL CONTAMINATION

	CLEAN WOUND	CLEAN-CONTAMINATED WOUND	DIRTY WOUND
INFECTION RATE	1 - 5 %	5 - 10 %	10 - 40 %
CHARACTERISTICS OF THE SURGICAL WOUND	Atraumatic wound. With no inflammation With no transgression of the aseptic technique. With no penetration in the gastrointestinal, oropharyngeal, genito-urinary, biliary or tra-cheobronchial tract. Wounds with closed drainage systems fall into this category.	Atraumatic wound. With no inflammation There is less trans-gression of the aseptic technique. Penetration in the gastrointestinal, oro-pharyngeal, genitou-rinary, biliary or tra-cheobronchial tract, with minimum dis-charge or with prior bacterial decolonisation.	Acute inflammation and/or discharge. Traumatic wound. Greater transgression than aseptic technique. Penetration in the gastrointestinal, oro-pharyngeal, genitou-rinary, biliary or tra-cheobronchial tract, with important dis-charge, with no prior bacterial decolonisa-tion. Chronic open wounds that are to be closed or grafted.
EXAMPLES OF SURGERY TYPES	Hernioplasty. Breast surgery.	Elective colectomy.	Appendectomy in acute perforated appendicitis.

5.3. CLASSIFICATION OF SURGICAL WOUNDS ACCORDING TO TYPE OF HEALING

HEALING BY FIRST INTENTION	HEALING BY SECOND INTENTION	HEALING BY THIRD INTENTION
This occurs when an immediate surgical alignment of the wound edges is carried out, using stitches, staples, or adhesive devices, as well as the one carried out using a flap or graft. In deep wounds, through adjustment and closure by anatomical planes. After 48 hours there is a protective barrier that isolates the wound of pollution by external agents. **(Figure 2.)**	Also called spontaneous closure of the wound. The wound is left open, allowing growth of granulation tissue, and finally the epithelisation from the edges of the wound, (approximately 1 mm / day) The proliferation occurs only in the absence of infection. **(Figure 3.)**	Also known as deferred closure or late primary healing. The wound is kept open to control infection, and when a uniform granulation tissue is seen, it is closed by aligning the edges.
Scheduled heart surgery, scheduled orthopaedic surgery.	Abscess cavities, radical excision of pilonidal cyst.	Closure of laparostomy after damage control.

Figure 2. **Closure by first intention (stitches)**

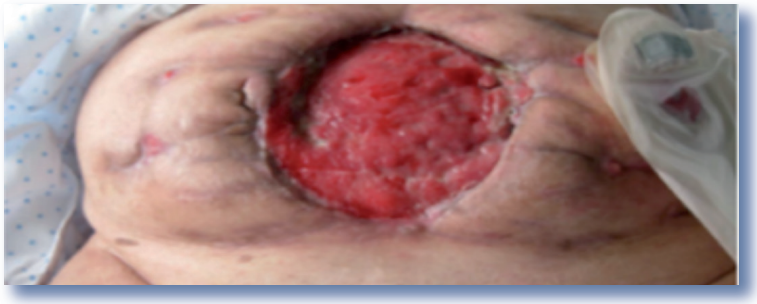
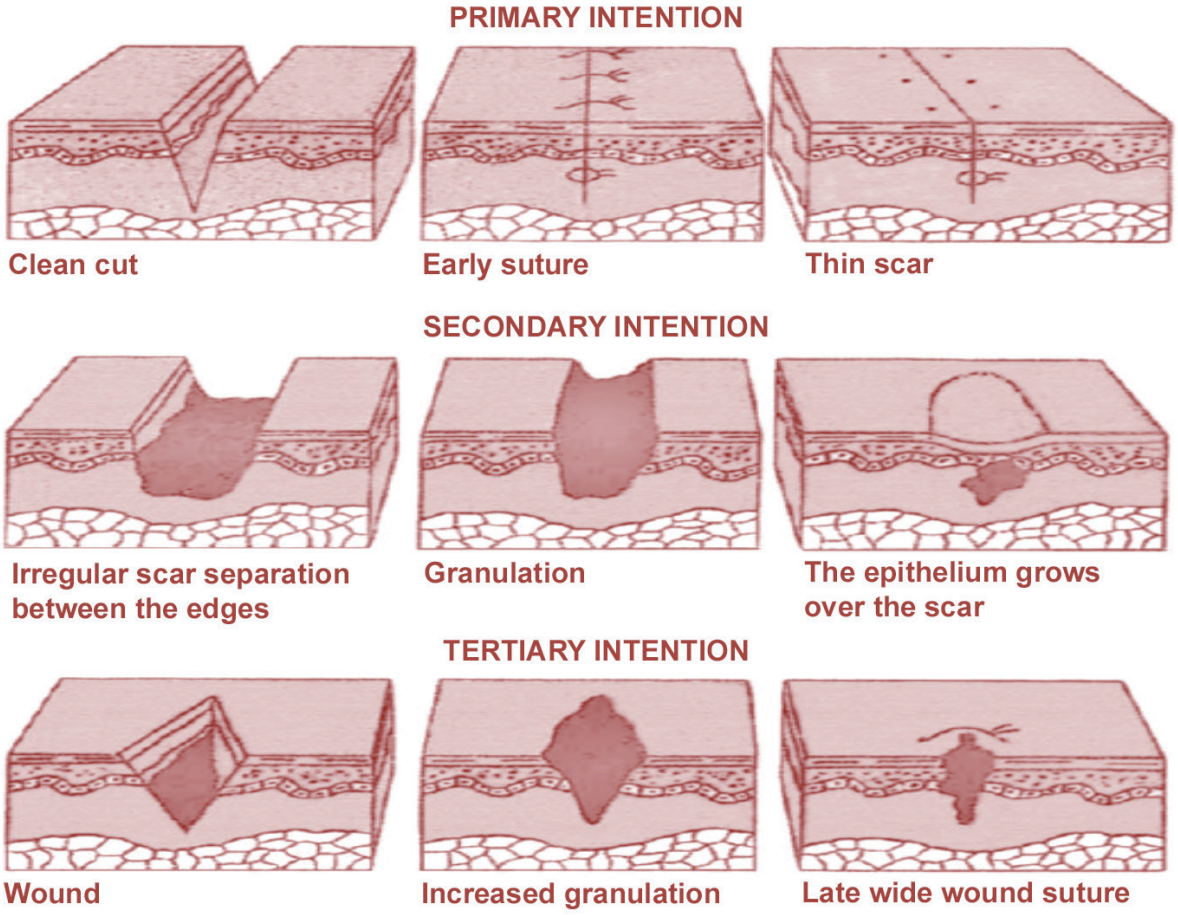


Figure 3. **Granulation tissue present in laparotomy closed by second intention**

5.4. HEALING OF SURGICAL WOUNDS ACCORDING TO INTENTION



Source: Clasificación da cicatrización.

Available at: http://gsdl.bvs.sld.cu/greenstone/collect/enfermeria/index/assoc/HASH47b0.dir/tabla7.1.png

5.5. TYPES OF SURGICAL SITE INFECTION (SSI)

TYPE:	Superficial incisional surgical site infection (SSSI).	Deep incisional surgical site infection (DSSI).	Organ and cavity surgical site infection (OCSSI).
AFFECTS:	Skin or subcutaneous tissue that surrounds the incision.	Deep soft tissues (fascia and muscle).	Any anatomical structure handled, different from the incision.
THAT MEETS ONE OF THE FOLLOWING CRITERIA:	Purulent drainage due to the superficial incision. Isolating organisms in fluid or tissue culture taken aseptically from the superficial incision.	Purulent drainage due to the deep incision but not from the organ or surgical area intervened. Spontaneous dehiscence of the deep incision or deliberate opening of incision by the clinician, when the patient has at least one of the following signs and symptoms: Fever > 38ºC, localised pain or pain on pressure (except if the culture is negative). Abscess or infection that affects the deep incision and that is diagnosed by physical examination, during a reintervention and by a radiological study or by histological study.	Output of purulent material through drainage placed in the organ or area, and externalised through a separate incision. Isolating organisms in fluid or tissue culture taken aseptically from the organ or area. Abscess or other evidence of infection that affects the organ or area, and that is diagnosed by physical examination, during a reintervention and by a radiological study or by histological study.
"The abscess at a point of suture (inflammation and minimum exudate confined to the areas of penetration of the stitches), the infection of episiotomy or the circumcision of a new-born is not considered SSSI".			

Adapted from *Surgical Infection Task Force*

06 ETIOPATHOGENESIS. PREDISPOSING FACTORS. DIAGNOSTIC CRITERIA

6.1. MODULATOR FACTORS OF THE NORMAL HEALING PROCESS

Healing is a complex occurrence of biochemical and cellular events. According to the definition of Barbul and Regan,[5] the process consists of three successive and overlapping stages: Inflammatory, proliferative and remodelling stage **(figure 4)**.

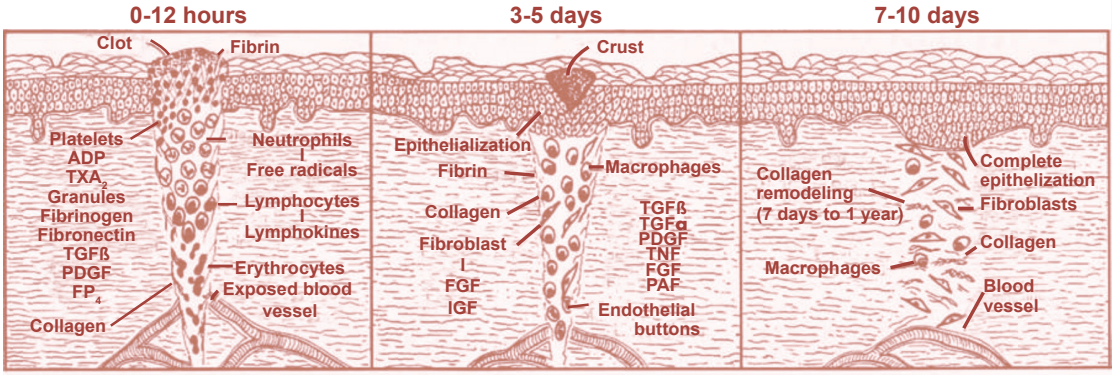


Figure 4. Normal healing process

Source: Modificado de Porras BH, Mustoe TA. Cicatrización: Conceptos actuais.

Available at: http://www.actamedicacolombiana.com/anexo/articulos/01-1992-07-.html

MODULAR HEALING FACTORS	
LOCAL (controllable)	SYSTEMIC (little controllable)
Surgical repair technique: • Incision depending on tension lines (Langer lines) • Careful haemostasis. • Suture material • Type of cure carried out	Age.
Local infection.	Race. Propensity to keloids (black race).
Nutrition and immunity: • Hypoproteinaemia • Deficit of vitamins C and A. • Deficit of Zinc and Copper.	Systemic diseases: • Diabetes mellitus • Collagenopathies • Arterial insufficiency • Chronic renal insufficiency.
Blood flow of tissue: • Anaemia. • Respiratory disorders. • Vascularisation. • Hyperoxia of tissues (hyperbaric chamber).	Neurological involvement.
	Administration of corticosteroids.
	Administrations of NSAIDS.
	Administration of Chemotherapy.
	Administration of Radiotherapy.
	Tobacco.
	Alcohol.

6.2. PATHOGENESIS OF SURGICAL SITE INFECTION

The skin of the human body is not sterile, but our body maintains a balanced relationship with micro-organisms in the normal flora.

The SSI (surgical site infection), shall be preceded by the contamination of the surgical area; the risk shall be directly proportional to the dose of bacterial contamination, to the virulence of the micro-organism and inversely proportional to the resistance of the host; that is, it is determined by the bacterial load, the virulence of the micro-organism and immune status of the patient.

6.2.1. PREDISPOSING FACTORS OF SURGICAL SITE INFECTION

The risk factors that can promote the development of SSI are divided into 2 types:

- **Endogenous**: They belong to the patient and difficult to control in the preoperative period.
- **Exogenous** (general), on which we can have an influence as a healthcare system.

PREDISPOSING FACTORS OF THE SURGICAL SITE INFECTION	
ENDOGENOUS FACTORS	**EXOGENOUS FACTORS**
Old age.	Pre-operative stay.
Diabetes mellitus.	Antibiotic prophylaxis.
Obesity.	Removal of body hair.
Immunosuppression.	Degree of contamination during surgery.
Corticotherapy.	During the operation.
Neoplasm.	Drainages.
Malnutrition.	Hyperglycaemia in the postoperative period.
Smoking.	Hypoxia.
	Hypothermia.
	Blood transfusion.
	Fluid restriction.
	Surgical technique.

6.3. DIAGNOSTIC CRITERIA OF SURGICAL SITE INFECTION

6.3.1. CLINICAL DIAGNOSTIC CRITERIA

At present, there is no valid and universal system for the early diagnosis of SSI. Given the complexity and diagnostic subjectivity of SSI, different studies have been developed to define the clinical diagnostic criteria of infection.

The EWMA (European Wound Management Association)[2] defines the criteria suggesting an infection in different types of lesions (acute surgical wound closed by first intention, acute surgical wound closed by second intention, diabetic foot ulcers, arterial vascular ulcers, vascular venous ulcers, pressure ulcers, first and second degree burns and third-degree burns). According to

this approach, cellulitis, bad smell, pain, delay in healing or its worsening and dehiscence of the wound are criteria common to all types of wounds.

The diagnostic criteria for the acute wound of EWMA are:

Scoring	Acute wound healed by first intention	Acute wound healed by second intention
HIGH **8 or 9 points**	Cellulite. Pus /abscess.	
MEDIUM **6 or 7 points**	Delay in healing. Erythema +- induration. Haemopurulent exudate. Bad smell. Seropurulent exudate. Dehiscence / Increase in the size of the wound.	
		Increase in the volume of exudate and formation of bags.
LOW **4 or 5 points**	Local rise in the skin temperature. Oedema. Unexpected pain / hypersensitivity to touch.	
	Serous exudate with erythema Swelling with increase in the volume of exudate.	Discolouration. Friable granulation tissue that bleeds easily.

Criteria that reach 8 or 9 points are considered important diagnostic criteria; those of the lower scores, are considered warning signs of infection, important for early identification.

6.3.2. ADDITIONAL TESTS

The initial clinical assessment, shall establish the need or otherwise for additional tests to confirm the suspicion of infection, to assess its severity, or to guide the antibiotic treatment if necessary (antibiogram).

Microbiological samples of the surgical wound can be obtained through: a smear of the wound, puncture- aspiration with a needle or tissue biopsy.

The identification and quantification of micro-organisms is performed through a culture but in case of need for quick identification it could be carried out a microscopic examination with Gram stain.

According to the international consensus on wound infection of the WUWHS (World Union of Wound Healing Society)[5] of 2008, it is not recommended for routine microbiological tests.

The collection of microbiological sample is indicated in:

- An acute wound with clinical diagnosis of infection (if associated with sepsis it is recommended that blood cultures be undertaken, as well as screening for other potential sources of infection).

- Chronic wounds with diagnosis of disseminated or generalised infection.
- Infected chronic wounds which have not responded to appropriate antibiotic treatment or that have shown worsening.

IMPORTANT: The microbiological study of a patient, without a proper clinical assessment does not in itself mean a diagnosis of SSI.

07 GENERAL CRITERIA AND GUIDELINES FOR PREVENTION

7.1.PRE-OPERATIVE PREVENTION

- **Pre-operative shower:** It is recommended to have a shower at least the night before surgery **(recommendation A)**. There is no scientific evidence to demonstrate that it is better to wash with chlorhexidine, compared to a shower with soap.[7]

- **Shaving hair:** If necessary, the shaving of the surgical area is recommended, although the micro-abrasions that it causes, can promote the growth of micro-organisms. The use of electric razor with a single use head compared to using a razor blade improves the SSI rate[8] **(recommendation A)**.

- **Mechanical preparation of the intestine:** The preparation of the intestine as a measure to avoid SSI[9] is not recommended **(recommendation A)**.

- **General hand hygiene:** Washing hands before and after contact with the patient is a measure with indisputable benefits. Hand hygiene must be carried out with soap and water **(annex 1)**. If they are not visibly soiled, an alcohol based gel can be used[10] **(recommendation B)** **(annex 2)**.

- **Antibiotic prophylaxis:** the antibiotic policy established in each healthcare centre **(recommendation D)** should be followed, a guidance chart for the recommended prophylaxis for the prevention of the infection of the surgical site is sown below[11, 12] **(annex 3)**.

7.2. PREVENTION DURING SURGERY:

- **Surgical cleaning of hands:** Hands must be decontaminated, in order to minimise microbial flora present in the skin **(recommendation A)**. Surgical brushing with antiseptic solutions must be carried for at least three minutes in order to eliminate micro-organisms living in the hair follicles or cracks in the skin[13] **(annex 4)**.

- **Use of single use or reusable operating theatre gowns:** The use of surgical gowns aims to prevent the transmission of micro-organisms from the surgical team to the surgical site, as well as protecting the professional to exposure from blood and fluids[14, 15] **(recommendation B)**.

- **Antiseptic preparation of the skin**: The use of alcohol chlorhexidine at 2 % for the antiseptic preparation of the intact skin **(recommendation B)**[16] **(figure 5)**.

Figure 5. **Preparation of the surgical area with tinted alcohol chlorhexidine at 2 %, in patient with ulcerated breast neoplasm**

- **Perioperative oxygenation:** the administration of high concentrations of oxygen is recommended[17, 18, 19] **(recommendation B)**.

- **Irrigation of a surgical wound:** subcutaneous irrigation of the surgical wound during operation with povidone iodine or with saline solution at pressure has demonstrated decrease of the SSI[20, 21] **(recommendation A)**.

7.3. POST-OPERATIVE PREVENTION

- **Change of bandaging:** the implementation of aseptic bandaging is recommended although there is no statistically significant evidence, showing that the technique of aseptic bandaging is more useful than carrying out any other bandaging **(recommendation D)**.[22]

- **Postoperative cleaning:** the use of drinking water is effective in cleaning acute wounds and cheaper than other cleaning solutions **(recommendation A)**.[23] When the technique used is the traditional cure, washing of the surgical wound with sterile saline serum in the first 48 hours is recommended **(recommendation D)**.[22]

08 GENERAL GUIDELINES FOR TREATMENT

The main objective of the treatment of surgical wounds must include:

- **Avoiding complications in the healing process:** preventing infection, the formation of phlyctenas, maceration and dehiscence.
- **Optimisation of health resources:** improve the cost-effectiveness and decrease the time and workload of the nursing staff.
- **Promote patient comfort:** not producing discomfort, facilitating mobility and personal hygiene.

8.1. TRADITIONAL CURE OR CURE IN DRY ENVIRONMENT

Traditional cure or cure in dry environment involves leaving the surgical wound open to the air or covering it with a sterile dressing (gauze) after cleaning with antiseptic solutions.

The healthy cells become dehydrated and flake off forming a scab; this hampers the formation of granulation tissue and the migration of the epithelial cells and can cause delays in healing.

The cure in dry environment can be associated with specific problems **(figure 6)**:

- Leaks (exudate): can lead to lesions due to maceration.
- Requires frequent changing of the dressing (at least every 24 hours).
- Usually there is pain associated with the withdrawal of the dressing.
- It can give a feeling of less autonomy and a lack of hygiene to the patient.
- The appearance of phlyctenas in relation to certain adhesives of some dressings is frequent.
- The postoperative period is long due to difficulty in mobilisation.
- It can mean a greater risk of infection; because it does not allow the wound to be assessed without removing the dressing (requires greater handling).

Figure 6. Traditional cure or cure in dry environment with povidone iodine. Haemorrhagic phlyctena is observed caused by dragging when the dressing is removed

8.2. CURE IN WET ENVIRONMENT

In the last 30 years, numerous studies have demonstrated the benefits of treatment in a wet environment for the healing of wounds, through the application of dressings that establish an effective semi-permeable barrier against contamination by micro-organisms, maintaining optimum conditions of humidity and temperature at the centre of healing, which prevents cellular dehydration and the maceration of the wound, favouring the regenerative process.

The wet environment in the surgical bed prevents the loss of exudation rich in growth factors that stimulate the proliferation and migration of fibroblasts, keratinocytes and endothelial cells.

A cure in a wet environment can be associated with certain benefits:

- Reduction of pain.
- Prevents friction.
- Barrier effect against micro-organisms.
- Reduces the time of healing.
- Is associated with lower rates of infection.
- Allows more space of time between the cures.
- Prevents maceration (absorbent power depending on the type of dressing used).
- Improves the comfort of the patient, as it allows daily cleaning.
- Better aesthetic results.
- Improvement of the cost-effectiveness associated with the treatment.
- Less time spent on cures by the healthcare staff.

8.2.1. HANDLING OF SURGICAL WOUND WITH THE MÖLNDAL TECHNIQUE

The Mölndal technique was developed in 2002 by Folestad A. in Sweden[24] and is widely implanted in Nordic countries as a first option in the cure of the surgical wound in knee and hip surgery.

The Mölndal technique is based on the therapeutic application of a hydrocolloid hydrofibre dressing combined with a semi-permeable transparent film (transparent polyurethane film), being successfully used in orthopaedic and trauma surgery, in thoracic surgery and digestive tract surgery; with an improvement in the rate of infection being seen, as well as greater comfort for the patient, together with an overall reduction of costs and workload.[24]

Various clinical practice guidelines on infection in surgical wounds consider this technique as an excellent clinical practice, despite the fact that there is still not sufficient evidence to support its exclusive use.[25, 26]

The use of this technique is recommended in clean surgery interventions, preferably in breast, thyroid and hernia surgeries;[24] although its use is not dismissed, under strict clinical control, in clean-contaminated or even contaminated surgery.

8.2.1.1. APPLICATION OF THE MÖLNDAL TECHNIQUE IN THE SURGICAL WOUND

a) Material:

- Surgical area (sterile cloth).
- Sterile gloves.
- Antiseptic (Alcohol chlorhexidine at 2 %).
- Physiological saline solution (0.9 % saline).
- Sterile instruments (tweezers, scissors).
- Gauze pads.
- Hydrocolloid hydrofibre dressing on a tape.
- Polyurethane transparent film.
- Non irritating barrier product (optional).

b) Method:

1. The cure must be done for the first time in the operating theatre, with aseptic technique and immediately after suturing the surgical wound; any successive cure or change of dressing (if required), must also be performed using a sterile technique.

2. Once the wound has been sutured, wash with physiological saline solution and then apply alcohol chlorhexidine at 2 %, leaving to air dry, for at least 30 seconds **(figure 7)**.

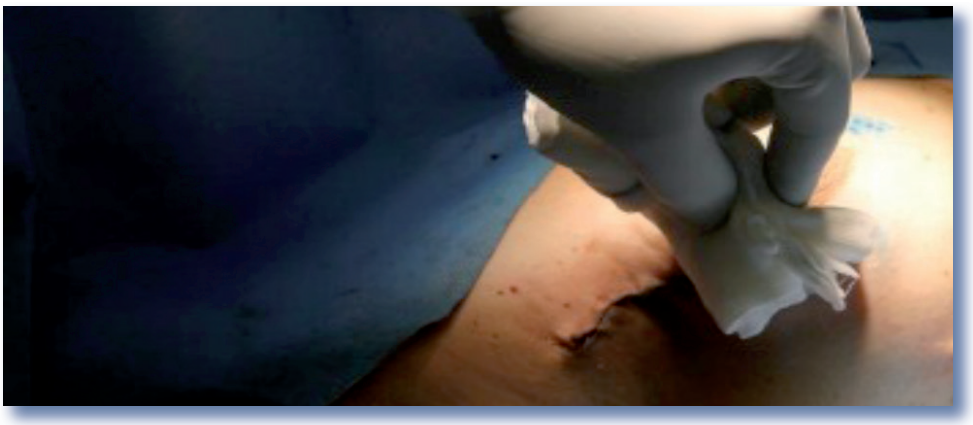


Figure 7. Cleaning the surgical wound with physiological saline solution + Chlorhexidine 2 %

3. Use a double hydrocolloid hydrofibre dressing strip, on a tape, which is placed on the surgical wound, covering it in its entirety. It must slightly exceed the edges **(figure 8)**.

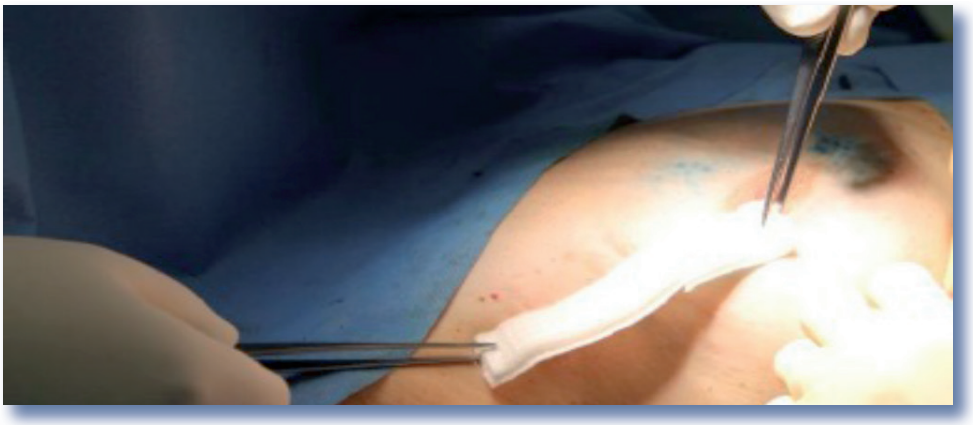


Figure 8. Coverage of the surgical wound with hydrocolloid hydrofibre tape

4. As a secondary dressing, we use transparent polyurethane film, which allows the wound to be isolated with respect to external agents and at the same time for daily assessment **(figures 9 and 10)**. The perilesional area must be dried to ensure the correct fixing of the dressings and in some cases it would be appropriate to use a non-irritating barrier product before placing the polyurethane film, to improve adhesiveness.

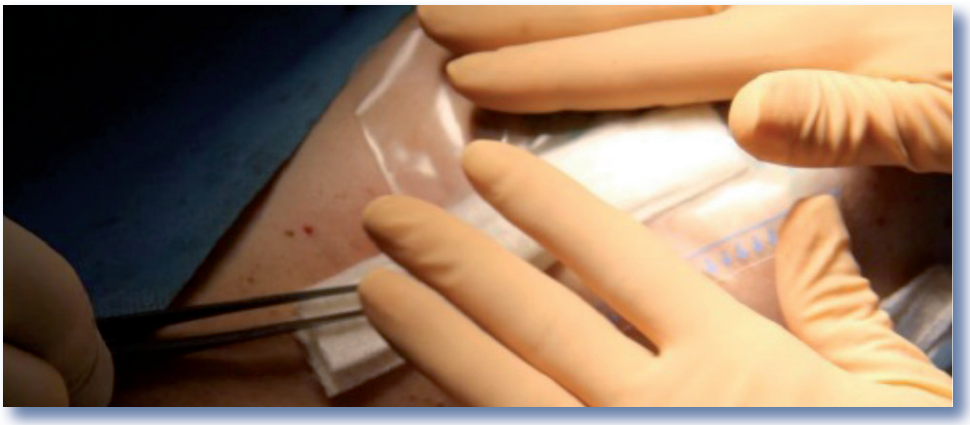


Figure 9. Coverage with polyurethane film as secondary dressing

Figure 10. Final appearance of the cure of the surgical wound using the Mölndal technique

5. In the event a compressive bandage is required, this shall be done externally on the Mölndal cure, taking special care not to apply adhesive bandages on the polyurethane film, in order to avoid their early removal.

6. The revision of the wound shall be done daily (without lifting the dressing), performing a visual inspection of the area and softly touching the entire trajectory of the lesion. The high capacity for absorption and retention of the hydrofibre and the semi-permeable properties of the secondary dressing, allow the dressing to be maintained for up to 7 days, unless any of the following circumstances are seen: protective film is detached, hydrocolloid fibre is over-saturated, or there are signs of abscess or infection.

7. In normal conditions, after 7-10 days the surgical wound can be left uncovered.

8.2.1.2. APPLICATION OF THE MÖLNDAL TECHNIQUE ASSOCIATED WITH DRAIN OR CATHETER INCISIONS

Use:

The Mölndal technique can also be used to fix and maintain drains or catheters (central venous pipes, reservoirs, lung, biliary, abdominal, Redon drains, Blake type drains…)

Benefits

- Prevents colonisation and infection at the insertion point in the skin.
- Improves the fixation and permanence of the catheter or drain.
- Increases the comfort and safety of the patient.

Preparation:

1. In the same way as for a surgical wound, the cure must be carried out for the first time in the operating theatre, immediately after the end of the intervention.

2. The area must be cleaned with physiological saline solution and antiseptic must be applied (alcohol chlorhexidine at 2%). In successive cures, it may be advisable to wash the insertion area with soap solution of chlorhexidine, in order to decontaminate the area and remove traces of organic detritus that might exist.

3. Secure the drain pipe, using stitches or specific normal system.

4. Apply hydrocolloid hydrofibre tape, surrounding the exit point of the drain and the drain tube itself **(figure 11)**.

Figura 11. Colocación da película de poliuretano como apósito secundario

5. Use a transparent polyurethane adhesive film dressing as a secondary dressing **(figure 12)**.

Figure 12. **Securing the polyurethane film as a secondary dressing**

6. Special care must be taken not to superimpose the polyurethane dressing of the surgical wound over that of the drain, since the withdrawal of the latter may be before the cure of the wound needs to be carried out and this would condition both having to be removed, due to being attached.

The end result is a cure that is not at all sightly, which does not need to be lifted up to assess its evolution, since it allows for a visual inspection and palpation of the whole length of the wound and it is very well tolerated by the patients, which compared with the traditional cure, they see an improvement in comfort and autonomy, because it allows hygiene to be carried out, even in the shower. **(figure 13)**.

Figure 13. **Final appearance of the surgical wound and drain incision with the Mölndal technique**

8.3. TREATMENT OF SURGICAL SITE INFECTION

Once the SSI diagnosis (using clinical criteria) has been established, it is important to carry proper treatment.

Within the treatment associated with SSI and following the guidelines of the EWMA, (European Wound Management Association), with respect to the treatment of the infection in wounds of 2006, this establishes:[27]

1. Reopening of the incision, debridement and drainage of the wound.
2. Use of antibiotics

3. Use of topical antimicrobials
4. Dressing associated with cure by second intention.

8.3.1. REOPENING OF THE INCISION, DEBRIDEMENT AND DRAINAGE OF THE WOUND

When there are clear and obvious signs of SSI the withdrawal of suture material are indicated, starting with the area of greatest fluctuation; if it affects the whole of the wound, one should begin with the most deteriorated area, to promote cleaning and drainage. In the event of there being devitalised tissue, sphacelus, purulent material or haematoma with signs of super-infection, these shall have to be cleaned.

The cleaning shall be done with a pre-loaded syringe containing 20 cc of physiological saline solution, and a 22G calibre needle, which exerts enough irrigation pressure to eliminate devitalised tissues and remains of necrotic material, reducing both the inflammation, as well as the bacterial load.[28] **(recommendation B)**.

To ensure good drainage of the wound and a suitable local management of the cures, the wound should be left open, to proceed to its closure by second intention, specifying occasionally the use of a drain using capillarity, to ensure a correct evacuation **(figure 14)**.

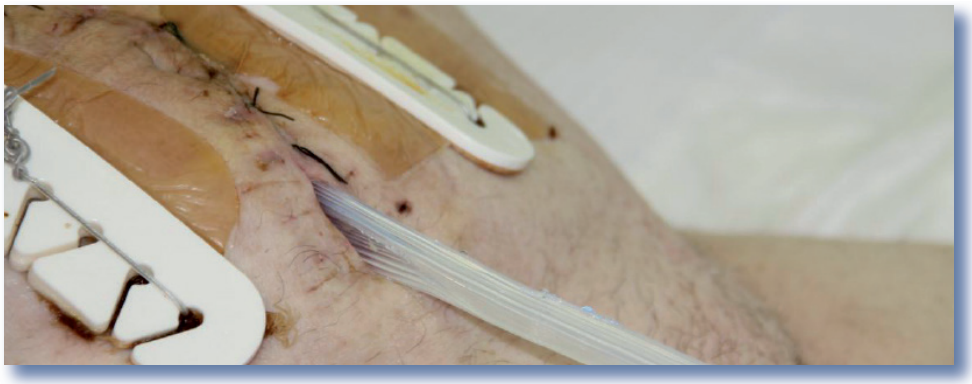


Figura 14. Ferida infectada con drenaxe por capilaridade

In some selected cases, after local treatment, and in the demonstrated lack of infection, the wound may then be closed (deferred stitches), called “closure by third intention”.

8.3.2. USE OF ANTIBIOTICS

In spite of the fact that the use of systemic antibiotics has increased the presence of multi-resistant germs, its indication continues to be recommended when the SSI is associated with clear signs of local inflammation, as are the cellulitis, lymphangitis or when this is associated with systemic complications (sepsis or bacteraemia), **(recommendation B)**.[29]

The initial antibiotic treatment is performed empirically taking into account the surgical procedure performed, the degree of contamination of the surgery, the anatomic location, the presence or not of implants and the suspicion of multi-resistant germs. The initial treatment should be modified, depending on the antibiogram, to avoid broad-spectrum treatments and thereby reduce the

emergence of resistance. We must follow the protocols established by the antibiotic policy of each health centre **(recommendation D)**[11, 12] for systemic antibiotic treatment of the SSI, a table of recommended antibiotics is set out below:[30]

TYPE OF INFECTION ACCORDING TO CDC PARAMETERS		INITIAL TREATMENT	SYSTEMIC ANTIBIOTIC	
			Of choice	Special Situations
Superficial infection of the surgical site (SSSI), without severity data.		Reopening of incision, debridement and drainage.	SSSI not required.	
ISSQ with severity data: Deep surgical site infection and organ and cavity infections.	Digestive or genitourinary surgery.		Amoxicillin-Clavulanic Acid 2 g / 200 mg iv every 8 h or Piperacillin-Tazobactam 4 g iv every 6 h or Imipenem 500 mg iv every 6 h.	If there is allergy to beta-lactams: Levofloxacin 750 mg every 24 h + Metronidazole 500 mg every 8 h.
	Facial, trunk or upper limb surgery.		Cloxacillin 1 g IV every 6 h, Amoxicillin-Clavulanic Acid 2 g / 200 mg iv 8 h or Cefazolin 1 g iv 8 h.	Suspicion of MRSA, previous surgery with vascular prosthesis, or joints, or allergy to beta-lactams: Vancomycin 15 mg / kg / 12 h + Clindamycin 600 mg IV / 6 h or Ciprofloxacin 400 mg iv / 12 h
	Perineum or lower limb surgery.		Cloxacillin 1 g IV every 6 h, Amoxicillin-Clavulanic Acid 2 g / 200 mg iv 8 h or Cefazolin 1 g iv 8 h.	

IMPORTANT: Topical antibiotics shall be used in a restricted manner, respecting the dosage and never for a prolonged time, to prevent the emergence of multi-resistant germs.

8.3.3. USE OF TOPICAL ANTIMICROBIALS

The role of preparing the skin for the prophylaxis of the SSI is essential. The use of chlorhexidine in alcoholic solution in a concentration above 0.5 % is recommended as an antiseptic of first choice to disinfect the healthy skin, by the CDC (Centres for Disease Control and Prevention)55 as CATEGORY IA. There are also studies that propose the use of the solution of Prontosan® (0.1 % Undecilenamidopropil betaine and 0.1 % Polyhexanide), as an alternative to the decontamination of the wound after surgical closure, but this practice is still not supported by conclusive evidence and can in addition be a more expensive option.[24]

Topical antimicrobials	Action spectrum	Start of action	Duration of the effect	Other characteristics
Chlorhexidine	BGP, BGN, Fungi, Virus, Spores.	15-30 seconds.	6 h.	> 4% tissue damage.
Povidone Iodine	BGP, BGN Fungi, Virus.	3 minutos.	3 h.	Affects the formation of granulation tissue.
Silver	BGP, BGN, Fungi, Virus Protozoa.	En función do apósito, pomada ou ungüento que o transporte.	Moi variable. Segundo a presentación.	Low toxicity Studies are needed to determine its use and its implementation depending on the type of injury. Resistant germs have been described.
Hydrogen peroxide	BGP, BGN, Virus.	Inmediato	Nulo.	Irritant in the mucous membranes. Risk of gaseous embolism.
BGP: Gram-positive bacteria, BGN: Gram-negative bacteria.				

The use of topical antibiotics in the healing of the surgical wound, closed by first intention is very discussed, due to the risk of possible absorption, toxicity, allergy and generation of potential microbial resistance. Also controversial is the systematic use of antiseptic solutions as postoperative prevention of infection in the surgical wound. To say in this regard that there is currently not enough information and evidence on the usefulness or not, of this indication of antimicrobials (antiseptics and antibiotics).

09 SUMMARY OF RECOMMENDATIONS FOR THE EVIDENCE

	EVIDENCE [E] / RECOMMENDATION [R] / GOOD PRACTICE [BP]	LEVEL / GRADE
[GP]	It is not recommended for routine microbiological tests. The collection of microbiological sample is indicated in: • Acute wound with diagnosis of infection (if associated with sepsis the implementation of blood cultures is recommended, as well as screening for other potential sources of infection). • Chronic wounds with diagnosis of disseminated or generalised infection. • Infected chronic wounds which have not responded to appropriate antibiotic treatment or that have shown worsening.	**IV / D** (Regan M. C., 1994).[5]
[GP]	Pre-operative shower: It is recommended to have a shower at least the night before surgery. There is no scientific evidence to demonstrate that it is better to wash with chlorhexidine, compared to a shower with soap.	**I / A** (Cochrane Database of Systematic Reviews, 2007).[7]
[GP]	Shaving hair: If necessary, the shaving of the surgical area is recommended, although the micro-abrasions that it causes, can promote the growth of micro-organisms The use of electric razor with a single use head compared to using a razor blade improves the surgical site infection rate (SSI).	**I / A** (Cochrane Database of Systematic Reviews, 2006).[8]
[GP]	Mechanical preparation of the intestine: The preparation of the intestine as a measure to avoid SSI is not recommended.	**I / A** (Cochrane Database of Systematic Reviews, 2009).[9]
[GP]	General hand hygiene: Washing hands before and after contact with the patient is a measure with indisputable benefits. Hand hygiene must be carried out with soap and water If they are not visibly soiled, an alcoholic based gel can be used.	**II / B** (Pratt R. J., 2007),[10] (OMS).[55]
[R]	Antibiotic prophylaxis: the antibiotic policy established in each health centre must be followed.	**III / D** (SING, 2008),[11] (Mensa J., 2012).[12]

[GP]	Surgical cleaning of hands: Hands must be decontaminated, in order to minimise microbial flora present in the skin. Surgical brushing with antiseptic solutions must be carried in order to eliminate micro-organisms living in the hair follicles or cracks in the skin.	**I / A** (Parienti J. J., 2002),[13] (OMS).[55]
[GP]	Use of single use or reusable operating theatre gowns: The use of surgical gowns aims to prevent the transmission of micro-organisms from the surgical team to the surgical site, as well as protecting the professional to exposure from blood and fluids.	**II / B** (Garibaldi R. A., 1986),[14] (Bellchambers J., 1999).[15]
[GP]	Antiseptic preparation of the skin: The use of alcohol chlorhexidine at 2% for the antiseptic preparation of the intact skin before surgery. The use of chlorhexidine in alcoholic solution in a concentration above 0.5% is recommended as an antiseptic of first choice to disinfect the healthy skin.	**II / B** (Darouiche R. O., 2010).[16] **I / A** (CDC, 2011).[56]
[GP]	Perioperative oxygenation: The administration of high concentrations of oxygen is recommended.	**II / B** (Greif R., 2000),[17] (Belda F. J.,2005).[18] (Pryor KO, 2004)[19].
[GP]	Irrigation of the surgical wound Subcutaneous irrigation of the surgical wound during operation with povidone iodine or with physiological saline solution at pressure has demonstrated a reduction of the SSI.	**I / A** (Sindelar W. F., 1979),[20] (Cervantes C. R., 2000).[21]
[R]	Change of bandaging: The implementation of aseptic bandaging is recommended although there is no statistically significant evidence, showing that the technique of aseptic bandaging is more useful than carrying out any other bandaging.	**IV / D** (Guía de práctica clínica para la seguridad del paciente quirúrgico).[22]
[GP]	Postoperative cleaning: The use of drinking water is effective in cleaning acute wounds and cheaper than other cleaning solutions.	**II / B** (García F. P., 2005).[23]
[R]	When the technique used is the traditional cure, the washing of the surgical wound with sterile saline serum during the first 48 hours is recommended.	**IV / D** (Guía de práctica clínica para la seguridad del paciente quirúrgico).[22]
[GP]	The cleaning shall be done with a pre-loaded syringe containing 20 cc of physiological saline solution, and a 22G calibre needle, which exerts enough irrigation pressure to eliminate devitalised tissues and remains of necrotic material, reducing both the inflammation, as well as the bacterial load.	**I / B** (J. B. I. Systematic Review; 2001).[28]

[GP]	The use of topical antibiotics has been a widespread practice traditionally, both in the prevention, as in the treatment of surgical site infection, but its use is currently not recommended, since it has been demonstrated that not only can it cause local reactions of hypersensitivity and contact dermatitis, but also increases the degree of antibiotic resistance.	**I / A** (Cochrane Database of Systematic Reviews, 2006).[31]

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11 ANNEX

ANNEX 1. HYGIENIC WASHING OF HANDS OR DISINFECTION WITH ANTISEPTIC SOLUTION (CHLORHEXIDINE, IODINE POVIDONE…)

¿Cómo lavarse las manos?

¡LÁVESE LAS MANOS SI ESTÁN VISIBLEMENTE SUCIAS!

DE LO CONTRARIO, USE UN PRODUCTO DESINFECTANTE DE LAS MANOS

Duración del lavado: entre 40 y 60 segundos

Organización Mundial de la Salud

Seguridad del paciente
Alianza mundial en pro de una atención de salud más segura

SALVE VIDAS
Límpiese las manos

La OMS agradece a los Hospitales Universitarios de Ginebra, en especial a los miembros del Programa de Control de Infecciones, por su activa participación en el desarrollo de este material.

11 TRANSLATION ANNEX 1

HOW TO WASH YOUR HANDS?

Wash hands if they are visibly dirty.

Otherwise use a disinfectant product on your hands.

Duration of washing : 40 or 60 seconds.

0 Wet hands.
1 Apply enough soap to cover all surfaces of the hands.
2 Rub hands against each other.
3 Rub the palm of the right hand against the back of the left hand by interlacing the fingers and vice versa.
4 Rub hands against each other, with the fingers interlaced.
5 Rub the back of the fingers of one hand against the palm of the opposite one, keeping the fingers together.
6 Surrounding the thumb of the right hand, rub with a rotating action and vice versa.
7 Rub the tip of the fingers of the right hand against the left palm, using a rotating action and vice versa.
8 Rinse hands.
9 Dry hands with a single use towel.
10 Use a towel to close the tap.
11 The hands are safe.

ANNEX 2. DISINFECTION OF HANDS WITH ANTISEPTIC SOLUTION (HYDROALCOHOLIC)

¿Cómo desinfectarse las manos?

¡Desinféctese las manos por higiene! Lávese las manos solo cuando estén visiblemente sucias

Duración de todo el procedimiento: 20-30 segundos

1a Deposite en la palma de la mano una dosis de producto suficiente para cubrir todas las superficies;

1b Frótese las palmas de las manos entre si;

3 Frótese la palma de la mano derecha contra el dorso de la mano izquierda entrelazando los dedos y viceversa;

4 Frótese las palmas de las manos entre sí, con los dedos entrelazados;

5 Frótese el dorso de los dedos de una mano con la palma de la mano opuesta, agarrándose los dedos;

6 Frótese con un movimiento de rotación el pulgar izquierdo, atrapándolo con la palma de la mano derecha y viceversa;

7 Frótese la punta de los dedos de la mano derecha contra la palma de la mano izquierda, haciendo un movimiento de rotación y viceversa;

8 Una vez secas, sus manos son seguras.

Organización Mundial de la Salud | **Seguridad del Paciente** — UNA ALIANZA MUNDIAL PARA UNA ATENCION MÁS SEGURA | **SAVE LIVES** Clean Your Hands

La OMS agradece a los Hospitales Universitarios de Ginebra (HUG), en particular a los miembros del Programa de Control de Infecciones, su participación activa en la redacción de este material.

Organización Mundial de la Salud, Octubre 2010

11 TRANSLATION ANNEX 2

HOW TO DISINFECT YOUR HANDS?

Disinfect hands for hygiene! Wash hands only when they are visibly dirty.

Duration of all the procedure: 20 - 30 seconds.

1 a / 1 b Put a dose of product in the palm of the hand, which is sufficient to cover all surfaces
2 Rub hands against each other.
3 Rub the palm of the right hand against the back of the left hand by interlacing the fingers and vice versa.
4 Rub hands against each other, with the fingers interlaced.
5 Rub the back of the fingers of the opposite hand, by holding the fingers.
6 Rub the left thumb using a rotating action, clasping it with the right hand and vice versa.
7 Rub the tip of the fingers of the right hand against the left palm, using a rotating action and vice versa.
8 Once dry your hands are safe.

ANNEX 3.
ANTIBIOTIC PROPHYLAXIS GUIDE FOR THE ACUTE SURGICAL WOUND

SURGICAL INTERVENTION	RECOMMENDATION	STUDY VARIABLE	DEGREE OF RECOMMENDATION	MICRO-ORGANISMS INVOLVED	RECOMMENDED PROPHYLAXIS OF CHOICE	ALTERNATIVE PROPHYLAXIS
NEUROSURGERY						
Intracranial						
Craniotomy	Recommended.	SSI.	High.[32]	S. Aureus, coagulase negative staphylococcus, streptococci, enterobacteriaceae.	Teicoplanin 600 mg iv + (cefotaxime or ceftriaxone 2 g iv).	Vancomycin 1 gr or linezolid 600 mg iv (instead of teicoplanin) and cotrimoxazole iv (instead of cephalosporin).
Shunting of the cerebrospinal fluid	Recommended.	SSI. Shunt. Infection.	High.[33]			
Spine Surgery	Recommended.	ISQ.	High.[34]		Cefazolin or cefonicid 2 gr iv.	(Teicoplanin 600 mg iv or vancomycin 1 g iv or clindamycin 600 mg) + gentamicin 3 mg / kg iv.
ORL						
Head and neck surgery (clean, benign)	Not recommended.		Low.[35]			
Head and neck surgery (clean, malignant and neck dissection)	Should be considered.	SSI.	Low.[36]	S. Aureus, anaerobic micro-organisms of the oropharyngeal flora.	Clindamycin 600 mg iv + gentamicin 3 mg / kg iv.	(Cefazolin or cefonicid 2 g iv) + metronidazole 500 mg iv or monotherapy with amoxicillin - clavulanic acid 2 g / 200 mg iv.
Head and neck surgery (contaminated/ clean-contaminated)	Recommended.	SSI.	Low.[35]			

CARDIOVASCULAR						
Pacemaker insertion	Recommended.	SSI. Any infection.	High.[37]	S. Aureus, coagulase negative staphylococcus, enterobacteriaceae, clostridia.	Cefazolin or cefonicid 2 gr iv.	(Teicoplanin 600 mg iv or vancomycin 1 g iv) + gentamicin 3 mg / kg iv.
Open Heart Surgery	Recommended.	SSI.	Low.[38]			
Amputation of the lower limb	Recommended.	SSI.	High.[39]			
Abdominal bypass and lower limbs	Recommended.	SSI.	High.[40]			
THORACIC						
Pulmonary resection	Recommended.	SSI.	High.[41]	S. Aureus, coagulase negative staphylococcus, enterobacteriaceae.	Cefazolin or cefonicid 2 gr iv.	(Teicoplanin 600 mg iv or vancomycin 1 g iv) + gentamicin 3 mg / kg iv.
BREAST						
Breast cancer surgery	Should be considered.	SSI.	High.	S. Aureus, enterobacteriaceae.	Cefazolin or cefonicid 2 gr iv.	Clindamycin 600 mg iv or teicoplanin 400 mg iv.
Mammoplasty	Recommended.	SSI 6 weeks.	Low.[42]			
Breast surgery with implant	Recommended.	SSI.	High.			
UPPER GASTROINTESTINAL						
Oesophageal surgery	Recommended.	SSI.	Very low.[43]	Enterobacteriaceae, streptococci, anaerobic flora of the oropharynx.	Cefazolin or cefonicid 2 gr iv.	Clindamycin 600 mg iv + gentamicin 3 mg / kg iv.
Gastric and duodenal surgery	Recommended.	SSI.	High.[44]			
Gastric bypass surgery	Recommended.	SSI.	Very low.[45]			
Small intestine surgery	Recommended.	SSI.	Very low.[45]			

HEPATO-BILIARY						
Hepato-bilio-pancreatic surgery	Recommended.	SSI.	High.[46]	Enterobacteriaceae, enterococci, clostridia.	Cefazolin or cefonicid 2 gr iv.	Amoxicillin - clavulanic acid 2 g / 200 mg iv or (clindamycin 600 mg iv + gentamicin 3 mg / kg iv).
Open cholecystectomy and laparoscopic	Recommended.	SSI.	High.[46, 47]			
LOWER GASTROINTESTINAL						
Appendectomy	Highly recommended.	ISQ. Abscesos intrabdominais.	High.[48]	Enterobacterias, organismos anaerobios (bacteroides).	Cephalosporin with anaerobic bacterial activity (cefoxitin or cefminox) 2 g iv.	(Metronidazole 500 mg iv or clindamycin 600 mg iv) + (gentamicin 3mg / kg iv cefazolin 2 g iv).
Colorectal surgery	Highly recommended.	SSI. Intra-abdominal abscesses.	High.[49]			
ABDOMINAL WALL						
Hernioplasty	Not recommended.	SSI.	High.[50]	S. Aureus, enterobacterias.	Cefazolin or cefonicid 2 gr iv.	Clindamycin 600 mg iv or teicoplanin 400 mg iv
SPLEEN						
Splenectomy	Not recommended (except in high-risk patients).	SSI.	High.[46]			
GYNAECOLOGY						
Caesarean section	Highly recommended.	SSI.	High.	Enterobacteriaceae, estreptococus agalactiae, enterococus, anaerobic microorganisms (Prevotella).	Cefazolin or cefonicid 2 gr iv (in anaesthetic induction or after clamping the cord).	Clindamycin 600 mg iv + aminoglycoside (after clamping the umbilical cord).
Perineal tearing	Recommended.	SSI.	Very low.[51]			

ORTHOPAEDIC AND TRAUMA SURGERY						
Open fracture	Highly recommended.	SSI.	High.[52]	S. Aureus, coagulase negative staphylococcus, enterobacteriaceae streptococci, clostridia.	Ceftriaxone 2 g iv or ertapenem 1 g iv.	Clindamycin 600 mg iv + Gentamicin 3 mg / kg iv on arrival at the A&E department. Continue with Clindamycin 600 mg iv 8 h + gentamicin 2 mg / kg iv every 8 h during 24 h.
Hip Fracture	Highly recommended.	SSI IPQ.	High.[53]	S. Aureus, coagulase negative staphylococcus, enterobacteriaceae.	Cefazolin or cefonicid 2 gr iv (repeat the cefazolin dose at 6 h). In the event of surgery with ischemia administer first dose at the time the cuff is released.	(Teicoplanin 600 mg iv or vancomycin 1 g iv or clindamycin 600 mg) + gentamicin 3 mg / kg iv.
UROLOGY						
Radical cystectomy	Recommended.	SSI.	Very low.[54]	Enterobacteriaceae, enterococci.	Ceftriaxona 1 g iv.	(Teicoplanin 600 mg iv or vancomycin 1 g iv) + gentamicin 3 mg / kg iv.
Source: own through bibliographic review.						

ANNEX 4: RECOMMENDATIONS FOR THE SURGICAL ANTISEPSIS OF HANDS (WORLD HEALTH ORGANISATION)

Classification system for Evidence of WHO[55]

CATEGORY	CRITERION
IA	Strongly recommended for its implementation and solidly supported by well designed experimental clinical and epidemiological studies.
IB	Strongly recommended for implementation and with the support of some experimental clinical and epidemiological studies and solid theoretic base.
IC	Required for its implementation according to federal or state regulations or standards.
II	Suggested for its implementation and support by indicative clinical or epidemiological studies or theoretic base or a consensus of a panel of experts.

RECOMMENDATIONS:

A. Remove rings, watches and bracelets before starting with the antisepsis of the hands for surgery **(II)**. Artificial nails are prohibited **(IB)**.
B. Sinks should be designed to reduce the risk of splashing **(II)**.
C. If hands are visibly dirty, wash them with common soap before the surgical antisepsis of hands **(II)**. Remove debris from under your fingernails using a nail cleaner, preferably under running water **(II)**.
D. Brushes for surgical antisepsis hands are not recommended **(IB)**.
E. The surgical antisepsis of hands should be done using a proper antimicrobial soap or appropriate drug alcohol-based preparation, preferably with a product that shall ensure a sustained activity before putting on gloves **(IB)**.
F. If the quality of the water in the operations room is not safe, surgical antisepsis of hands with a preparation based on alcohol before putting the sterile gloves when performing surgical procedures **(II)** is recommended.
G. When carrying out surgical antisepsis of hands using an antimicrobial soap, rub the hands and forearms during the time recommended by the manufacturer, generally 2 to 5 minutes. A long-time of rubbing is not required **(IB)**.
H. When an alcohol-based preparation surgical with sustained activity is used, follow the manufacturer's instructions for the application time. Apply the product only to dry the hands **(IB)**. Do not combine surgical rubbing of hands with the rubbing with an alcohol-based preparation consecutively **(II)**.
I. When an alcohol-based preparation, use enough to keep the hands and forearms and wet with the product during the entire procedure of surgical antisepsis of hands **(IB)**.
J. After the implementation of the alcohol-based preparation as recommended, allow the hands and forearms to dry completely before using the sterile gloves **(IB)**.

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