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## ANNEXES

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### APPENDIX I- SKIN AND BURN WOUNDS

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#### SKIN AND BURN WOUNDS IN GENERAL

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Skin, the largest organ of the body averaging 2 square meters and 5 kilos, is a very important organ. For 1 cm<sup>3</sup> of skin, there are approximately 1 meter of vessels, 100 sweat glands, 15 sebaceous glands, 4 meters of nerves, 300,000 stem cells and 10 hairs. Made up of three principal layers, the skin's role is to protect the body against injury, infection, heat and light. By its ability to store water and fat and to sweat, the skin regulates the body temperature.

As seen in Figure 1, layers of the skin include the epidermis, dermis and hypodermis where the epidermis aims to protect the body from invasion with its multi-layers of keratinocytes that stratify and form a stratum corneum. The dermis and hypodermis contain different cell types, capillaries, glands, nerves, vessels and fat.

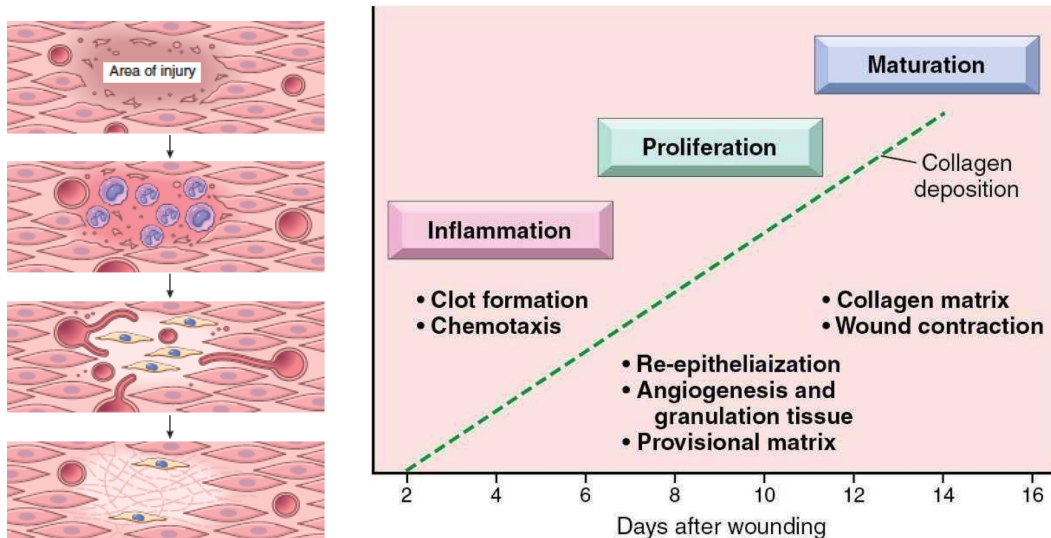
**Figure 6:** Structure of the skin (<http://biology-forums.com/index.php?action=gallery;sa=view;id=8753>)

By definition, a wound is a traumatic opening in the skin and/or associated organs. It can be an open wound when there is a traumatic rupture of the integument or a contusion when the injury is closed.

Contusions, fractures, sharp cuts, bite wounds, compression wounds, abrasions, lacerations, burns are all different types of wounds. Their pathophysiology and management differ from each other and especially for burns because all systems of the body are affected. Therefore, the management of a burn wound has to be treated as defined in Highly Specialized Medicine fields by teams of health care professionals. The involvement of Intensive Care Specialists and physicians is more important than with other traumatic wounds.



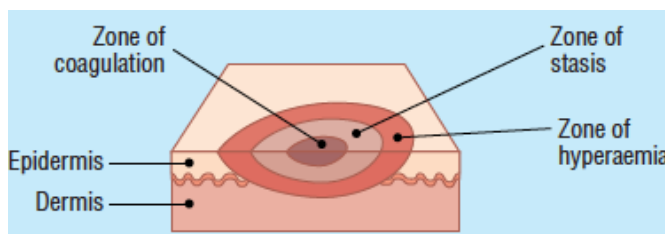




**Figure 9:** Steps of wound repair

(<https://www.studyblue.com/notes/note/n/6-wound-healing/deck/3378600>)

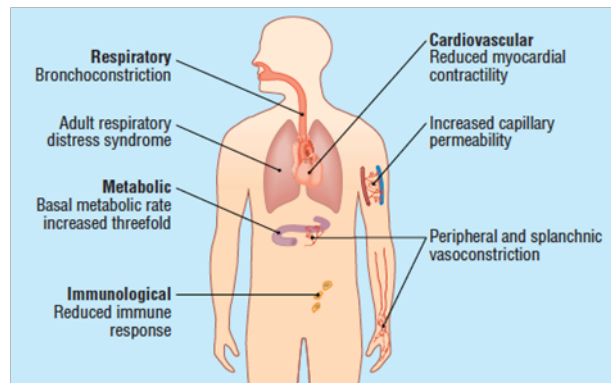
- i. The body reacts locally and systemically to burn wounds. Locally, there are three zones: Zone of coagulation is where the tissue is irreversibly lost due to the coagulation of the constituent proteins.
- ii. Zone of stasis surround the zone of coagulation. The tissue is alive and can possibly recover. In burn wound management, it is this zone that physicians have to pay particular attention to. Because of a decreased perfusion, infection and necrosis are likely to occur. Infection and decreased perfusion such as hypotension or edema can lead to death of the tissue. A good perfusion and prevention of infections are the goals of physicians.
- iii. Zone of hyperaemia is where the tissue is in an inflammatory state and will recover.



**Figure 10:** Zones of body reactions after a burn (Arturson G. *Pathophysiology of the burn wound and pharmacological treatment. The Rudi Hermans Lecture, 1995. Burns. 1996 Jun;22(4):255–74.*)

The systemic response involves cardiovascular, respiratory, metabolic and immunological reactions.

The local reaction and the inflammation begin when the burn occurs but the systemic reaction evolves over time and reaches a peak at 5 to 7 days(1). The systemic response takes place generally when 30% of the body is burned(2) but this also is dependent on anatomical sites and depth of injury. Burned tissues release toxins, free radicals and inflammatory mediators such as prostaglandins, kinins, catecholamines, glucocorticoids, interleukins, and growth factors such as tumor necrosis factor. All of these mediators induce changes in different systems throughout the body systemically.



**Figure 11:** Pathophysiology and types of burns (Arturson G. Pathophysiology of the burn wound and pharmacological treatment. The Rudi Hermans Lecture, 1995. Burns. 1996 Jun;22(4):255–74.)

- Cardiovascular reaction: in the first 48 hours burn wounds release vasoactive mediators which cause hypotension and then hypoperfusion of organs or even hypotension shock(3). Those mediators cause as well a generalized increase of the capillary permeability inducing hypoproteinemia, immunosuppression, loss of electrolytes (severe burn injuries) and a leakage of plasma from the vessels to the interstitial space called "capillary leak syndrome". Edema formation is then increased. When the sanguine pressure decreases, baroreceptors are stimulated. This causes a sympathetic reaction with release of adrenaline and noradrenaline. Those hormones constrict the vessels and then compensate the hypotension(3). A myocardial injury is likely to happen due to adrenergic stimulation which can induce arrhythmias, hypotension and hypercoagulative state present in any injury increase risks of myocardial infarction(4). Anemia is also likely to happen due to blood loss, hemolyse and infections.
- Pulmonary reaction: lungs are affected by the inflammatory state of the body and by the release of free radical. Inhaled smoke causes hypoxiemia, pulmonary arteria hypertension, increasing airways resistance by obstruction of bronches, airways edema and reduced pulmonary compliance(3).
- Renal reaction: hypermetabolic state, hypotension and diminution of the cardiac output diminish the glomerular filtration rate and blood flow to the kidneys. This may induce acute renal failure.
- Gastrointestinal reaction: decrease of the mesenteric flow and increase of basal metabolism can lead to catabolism and impair the gastrointestinal tract. Diminished nutrient absorbtion of a patient with a hypermetabolic state should be avoided(3).
- Immunological reaction: an immunosuppressive state occurs after a severe burn. Patients have more risk to develop infections and multiple organ dysfunction syndrom(3).

Increased energy consumption, immunosuppression, loss of plasma and electrolytes require compensation as fluid resuscitation and special nutrition. The body therefore needs increased calories, proteins, vitamins, oligoelements and electrolyte intake. A special nutrition is associated with lower infection rate(5) and more rapid wound healing compared to patients with without care.

Furthermore, decrease of the energy intake(6) or overfeeding(7) of burn patients can aggravate their state.

In severe burns, the capillary leak syndrome reaches the maximum in 8 hours and persists 48 hours and requires constant medical care to avoid hypovolemic shock(4).

A burn involving more than 10% of the body area in pediatric cases and 15% in adult cases may end up in hypovolemic shock without fluid compensation(4).

Many formulas estimate the amount of replacement fluid needed for the burn patient to remain hemodynamically stable for the first 24 hours. Fluid resuscitation is very important and has to be calculated as the patient can suffer from underperfusion of organs.

The Parkland formula was historically used by intensive medical care in Switzerland (Figure 7). The formula is mathematically expressed as: Volume in ml = 4 x mass of the patient in kg x percentage of burn surface area (BSA) x 100.

Too much fluid is also known to cause complications as abdominal compartment syndrome and impaired gas exchange(8). Therefore, new recommendations suggest to use Ringer Lactate at a volume of 2 to 4ml x BSA (%) x weight(8).



**Figure 12:** Parkland Formula

<https://s-media-cache-ak0.pinimg.com/736x/72/4c/20/724c20719cff2a798dce4db5b584426f.jpg>

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## MAJOR BURN CRITERIA

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Burns considered as severe are referred to a specialized burn care center. The American & European Burn Associations have defined criteria for a major burn:

- Deep burns independent of the affected body surface
- Superficial burns >20% of BSA
- Superficial burns >10% of BSA in patients >50 years
- All burns in children <10 years
- All burns of the face, as well as of the hands, feet, genitals/perineum, breasts
- Electricity-related accidents and chemical burns
- Inhalation trauma
- Burns in patients with significant secondary diagnoses which may lead to prolonged treatment
- All patients with multiple trauma and burn injuries where the main injury is the burn.

## MANAGEMENT OF BURNS

First of all, it is important to know the classification of burn degrees and the overall surface area to decide whether or not the patient requires hospitalization in intensive care and specialized burn centers or if he can be treated in out-patient care.

Basically, burns that are considered as a major burn have to be treated in a specialized burn center. Criteria defined by the American Burn Association are presented above and European criteria follow the same. Burns are considered as trauma and the management should follow the usual procedure of prehospital care. Furthermore, airway edema and inhalation injury can occur with wounds on the face or neck.

Ambulatory management depends on the degree of the burn. In case of a minor burn, it can be treated ambulatory if there is no suspicion of abuse or inhalation injury.

In this case a simple method of immediate cooling with running water is recommended to reduce the effects of the burn with 15 minutes of cool water(9). Jewellery, cloth and all objects that can constrict the body should be removed. Analgesia is always required and pain should be rapidly controlled especially before cleaning or dressing application. After cleaning with sterile water or cleaning agents like providone/iodine-solution or chlorhexidine, debridement is required if large blisters remain on the wound. At the end, dressings can be applied to prevent infections and to promote healing.

The patient should then be followed-up to control pain and if any sign of infection, scarring or contracture appear. In this case, the patient should be referred in a specialized care unit where extensive debridement can also be done(10).

Areas as face, ear, eyes, hands, feet and perineum are delicate and have to be referred to experts.

As children younger than 5 years of age have a thin skin, the burn can be deeper than initially assessed.

We can also understand that as the skin barrier is thinner as adults, children are more sensitive to infections or aggressions of antiseptic agents.



**Figure 13:** Management of burn injury. Adapted from *Ambulatory Management of Burns - American Family Physician*

## CERTIFICATE OF VERIFICATION

Awarded to the Burn Centre of (Centre Romand des Grands Brûlés)

### University Hospital CHUV

Lausanne, Switzerland

On this day of  
August 20, 2015

*For the dedicated commitment of demonstrating high standards of quality in patient care.*



Prof. dr. P. Vogt  
President European Burns Association

This verification award is in effect for five (5) years from the above date.



## APPENDIX III- MÉDICAMENTS CONTENANT DE LA CHLORHEXIDINE AUTORISÉS EN SUISSE

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[https://www.swissmedic.ch/marktueberwachung/00135/00157/00285/index.html?lang=fr&download=NHzLpZeg7t,lnp6lONTU042l2Z6ln1ae2lZn4Z2qZpnO2Yuq2Z6gpJCDdnt7gGym162epYbg2c\\_JjKbNoKSn6A--](https://www.swissmedic.ch/marktueberwachung/00135/00157/00285/index.html?lang=fr&download=NHzLpZeg7t,lnp6lONTU042l2Z6ln1ae2lZn4Z2qZpnO2Yuq2Z6gpJCDdnt7gGym162epYbg2c_JjKbNoKSn6A--)

Antébor N, solution	Hibidil, sterile Lösung
Atoseptal, atomiseur	Hibiscrub, Lösung
Bepanthen Plus, Wundspray	Keli-med, Crème
Chlorhexamed 0.1%, Lösung	Lifo-Scrub, Lösung
Chlorhexamed forte 0.2% alkoholfrei, Lösung	Malaseb ad us.vet., Shampoo
Chlorhexamed forte 0.2%, Lösung	Merfen, Tinktur
Chlorhexamed Gel 1%, Gel	Merfen, wässrige Lösung
Collu-Blache, Rachenspray	Meridol perio Chlorhexidin Lösung 0.2%, Lösung
Collunosol N, collutoire spray	Mucokehl D5, homöopathische Augentropfen
Colluspryl, collutoire nébuliseur	Neo-Angin mit Lidocain und Chlorhexidin Spray, Lösung
Collyre bleu, Laiter	Neodermovet ad us.vet., Salbe
Congo, Salbe	Novesin 0,4 %, Augentropfen
Corsodyl alkoholfrei, Lösung	Parodontosan Gel
Corsodyl, Gel	Parodontosan Spüllösung
Corsodyl, Mundwasser	Parodontosan-N, Mundwasser
Dentisept ad us.vet., Paste	PerioChip, Implant
Dentohexin, Lösung	Plak-out Spray 0,1 %
Dialens, Augentropfen	Plak-Out, collutorio
Dosiseptine, solution	Plak-Out, Gel
Drill ohne Zucker, Lutschtabletten	Plak-Out, soluzione
Drill, Lutschtabletten	Riopan Gel, Gel
Elgydium, Zahnpasta	Uro-Tainer Chlorhexidine, Lösung
Eludril mit Tetracain, Mund- und Rachenspray	Vicks Sinex, spray pour le rhume
Eludril N, Lösung für Mundspülungen	Vicks Sinex, spray-doseur
Eludril, Lösung für Mundspülungen und zum Gurgeln	Vita-Hexin, Salbe
Gem neue Formel, Halsweh-Lutschtabletten	Vita-Merfen, Salbe
Gingisan ad us.vet., Gel	Vitreolent, Augentropfen
Hexamedal, Spüllösung	

APPENDIX IV- INTERNAL PROTOCOLS OF CHUV

A. ANTISEPTIQUES ET DÉSINFECTANTS / PHARMACIE DU CHUV



CH - 1011 Lausanne

ANTISEPTIQUES ET DESINFECTANTS



Nom	Composition	Utilisation	Remarques	Conservation après ouverture	Incompatibilités
<b>A. Pour les mains</b>					
<b>Sterillium</b> (L) Teinture 100 et 500 ml	- alcools 75% m/m (45 gr 2-propanol, 30 gr 1-propanol) - ammonium quat. 0.2% (mécetronium)	Désinfection des mains du personnel soignant et des visiteurs. Désinfection chirurgicale des mains.	Frictionner avec env. 3 ml (ou 1 pression) sur des mains sèches jusqu'à évaporation complète (min. 30 secondes).	- 6 mois en distributeur - 12 mois en flacon fermé	- subst. anioniques ; ex. savons - autres antiseptiques
<b>Sterillium</b> (L) Gel 100 ml	- alcool 85% m/m (éthanol)	Désinfection des mains du personnel soignant et des visiteurs.	Frictionner avec env. 3 ml (ou 1 pression) sur des mains sèches jusqu'à évaporation complète (min. 30 secondes)	- 6 mois en distributeur - 12 mois en flacon fermé	- autres antiseptiques
<b>Alternative</b> <b>Braunosan**</b> Savon 500 et 1000 ml	- iodophore (0,78% iode)	Désinfection hygiénique et chirurgicale des mains.	Désinf. hygiénique : 5 ml + eau, frotter pdt 1 min, rincer Désinf. chirurgicale : 5 ml + eau, frotter pdt 2.5 min, rincer, répéter <b>Important</b> : voir précautions p.3	Jusqu'à date de péremption si le flacon est bien reformé après emploi	- métaux - Taurolin® (risques brûlures) - ammoniacale, acétone, essence eau oxygénée (réaction chimique) - chlorhexidine, bicarbonate ou autres subst. alcalines, argent (inactivation)
<b>B. Pour la peau intacte ou cicatrisée</b>					
<b>Destrobac**</b> (L) Teinture colorée 1000 ml	- iodophore (0,1% iode) - alcool 55% m/V (2-propanol)	Désinfection du champ opératoire ou de la peau intacte avant intervention invasive ou injections.	<b>Important</b> : voir précautions p. 3	12 semaines si le flacon est bien reformé après emploi	- métaux - ammoniacale, acétone, essence eau oxygénée (réaction chimique) - chlorhexidine, bicarbonate ou autres subst. alcalines, argent (inactivation)
<b>Hibitane* 0,5%</b> (L) Teinture 490 ml + colorant 10 ml	- chlorhexidine 0,5% - alcool 56% m/V (2-propanol) - colorant E122	Désinfection du champ opératoire ou de la peau intacte avant intervention invasive.	A utiliser sans dilution.	2 semaines après ajout du colorant, sauf si décoloration	- subst. anioniques ; ex. savons - autres antiseptiques - ions (Mg, Zn, Ca)
<b>Hibitane* 0,5%</b> (L) Teinture incolore 50 et 500 ml	- chlorhexidine 0,5% - alcool 56% m/V (2-propanol)	Désinfection du champ opératoire ou de la peau intacte avant intervention invasive, si on désire éviter une coloration (ex. parties découvertes).	Alternative en cas de contre-indication ou allergie aux iodophores.	50 ml : usage unique 500 ml : 1 mois si le flacon est bien reformé	- bicarbonate, citrate, phosphate, nitrate, sulfate (précipitation) - diverses matières comme aluminium, PP, PE, acier inox
<b>Lifo-Scrub*</b> Savon 100 (L) et 500 ml	- chlorhexidine 4% - détergents	Lavage des patients en préopératoire et/ou colonisés par des germes multirésistants.	Selon ordre médical Alternative: Braunosan savon	Jusqu'à date de péremption si le flacon est bien reformé après emploi	- subst. anioniques ; ex. savons - autres antiseptiques
<b>Softasept Plus*</b> (L) Teinture incolore 250 ml	- chlorhexidine 0,5% - alcool 56% m/V (2-propanol)	Désinfection de la peau avant prises de sang ou injections; désinfection de connexions iv, robinets et gants.			- subst. anioniques ; ex. savons - autres antiseptiques

HOS-CHUV/DCILM/PHA/VD-BH/Désinfectants 2005.doc

Version 4..1 du 08 07.2005

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## B. SCHÉMA DE DÉSINFECTION / SERVICE DES MALADIES INFECTIEUSES

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CENTRE UNIVERSITAIRE HOSPITALIER VAUDOIS

Service des Maladies Infectieuses – Isolements de médecine

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### Schéma de désinfection

PRODUIT	APPLICATION	INDICATION dans les situations décrites ci-dessus
Povidone iodée (Bétadine <sup>®</sup> ) pommade	1x/jour + après chaque selle/douche autour de l'anus (avec compresse stérile 4x4cm)	A + B + C
Chlorhexidine (Corsodyl <sup>®</sup> ) solution / Hexetidine (Hextril <sup>®</sup> ) solution / Benzylamine (Bucco-Tantum <sup>®</sup> ) solution	gargariser et cracher 10ml 3-6x/jour	A + B + C ( <b>seulement si soins de bouche nécessaires</b> ) : un produit à choix selon tolérance subjective du malade
Bacitracine-neomycine (Batramycine <sup>®</sup> ) onguent nasal	4x/jour (dans les deux narines)	B + C
Chlorhexidine (Lifoscrub <sup>®</sup> ) savon pour toilette complète	1x/jour	B + C

## Cathéter veineux central type PICCline® : Soins et surveillance

### CHANGEMENT DE VALVE ANTI-REFLUX

Si la perfusion est en cours. la stopper, puis :

- Se désinfecter les mains avec la solution hydro-alcoolique
- Mettre la protection pour le lit
- Mettre un masque
- Se désinfecter les mains avec la solution hydro-alcoolique
- Purger préalablement la valve avec du NaCl 0.9%
- Appliquer sous la valve une compresse stérile imbibée de Antiseptique alcoolique à base de chlorhexidine 2% sept®
- Rincer le cathéter pour s'assurer de la perméabilité
- Clamper le cathéter (**seul moment où l'on clampe le PICCline**)
- Retirer l'ancienne valve
- Connecter la nouvelle valve au cathéter PICC
- Déclamper le cathéter
- Retirer la seringue et la compresse
- Redémarrer la perfusion selon le cas

Se désinfecter les mains avec la solution hydro-alcoolique

Si la perfusion est en cours la stopper, puis :

- Se désinfecter les mains avec la solution hydro-alcoolique
- Mettre un masque
- Se désinfecter les mains avec la solution hydro-alcoolique
- Mettre les gants non stériles
- Se désinfecter les mains avec la solution hydro-alcoolique
- Appliquer sous la valve une compresse stérile imbibée de Antiseptique alcoolique à base de chlorhexidine 2% sept®
- Désinfecter la valve avec la compresse imbibée
- Rincer avec 10 ml de NaCl 0.9%
- Prélever immédiatement 5 à 8 ml de sang (avec la seringue de rinçage) et les jeter dans le bac prévu à cet effet
  - ✓ Sur le cathéter PowerPicc Solo®, prélever 10 ml de sang **en tirant très doucement sur le piston de la seringue** pour ouvrir la valve et permettre l'arrivée du sang et jeter la seringue.
- Prélever la quantité nécessaire de sang pour effectuer les prélèvements sanguins selon la prescription médicale avec la seringue de 10 ml vide
- Rincer avec 10 ml de NaCl 0.9%
- Retirer la seringue sans manœuvre de pression positive
- Remettre la perfusion selon le cas
- Retirer les gants et se désinfecter les mains
- Disposer du matériel souillé dans le bac prévu à cet effet

### PRELEVEMENT SANGUIN

## D. PRÉPARATION ET MANIPULATION D'UNE ALIMENTATION PARENTÉRALE TOTALE / SERVICE DE PÉDIATRIE



Département médico-chirurgical  
de pédiatrie - DMCP

Service de pédiatrie (PED)

Fiche Technique de soin

PERIMETRE D'APPLICATION: CHPH, PEDH  
SPECIALITES: Chirurgie Pédiatrique  
Gastro-entérologie Pédiatrique  
Onco-hématologie Pédiatrique  
SYSTEMES:

### TPN: Préparation et manipulation d'une alimentation parentérale totale

<b>DEROULEMENT</b>	<p><u>Montage des tubulures</u></p> <ul style="list-style-type: none"><li>- Désinfecter la surface de travail à l'alcool 70%</li><li>- Se désinfecter les mains par friction avec une solution ou un gel hydro-alcoolique</li><li>- Mettre le masque</li><li>- Se désinfecter les mains par friction avec une solution ou un gel hydro-alcoolique</li><li>- Ouvrir un champ stérile et y déposer tout le matériel selon les règles d'asepsie</li><li>- Connecter toutes les tubulures et le filtre</li></ul>
	<p>Pour éviter que le filtre soit dans le lit du patient :</p> <p>Lors d'un montage sur rampe,</p> <ul style="list-style-type: none"><li>➢ Mettre le filtre PALL® immédiatement après la rampe en prenant soin de suivre le sens de perfusion du filtre</li><li>➢ Purger tout le système avec une solution de NaCl 0.9%</li><li>➢ Mettre la tubulure de perfusion purgée de TPN sur le robinet ROUGE</li></ul> <p>Lors d'un montage seul:</p> <ul style="list-style-type: none"><li>➢ Mettre le filtre PALL® entre la tubulure de perfusion et la rallonge</li></ul> <ul style="list-style-type: none"><li>- Purger les autres tubulures au besoin</li><li>- Mettre l'extrémité de la rallonge dans une compresse stérile imbibées d'antiseptique alcoolique à base de chlorhexidine 2% et dans son emballage</li><li>- Déposer la poche de TPN sur le champ stérile et refermer le champ</li><li>- Déposer ce champ sur un chariot désinfecté</li><li>- Retirer le masque</li><li>- Se désinfecter les mains par friction avec une solution ou un gel hydro-alcoolique</li></ul> <p><u>Changement de l'alimentation parentérale</u></p> <p>Préparer au préalable les seringues de rinçage NaCl 0,9%</p> <p><i>Au lit du patient :</i></p> <ul style="list-style-type: none"><li>- Informer l'enfant et ses parents</li><li>- Installer l'alimentation parentérale sur la pompe à perfusion</li><li>- Arrêter la perfusion en cours et fermer le robinet</li><li>- Mettre le masque</li><li>- Se désinfecter les mains par friction avec une solution ou un gel hydro-alcoolique</li><li>- Mettre les gants</li><li>- Avec une compresse stérile imbibée d'antiseptique alcoolique à base de chlorhexidine 2%, tenir le robinet</li><li>- Retirer l'ancienne tubulure</li></ul>

## E. TOILETTE ET UTILISATION DE GANTS ET LINGETTES À USAGE UNIQUE / SERVICE DE MÉDECINE INTENSIVE ET CENTRE DES BRÛLÉS

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Service de médecine intensive adulte  
et Centre des brûlés

Protocole

### La toilette et utilisation de gants et lingettes à usage unique

Rédigé par : Christine Joseph, infirmière-clinicienne, spécialisée en soins intensifs	
Validé par :	
Dr. Ph. Eggimann, médecin adjoint SMIA	CMD : Valéry Plouhinec
ICUS : Stephanie Terrier	Hyg.Hosp : M.-J. Thevenin
Dernière mise à jour : 4.09.2014	Version : n° 4

#### Indications



**SINAQUA®Chlohexidine** (paquet rouge = gants) : toilette quotidienne pour tous les patients

**SINAQUA® standard** (paquet bleu = lingette) : tous les patients

NB : ne pas utiliser les gants avec Chlorhexidine 2 % sur le visage (yeux et bouche) et les muqueuses (toilette intime)

## F. ANTISEPSIE DU SITE OPÉRATOIRE / UNITÉ HYGIÈNE PRÉVENTION ET CONTRÔLE DE L'INFECTION

Hygiène Prévention  
et Contrôle de l'Infection  
Unité HPCI, Vaud

BOP: Patient - Antiseptie du site opératoire

R

Recommandation

### 1. OBJET

La préparation cutanée du site opératoire avant une opération fait partie d'un processus complet qui prend en compte **la préparation dans le service** et celle pratiquée au bloc opératoire. L'objectif de cette préparation est d'éliminer les micro-organismes superficiels de la peau en vue d'une intervention chirurgicale et de limiter ainsi les risques de contamination du site opératoire.

La préparation cutanée du patient n'est pas spécifique à un type d'intervention mais **doit être effectuée quelque soit l'opération.**

#### Détersion

Les données de littérature ne permettent pas de conclure sur l'utilité de la détersion (lavage) systématique avant l'antiseptie du site opératoire (SFHH 2013, B2). Elle est par contre recommandée lorsque la peau est souillée (C3). La détersion est décrite dans la Rec BOP : Patient – Préparation du patient à la chirurgie (REC 00071).

#### Antiseptie

Les différentes études et méta-analyses permettent de fortement recommander la désinfection large du site chirurgicale (A1). Pour ce qui est du choix du produit à utiliser, les connaissances actuelles ne permettent pas de conclure avec certitude à la supériorité de la **chlorhexidine** sur la polyvidone iodée (C2). Cependant, certaines études spécifiques tendent à démontrer une supériorité de la chlorhexidine. Les résultats des études permettent par contre de recommander de privilégier un antiseptique en

### 2. NIVEAU RECOMMANDATION :

Tableau : Niveau de recommandations de la préparation opératoire du site chirurgical

ANTISEPSIE	Niveau de la recommandation	Recommandation HPCI
<b>Chirurgie programmée et en urgence</b>		
Antiseptie du site opératoire	Fortement recommandée (CDC : II ; SFHH:A1)	L'antiseptie du site opératoire doit être large et se faire sur <u>peau propre</u>
Choix de l'antiseptique : 1. Antiseptique en solution alcoolique 2. Chlorhexidine versus polyvidone iodée	Recommandé (SFHH : B3)  Pas de recommandation (SFHH : C2)	L'utilisation d'une solution alcoolique à base de chlorhexidine est recommandée



## 5. DEROULEMENT

Une déterSION à l'aide d'un savon antiseptique peut précéder l'antiseptie si le site opératoire est fortement contaminé. Cette étape se termine par un rinçage à l'eau et un séchage.

### L'antiseptie :

- L'antiseptie du site se fait à l'aide d'un antiseptique en solution alcoolique.
- Elle doit être large et doit se faire sur une peau propre et sèche.

A privilégier : une solution alcoolique à base de chlorhexidine.

L'antiseptique utilisé en routine peut être remplacé par un produit à base d'octénidine lors d'intolérance à la chlorhexidine et à la polyvidone iodée.

L'excès d'antiseptique (solution alcoolique + **chlorhexidine** ou polyvidone iodée) qui aurait coulé **sur les parties déclives du patient doit être prévenu par des protections** en raison du risque de contact avec l'électrode neutre et de brûlure du patient.

La préparation du champ opératoire doit avoir lieu immédiatement avant l'incision.

## G. DÉCOLONISATION : INDICATION ET TRAITEMENT / UNITÉ HYGIÈNE PRÉVENTION ET CONTRÔLE DE L'INFECTION

The banner features three elements: on the left, a logo for 'Hygiène Prévention et Contrôle de l'Infection' from the 'Unité HPCI, Vaud'; in the center, the text 'ESBL - Décolonisation: indication et traitement'; and on the right, a grey box with a white 'R' in a circle and the word 'Recommandation' below it.

### TRAITEMENT DE DECOLONISATION CHEZ L'ADULTE

#### 1.1. Décolonisation digestive\*

- **Colistine sulfate (Polymyxine E) 4 x 50 mg/j par voie orale pendant 5 jours**
- +
- **Néomycin Drossapharm® 4x 1g/j par voie orale pendant 5 jours**

\*à faire préparer par la pharmacie

**Effets secondaires fréquents : nausées, troubles intestinaux**

**Contre-indications : insuffisance rénale, femme enceinte**

#### 1.2. Toilette corporelle avec savon désinfectant

Dans le but de limiter la colonisation cutanée utilisation quotidienne d'un savon désinfectant à base de **chlorhexidine** pour la toilette quotidienne pendant 5 jours



## H. ANTISEPTIQUES : PEAU ET MUQUEUSES / UNITÉ HYGIÈNE PRÉVENTION ET CONTRÔLE DE L'INFECTION

### Antiseptiques pour la désinfection de la peau et des muqueuses

Classe	Usage clinique	Spectre d'activité	Précautions / Risques	Incompatibilité	Conservation	Remarques
<b>Alcools</b> (alcool éthylique)	<ul style="list-style-type: none"> <li>Désinfection de la peau saine avant prise de sang ou injection</li> <li>Désinfection des mains</li> </ul>	Gram + : +++ Gram - : +++ Mycobactéries : ++ Spores : - Virus : + Champignons : +	<ul style="list-style-type: none"> <li>Produit desséchant</li> <li>Ne pas utiliser sur les muqueuses</li> <li>Ne pas utiliser sur les nourrissons de moins de 30 mois</li> <li>Non actif sur les spores</li> <li>Inflammable, volatile</li> </ul>	<ul style="list-style-type: none"> <li>Autres désinfectants</li> </ul>	<ul style="list-style-type: none"> <li>Jusqu'à la date de péremption</li> <li>Fermer après chaque emploi</li> </ul>	<ul style="list-style-type: none"> <li>Aucune toxicité</li> <li>Pas d'action rémanente</li> </ul>
<b>Ammoniums quaternaires</b> (Chlorure de benzalkonium)	<ul style="list-style-type: none"> <li>Utilisés en combinaison avec d'autres principes actifs: ex: solutions hydro-alcooliques</li> </ul>	Gram + : +++ Gram - : + Mycobactéries : - Spores : - Virus : +/- Champignons : ++	<ul style="list-style-type: none"> <li>Réaction d'hypersensibilité</li> <li>Doit être manipulé avec des gants si utilisé pur</li> <li>Ne pas utiliser avec les composés anioniques</li> <li>Ne pas employer sur les muqueuses</li> </ul>	<ul style="list-style-type: none"> <li>Subst. anioniques ex. savon</li> <li>Autres désinfectants</li> </ul>		<ul style="list-style-type: none"> <li>Non actif sur les spores et les mycobactéries ainsi que certains Gram nég.</li> <li>Attention à la contamination des solutions moussantes</li> </ul>
<b>Biguanides</b> (Chlorhexidine)	<ul style="list-style-type: none"> <li>En solution aqueuse pour irrigation de plaies et/ou de muqueuses</li> <li>Bain de bouche</li> <li>En solution alcoolique pour la désinfection pré opératoire de la peau</li> </ul>	Gram + : +++ Gram - : ++ Mycobactéries : - Spores : - Virus : - Champignons : +	<ul style="list-style-type: none"> <li>Légèrement irritant pour les muqueuses selon la concentration</li> <li>Pas d'application sur les méninges et le tympan lésé</li> </ul>	<ul style="list-style-type: none"> <li>Subst. anioniques ex. savon</li> <li>Ions (Mg, Zn, Ca)</li> <li>Bicarbonate, citrate, phosphate, nitrate, sulfate (précipitation)</li> <li>Aluminium, PP, PE, acier, inox</li> </ul>	<ul style="list-style-type: none"> <li>Teinture incolore: jusqu'à date de péremption si flacon bien fermé</li> <li>Teinture colorée: 2 sem. après ajout colorant</li> </ul>	<ul style="list-style-type: none"> <li>Attention à la stabilité et à la contamination des solutions</li> </ul>

## BRANCHEMENT SUR FISTULE NATIVE OU PROTHETIQUE

### **MATERIEL**

#### ***Matériel le montage du générateur***

- Selon les recommandations du fabricant

#### **Remarque :**

En fonction du type de générateur (ex Gambro, *Frésenius* 4008) et de l'état du patient, le branchement avec poche reste possible

#### ***Matériel de protection***

- Masque de soins et lunettes de protection ou masque à visière
- Masque de soins pour le patient présentant des signes d'infection respiratoire
- 2 paires de gants à usage unique non stériles
- Blouse de protection

#### ***Matériel d'évacuation des déchets***

- Sac poubelle déchets médicaux assimilés aux déchets urbains type A (©OFEFP 2004)
- Sac/bac rigide à déchets spéciaux médicaux type B1.2 (©OFEFP 2004) : déchets contenant du sang, des excréments / sécrétions présentant un danger de contamination
- Conteneur rigide type safe box pour déchets spéciaux médicaux type B2 (©OFEFP 2004) certifié UN : déchets présentant un danger de blessure

#### ***Matériel de soins***

- Solution hydro alcoolique pour la désinfection des mains

#### ***Lavage du bras porteur de la fistule :***

- 1 savon liquide
- 2 gants de toilette si lavage effectué au lit
- Essuie-mains à usage unique

#### ***Branchement :***

- 1 set de branchement stérile
- 1 antiseptique, de préférence à base de **chlorhexidine** alcoolique à 2% : les allergies du patient doivent être prises en compte lors du choix du produit. En cas d'allergie à la chlorhexidine, utiliser un antiseptique à base de povidone iodée 4% alcoolique ou d'alcool à 70% ou d'octénidine
- Spray anesthésiant si nécessaire
- 2 aiguilles à fistule



## FICHE TECHNIQUE I HYGIENE DES MAINS

### **Indications à l'hygiène des mains avec une solution hydro-alcoolique**

(Who Guidelines on Hygiene in Health Care)

- ☞ Avant contact patient
- ☞ Après contact patient
- ☞ Avant acte aseptique (propre)
- ☞ Après liquides biologiques/gants
- ☞ Après contact avec objet

### **Les produits : caractéristiques**

Groupe	Bactéries Gram +	Bactéries Gram -	Mycobactéries	Champignons	Virus	Rapidité d'action / remarques
Alcools action max. à 60% et 90%	+++	+++	+++	+++	+++	Immédiate
Chlorhexidine 2% et 4%	+++	++	+	+	+++	Intermédiaire / rare allergie

## K. PRÉPARATION DU PATIENT À LA CHIRURGIE / UNITÉ HYGIÈNE PRÉVENTION ET CONTRÔLE DE L'INFECTION



BOP: Patient - Préparation du patient à la chirurgie

R

Recommandation

### 2. NIVEAUX DE RECOMMANDATION

Tableau : Niveau de recommandations de la préparation préopératoire du patient

DOUCHE	Niveau de la recommandation	Recommandation HPCI
Chirurgie programmée		
Douche préopératoire	Niveau 1B (CDC) Niveau B2 (SFHH)	Au minimum 1 douche pour toutes interventions
Utilisation d'un savon antiseptique pour la douche	Aucune recommandation C2 (SFHH)	Au moins 1 douche avec un <u>savon à base de chlorhexidine</u> lors de chirurgie propre (classe I) avec implant
Période de la douche	Aucune recommandation C3 (SFHH)	Au moins 1 douche <u>le jour opératoire</u> avec un savon à base de <u>chlorhexidine</u> lors de chirurgie propre (classe I) avec implant
Chirurgie en urgence		
Douche préopératoire	Niveau 1B (CDC) Niveau B2 (SFHH)	Au minimum <u>1 douche lors de chirurgie propre</u> (classe I). La douche peut être remplacée par <u>l'utilisation de tissu imprégné de chlorhexidine</u> pour le lavage du corps. En dehors de la chirurgie propre, <u>la douche peut être remplacée par une déterision</u> du site opératoire.

L. DOUCHE / TOILETTE PRÉOPÉRATOIRE : TECHNIQUES ET INDICATION / UNITÉ  
HYGIÈNE PRÉVENTION ET CONTRÔLE DE L'INFECTION



BOP: Patient - Douche / Toilette préopératoire:  
technique et indication

F

Fiche technique

Principes de la technique de la douche

- Doit faire l'objet d'une information exhaustive au patient.
- Consiste en un lavage complet du corps
- Un shampoing est recommandé quand le cuir chevelu est dans le champ opératoire
- Lors de chirurgie ambulatoire, la douche se fait au domicile du patient.
- En présence de plaies ou de drains ou lors d'interventions en urgence, la douche est remplacée par une toilette complète (excepté cheveux) avec un savon antiseptique ou des lingettes imprégnées de **chlorhexidine**.
- La préférence est à donner à un savon antiseptique à base de **chlorhexidine**, qui peut être remplacé par un savon à base d'iode (polyvidone iodée) en cas d'intolérance ou d'allergie à la **chlorhexidine**.

Type de chirurgie	Nombre de douches
<b>Programmée</b>	
Chirurgie classe I :	Au moins 1 douche le jour opératoire Si 2 douches sont programmées: 1 la veille et 1 le jour op
Chirurgie classe II – III – IV	1 douche le jour opératoire
<b>En urgence</b>	
Chirurgie classe I avec ou sans implant	Au moins 1 douche le jour opératoire. La douche peut être remplacée par l'utilisation de tissu (lingette) imprégné de <b>chlorhexidine</b> pour le lavage du corps
Chirurgie classe II III et IV	La douche peut être remplacée par une détersion du site opératoire



## Pansement avec Biopatch®

Rédigé par : Christine Joseph, infirmière clinicienne, spécialisée en soins intensifs	
Validé par : Ph. Eggimann, médecin adjoint SMIA	ICUS : R. Allaire CMD : V. Plouhinec PF : V. Jacobeen EFSI : M.C. Pinõn
Dernière mise à jour : 06.08.2014	Version : n° 4

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- [Complications / Risques / Dangers](#)
- [Déroulement](#)
- [Soins et Surveillances](#)
- [Références](#)

### Définition

Le pansement antimicrobien BIOPATCH® est constitué de mousse polyuréthane hydrophile absorbante imprégnée de gluconate de chlorhexidine 2%. Cette mousse absorbe jusqu'à 8 fois son poids de liquide, tandis que le gluconate de chlorhexidine dont elle est imprégnée réduit le risque de prolifération bactérienne pendant plusieurs jours. Le gluconate de chlorhexidine à 2% est un antiseptique à large spectre antimicrobien, doté d'une action antifongique et dont l'efficacité est supérieure aux produits à base d'iode.

### Buts

Le Biopatch® se place au niveau du point de ponction, autour du cathéter. Il a pour but de prévenir les infections liées aux accès vasculaires. Il absorbe les suintements éventuels.

### Indications

- ➔ **En première intention mettre en place un Pansement Tegaderm® CHG**  
Le Biopatch® s'utilise lors de problèmes cutanés, de lésions dues à la macération, et, chez le patient brûlé, mais pas sur des plaies infectées, à l'exception de la peau brûlée.

## Pansement avec TEGADERM® CHG

Rédigé par : Christine Joseph, infirmière clinicienne, spécialisée en soins intensifs	
Validé par : Ph. Eggimann, médecin adjoint SMIA	ICUS : R. Allaire CMD : V. Plouhinec PF : V. Jacobsen EFSI : M.C. Pinon
Dernière mise à jour : 24.12.13	Version : n° 1

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- [Complications / Risques / Dangers](#)
- [Déroulement](#)
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- [Références](#)

### Définition

Le pansement Tegaderm™CHG est composé d'un film transparent adhésif et d'un tampon de gel contenant du gluconate de **chlorhexidine** (CHG) à 2%, un agent antiseptique avec activité antimicrobienne et antifongique à large spectre. Le tampon de gel absorbe les liquides. Le film transparent protège le site IV et offre une barrière efficace contre la contamination externe, y compris les liquides (le film est étanche), les bactéries, les virus et les levures

### Buts

Le Tegaderm™CHG se place au niveau du point de ponction il couvre et protège les sites de pose de cathéter et fixe les dispositifs à la peau. Il a pour but de prévenir les infections liées aux accès vasculaires.

### Indications

**Pansement Tegaderm® CHG est mis en première intention, sur toutes les voies veineuses centrales et artérielles**



## O. POSE ET ENTRETIEN DES CATHETERS VEINEUX CENTRAUX CHEZ LES PATIENTS ONCO-HÉMATOLOGIQUES / SERVICE DES MALADIES INFECTIEUSES



### Pose et entretien des cathéters veineux centraux chez les patients onco-hématologiques

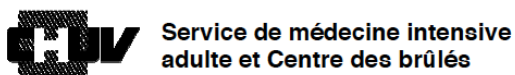
#### OBJET

Les cathéters veineux centraux sont essentiels pour une prise en charge optimale des patients hospitalisés dans l'Unité MINK. Leur utilisation est cependant grevée de complications infectieuses (les plus fréquentes sont l'infection du site d'insertion du cathéter et la bactériémie). L'infection est précédée par une colonisation de la surface externe et/ou interne du cathéter. Celle-ci est due à des micro-organismes colonisant la peau (du patient ou du personnel soignant) qui pénètrent soit par le site de ponction à travers la peau, soit par la voie endoluminale lors de l'utilisation du cathéter, p.ex. par une colonisation des bouchons, robinets, tubulures, etc.

Considérant les conséquences en termes de morbidité et de coûts des infections de cathéters veineux centraux, les stratégies de prévention recommandées sont:

- Asepsie chirurgicale lors de la pose du cathéter
  - Asepsie lors de l'entretien et utilisation du cathéter
- 
- Mettre une blouse stérile et des gants stériles
  - Désinfection large à 3 reprises (avec 3 tampons différents) du site de ponction avec Teinture de **Chlorhexidine 0.5%**® par des mouvements circulaires centrifuges, **laisser sécher après chaque désinfection (1 minute)**
  - Couvrir largement avec champs stériles
  - Préparation du cathéter veineux central en remplissant toutes les voies par du NaCl 0.9% stérile
  - Préparation du matériel selon la séquence de l'intervention
    - **Anesthésie locale et pose du cathéter (technique cf. le manuel de Matteo Monti et Gérard Weber « ABC des gestes techniques en médecine interne », 2009, Ed. Médecine et Hygiène, p 13-43)**
      - Evtl. repérage de la veine avec l'aiguille d'anesthésie
      - Vérification reflux et rinçage de toutes les voies par NaCl 0.9%
  - Nettoyer et désinfecter le site de ponction avec Teinture de **Chlorhexidine 0.5%**®
  - Fixation adéquate du dispositif qui s'insère à pression sur le cathéter par 2 points de suture
  - **Placer stérilement le pansement compresses + méfix le 1<sup>er</sup> jour. Changer par Tegaderm® I.V le lendemain**
  - Connecter le(s) système(s) de perfusion(s) et/ou liquéminer les 3 voies avec **1,5 ml** héparine 100 UI/ml

## P. CONTENU DU CHARIOT POSE PACE-MAKERS / SERVICE DE MÉDECINE INTENSIVE ADULTE ET CENTRE DES BRÛLÉS



Fiche

### Contenu du chariot pose Pace-Makers

#### Tiroir 8 :

Texte

Article	Nombre	Remarque
<b>Chlorhexidine</b> BBraun teinture colorée 0.5%, 100 ml	2	
Sérialium, 100 ml	1	
Méfix 10 cn, rouleau	1	
Boîte de masques, type 3M 1826	1	
Ruban adhésif, type Transpore® 3M	2	



Q. RECOMMANDATION POUR LA PRISE EN CHARGE PÉRI-OPÉATOIRE DE PATIENTS COLONISÉS PAR DU STAPHYLOCOQUE DORÉ RÉSISTANT À LA MÉTICILLINE (MRSA) / SERVICE DE MÉDECINE PRÉVENTIVE HOSPITALIÈRE

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**RECOMMANDATION POUR LA PRISE EN CHARGE PÉRI- OPÉATOIRE DE PATIENTS COLONISÉS PAR DU STAPHYLOCOQUE DORÉ RÉSISTANT À LA MÉTICILLINE (MRSA)**

**d. Traitement de décolonisation topique**

Dans la mesure du possible (intervention programmée), instaurer un traitement de décolonisation dans les 4 j précédant l'intervention chirurgicale (J-4) + le jour de l'intervention (J0= 5<sup>ème</sup> jour de traitement de décolonisation).

Le cas échéant, le débouter au moins la veille de l'intervention (si possible) (J-1) + le jour de l'intervention (J 0), et le poursuivre en post opératoire pour une durée totale de 5 jours :

- **Douche, ou en alternative toilette complète**, avec un savon antiseptique contenant de la **chlorhexidine** 4% (Lifoscrub® ,Hibiscrub®), en alternative un savon à base d'iode (Bétadine® savon), 1x/ jour pendant 5 jours.
  - o *Technique* : Mouiller soigneusement la peau (tête, cheveux et l'ensemble du corps). Savonner toutes les parties du corps (5 ml de solution) en insistant particulièrement au niveau des aisselles, des plis inguinaux, du périnée et de l'ombilic. **Ne pas utiliser de gant de toilette**. Laisser agir le savon au moins 2-3 minutes avant de bien rincer. Pour les interventions portant sur le cuir chevelu (neurochirurgie, chirurgie plastique), appliquer le savon désinfectant (5 ml de solution) comme un shampoing puis bien rincer.
- **Mupirocine (Bactroban®) onguent nasal** 3x/ jour pendant 5 jours.
  - o *Technique* : appliquer une pointe de pommade (environ la quantité d'une petite noisette) sur un coton tige type Q tips. Insérer le coton tige dans la narine afin de déposer la substance (s'assurer que la pommade ne reste pas au bord de la narine). Masser la narine pour répartir la pommade. Répéter la procédure pour l'autre narine.
- **Chlorhexidine 0.1% spray buccal** (Collunovar®) 3x/jours pendant 5 jours. Chez les patients porteurs de prothèses dentaires, il est souhaitable de procéder à une désinfection quotidienne des prothèses dans une solution désinfectante à base de chlorhexidine (Corsodyl®).



## Catheter veineux central: pansement, changement des lignes, robinets et autres raccords

### Pansement du site d'insertion du cathéter

Utiliser soit des compresses stériles, soit un pansement transparent hautement perméable pour couvrir le point d'insertion du cathéter:

- Comresse stérile + ruban adhésif (changement aux 48 heures).
  - Si compresses décollées, souillées ou humides: réfection immédiate.
- Pansement transparent hautement perméable (changement aux 8 jours, en même temps que le changement des tubulures).
  - Si pansement transparent décollé, souillé ou humide: réfection immédiate.

### Réfection du pansement

#### Matériel

- 1 table roulante sur laquelle disposer le matériel sous-mentionné
- 1 masque de soins
- 1 solution hydro-alcoolique pour la désinfection des mains
- 1 paire de gants non stériles
- 1 protection pour le lit
- 1 paire de ciseaux désinfectés
- 1 sac à déchets urbains
- 1 set de désinfection
- 1 pincette anatomique stérile
- Une solution alcoolique à base de **chlorhexidine** 0.5% - 2%. En cas d'intolérance à la **chlorhexidine**, une solution alcoolique ou une solution aqueuse à base d'iode, respectivement à une concentration de 0.1% (solution alcoolique) ou 10% (solution aqueuse) d'iode.
- 2 compresses fendues stériles ou 1 pansement transparent Hautement Perméable
- 1 ruban adhésif




## Toilette et pansement du patient brûlé en chambre

Rédigé par : René Allaire (ICSI), Carine Praz (ICUS), Aline Schmid (ICSI)	
Version 1 validé par : C. Joseph, S. Louis, C. Praz Version 2 validé par : P. Maravic ICUS : Stéphanie Terrier ICSI: Aline Schmid ICL : C. Joseph	
Dernière mise à jour : 24.02.15	Version : n° 2

### Déroulement des soins :

#### Déroulement des soins

1. Temps 1 : sur le 1<sup>er</sup> Foliodrape®
2. Temps 2 : sur le 2<sup>ème</sup> Foliodrape®
  - Avec des gants stériles, laver le patient avec de l'eau et le Lifo-Scrub® sur les zones « fermées » ; rincer avec de l'eau et sécher en tamponnant.
  - Utiliser les compresses stériles pour laver, rincer et sécher le patient
  - Les zones ouvertes et fragiles ne sont pas lavées mais désinfectées pendant 10 minutes avec de la Bétadine® 10% sur le corps et de la Chlorhexidine® Aqueuse 0,05% au visage.
  - Les greffes de cultures se désinfectent à la Chlorhexidine® Aqueuse 0,05%
  - Commencer toujours à enrouler les bandes de l'extrémité du membre vers le patient.
  - Lorsque les membres sont propres, rouler le 2<sup>ème</sup> Foliodrape® près du patient et emballer chaque membre dans un champ vert stérile.

 Edit this form



## Chlorhexidine for Burn Patients

I am doing my Masters in Medicine in the University Hospital of Lausanne in Switzerland under the supervision of Prof. Wassim Raffoul and Prof. Lee Ann Laurent-Applegate.

For this Masters Project, I am a doing a survey on the use of Chlorhexidine on burn wounds.

It has been shown that Chlorhexidine can induce burn wounds especially on preterm infants and have a cytotoxicity on mucous but the use of chlorhexidine has appeared to be relatively safe with low problems related to wound healing.

There are very few studies on which solution and concentration the Chlorhexidine is used.

One of these aspects of this project will be to find which form and with which concentration the Chlorhexidine is better for burn wounds, report on Standard Operating Procedure for burn cleansing and recommendations for the clinic.

Therefore, I will be very grateful if you could take the time to help me by answering some short questions as follows:

### Demographic questions

What geographical region are you from ?

- Europe
- USA
- Middle East
- Asia

What is your principal medical practice ?

- Burn care
- Plastic surgery
- Intensive care
- General surgery

What Health Care Category do you belong to ?

- Physician

- Nurse
- Pharmacist

## Please answer these questions if you use Chlorhexidine at any stage of burn treatments:

If not, please see the general questions below

Do you use Chlorhexidine on burn wounds ?

- yes
- no

If you use Chlorhexidine, with which percentage and in which solution (with OH, aqueous) ?

Do you wash the patient with water after the use of chlorhexidine or other disinfectants (i.e Betadine) ?

- yes
- no

Did you notice any side effect with the use of Chlorhexidine like toxicity, inhibition of wound healing or other complications?

- yes
- no

If yes, what did you notice ?

## General Questions for the Survey:

If no Chlorhexidine is used, which substances do you use and why ?

What is your Standard Operating Procedure (SOP) for cleaning burn wounds depending on the burn degree and TBSA ?

Do you have different SOPs depending on the age of the patients?

- yes
- no

What is your shower system and frequency?

What kind of coverage do you use after the shower/cleansing ?

- Jelonet
- Aquacel-silvercel
- Betadine with compresses
- Other

If you use other coverage, explain which coverage and why you use it.

If you use Cellular Therapie, what is your SOP for burn wound preparation before the application of any cell type or graft procedure ?

Do you use autologous cell therapies ?

- Platelet-enriched-plasma
- Autologous keratinocytes- spray
- Autologous keratinocytes-stratified sheets
- Other:

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APPENDIX VI- TABLES SUMMARIZING THE ARTICLES CITED CLASSIFIED BY CATEGORIES USED IN THE REPORT

A. CASE REPORTS

Article	Type of article	% of CHL	Exipient	Content and recomandations
Lashkari HP et al. Aqueous 2% chlorhexidine-induced chemical burns in an extremely premature infant. Arch Dis Child Fetal Neonatal Ed. 2012 Jan;97(1):F64.	Case report	2%	Aqueous	Chlorhexidine-induced burn in a premature infant Recommend to wipe the excess of chlorhexidine with normal saline solution
Kutsch J, Ottinger D. Neonatal skin and chlorhexidine: a burning experience. Neonatal Netw. 2014 Feb;33(1):19–23.	Case report			CHG does have a strong association with causing skin burns in the ELBW (extremely low birth weight) population; however, wiping the solution off of the skin seems to reduce injury
Sivathasan N et al., Chemical Burns Associated With Chlorhexidine-Alcohol Solution: An Avoidable Complication?: Journal of Burn Care & Research. 2010 Sep;31(5):833.	Review article		Alcohol	Major contributory factor is perioperative care. In this case theater staff didn't notice the excess of chlorhexidine on the body, didn't dry the torso and were unaware of the risk of a chemical injury. Recommend a specific check for pooled fluid beneath the patient (especially at the extremes of age), appropriately followed by saline rinsing and mopping until the dependent skin is completely dry. Increased vigilance/awareness regarding the dangers of chemical injury amongst all theatre staff.
Stables GI, Turner WH, Prescott S, Wilkinson SM. Generalized urticaria after skin cleansing and urethral instillation with chlorhexidine-containing products. Br J Urol. 1998 Nov;82(5):756–7.	Case report	0.5%		67 year-old man attended for routine flexible urethroscopy disinfected with chlorhexidine 0.5%. Recommend to consider alternative antiseptics and by the manufacturer to use at the lowest concentration available at 0.05%.



Sharp G, Green S, Rose M. Chlorhexidine-induced anaphylaxis in surgical patients: a review of the literature. ANZ J Surg. 2015 Sep 11;	Review of literature	of 4%		Review of 36 articles on surgical patients suffering anaphylaxis to CHL. The most commonly affected speciality was urology. The majority occurred during elective procedures. Chlorhexidine was recently noted in the five most common cause of perioperative anaphylaxis. Unfortunately, there is still a lack of CHL allergy testing in those who have suffered perioperative anaphylaxis with authors quoting as little as 4% being tested for CHL allergy. This failure is illegibly due to a global lack of recognition regarding CHL as a potential source of anaphylaxis. Recommendations are : 1.rationalization of CHL-containing products, greater vigilance 2. regarding subtle symptoms of CHL allergy, appropriate investigation of these 3. symptoms and a greater awareness of CHL-containing products. 4. appropriate investigations and highlight the need for meticulous documentation in those who are CHL allergic
Beaudouin E, Kanny G, Morisset M, Renaudin JM, Mertes M, Laxenaire MC, et al. Immediate hypersensitivity to chlorhexidine: literature review. Eur Ann Allergy Clin Immunol. 2004 Apr;36(4):123–6.	Review of literature	of		Out of the fifty case reports of chlorhexidine-related anaphylaxis published worldwide over the past ten years, fifteen occurred during surgery. If there is any suspicion of immediate allergy to chlorhexidine, prick-tests or even intradermal reaction (IDR) techniques are highly recommended. In the event of confirmed allergy to chlorhexidine, strict eviction is required, bearing in mind that over a hundred medicinal products currently on the French market contain chlorhexidine.
Wittczak T, Dudek W, Walusiak-Skorupa J, Świerczyńska-Machura D, Pałczyński C. Chlorhexidine--still an underestimated allergic hazard for health care professionals. Occup Med (Lond). 2013 Jun;63(4):301–5.	Case report			Chlorhexidine allergy can take many clinical forms, be it skin, airway or even systemic manifestations.
Sanders TH, Hawken SM. Chlorhexidine burns after shoulder arthroscopy. Am J Orthop. 2012 Apr;41(4):172–4.	Case report			3 cases of 2% chlorhexidine with alcohol burn localized in the area of the anterior arm near axillia. Authors believe that the combination of chlorhexidine, swelling and traction are responsible of the burn.

Palmanovich E, Brin YS, Laver L, Nyska M, Kish B. Third-degree chemical burns from chlorhexidine local antiseptics. <i>Isr Med Assoc J.</i> 2013 Jun;15(6):323–4.	Case report			Chlorhexidine solution can produce second and third-degree burns when used as a preoperative antiseptic solution. Recommendation : the surgeon must be alert and must carefully dry the area where a large quantity of chlorhexidine solution might accumulate.
Web page available on <a href="http://www.theguardian.com/society/2014/jun/30/premature-babies-burned-antiseptic-mhra-chlorhexidine">http://www.theguardian.com/society/2014/jun/30/premature-babies-burned-antiseptic-mhra-chlorhexidine</a>	Web page			The regulator said chlorhexidine had been identified as causing serious side effects – including burns causing skin loss in some cases and a skin condition called erythema – in 28 babies in the UK, of whom three died. It warned doctors to be careful when administering it.
Siddique H. Premature babies could get burned by antiseptic solution, warns regulator [Internet]. <i>the Guardian.</i> 2014 [cited 2016 May 25]. Available from: <a href="http://www.theguardian.com/society/2014/jun/30/premature-babies-burned-antiseptic-mhra-chlorhexidine">http://www.theguardian.com/society/2014/jun/30/premature-babies-burned-antiseptic-mhra-chlorhexidine</a>	Case report	0.5%	70% in alcohol	Case report of extensive chemical burn in an extremely low birth weight (ELBW) infant caused by clear, colourless solution of 0.5% chlorhexidine in 70% alcohol mistaken for normal saline for skin cleansing during umbilical catheter insertion. This case reflects the on going problem faced by many neonatal intensive care units of similar coloured solutions with similar packages, but with varying degrees of toxic effects.
Bringué Espuny X, Soria X, Solé E, Garcia J, Marco JJ, Ortega J, et al. Chlorhexidine-methanol burns in two extreme preterm newborns. <i>Pediatr Dermatol.</i> 2010 Dec;27(6):676–8.	Case report	0.5%		Two case reports of chemical burn after skin cleansing, due to alcoholic chlorhexidine (0.5%) use in extremely premature infants used for umbilical catheter insertion. High efficacy and a low number of side-effects from chlorhexidine have permitted avoidance of the use of mercurials and iodine derivatives, but methanol use can be unsafe in extreme preterm newborns. Recommendation : although this formulation is less concerning for use in full-term newborns, nonalcoholic preparations are preferable for use in preterm newborns.

## B. TOXICITY

Article	Type of article	Toxicity
Boyce ST, Warden GD, Holder IA. Cytotoxicity testing of topical antimicrobial agents on human keratinocytes and fibroblasts for cultured skin grafts. <i>J Burn Care Rehabil.</i> 1995 Apr;16(2 Pt 1):97–103.	Review article	Chlorhexidine 0.05% was uniformly toxic to both human cell and microorganisms
Brennan SS, Foster ME, Leaper DJ. Antiseptic toxicity in wounds healing by secondary intention. <i>Journal of Hospital Infection.</i> 1986 Nov;8(3):263–7.	Review article	Toxicity of chlorhexidine does not differ from saline water.
Hidalgo E, Dominguez C. Mechanisms underlying chlorhexidine-induced cytotoxicity. <i>Toxicology in Vitro.</i> 2001 Aug;15(4–5):271–6.	Review article	Potent antiproliferative activity. Chlorhexidine >0.001% induces a statistically significant, time- and concentration-dependent depletion of ATP compared with untreated controls. Chlorhexidine, at concentrations far below those used in clinical practice, have significant adverse effects on dermal fibroblast growth.
Severyns AM, Lejeune A, Rocoux G, Lejeune G. Non-toxic antiseptic irrigation with chlorhexidine in experimental revascularization in the rat. <i>J Hosp Infect.</i> 1991 Mar;17(3):197–206.	Review article	Wound irrigation by chlorhexidine 0.05% ,0.02% and 0.001% has a low toxicity which was comparable to physiological saline
Bonacorsi C, Raddi MSG, Carlos IZ. Cytotoxicity of chlorhexidine digluconate to murine macrophages and its effect on hydrogen peroxide and nitric oxide induction. <i>Braz J Med Biol Res.</i> 2004 Feb;37(2):207–12.	Review article	Chlorhexidine does not produce an immunostimulatory effect. However, this substance may have an immunosuppressive effect on exposed macrophages.
Ar G, Y I. Cytotoxicity of chlorhexidine. <i>Can J Ophthalmol.</i> 1975 Jan;10(1):98–100.	Review article	Chlorhexidine is safe for use on contact lenses, even when used in higher concentrations than commercially available or required for bactericidal effect

### C. EFFECTS ON WOUND HEALING-INHIBITION OF HEALING PROCESS

Article	Type of article	Inhibit the healing process and recommendations
<p>Salami AA, Imosemi IO, Owoeye OO, SALAMI A, IMOSEMI I, OWOEYE O. A comparison of the effect of chlorhexidine, tap water and normal saline on healing wounds. <i>Int J Morphol.</i> 2006;24(4):673–6.</p>	<p>Article review</p>	<p>Inhibitory effect of chlorhexidine 0.05% on healing wounds. The average number of days for wound healing to be completed in the antiseptic group was more than the other two.</p> <p>Most of the work on wound tissue that suggested the detrimental effect of antiseptics has been invitro studies that did not corroborate in-vivo studies (Drosou et al. Tatnall et al.), has shown that a lot of the cytotoxicity exhibited by antiseptics in in-vitro studies on wound tissue were due to differences in concentration of serum to antiseptics and period of exposure to the agent affected the toxicity significantly (Tatnall et al.).</p> <p>These agents should not be used on clean healing wounds. Although chlorhexidine is useful in disinfecting intact skin and cleaning dirty traumatized wounds, these agents should not be used on clean healing wounds. Their effect on the healing wound can further cause increased morbidity for the patient. Physiological saline is a widely recommended irrigating and wound dressing solution, as it is known to be compatible with human tissue ((Sibbald et al.; Morgan; Crest; Edmonds et al., 2004 and Jacobson, 2004). It causes no damage to new tissue and does not affect the functions of fibroblast and keratinocytes in healing wounds. Its effectiveness in preventing infection has not been ascertained (Morgan).</p>
<p>Morgan ED, Bledsoe SC, Barker J. Ambulatory management of burns. <i>American family physician.</i> 2000;62(9):2015–26.</p>	<p>Article review</p>	<p>Disinfectants (e.g., chlorhexidine gluconate solution [Hibiclens], povidone-iodine solution [Betadine®]) inhibit the healing process. Their use is discouraged because these agents can actually inhibit the healing process.</p>
<p>Saatman RA, Carlton WW, Hubben K, Streett CS, Tuckosh JR, DeBaecke PJ. A wound healing study of chlorhexidine digluconate in guinea pigs. <i>Fundam Appl Toxicol.</i> 1986 Jan;6(1):1–6.</p>	<p>Article review</p>	<p>Group with chlorhexidine had a delayed healing compared to the saline control animals on Days 3 and 6. Most pronounced effect observed in the animals treated with the 4% aqueous chlorhexidine solution, which had a delayed healing response through Day 9. No detectable histological differences among the animals of the various treatment groups by Days 14 and 21.</p>

Uptodate : Emergency care of moderate and severe thermal burns in children	Uptodate	Burn wounds should initially be cleaned with mild soap and water. Disinfectants are typically avoided because they may inhibit wound healing.
Paunio KU, Knuttila M, Mielitynen H. The effect of chlorhexidine gluconate on the formation of experimental granulation tissue. J Periodontol. 1978 Feb;49(2):92–5.	Journal review	Formation of granulation tissue delayed
Niedner R, Schöpf E. Inhibition of wound healing by antiseptics. British Journal of Dermatology. 1986 Aug 1;115:41–4.	Journal review	Strong inhibition by chlorhexidine. 66% decrease of thickness of the granulation layer in comparison to control, p < 0.001)

#### D. EFFECTS ON WOUND HEALING-NEUTRAL EFFECT ON HEALING PROCESS

Article	Type of article	Neutral effect on the healing process
Brennan SS, Foster ME, Leaper DJ. Antiseptic toxicity in wounds healing by secondary intention. Journal of Hospital Infection. 1986 Nov;8(3):263–7.	Journal review	Toxicity of chlorhexidine in wounds healing does not differ from saline water. There is no difference from saline on collagen production and on histologic examination
Dai T, Huang Y-Y, Sharma SK, Hashmi JT, Kurup DB, Hamblin MR. Topical Antimicrobials for Burn Wound Infections. Recent Pat Antiinfect Drug Discov. 2010 Jun 1;5(2):124–51.	Article review	Only for superficial burns, chlorhexidine does not interfere with reepithelialization.
Crosfill M, Hall R, London D. The use of chlorhexidine antiseptics in contaminated surgical wounds. Br J Surg. 1969 Dec;56(12):906–8.	Journal review	No effect on hospital stay (average stay of 8.2 days for noninflamed appendices vs. 8.3 and 8.8 for saline and no treatment groups, nonsignificant difference) -> voir si possible de changer texte car plagiat -> regarder comment c'est écrit dans l'article original
Fumal I, Braham C, Paquet P, Piérard-Franchimont C, Piérard GE. The beneficial toxicity paradox of antimicrobials in leg ulcer healing impaired by a polymicrobial flora: a proof-of-concept study. Dermatology (Basel). 2002;204 Suppl 1:70–4.	Article review	No effect (mild improvement of healing rate vs. untreated, -1-5%, non significant) -> voir si possible de changer texte car plagiat -> regarder comment c'est écrit dans l'article original
Popp JA, Layon AJ, Nappo R, Richards WT, Mazingo DW. Hospital-acquired infections and thermally injured patients: chlorhexidine gluconate baths work. Am J Infect Control. 2014 Feb;42(2):129–32.	Article review	No delay of wound healing
Uptodate : Local treatment of burns/ Topical antimicrobial agents and dressings	Uptodate	Chlorhexidine dressings do not interfere with wound reepithelialization in contrast to silver sulfadiazine.

## E. EFFECTS ON WOUND HEALING-HELP THE HEALING PROCESS

Article	Type of article	Help the healing process
Sanchez IR, Swaim SF, Nusbaum KE, et al. Effects of chlorhexidine diacetate and povidone iodine on wound healing in dogs. <i>Vet Surg</i> 1988;17(6):291-5.	Journal review	At 0.05% chlorhexidine is more beneficial to wound healing than irrigations with normal saline alone. Concentration of chlorhexidine which are cytotoxic in vitro does not interfere with wound healing in vivo.
Drosou A, Falabella A, Kirsner RS. Antiseptics on wounds : an area of controversy. <i>Wounds</i> . 2003;15(5):149–66.	Article review	Relatively safe with little effect on the wound healing process, and its use may favor healing of open wounds in risk for infection. However, the results from studies to date are insufficient to draw conclusions about the use of chlorhexidine on open wounds. More human trials need be performed to assess its efficacy and safety.

## F. EFFECTS ON INFECTIONS

Article	Type of article	Effect on infections
Gunjan K, Shobha C, Sheetal C, Nanda H, Vikrant C, Chitnis DS. A comparative study of the effect of different topical agents on burn wound infections. <i>Indian J Plast Surg</i> . 2012 May;45(2):374–8.	Journal review	Chlorhexidine was checked at three different concentrations and had excellent activity up to 0.5% concentration; the effect was marginally reduced for 5/44 <i>Pseudomonas</i> at 0.25% concentration
Snelling CF, Inman RJ, Germann E, Boyle JC, Foley B, Kester DA, et al. Comparison of silver sulfadiazine 1% with chlorhexidine digluconate 0.2% to silver sulfadiazine 1% alone in the prophylactic topical antibacterial treatment of burns. <i>J Burn Care Rehabil</i> . 1991 Feb;12(1):13–8.	Journal review	Washing of the wounds of 65 patients with chlorhexidine gluconate 4% during daily dressing changes was associated with reduced wound colonization by <i>S. aureus</i> (35% versus 51%, $p = 0.03$ ) and <i>P. aeruginosa</i> (8% versus 16%, $p = 0.08$ ) when compared to the 188 washed with nonantibacterial soap. Chlorhexidine, whether added to the topical agent silver sulfadiazine (chlorhexidine digluconate 0.2%) or in the bath soap (chlorhexidine gluconate 4%), decreased colonization by <i>S. aureus</i> .

Sanchez IR, Swaim SF, Nusbaum KE, Hale AS, Henderson RA, McGuire JA. Effects of chlorhexidine diacetate and povidone-iodine on wound healing in dogs. <i>Vet Surg.</i> 1988 Dec;17(6):291–5.	Article review	More bactericidal activity of chlorhexidine than saline and providone-iodine and more beneficial to wound healing. Concentration of chlorhexidine which are cytotoxic in vitro does not interfere with wound healing in vivo.
Rubin C, Louthan RB, Wessels E, McGowan M-B, Downer S, Maiden J. Chlorhexidine gluconate: to bathe or not to bathe? <i>Crit Care Nurs Q.</i> 2013 Jun;36(2):233–6.	Article review	Greater reduction of Hospital acquired infections compared to bathing with soap and water. Bathing with Chlorhexidine gluconate can reduce the number of HAIs.
Vernon MO, Hayden MK, Trick WE, Hayes RA, Blom DW, Weinstein RA. Chlorhexidine gluconate to cleanse patients in a medical intensive care unit: the effectiveness of source control to reduce the bioburden of vancomycin-resistant enterococci. <i>Archives of Internal Medicine.</i> 2006;166(3):306–12.	Article review	Cleansing patients with chlorhexidine- saturated cloths is a simple, effective strategy to reduce VRE contamination of patients’ skin, the environment, and health care workers’ hands and to decrease patient acquisition of VRE.
Uptodate : Complications, diagnosis, and treatment of odontogenic infections	Uptodate	Chlorhexidine 0.12 percent oral rinse can be used in most cases. Use of topical fluorides and oral antimicrobial rinses, such as chlorhexidine for high-risk patients.
Bhate D, Jain S, Kale R, Muglikar S. The comparative effects of 0.12% chlorhexidine and herbal oral rinse on dental plaque-induced gingivitis: A randomized clinical trial. <i>J Indian Soc Periodontol.</i> 2015 Aug;19(4):393–5.	Journal review	0.12% CHX mouth rinse effectively reduced the clinical symptoms of plaque-induced gingivitis
Uptodate : Epidemiology and prevention of infections and antimicrobial resistance in the intensive care unit	Uptodate	Bathing patients daily with chlorhexidine gluconate is an effective method of decreasing both hospital-acquired infections and colonization with drug-resistant organisms among patients in the ICU, as demonstrated in many studies [81-94]. Despite the limitation of some of these studies, given apparent benefits, the low rate of associated adverse effects, and the relative ease of implementation, we recommend daily chlorhexidine bathing for all ICU patients.
Popp JA, Layon AJ, Nappo R, Richards WT, Mazingo DW. Hospital-acquired infections and thermally injured patients: chlorhexidine gluconate baths work. <i>Am J Infect Control.</i> 2014 Feb;42(2):129–32.	Journal review	Decrease of HAI rate in an intensive care unit to zero with use twice a day of chlorhexidine 0.9% for bathing. No delay of wound healing.

D'Avignon LC, Saffle JR, Chung KK, Cancio LC. Prevention and management of infections associated with burns in the combat casualty. J Trauma. 2008 Mar;64(3 Suppl):S277–86.	Journal review	A broad-spectrum surgical detergent such as chlorhexidine gluconate should be used. The most commonly employed topical antimicrobials for the prevention and treatment of burn wound infection are mafenide acetate, silver sulfadiazine, silver nitrate solution, and silver-impregnated dressings.
Lee I, Agarwal RK, Lee BY, Fishman NO, Umscheid CA. Systematic Review and Cost Analysis Comparing Use of Chlorhexidine with Use of Iodine for Preoperative Skin Antisepsis to Prevent Surgical Site Infection. Infect Control Hosp Epidemiol [Internet]. 2010 Dec [cited 2015 Sep 30];31(12). Available from: <a href="http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3833867/">http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3833867/</a>	Web page	Preoperative skin antisepsis with chlorhexidine is more effective than with iodine for preventing Surgical Site Infection and results in cost savings.
Hannan MM, O'Sullivan KE, Higgins AM, Murphy A-M, McCarthy J, Ryan E, et al. The Combined Impact of Surgical Team Education and Chlorhexidine 2% Alcohol on the Reduction of Surgical Site Infection following Cardiac Surgery. Surg Infect (Larchmt). 2015 Aug 10;	Article review	Significant lower SSI infection rates in cardiothoracic surgeries use of Chlorhexidine as pre-operative antiseptic in a risk-adjusted cohort with education of the surgical team with when compared with API. "Emphasis must be placed on the multifactorial approach required to prevent postoperative wound infection" phrase piquée de l'article
Climo MW, Sepkowitz KA, Zuccotti G, Fraser VJ, Warren DK, Perl TM, et al. The effect of daily bathing with chlorhexidine on the acquisition of methicillin-resistant Staphylococcus aureus, vancomycin-resistant Enterococcus, and healthcare-associated bloodstream infections: results of a quasi-experimental multicenter trial. Crit Care Med. 2009 Jun;37(6):1858–65.	Article review	Daily chlorhexidine bathing among ICU patients may reduce the acquisition of MRSA and VRE.
Uptodate : Chlorhexidine gluconate/ Drug information	Uptodate	"Do not routinely apply to wounds which involve more than superficial layers of skin. Avoid repeated use as general skin cleansing of large surfaces (unless necessary for condition) Chlorhexidine has activity against gram-positive and gram-negative organisms, facultative anaerobes, aerobes, and yeast; it is both bacteriostatic and bactericidal, depending on its concentration.
Eiselt D. Presurgical Skin Preparation With a Novel 2% Chlorhexidine Gluconate Cloth Reduces Rates of Surgical Site Infection in Orthopaedic Surgical Patients: Orthopaedic Nursing. 2009 May;28(3):141–5.	Article review	SSI rates reduced by 50% with 2% chlorhexidine cloth before surgery



Uptodate : Basic principles of wound management	Uptodate	For wound irrigation, the addition of dilute iodine or other antiseptic solutions (eg, chlorhexidine and hydrogen peroxide) is generally unnecessary.
Noto MJ, Domenico HJ, Byrne DW, Talbot T, Rice TW, Bernard GR, et al. Chlorhexidine Bathing and Healthcare-Associated Infections: A Randomized Clinical Trial. JAMA. 2015 Jan 27;313(4):369–78.	Article review	In this pragmatic trial on 9340 patients, daily bathing with chlorhexidine did not reduce the incidence of healthcare-associated infections including central line-associated bloodstream infections, catheter-associated urinary tract infections, ventilator-associated pneumonia, or C. difficile. These findings do not support daily bathing of critically ill patients with chlorhexidine.
Alawadi ZM, Kao LS. Chlorhexidine gluconate, 4%, showers and surgical site infection reduction. JAMA Surg [Internet]. 2015 Aug 26 [cited 2015 Sep 30]; Available from: <a href="http://dx.doi.org/10.1001/jamasurg.2015.2219">http://dx.doi.org/10.1001/jamasurg.2015.2219</a>	Web page	Although there is clear biological rationale for chlorhexidine gluconate in terms of reduction of skin microbial burden, clinical evidence of benefit has been lacking. (! article Preoperative bathing or showering with skin antiseptics to prevent surgical site infection. Cochrane Database Syst Rev. 2015;2: CD004985.) Aqueous chlorhexidine gluconate, 4%, and a 1-minute pause before rinsing resulted in a maximal chlorhexidine gluconate skin surface concentration ; this level was well above the minimum inhibitory concentration for most surgical wound pathogens. However, skin chlorhexidine gluconate concentration is only a surrogate outcome, and past experience has shown that improvements in surrogate outcomes do not always translate into better clinical outcomes.
Crossfill M, Hall R, London D. The use of chlorhexidine antiseptics in contaminated surgical wounds. Brit J Surg 1969;56(12):906-8.	Journal review	No effect (overall sepsis rate 13.2% vs. 12.2% and 14.1% for saline and no treatment groups, nonsignificant difference)
Dai T, Huang Y-Y, Sharma SK, Hashmi JT, Kurup DB, Hamblin MR. Topical Antimicrobials for Burn Wound Infections. Recent Pat Antiinfect Drug Discov. 2010 Jun 1;5(2):124–51.	Article review	Clinical studies demonstrate that the majority of bacteria and yeast, with the exception of mycobacteria, are eradicated by chlorhexidine. In vitro studies have demonstrated chlorhexidine's ability to broaden silver sulfadiazine's antimicrobial profile because of its activity against Staphylococcus species.

## G. EFFECT ON BURN WOUNDS

Article	Type of article	Effect on burn wounds
Tiwari VK. Burn wound: How it differs from other wounds? Indian J Plast Surg. 2012;45(2):364–73.	Journal review	"Burn wounds as mentioned earlier are sterile in the beginning. Only organism present are those which are deep seated in the epithelial appendages of the hair follicles and sebaceous glands. Some of these organisms may multiply and come to the surface of the burned skin. Therefore, dressing of burn wound by antimicrobial agent helps in killing of these organisms and keeps the wound sterile for a longer period. The topical agents used in burn wound dressing also prevent entry of new organisms from the exterior. Burn wound may take several weeks to heal completely and will require dressing change several times during this period with same antibacterial cream. There should be minimal emergence of resistance amongst the organism against the antimicrobial agent. Considering all these criteria, 1% silver sulfadiazine cream is one of the best available cream for extensive burn dressing."
Church D, Elsayed S, Reid O, Winston B, Lindsay R. Burn wound infections. Clin Microbiol Rev. 2006;19:403–34.	Article review	Damage to skin following a burn disrupts the innate immune system and increases susceptibility to bacterial infection
Wasiak J, Cleland H, Campbell F. Dressings for superficial and partial thickness burns. Cochrane Database Syst Rev. 2008;(4):CD002106.	Cochrane review	There was no significant difference in mean time to wound healing between hydrocolloid dressing and chlorhexidine impregnated paraffin gauze dressing.
Uptodate : emergency care of moderate and severe thermal burns in children	Uptodate	Burn wounds should initially be cleaned with mild soap and water. Disinfectants are typically avoided because they may inhibit wound healing.
Waitzman AA, Neligan PC. How to manage burns in primary care. Can Fam Physician. 1993 Nov;39:2394–400.	Article review	"Topical chemoprophylaxis should not be used routinely on small burns but is useful for large burns to reduce the incidence of burn wound sepsis"

Uptodate : local treatment of burns/ Topical antimicrobial agents and dressings	Uptodate	In our practice, we generally prefer to begin with well-moistened soft gauze or cotton laparotomy pads. When more aggressive debridements are required, we will often use well-moistened chlorhexidine surgical scrub brushes. Chlorhexidine — Chlorhexidine gluconate, a long-lasting antimicrobial skin cleanser, is often used with a gauze dressing for burn wound coverage in superficial partial-thickness burns. Chlorhexidine dressings do not interfere with wound reepithelialization in contrast to silver sulfadiazine [1,6]. (1 : Wasiak J, Cleland H, Campbell F. Dressings for superficial and partial thickness burns. Cochrane Database Syst Rev 2008; :CD002106.) 6 : Hartford CE, Kealey GP. Care of outpatient burns. In: Total Burn Care, Third edition, Herndon, DN (Eds), 2007. p.67.
D'Avignon LC, Saffle JR, Chung KK, Cancio LC. Prevention and management of infections associated with burns in the combat casualty. J Trauma. 2008 Mar;64(3 Suppl):S277–86.	Journal review	A broad-spectrum surgical detergent such as chlorhexidine gluconate should be used.
Uptodate : Topical antimicrobial agents for the management of superficial partial thickness burns	Uptodate	Only superficial burns. Does not interfere with reepithelialization.
Dai T, Huang Y-Y, Sharma SK, Hashmi JT, Kurup DB, Hamblin MR. Topical Antimicrobials for Burn Wound Infections. Recent Pat Antiinfect Drug Discov. 2010 Jun 1;5(2):124–51.	Article review	Chlorhexidine performed as well as silver sulfadiazine
Miller LM, Loder JS, Hansbrough JF, Peterson HD, Monafo WW, Jordan MH. Patient tolerance study of topical chlorhexidine diphosphanilate: a new topical agent for burns. Burns. 1990 Jun;16(3):217–20.	Article review	Formulations at or below 0.5 per cent chlorhexidine-diphosphonate, a new topical agent, may prove acceptable for wound care.
Monafo WW, West MA. Current treatment recommendations for topical burn therapy. Drugs. 1990 Sep;40(3):364–73.	Article review	May be useful in isolated clinical situations
Noronha C., Almeida A. LOCAL BURN TREATMENT - TOPICAL ANTIMICROBIAL AGENTS. 2000 Dec;13(4).	Article review	Addition of other drugs such as chlorhexidine and norfloxacin seems reduce the emergence of bacterial resistance.

<p>Burn Wound Infections Treatment &amp; Management: Medical Care, Surgical Care, Consultations. 2016 May 9 [cited 2016 May 25]; Available from: <a href="http://emedicine.medscape.com/article/213595-treatment">http://emedicine.medscape.com/article/213595-treatment</a></p>	<p>Web page</p>	<p>Wound care should be directed at thoroughly removing devitalized tissue, debris, and previously placed topical antimicrobials. A broad-spectrum surgical antimicrobial topical scrub such as chlorhexidine gluconate should be used along with adequate analgesia and preemptive anxiolytic in order to permit adequate wound care.</p>
<p>DeSanti L. Pathophysiology and current management of burn injury. <i>Adv Skin Wound Care</i>. 2005 Aug;18(6):323–32; quiz 332–4.</p>	<p>Article review</p>	<p>Open areas are gently cleansed daily with a dilute chlorhexidine solution to remove crust and surface exudate</p>
<p>McManus AT, Denton CL Mason AD, Jr. Topical chlorhexidine diphosphanilate (wp-973) in burn wound sepsis. <i>Arch Surg</i>. 1984 Feb 1;119(2):206–11.</p>	<p>Article review</p>	<p>Chlorhexidine diphosphanilate and sulfadiazine silver were effective against both aeruginosa and P mirabilis. Control results indicate the mortality observed was related to infection and that placebo cream had no significant antimicrobial activity. The development of sulfonamide-resistant gram-negative organisms has been associated with the use of sulfadiazine silver.<sup>15</sup></p> <p>Chlorhexidine is as active as sulfadiazine silver in the models of invasive burn wound sepsis tested and that no evidence of cross resistance with sulfonamide-resistant strains was observed. These data suggest that chlorhexidine diphosphanilate should be evaluated in a clinical trial for use as an alternative topical therapy for the burn wound.</p>
<p>Patel PP, Vasquez SA, Granick MS, Rhee ST. Topical antimicrobials in pediatric burn wound management. <i>J Craniofac Surg</i>. 2008 Jul;19(4):913–22.</p>	<p>Journal review</p>	<p>Chlorhexidine has a broad-spectrum antimicrobial activity; the chemical precipitates cellular contents by destroying the bacterial cell wall and cytoplasmic membranes.<sup>42,57,58</sup> Clinical studies demonstrate that the majority of bacteria and yeast, with the exception of mycobacteria, are eradicated by chlorhexidine. Recently, increased resistance has been noted with certain bacterial strains such as Proteus. Its clinical use is typically seen in conjunction with silver sulfadiazine. In vitro studies have demonstrated chlorhexidine's ability to broaden silver sulfadiazine's antimicrobial profile because of its activity against Staphylococcus species. Other studies have confirmed that chlorhexidine reduces the colonization of S. aureus.<sup>57</sup> Chlorhexidine's clinical effectiveness in pediatric burn injuries is still undergoing further study; however, it is currently widely used in Australia. Local pain is the most frequent adverse effect seen. Ototoxicity is rarely reported.<sup>58</sup></p>

<p>Acar A, Uygur F, Diktaş H, Evinç R, Ulkür E, Oncül O, et al. Comparison of silver-coated dressing (Acticoat®), chlorhexidine acetate 0.5% (Bactigrass®) and nystatin for topical antifungal effect in <i>Candida albicans</i>-contaminated, full-skin-thickness rat burn wounds. <i>Burns</i>. 2011 Aug;37(5):882–5.</p>	<p>Article review</p>	<p>The burn wound represents a site susceptible to opportunistic colonization. <i>P. aeruginosa</i> is one of the most prevalent bacteria in our burn patient population. In the present study, the results showed that SS was the most potent antipseudomonal agent in our experimental study. It prevented the colonization of the <i>P. aeruginosa</i> in all of the tissues, including eschar, which the other agents could not achieve. The main disadvantage with using SS is that it is commonly applied at least twice a day. Although there is need to change SS dressings frequently, it is logical to do so when treating <i>P. aeruginosa</i>-contaminated burn wounds. In conclusion, the animal data suggest that SS is the most effective agent in the treatment of the <i>P. aeruginosa</i>-contaminated burn wounds and that Acticoat™ can be a choice of treatment because its use limits the frequency in which one must replace the wound dressings.</p> <p>CA is another skin antiseptic choice that we use very often in the burn treatment. CA is effective against most Gram-positive and Gram-negative bacteria in addition to some fungi.<sup>13</sup> Acid fast bacilli and heat-resistant bacterial spores are not susceptible to the lethal action of chlorhexidine, even in strong concentrations at room temperature. The adsorption of chlorhexidine in organic matter, pus, serum, and blood will cause a reduction in the amount of chlorhexidine available for reaction with bacterial cells. A 0.5% solution of CA in 70% isopropyl alcohol is used for preoperative disinfection of the skin. It has greater activity in alkaline media. Chlorhexidine disrupts cytoplasmic membranes and, importantly, remains active for at least 6 hours after application. Its rapid uptake, with maximal absorption within 20 seconds, and prolonged effect (&gt;6 h) make chlorhexidine a very potent agent.<sup>14</sup></p>
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