WHASA consensus document on the management of Acute Thermal Burns

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INTRODUCTION

Burns are amongst the most common and devastating forms of trauma. Increased morbidity and mortality accompany thermal injury and survival is very dependent on correct assessment and management. Although acute treatment regimens and dressing selection have evolved and tremendously improved outcome, deep burn injury often leaves the patient with serious cosmetic and functional disabilities which may lead to a lifetime of ongoing problems.

The real incidence or prevalence of burn injuries in South Africa has not been fully estimated. It is well established that burns are the leading cause of non-natural death in infants and children aged less than 5 years of age, and the 4th major cause of accidental death within the 5-9 year old age group.[1] (Cox et al SAMJ 2011)

This document has been adapted from the published guideline document issued by the South African Burn Society [2](Karpelowsky et al SAMJ2007)* which refers to acute thermal burn management. All effort has been made to search for the best level of evidence for the recommendations made in this document, in order to offer healthcare professionals involved with burns management an evidence-based approach needed for decision making.

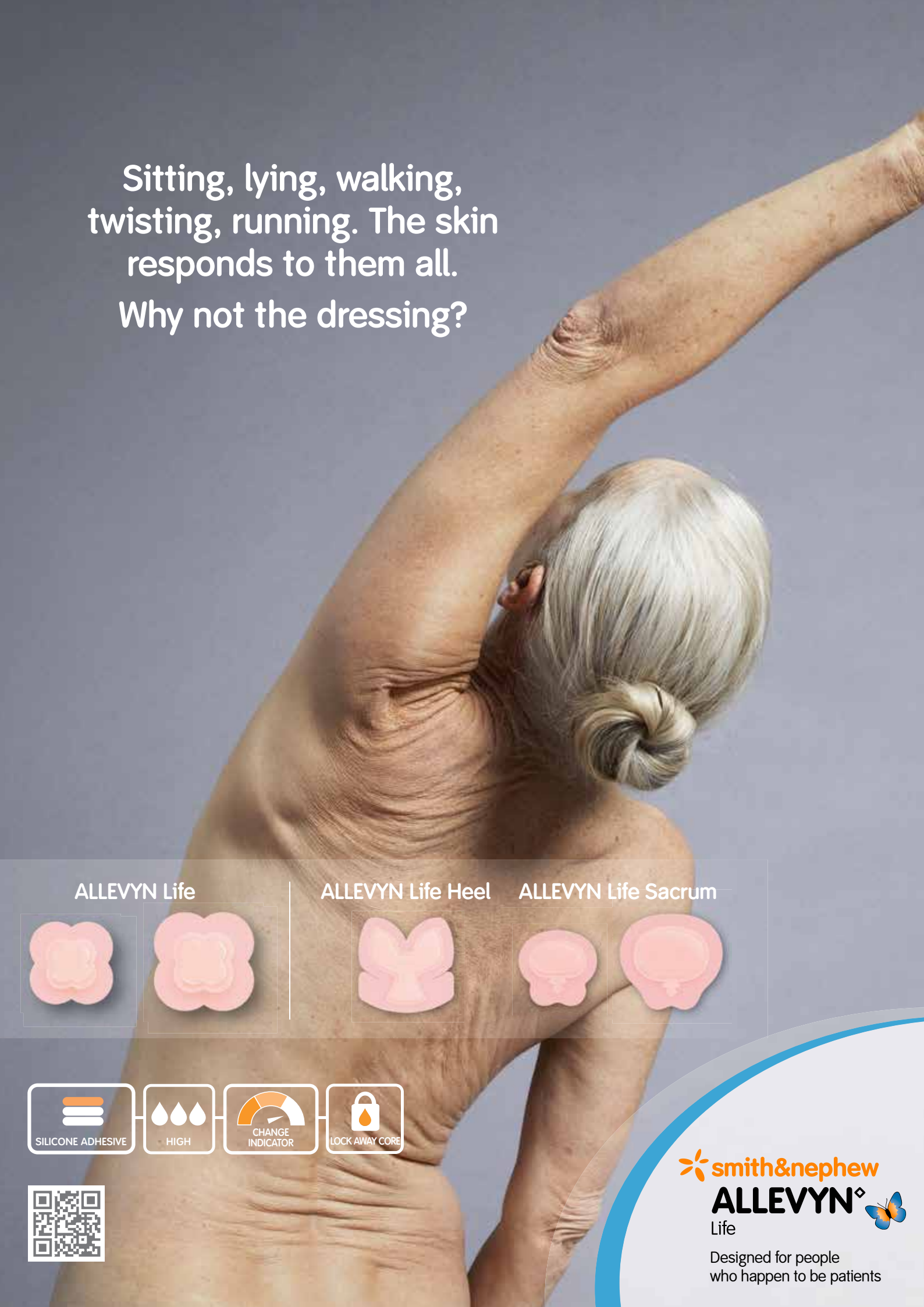
Key message of this document
Optimise the crucial first period post-burn. Optimum outcome cannot be achieved once time for early intervention has lapsed.

METHOD

An expert collaboration panel group from all walks of clinical care assembled for two days in Gauteng, South Africa, to discuss and formulate a consensus document on the Management of Acute Thermal Burn Injury as a guide for wound care practice in South Africa. Attendees were selected based on their clinical expertise and background in general surgery, paediatric burn care, critical care, wound management, reconstructive surgery, product application and managed health care.

The Burn team consisted of members of whom 69% had more than 15 years of experience and 50% of them specialists (surgery and, nursing). Panel participants were asked to review all the literature pertaining to their area of expertise and present their findings during the meeting in a format based on the Wound Bed Preparation Paradigm.[3] The purpose was not to reinvent the wheel but rather to put forward the South African voice and experience within a list of recommendations. The list of recommendations was presented on day 2 to the full audience where a modified Delphi method was used (on the day) to evaluate the recommendations proposed by each team to generate at least an eighty percent immediate consensus for each recommendation.

As verification of this, an online-based modified Delphi method was used where each team member voted independently to verify the initially reached recommendation strength. Thereafter it was verified by an independent second panel consisting of national and international experts who were not part of the panel. A 4-point Likert scale (strongly agree, partially agree, partially disagree, strongly disagree) was used with space for individual comments. Each item to be included in this document has achieved eighty percent agreement


Sitting, lying, walking, twisting, running. The skin responds to them all.
Why not the dressing?
ALLEVYN Life
ALLEVYN Life Heel
ALLEVYN Life Sacrum
SILICONE ADHESIVE
HIGH
CHANGE INDICATOR
LOCK AWAY CORE
smith&nephew
ALLEVYN Life
Designed for people who happen to be patients

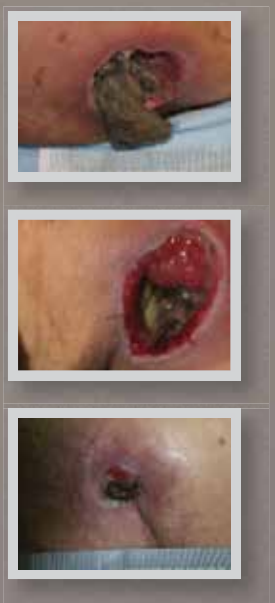
ALLEVYN◇ Life Dressings: Designed to provide an optimal patient experience

94% of clinicians would recommend ALLEVYN Life for use in their practice[1]

For people living with wounds 24/7, wound care means far more to them than physical healing. At Smith & Nephew we want people to feel good whilst healing happens. With our uniquely shaped, secure-fitting, wide-bordered dressings, wound care patients feel less like patients, and more like people.[2–4]

- **Quadrilobe shape for a secure fit**
  Conforms closely to the body, optimising dressing changes and minimising wastage,[1] while allowing patients to shower[2–4]
- **Discretion layer for patient confidence**
  Minimises the visual impact of strikethrough (in-vitro),[5] giving patients discretion, optimising dressing changes[1] and reducing wastage
- **Silicone wound contact layer for gentle removal**
  Gentle on the skin, providing minimal pain on dressing removal[6]
- **Lock-away layer providing patient peace of mind**
  Excellent fluid locking under pressure *(in-vitro)*, provides reassuring leakage prevention *(in-vitro)*.[7] Common wound odour absorption when tested *in-vitro* on representative compounds[8]
- **Cushioning layer for maximum protection**
  The dressing's multi-layered design provides cushioning and helps to spread pressure *(in-vitro)*,[9] so patients can feel protected from everyday knocks and bumps.[10]

ALLEVYN Life -at-work: Case study of Mr A[11]



Treating a rapidly deteriorating pressure ulcer

- Male, early eighties, with limited mobility, incontinence and poor nutrition
- Malodorous, grade III, sacral pressure ulcer, covered in slough with high exudate
- Current dressing changed at least once a day, often much more frequently

Clinical aims

- Improve nutrition and reduce the wound bed's necrotic burden
- Find a dressing that stays in place, minimises odour and effectively manages exudate

Finding the right treatment solution

- ALLEVYN Life was selected as a secondary dressing to manage exudate and odour, and stay in place
- DURAFIBER™ribbon was selected to absorb and retain a large amount of exudate

Treatment success (After 6 weeks)

- Wound continued to improve with considerable reduction in wound size, malodour completely resolved and exudate effectively managed
- ALLEVYN Life stayed in place securely and dressing changes reduced to twice a week, assisted by the change indicator
- Mr A's physical and social quality of life improved significantly

Looking for ALLEVYN Life? Reach for the packaging with the blue band...

ALLEVYN Life			
S&N Code		Size (cm)	Carton
66801067		10.3cm x 10.3cm	10
66801068		12.9cm x 12.9cm	10
66801069		15.4cm x 15.4cm	10
66801070		21cm x 21cm	10
66801304	Heel	25cm x 25.2cm	5
66801306	Sacrum	17.2cm x 17.5cm	10
66801307	Sacrum	21.6cm x 23cm	10

References: 1. Stephen-Haynes *et al*, An appraisal of the clinical performance and economic benefits of a silicone foam in a large UK primary care organisation. Journal of Community Nursing 2013. **2.** Smith & Nephew data on file report OR-DOF 020 An open, prospective, randomised, comparative volunteer trial to compare the performance of silicone adhesive dressings. Mepilex™ Border. **3.** Smith & Nephew data on file report OR-DOF 041 An open, prospective, comparative volunteer trial to assess the retention qualities of ALLEVYN Life and Biatain™ Silicone. **4.** Smith & Nephew data on file report OR-DOF 011, Results from a multi-centre, non-comparative clinical in market evaluation of ALLEVYN Gentle Border dressing and from Open, prospective randomised, within volunteer comparison of Dakota and Mepilex Border in terms of showerproof and use on awkward areas. Hussein D; August 2010. **5.** Smith & Nephew data on file report DS/12/129/DOF Simulated wound model testing of ALLEVYN Life and Mepilex Border. **6.** Rossington *et al*, Clinical performance and positive impact on patient wellbeing of ALLEVYN Life. Wounds UK, Vol 9, No 4. 2013. **7.** Smith & Nephew data on file report DS/12/130/DOF Simulated wound model testing of ALLEVYN Life and Mepilex Border. **8.** Smith & Nephew data on file report DS/12/127/DOF Odour reducing properties of ALLEVYN Life. **9.** Smith & Nephew data on file report DS/12/185/DOF Impact protection properties of ALLEVYN Life, Mepilex Border and Biatain Silicone. **10.** Smith and Nephew data on file report OR-DOF/024 - An open, prospective, randomised, volunteer trial to assess ALLEVYN Life dressings in terms of volunteer's perception of protection. **11.** ALLEVYN Life in the treatment of category 3 pressure ulceration. Debbie Simons.

VAR11ALL01

(either strongly agree or partially agree) by all panels. This process took 24 months to complete.

CONTRIBUTORS

Clinical expert Panel Members:

Alan Widgerow (Plastic and Reconstructive surgeon), **Alan Rogers** (Plastic and Reconstructive surgeon), **Hiske Smart** (Project Coordinator – RN), **Saleigh Adams** (Plastic and Reconstructive surgeon), **Liljana Delectic** (Wound practitioner – RN), **Liz Wilson-Chandler** (Wound Practitioner – RN), **Adelin Muganza** (Plastic and Reconstructive surgeon – MD), **Thabo Mokhobo** (Nurse Educator – RN),), **Heinz Rode** (Plastic and Reconstructive surgeon), **Maria Giaquinto** (Plastic and Reconstructive surgeon)

Industry representative panel members:

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Theoretical base of Acute thermal wound: Pathophysiology

A burn injury is damage to the skin caused by excessive heat or caustic chemicals. [4] It is not only a local injury- the burn wound, but involves a systemic response to the body that may lead to the death of the patient, depending on the extent of the burned area, the depth of the injury, the anatomical area involved, the age of the patient, the presence of co-morbidities and lung involvement.

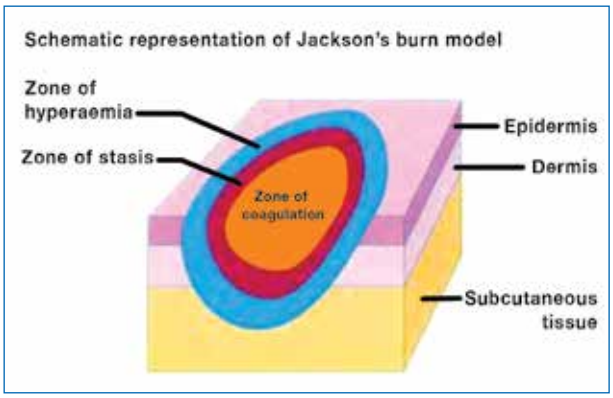
The central zone of the burn wound (Fig.1) relates to the most severe tissue damage – coagulative necrosis devoid of blood supply. Surrounding this zone is an area of relative ischaemia characterized by stasis of blood flow. The outer layer of the burn wound represents increased flow and vessel reactivity with a hyperaemic appearance.

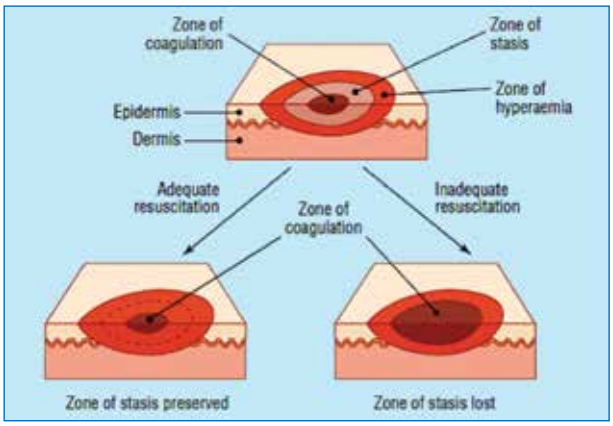
Since superficial and most partial thickness burns (Table I) have remnants of epithelium, healing for these types of wounds involves re-epithelialisation. For very superficial burns, such as sunburns the process of re-epithelialisation is usually complete within 3-4 days. Little treatment is needed to manage these wounds other than a protective dressing (film) and possibly a moisturizer.

Once the burn extends into the dermis (superficial & mid dermal partial thickness), the entire epidermis regenerates from the wound edges and the adnexal structures. Basal keratinocytes at the wound edge and the adnexal epithelial cells are stimulated to migrate on to the surface of the wound, provided inflammation and bacterial colonisation are controlled and a healthy dermal wound bed has been established. As the epithelial cells migrate up from the adnexa, whitish dots (epithelial buds) appear on the wound bed. Wounds with the highest concentration of skin adnexa heal the fastest. This is the reason why partial thickness scalp wounds heal within 5-10 days, while areas lacking hair, such as the lower legs in older people, take longer to re-epithelialise.[6]

It has been shown that maintaining a moist and viable wound bed leads to more rapid re-epithelialisation than if the wound is allowed to dry out. [7] If the wound dries and forms a "scab" (composed of fibrin, dead neutrophils and other debris), then the keratinocytes have to "cut" their way along the viable surface by releasing proteases and other enzymes, and the time to epithelialisation will be much longer. [8]

As opposed to superficial or dermal burns, full thickness burns involve areas of central necrosis and coagulation that needs to be excised and grafted as soon as possible. Re-epithelialisation does not take place due to lack of adnexal structures, and healing depends on the contraction of the wound edges which may take longer. In the absence of active intervention (through excision of the compromised





Figures 1 & 2: Schematic representation of acute burn wound according to Jackson's model.[5]

Table 1: Classification and characteristic of burn wounds according to depth of the injury. (Adapted from EMSB manual 2011)[9]

Skin Depth	Cause	Surface/colour	Pain
Superficial (epidermal)	Sun, flash, minor scald	Dry, erythema, brisk capillary return	Painful
Partial thickness (superficial dermal)	Scald	Moist, pale pink, with broken blisters, brisk capillary return	Painful
Partial thickness (mid dermal)	Scald, flame, contact	Moist, dark pink, sluggish capillary return	May or not be painful
Partial thickness (deep dermal)	Scald, flame, contact	Moist, blotchy red, white, mottled,	Painless
Full thickness	Flame, severe scald	Dry, charred whitish, absent capillary return, leathery	Painless

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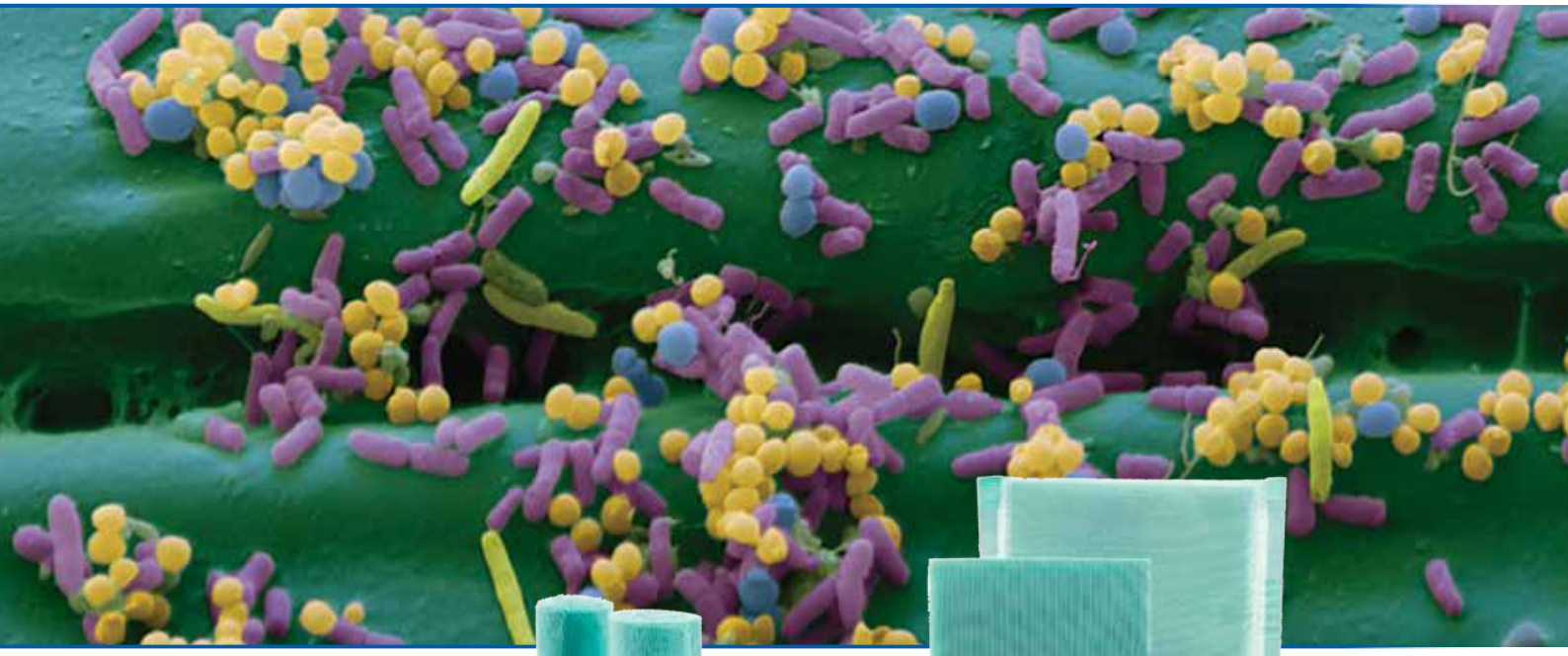

Wound bacteria and fungi
Staph. aureus (yellow), *Pseudomonas* (purple) and *Klebsiella* (green) bound to Cutimed Sorbact.
(Magnification x4000)

DACC antimicrobial dressings

Safe.[1] Innovative. No contra-indications.[2]

CUTIMED SORBACT is the only range of dressings coated with DACC that can reduce the microbial load. In a moist environment, bacteria and fungi will bind to the dressing helping to kick start the healing process.[3,4]

1) Haycocks S, Chadwick P (2011). Use of a DACC coated antimicrobial dressing in people with diabetes and a history of foot ulceration. Wounds UK Vol 6 No 4 2) Powell G (2009) Evaluating Cutimed Sorbact: using a Case Study Approach. British Journal of Nursing 18 (15): S30. S32-S36 3) Ljungh et al (2006) Using the principle of hydrophobic interaction to bind and remove wound bacteria. Journal of Wound Care, 15 (4): 175 80 4) Hampton S (2007). An evaluation of the efficacy of Cutimed Sorbact in different types of non-healing wounds. Wounds UK Vol 3 No 4.

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Figure 2: Quick reference guide for Management of Acute Thermal Burns following the format based on the Wound Bed Preparation Paradigm.[3]

Recommendations for Management of Acute Thermal Burns		Agreement
1	**Assess patient ability to heal and treat the cause**	
	• Determine the extent of the burn wound	
	- Care for extremes of age	100%
	- The hand of the patient may help to estimate the extent of burns	84.6%
	• Determine the depth of the burn wound	
	- Use capillary filling to help determining depth	96.1%-100%
	• Determine the anatomical area involved	
	- Care for hands, joints, circumferential burns	100%
	• Identify co-morbid factors	96.1%-100%
2	**Develop an individualized plan of care**	
	• Superficial burns re-epithelialise within 3-4 days with little care	100%
	• Dermal burns will need moisture to heal	100%
	• Full thickness burns will need excision and grafting to heal	96.1%
3	**Assess and support individualized patient-centred concerns**	
	• Use first aid measures to reduce impact of the burn injury	96.1%-100%
	• Follow the emergency treatment guidelines applicable to burn trauma for life threatening injuries	100%
	• Start enteral feeding early	100%
	• Assess, relieve and keep levels of pain under control	100%
4	**Local wound care**	
	• Debride loose skin and remove all exudate from burn wound	96.1%
	• Choose a dressing that is appropriate to prevent colonisation of the wound , minimize pain, ensure adequate moisture that is conducive to optimum wound healing	100%
5	**Advanced therapies**	
6	**Educational aspects to deal with post-burn care issues**	
	• Post burn care relies on education that incorporates Long term care actions and life style adaptations to promote better quality of life	96.1%-100%

tissue and replacement by skin grafting), the contraction may lead to secondary contractures and deformities of the adjacent structures.

As burn management is a complex process involving multiple specialties with seemingly simultaneous interventions, this document aims to create an understanding for the rationale and decisions taken by burns teams to guide the clinician, who deals with the wound care part, to be evidence informed and continue the work already achieved towards a patient centred and patient acceptable outcome. Table II depicts a quick reference guide for Recommendations for Management of Acute Thermal Burns, following the format based on the Wound Bed Preparation Paradigm.

EXTENT - TBSA (Total Surface Body Area) Calculation
Accurate calculation – Lund & Browder
Estimation – Rule of 9's and hand palmar surface

Assess patient ability to heal and treat the cause

1. **The assessment of the extent (Figures 2, 3 and 4) and depth (Table I) of burn injury is very important in relation to management and prognosis.**

Recommendation 1 A1	Agreement: 100%
The extremes (youngest and oldest) of age and the extent of the burn directly affect clinical outcome.	

Recommendation 1 A2	Agreement: 84.6%
The hand of the patient is 1% TBSA. It is useful for small and scattered burns. Can be used for subtraction e.g. to subtract for parts of a burnt arm. **The exception is for the burnt hand that will be equal to 8% TBSA burn.**	

Recommendation 1 B1	Agreement: 96.1%-100%
The depth of a Burn can clinically be assessed by the appearance of capillary filling: • Superficial (epidermal) with blanching, good capillary filling • Partial thickness dermal is often difficult to assess and needs re-assessment every 48 h • Superficial dermal with brisk capillary filling; • Mid dermal with mottled sluggish capillary return • Deep dermal with absent capillary return • Full thickness with absent capillary return	

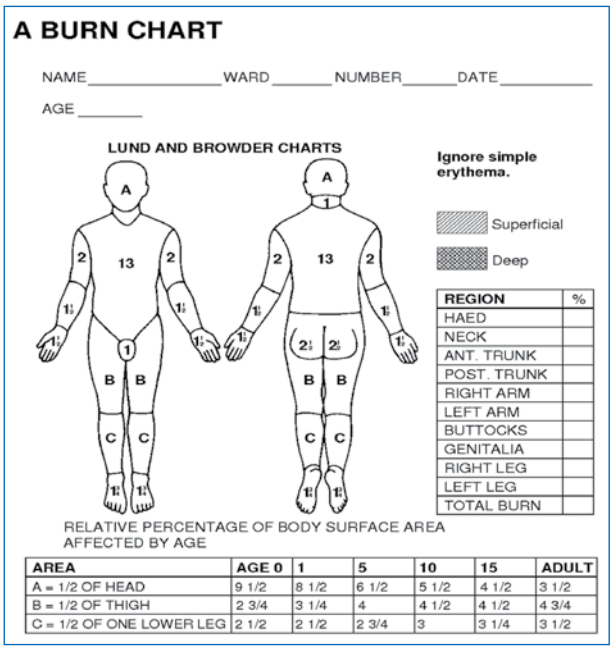

Figure 2: Lund and Browder chart for calculation of body surface area burned.

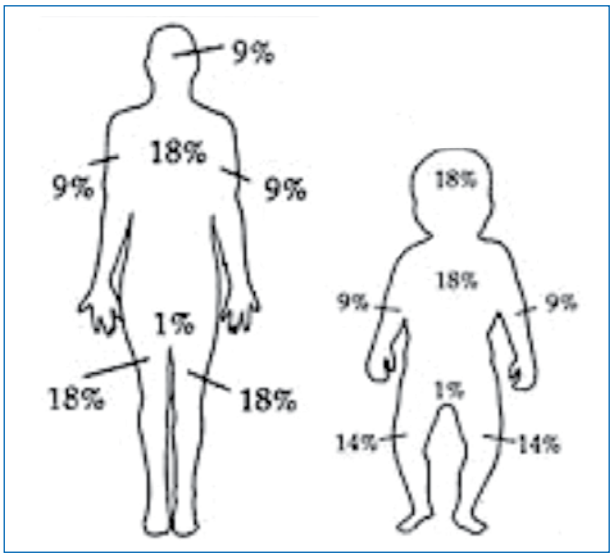

Figure 3:" Rule of Nines" for estimation of body surface area burned (adjusted for age: head larger + lower limbs shorter in child). Estimation is not as accurate but often more practical than Lund & Browder chart.

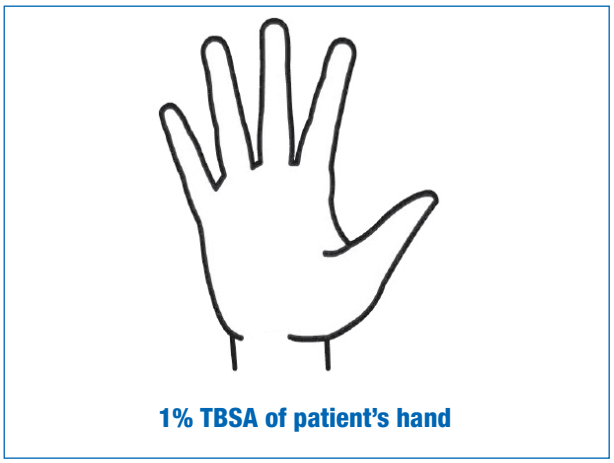

Figure 4: Estimation of burned area by the hand of patient

Recommendation 1 C1	**Agreement: 100%**
The anatomic location (hands, flexion contractures, circumferential burns) dictate the method of treatment and management.	

Certain co-morbid diseases impact greatly on the prognosis of the burn wound outcome. These may be especially relevant to the South African situation:

Recommendation 1 D	**Agreement: 96.1%-100%**
Special treatment and management considerations are indicated for: • HIV (CD4 counts <200 indicates poor prognosis in burn patients) • Tuberculosis • Diabetes Mellitus Type 1 & 2 • Obesity • Epilepsy • Drug eruption (TENS or Steven-Johnson) • Medication and recreational drug abuse.	

2. Develop an individualized plan of care

The aim is to individualise a plan of care as the life of the burn victim is at stake and should receive priority. In order to incorporate quick action of management of cause and effect, an interprofessional team need to be part of the process from admission to after care.

CAUSES OF BURN INJURY
Thermal (scald, flame, flash), chemical, electrical, radiation, contact, friction, radiant heat.

Since superficial and most partial thickness burns have remnants of epithelium, healing for these involves re-epithelialisation.

Recommendation 2.1	**Agreement: 100%**
For very superficial burns, such as sunburns the process of re-epithelialisation is usually complete within 3-4 days. Little treatment is needed to manage these wounds other than a protective dressing (film) and possibly a moisturizer.	

Once the burn extends into the dermis (superficial & mid dermal partial thickness), the entire epidermis regenerates from the wound edges and the adnexal structures.

Recommendation 2.2	**Agreement: 100%**
It has been shown that maintaining a moist and viable wound bed in superficial to mid dermal partial thickness wounds leads to more rapid re-epithelialisation than if the wound is allowed to dry out.	

Recommendation 2.3	**Agreement: 96.1%**
As opposed to superficial or dermal burns, full thickness burns involves areas of central necrosis and coagulation that needs to be excised and grafted as soon as possible.	

3. Assess and support individualized patient centred concerns

3.1 First aid treatment

The application of timely and effective first aid measures such as **cold running water for 20 minutes given within the first three hours after injury can have a beneficial effect** on the zone of

Table 3: Emergency First Aid measures

Priority	Actions	Caution
STOP the burning process	Remove patient from the source of injury. • If on fire STOP, DROP, COVER face & ROLL • Remove hot, scalding or charred clothing.	Avoid self-harm during above steps.
COOL the burn wound	Cool burn with cold running tap water for at least 20 minutes • Ideal water temperature for cooling is 15°C, range 8°C to 25°C • Keep the remaining areas dry and warm to avoid hypothermia. If patient's body temperature falls below 35°C - stop cooling.	NO ICE NO TOOTHPASTE NO HOMEMADE REMEDIES NO BUTTER NO WET TOWELS
COVER the burn wound	Where the surface is blistered and/or raw, the wound should be covered with a dressing. In the absence of any wound dressings, cover the wound with **plastic film wrap or clean cloth to keep the burn wound clean** until definitive management can occur. It protects against colonisation and excess fluid and heat loss. **Plastic film wrap is a suitable dressing for patients being transferred to the burns unit.**	Avoid wrapping affected area circumferentially with plastic film wrap as this can have a tourniquet effect as oedema worsen.
CONSULT medical help	Children Elderly Hands and face See appendix 2 and 3	**DO NOT WAIT**

stasis by stopping the burning process and assisting in cell survival. Conversely the lack of effective first aid can lead to an increased chance of further tissue necrosis as the zone of stasis can progress to coagulation.

Recommendation 3.1	**Agreement: 96.1%-100%**
First aid measures that is a priority: • **Stop** the Burning process • **Cool** the burn wound • **Cover** the burn wound • **Consult** medical Help	

IMPORTANT NOTES

ICE causes vasoconstriction, hypothermia AND burning if directly against the skin.

RUNNING WATER duration at least 20 minutes unless other factors prevent this (e.g. large burn causing rapid heat loss, hypothermia, and multiple trauma).

PREVENT WET TOWELS as they heat up quickly. IF all available: use 2 moistened towels/pads and alternate at 2 minute intervals.

REMOVE any jewellery or constrictive clothing as soon as possible.

3.2 Emergency treatment

Recommendation 3.2	**Agreement: 100%**
Life threatening burn injuries are treated as per all acute emergency situations with some esoteric differences applicable to the burn injury – thus do **ABCDEF:**	

Airway maintenance with cervical spine control (early intubation with significant inhalation injuries; check for carbon monoxide poisoning: non-burnt skin may by cherry pink in colour in a non-breathing patient)

Breathing and Ventilation – limitation of chest expansion may necessitate escharotomy (see appendix 1)

Circulation – check peripheral pulses, capillary blanching test to assess circulation problems and the need for escharotomy (appendix 1) on that limb; stop any obvious bleeding with direct pressure.

Disability: Neurological Status – alert responsive/unresponsive to vocal or painful stimuli

Exposure with Environmental Control - remove all clothing and jewellery; keep patient warm; remove wet sheets and examine posterior surfaces for burns and other injuries.

Fluid Resuscitation – the usual primary component of resuscitation in acute burn injuries.

Other patient centred aspects also form part of emergency care and need early intervention to be immediately lifesaving and reduce potential mortality and morbidity further down in the timeline of events.

Recommendation 3.3	**Agreement: 100%**
Start Enteral Feeding early	

Recommendation 3.4	**Agreement: 100%**
Assess, relieve and keep levels of wound related pain under control by appropriate analgesics administered 30 mins prior to dressing change and by using non adherent silicone based dressings.	

Once the life of the patient is saved and the trauma is brought under control the team has responsibilities to conduct a secondary survey to complete the clinical picture of the patient they are dealing with.

History needs to be **AMPLE**
Allergies; **M**edications; **P**ast Illnesses; **L**ast Meal;
Events/**En**vironment related to injury

When a patient is stabilized and first line of actions are all performed it is time to gather all relevant information not yet obtained, to ensure

Table 4: Critical burn care interventions

Fluid resuscitation for major burn wound patients		
Who	**How**	**What**
>10% for children, >15% for adults.	• •Calculate the %TBSA burnt. • •Insert 2 large bore, peripheral IV lines preferably through unburned tissue. • •Collect bloods simultaneously for essential base line bloods – FBC/EUC/ LFT. /Type & Screen/Coagulations/ Drug/alcohol screen/ Amylase/Carboxyhaemoglobin if available • •Obtain patients body weight in **kg.**	Intravenous Hartmann solution At an initial rate of the **Parkland Formula** **BUT adjust according to urine output**
Fluid requirement Calculation Formula 2-4mls x kg x % TBSA burnt = IV fluid mls to be given in the 24hrs following injury		
When	**Make sure of**	**Vigilance needed**
Give ½ of this fluid in the first 8hrs from the time of injury Give the other ½ of this fluid in the following 16hrs	Children less than 30kg require maintenance fluids in addition to resuscitation fluids. Insert a urinary catheter for all burns. IV Hartmann's is adjusted each hour **according to the previous hour's urine output**.	**Urine output maintained at a rate** **Adult 0.5–1 ml/kg /hr** **Children 0.5–2ml/kg/ hr** **AIM for 1 ml/kg/hr in children**
The infusion rate is guided by the urine output, not by formula.		
Consider patient response:	**Adjustments needed:**	**Additional need if:**
Hourly urine output, Heart rate Blood pressure.	If urine output <0.5mls/kg/hr **increase** IV fluids by 1/3 of current IV fluid amount. If urine output >1ml/hr for adults or >2ml/kg/hr for children **decrease** IV fluids by 1/3 of current IV fluid amount.	Pigmenturia (dark red, black urine): (Pigmenturia occurs with thermal damage to muscle e.g. electrical injury). Inhalation Injury. Delayed resuscitation.
REMEMBER: Choose the 2-4 mls according to local circumstances.		

Table 5: Patient centered concern interventions

	Procedure	**Rationale**
Nutrition **EARLY ENTERAL FEEDING** is vital and forms part of the pillars of acute burn management	Insert nasogastric/ nasoduodenal tube for larger burns or if associated injuries: >20% TBSA in adults; >15% TBSA in children; *If feed unavailable initially, commence 5% dextrose water via the nasogastric tube*	Reduce the hyper-metabolic state that occurs in major burns Decreases the likelihood of gastric stasis which would prohibit adequate nutrition so vital to burns.
Pain relief	Give morphine (or other appropriate analgesia) slowly, intravenously and in small increments according to pain score and sedation scale.	Stabilize metabolism
Pain control (for dressing changes)	Three drug classes – Sedative/hypnotic; Anti-inflammatory; and Opiate analogues *(administered 30 min prior to dressing change)* Non adherent silicone based dressings	Prevents a wind-up phenomenon: allodynia (exaggerated reaction to stimuli)

Gather information from the patient or others on the following:

Date and time of burn injury,
Date and time of first presentation.
Source of injury and length of contact time.
Clothing worn.
Activities at time of burn injury.
Adequacy of first aid.

that all aspects of the patient's life is taken in consideration. This is the process needed for determining the best specialties to be included in the interprofessional team to guide this patient through the process of saving life, tissue and future.

Table 7: Final assessment priorities

Secondary head to toe assessment		
P	Perform	Head to toe examination
R	Re-assess	A, B, C, D, E and F
E	Elevate	The affected limb above the heart line
C	Commence	A circulation chart
E	Escharotomy	To relief compromised tissue
P	Psycho-social care	Support to victim
T	Tetanus prophylaxis	If needed
O	Ongoing information	To the family as support
R	Reachability	Of direct family- document mobile numbers
S*	Special observations	Haemoglobin/haemoatocrit Urea/creatinine Electrolytes Urine microscopy Arterial blood gasses

*An expert or specialist, such as a physician, who gives practical experience and training to astudent, especially of medicine or nursing

4. Local wound care

Burn dressing selection revolves around the depth and extent of the injury, the cause of the burn, anatomic location, contamination or sepsis, exudate level and local patient factors such as pain.

Newer therapies for burn wounds have improved outcome. For burns less than 10% (even less than 20% in some cases, non-circumferential) consider debriding, applying antimicrobial modern dressing and or a skin substitute and discharging the patient same day or in the following day. The dressing combination (although costly per unit cost) allows the patient to be discharged cost-effectively and results in better healing outcomes.

Additionally some dressings have anti-inflammatory component added to their anti-microbial properties, which have shown to be beneficial to healing and outcome. The principle in burn wound dressing concern is avoidance of infection – thus, depending on the extent of the burn, speed of microbial killing, sustained efficacy, longer duration of action to avoid multiple dressing changes and creation of a moist environment conducive to healing, those are all considerations when choosing a particular dressing.

4.1 Cleansing and Debridement

To ensure the above principles are achieved, the following **concepts** for burn wound management should be followed:

Recommendation 4.1	**Agreement: 96.1%**
Debride loose skin and remove all exudate from burn the wound surface	

Sharp debridement should be carried out by experienced practitioners

Special Considerations to take into account for cleansing and debridement situations:

- Assess and monitor for possible hypersensitivity or allergic response to products.
- Burns to scalp and excessively hairy areas should be shaved to allow initial burn wound assessment and ongoing wound management, and preventing folliculitis. Ideally this should extend 2-5cm past the boundary of the burn to ensure full visualisation and prevent hair impeding skin regeneration.
- The necessity for this procedure should be discussed with the patient: some religious beliefs preclude cutting of the hair under normal circumstances, and may cause great distress if the rationale is not understood.
- Burn wounds are an excellent medium for bacterial contamination, colonisation and localized infection, which may spread, resulting in systemic infection.
- Topical antimicrobial therapy should be started as early as possible to prevent burn wound infection
- Prophylactic antibiotics are not routinely given to burn patients, as they do not reduce the risk of infection.
- Antibiotics should only be given to patients with known infection, and are prescribed according to known sensitivity profiles and in consultation with the resident microbiologist/infectious disease specialist.

Table 8: Cleansing and debridement priorities and procedures

Cleansing and debridement		**Agreement**
Outcome aimed for:	• The burn wound surface should be free of loose slough, exudate, clots/crusts and creams - Remove exudate and creams	**100%**
	• Eschar and loose tissue should be non-surgically removed where possible	**96.1%**
	• Adherent dead and devitalised tissue should be surgically debrided	**96.1%**
	• Damaging to the healing burn wound bed must be prevented at all times	**100%**
	• Bacterial contamination and infection must be prevented	**100%**
	• Psychological trauma must be minimized and managed.	**100%**
	• The wound should be assessed and re-assessed on a regular basis.	**100%**
Preparation:	The patient should be well informed about the procedure. Environment and equipment must be adequately prepared: i.e. warm environment, heated fluids, use of Bair huggers etc. The patient with an acute large TBSA burn wound should be washed and dried within 30 minutes or less, if possible. Longer sessions may cause heat loss, pain, stress and sodium loss (water is hypotonic). Bathroom/wash area should be well heated.	
Procedure:	Cleanse the wound gently to remove loose devitalised tissue, exudate, old dressings and/or creams. Wash with soft gauze or sterile hand towels soaked in diluted solution such as Chlorhexidine Gluconate (diluted in water 1:2000). Clean and wash unburnt parts of the body to maintain hygiene. Dry the patient well: moisture left behind may macerate the burn, provide an ideal environment for bacterial contamination and cause evaporation that may decrease the body patient's body temperature.	

4.2 Dressing selection

The full set of circumstances surrounding a patient need to be taken into consideration. That will ensure dressing cost-effectiveness, efficacy and efficiency adding to time and tissue that can be saved. It will also prevent potential complications if the dressing is tailored to facilitate optimal dressing function and patient comfort. The face, hands and blister management are of particular importance.

Aims and functions of the dressings:

- To apply most appropriate dressing using correct technique.
- To apply the appropriate dressing in timely manner to avoid infection, maceration, hypothermia, excess pain or trauma.
- Maintain an aseptic technique at all times.
- Apply compression to control haemorrhage or venous stasis if indicated.
- Immobilise an injured body part.

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Table 9: Special attention to blisters and the face

Special Considerations
Blisters:
Based on the current available evidence, blisters should, wherever possible, be left intact to reduce the risk of infection, but if anatomical position necessitates intervention for functional purposes, aspiration appears to result in less pain than de-roofing. If the burns are very extensive and patient is undergoing a surgical debridement de-roofing may be an option. Large: Remove blisters if extensive to allow adequate assessment of burn size and depth Small: Acceptable to aspirate or completely remove the blister after 72hours of aspiration Treat as a superficial dermal wound Reassess the wound depth on all dressing changes Dress as appropriate
Face:
Generally conservative Consider the following options: • Temporary skin substitute for partial thickness burns • Topical antimicrobial dressing Ointment/petroleum jelly on surrounding skin Debridement and grafting once depth and/or healing potential has been evaluated

- Protect the wound and surrounding tissue.
- Promote a moist wound healing environment.

Recommendation 4.2	Agreement: 100%
Choose a dressing that is appropriate to prevent colonisation of the wound, minimize pain and ensure adequate moisture that is conducive to optimum wound healing.	

Important points to take into account in selection of dressing material: (See Addendum D: Table 10)

- Exudate management - appropriate absorbency level of dressing must be considered on application. Appropriate primary dressing should be chosen to maintain optimal moisture levels and promote wound healing.
- Occlusive dressings should not be applied to infected wounds. 76.9%
- Healed areas of skin require moisturizing with appropriate moisturizer; a small amount is rubbed in until absorbed.
- Consider dressings with longer wear times to prevent trauma and pain on dressing removal.
- Pre and post procedure pain relief may be required for most patients.
- Care should be taken when applying dressings to protect against impeding distal perfusion due to constrictive dressings.
- Select appropriate topical antimicrobial dressings to protect the wound bed from bacterial colonisation and infection.
- Pressure garments should be considered to counteract and minimize the effects of scarring after the burn wound heals.
- Secondary dressings must not come in contact with the wound as they may adhere and cause trauma on removal. 80.7%

5. Advanced therapies

The most modern advances will not compensate for lack of care in the crucial first period post-burn. Fluid resuscitation and early excision and grafting cannot be brought back once the time for optimal outcome has lapsed. Modern management is focussed on maximizing tissue preservation in a timely manner. Of particular interest to the Burns Clinician are:

- Laser Doppler Technology
- Tissue Preservation with Hydrosurgery
- Negative Pressure Wound Therapy (NPWT)
- Dermal graft substitutes
- Tissue Engineering

6. Educational aspects to deal with Post-burn care issues

The patient has to live with the result of the trauma suffered and, despite lifesaving interventions, there will be factors and aspects of this patient's life that will remain permanently. It is important to convey to the patients the care for those permanent aspects as it forms the backbone of an important patient education piece. This piece directly influences the quality of life, activities of daily living and general social adaptations needed of a patient, to live a life as close as normal as to that of an unburnt person.

Recommendation 6.1	Agreement: 96.1%-100%
Post burn care relies on education that incorporates long term care actions and life style adaptations to promote better quality of life.	

- Avoid unnecessary sun exposure: wear protective clothing and acquire a high protection factor sun block (SPF 50 or higher; titanium oxide based) to be used daily for life.
- Tepid bath or shower (temperature sensitivity); avoid getting soap in unhealed wounds.
- Moisturiser should be applied at least twice daily to healed skin due to the damage to natural oil secreting glands.
- Itching - try not to scratch. Lukewarm showers, bath oil, colloidal oatmeal products, and moisturisers may help with itching. Sometimes medication such as antihistamines may be needed for persistent disruptive itching. Drugs such as Gabapentin and Clonidine are useful for the management of pain and itching.
- Scarring depends on the size, location and depth of the burn: hypertrophic scarring usually corresponds with any burn that has taken longer than 3 weeks to heal. Management of the burn scar is varied and involves a combination of silicone sheeting, compression garments and massage with certain topical agents. Newer generation elasticized biologic impregnated silicone sheets are being developed to stabilise the burn wound limiting collagen formation. Following deeper burn injuries, scar formation and maturation may take up to two years.

7. The interprofessional team

Care is focussed on the most appropriate intervention for the given circumstances at the time. Major burn care spans many specialties and needs a pro-active involvement with a healthy respect of the fragile situation under correction. The team is required to ensure outcomes and is therefore not divided into disciplines but into

components:

- Emergency Management
- Fluid Resuscitation and critical care
- Early enteral feeding
- Early excision and grafting
- Occupational therapy and Prosthetics
- Physiotherapy
- Psychological support
- Tissue management and epithelial cover

CONCLUSION

the aim of this document is to implement a global wound care guideline adapted for the South African context. This document should not be used in isolation but together with the international guidelines that it supports.

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Addendum A: indications and instructions for escharotomy

Indications:

Circumferential full thickness & deep dermal burns of the chest or limbs with circulatory or respiratory compromise.

Limb

Escharotomy is indicated when the circulation is compromised due to increased pressure in the burned limb and cannot be relieved by simple elevation of the limb. The burned skin is rigid and increasing oedema under this rigid skin may interfere with circulation. Elevation of the affected limb should always be done first and then closely monitored.

Signs in a limb that may indicate the need for an Escharotomy are:

- Loss of circulation
- Pallor, cyanosed
- Reduced or absent capillary return related to capillary return in non burned areas
- Coolness
- Loss of palpable pulses (late sign)
- Decrease pulse pressures as measured by Doppler ultrasound
- Numbness
- Decreased oxygen saturation as detected by pulse oxymetry

Chest

Escharotomy should be considered when a circumferential burn of the chest wall results in respiratory compromise by restricting normal chest wall movement. Under some circumstances escharotomy may be necessary for non-circumferential burns of the chest wall if chest wall movement is restricted.

Circumferential burns of the abdomen may also cause respiratory compromise by restricting diaphragmatic movement. Infants under 12 months are particularly vulnerable since respiration is predominately diaphragmatic. Under these circumstances a sub diaphragmatic transverse escharotomy may be necessary.

Consider the inhalation injury high priority

Flame burns of the chest are often accompanied by burns to the face and neck and are commonly associated with an inhalation injury.

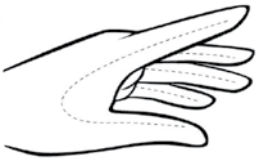
- Secure the air way
- Oxygen by non rebreathing mask at 15 litres/min

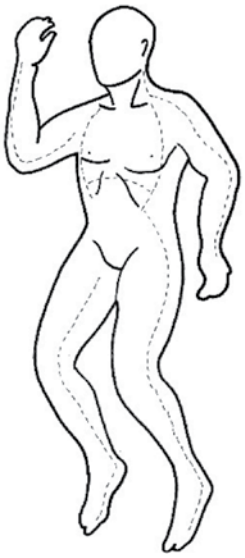
**Endotracheal intubation should be considered early if the airway is compromised.*

Once the airway has been secured consider chest escharotomy if there is:

- Circumferential full thickness burns of the thorax and abdomen.
- Restricted movement of the chest wall or abdomen
- Reduced air entry bilaterally
- Shallow respiratory effort
- Tachypnoea
- Hypoxaemia

Instruction on performing Escharotomy





Limbs: incisions should be performed in the “mid axial line” bilaterally (see figures herewith)

- Generally no anaesthesia is required - the patient should be appropriately sedated and given adequate pain relief.
- Always start and finish the incision one centimetre into unburned healthy tissue where possible (use local anaesthetic for the unburned skin).
- Sterile procedure with adequate drapes.
- Before starting, the upper limb should be in the supine position, and the lower limb in the neutral position.
- Avoid the ulnar nerve at the elbow and common peroneal nerve at the knee.
- Incisions of the limbs are in the mid-axial lines between flexor and extensor surfaces; avoid incisions across the flexural creases of joints. Mark anatomical “at risk areas”.
- For the chest, incisions along the mid axillary lines, continuing over the abdominal wall if the burn extends to this region. A transverse elliptical incision across the abdomen below the costal margin can be made joining the vertical incisions.
- Draw a line where you will make the incision if possible.
- Full thickness incision into subcutaneous fat sufficiently to see obvious separation of the wound edges.
- Running a finger along the incision will detect residual restrictive areas.
- • Incision needs to be on both sides of limb or chest to restore circulation.
- • Have diathermy or ligatures available for haemorrhage control.
- • Dress wounds taking care not to be constricting to the limbs.

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Addendum B: Referral Procedure

SOUTH AFRICAN BURN SOCIETY TRANSFER INFORMATION CHART

REFERRING HOSPITAL:.....
Name of person:.....
Designation:.....
Date: / / Time:.....
Contact No:.....
Transport by: ambulance AMS/ Air other

ACCEPTING HOSPITAL:.....
Name of person:

(Please insert patient ID sticker or write in details)

Patient's name:.....
ID/Folder No:.....
Date of Birth: / /

Gender: Male Female

Address/Contact No:.....

A. HISTORY:

1. Date &Time of incident:.....
2. Time of arrival at referring facility:.....
3. How incident happened:.....
.....
4. Agent: Scald ☐ Flame ☐ Electricity ☐ Chemical ☐ Contact ☐
5. Nature: Accident ☐ Assault ☐ Domestic Violence ☐
Self-Inflicted ☐ Other ☐
6. Associated Injury: Multiple Trauma Yes ☐ No ☐
MVA ☐ Fall ☐ Stab ☐ Other ☐
7. State of consciousness when found: A ☐ V ☐ P ☐ U ☐
8. First aid given (cooling): Yes ☐ No ☐
<20 min ☐ >20 min ☐
9. Tetanus toxoid: Up to date given

B. FLUID REQUIREMENT CALCULATION & MONITORING:

Weight of patient: .....Kg Estimated Burn Area: .....% TBSA
Total for first 24 Hrs:.....
Urine Catheter passed: Yes ☐ No ☐
Urine Output: ..... ml (since insertion catheter; discard urine obtained initially)
Venous access: Peripheral ☐ Central ☐
BP: ..... Pulse: ..... Temperature:.....

C. RESPIRATORY CARE:

Smoke inhalation suspected? Yes ☐ No ☐
Soot in throat/nose? Yes ☐ No ☐ Hoarse voice: Yes ☐ No ☐
Stridor: Yes ☐ No ☐
Breathing spontaneously: Yes ☐ No ☐ Respiratory rate: .....
Intubation required: Yes ☐ No ☐
Size of tube:..... Sats: .....

D. EXAMS:

Chest X-Rays: Yes ☐ No ☐ ABG:.....

Fluid regime estimated given first 12 hrs from injury:

Time	Fluid Type	Amount	Urine Output

Pain Management (Analgesia):

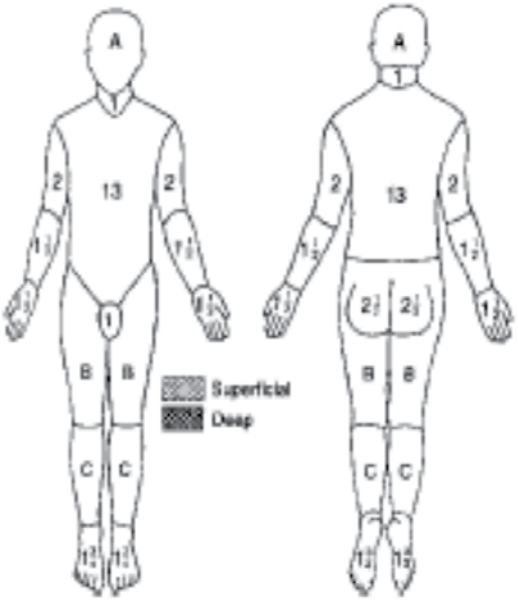
Drug type	Amount	Route	Time given

Wound Management:

Dressing applied: Cling wraps ☐ Burn Shield ☐
Bactrazine ☐ Jelonet ☐ Other ☐ .....

Escharotomy done: Yes ☐ No ☐
Areas: .....

SOUTH AFRICAN BURN SOCIETY TRANSFER INFORMATION CHART



Region	%
Head	
Neck	
Ant. Trunk	
Post. Trunk	
Right arm	
Left arm	
Buttocks	
Genitalia	
Right leg	
Left leg	
Total burn area	

Age (years)	0	1	5	10	15	Adult
A - half of head	9.5	8.5	6.5	5.5	4.5	3.5
B - half of one thigh	2.75	3.25	4	4.24	4.25	4.75
C - half of one leg	2.5	2.5	2.75	3	3.25	3.5

Fluid Requirement 1st 24 hrs: Use Hartman's solution, give ½ the total amount in 1st 8 hrs after injury & remainder in following 16 hrs			
Adults	2-4 ml solution / kg body weight /percent		
Children	2-4 ml solution / kg body weight /percent PLUS maintenance with 4% glucose in ¼ or 1/5 Normal Saline		
	100ml/Kg up to 10kg plus ⇨	50ml/Kg from 10-20kg plus ⇨	20ml/kg for each Kg over 20 Kg

Addendum C: Referral Criteria: American Burn Association

Courtesy of the

American Burn Association

Advanced Burn Life Support (ABLS)

Learn more about the ABA and ABLS at **www.ameriburn.org**

Burn Center Referral Criteria

A burn center may treat adults, children, or both.

Burn injuries that should be referred to a burn center include:

1. Partial thickness burns greater than 10% total body surface area (TBSA).
2. Burns that involve the face, hands, feet, genitalia, perineum, or major joints.
3. Third degree burns in any age group.
4. Electrical burns, including lightning injury.
5. Chemical burns.
6. Inhalation injury.
7. Burn injury in patients with preexisting medical disorders that could complicate management, prolong recovery, or affect mortality.
8. Any patient with burns and concomitant trauma (such as fractures) in which the burn injury poses the greatest risk of morbidity or mortality. In such cases, if the trauma poses the greater immediate risk, the patient may be initially stabilized in a trauma center before being transferred to a burn unit. Physician judgment will be necessary in such situations and should be in concert with the regional medical control plan and triage protocols.
9. Burned children in hospitals without qualified personnel or equipment for the care of children.
10. Burn injury in patients who will require special social, emotional, or rehabilitative intervention.

Excerpted from Guidelines for the Operation of Burn Centers (pp. 79-86), Resources for Optimal Care of the Injured Patient 2006, Committee on Trauma, American College of Surgeons

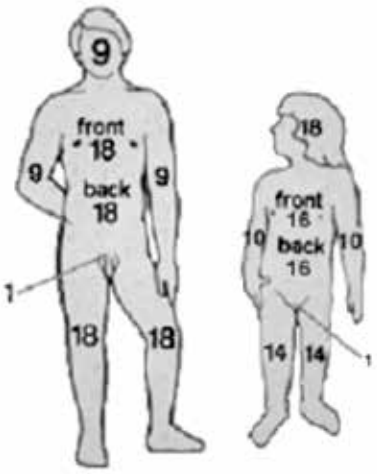
Severity Determination

First Degree (*Partial Thickness*)
Superficial, red, sometimes painful.

Second Degree (*Partial Thickness*)
Skin may be red, blistered, swollen. Very painful.

Third Degree (*Full Thickness*)
Whitish, charred or translucent, no pin prick sensation in burned area.

Percentage Total Body Surface Area (TBSA)



Addendum D: Dressing Options

Table 10: Dressing options most often used in burn care

Burn wound management – Dressing selection options		
	< 10 %	**>10%**
Superficial Dermal	• Polyurethane film • Non- adherent impregnated dressing • Hydrogel • Hydrocolloid • Fibre-gelling dressing • Foam Consider ambulatory treatment after debridement: • Topical anti-microbial • Temporary skin substitute (especially in children) • 2° absorbent wound dressing	Mandatory: • Topical antimicrobial dressing - Silver based - Non silver-based • Temporary skin substitute Plus: • 2° Absorbent wound dressing
Mid dermal/ Indeterminate	• *Mandatory*: topical antimicrobial dressing - Silver based - Non silver-based *Plus:* 2° absorbent wound dressing *Consider:* • Excision/debridement with hydrosurgery system • Temporary skin substitute * If burn is assessed to heal within 7 days: treat as superficial dermal; if assessed not to heal within 14 days or there is wound progression: treat as deep dermal	
Deep Dermal **Full Thickness** **Where is the separation between deep dermal and full thickness dressing choices? Why not consider them together seen that the management is almost the same?**	Early excision & Immediate grafting <u>Cover for Graft site:</u> Non- adherent impregnated dressing Foam dressing and/or absorbent anti-sheer dressing *Consider:* topical antimicrobial dressing *Plus:* 2° absorbent wound dressing <u>Cover for donor site:</u> Polyurethane film Non- Adherent impregnated dressing Foam Dressing Hydrocolloid Dressing Fibre gelling dressing Alginate	Aim: total early excision Practical: sequential excision 10-20% each operative visit depending on resources such as blood and ICU access Aim: immediate autografting if possible. If unable due to patient condition/situation: <u>Cover for excised area</u>: *Mandatory:* topical antimicrobial dressing *Consider:* skin substitute (to stabilise patient, reduce fluid loss) - Allograft - Biological skin substitute *Consider:* dermal substitute over neck, face and joints *Plus:* 2° absorbent layer <u>Cover for remaining burn wound:</u> *Mandatory:* topical antimicrobial dressing - Silver based - Non silver-based *Plus:* 2° absorbent layer <u>Cover and dressing for graft site</u>: Non- adherent impregnated dressing Hydrocellular foam dressing Absorbent anti-sheer wound dressing *Consider:* topical antimicrobial dressing - Silver based - Non silver-based *Plus:* 2° absorbent wound dressing <u>Cover for donor site:</u> Polyurethane film Non- adherent impregnated dressing Foam Hydrocolloid Topical antimicrobial dressing Fibre “gelling” dressing Alginate

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