Guidelines for use of Nanocrystalline Silver Dressing - Acticoat™

Injury and Trauma Health Network

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Summary
The Injury & Trauma Health Network’s Burn Injury Model of Care under the Clinical Lead of Professor Fiona Wood, was endorsed by the State Health Executive Forum in May 2009.

In the Executive Summary it is noted that in Western Australia (WA), people who experience a Burn Injury are well supported by a range of services that are delivered within a multi-disciplinary team approach.

Although largely preventable, the Model of Care states that “Severe Burn Injury is fortunately far less frequent but the devastating outcome can be reduced dramatically when the right care is provided at the right time, in the right place, by the right team.”

Other important factors include an accurate definition of the Burn Injury and access to safe and reliable services. It is imperative to have referral points that are well supported by information and education from injury prevention, to first aid and multidisciplinary clinical specialist’s care.

Epidemiological data indicate decreases in hospital admissions and readmissions in recent times. This decrease can be attributed to primary and secondary prevention interventions as well as advances in burns care processes and new technology that promotes consultant-led support for collaboration and integration of services.

During mass casualty events Burn Injury is one of the most common injuries and therefore planning and response to a disaster requires the involvement of trained burns injury specialists.

A prospective review of burn injury in WA between January 2004 and November 2004 found 61% of cases recorded received inadequate or inappropriate first aid management. The review also identified that indigenous children who reside predominantly in rural/remote areas have a high incidence of burn injury and complications such as infection.

This Guideline for use of Nanocrystalline Silver Impregnated Dressings on Burn Wounds provides important information for health professionals and first responders seeking advice on burn wound dressings for a burn injured patient as part of initial burn injury management and early care.

The Department of Health, Health Networks Branch working group, in developing the Burn Injury Model of Care identified the need to provide information and support, on burn injury management at a state-wide policy level. This supporting operational guideline for the recommended ‘silver impregnated antimicrobial dressing’ - Acticoat™ is endorsed and operational within the major Burn Injury Units in WA.

In order for all patients in WA with a burn injury to benefit from Acticoat™ a review of the Royal Perth Hospital (RPH) Acticoat™ guidelines was undertaken. The intent of this review was to consider suitability for state-wide implementation and to provide an evidence-based framework to support use of Acticoat™ over other ‘silver impregnated’ dressings.
There was close liaison with the RPH Acticoat™ guideline development team, and the Injury and Trauma Health Network during the review process and development of this policy.

**Definition of burn injury**
Burn injury was traditionally defined by percentage of total body surface areas (%TBSA) affected. This definition excluded many other factors that impact on a person's well being.

The classification is dependant on a range of variables that describe the mechanism of injury, how the patient is affected by the injury, %TBSA affected and depth of Burn Injury. Other clinical variables include: age, site of burn, effect on airway, other injuries, co morbidities, and psychiatric and psychosocial considerations. Assessment of these factors allows the Burn Injury to be defined as minor, moderate and severe.

Different types of Burn Injury include flame burns, scalds from steam or hot liquids/food, contact burns from hot surfaces such as stoves, heaters, and irons; electrical burns, chemical burns, friction burns and radiation burns. The extent of the injury is dependant on the degree of heat and length of time in contact with the heat. For example, flash burns are generally less severe than scalds.

“Burns are one of the most common and devastating forms of trauma. Patients with serious thermal injury require immediate specialized care in order to minimize morbidity and mortality. Significant thermal injuries induce a state of immuno-suppression that predisposes burn patients to infectious complications.”

**Definition of burn injury dressings mentioned in this guideline**

**Acticoat™** (with Nanocrystalline Silver) dressing is an effective antimicrobial barrier dressing. The nanocrystalline coating of silver rapidly kills a broad spectrum of bacteria in as little as 30 minutes. Acticoat™ dressing consists of three layers: an absorbent inner core sandwiched between outer layers of silver coated, low adherent polyethylene net. Nanocrystalline silver protects the wound site from bacterial contamination while the inner core helps maintain the moist environment optimal for wound healing.

**Jelonet™** is a soft paraffin, non-medicated dressing, making it ideal for use with topical antibiotics or antiseptics. It is soothing and low-adherent, and allows the wound to drain freely into an absorbent secondary dressing. Jelonet is available in a wide range of sizes, the largest of which is suitable for use in burns units.

**DuoDERM® CGF™** Dressing is a hydrocolloid, moisture-retentive wound dressing used for partial and full-thickness wounds with minimal to moderate amounts of exudate. It incorporates a unique ConvaTec hydrocolloid formulation that distinguishes it from other hydrocolloid dressings. DuoDERM® CGF™ Dressing is indicated for chronic wounds such as pressure ulcers (Stage I-IV) and leg ulcers, as well as acute wounds such as traumatic wounds (minor abrasions, lacerations) partial thickness burns and donor sites.
Scope
Patient group to whom this guideline applies: all burn injury patients – adults and children, throughout Western Australia.

Target area for guidelines
The target for this guideline is any location, place, community or health service where a patient with burn injuries may be treated.

The guideline will inform state-wide practice of doctors, nurses, allied health professionals, first aid personnel such as St John Ambulance and OH&S, and personnel in the mining industry.

Aims of this guideline:
1. To identify the importance of skilled, early intervention in burn injury management and the optimal early use of Nanocrystalline Silver Dressings.
2. To describe the guidelines, protocols and evidence-based information for practice for use of Acticoat™ as a wound dressing, for patients with burns in Western Australia.
3. To provide evidence-based practice guidelines for burn injury wound care.
4. To ensure the guideline is widely distributed to all health professionals such as medical and nursing personnel, allied health organizations, paramedics and first aid personnel, throughout the State of Western Australia.

Implementation of the guideline should be facilitated with a designated web page link to ensure dissemination is as effective as possible, for the benefit of all burn injured patients in Western Australia, and for professional guidance to all health professionals, emergency and first aid personnel.

The body of this guideline comprises two documents from Royal Perth Hospital Surgical Division, Burns Service.


In both documents, levels of evidence (Level 1-4) are cited against relevant literature to demonstrate an evidence-based context for the use of Acticoat™. These levels of evidence are based on the hierarchy of evidence framework endorsed by the Joanna Briggs Institute (www.joannabriggs.edu.au) which were originally adopted from the NHMRC".

The levels of evidence relate to the design of studies reported in the literature, and are outlined below.
Levels of evidence

Level 1: Systematic review of Level 2 studies.

Level 2: A randomised controlled trial.

Level 3: Pseudo randomised control trial, comparative study with and without concurrent controls.

Level 4: Case series with either post test or pre-test/post test and expert opinion.

The WA Department of Health endorses the RPH practice statement and guidelines in their entirety. The RPH Burns Service Evidence Based Practice statement and guidelines have been provided with the full permission of the authors.

References

1. Department of Health Western Australia, Burn Injury Model of Care, 2009, Health Networks Branch: Perth.


Part 1
Royal Perth Hospital Burns Service Evidence-Based Practice Statement

The use of a silver impregnated dressing Acticoat™ for early burn wound management: an evidenced based practice.
Compiled by: Fong, Joy; Wood, Fiona, Burns Service, Royal Perth Hospital, WA.

Equipment for Burn injuries over 5% TBSA

Warm cubicle, appropriate personal protection equipment (PPE), Acticoat™ dressing, (appropriate sizes and numbers of pieces), large burns gauze, paraffin gauze (Jelonet™), bandages or stretch netting (appropriate sizes).

Recommended Practice

All burn injuries should have antimicrobial dressings applied if estimated time to arrive at Burn Unit, Royal Perth Hospital will exceed 2 hours from time of burn injury.

Management to be performed prior to transfer:

Actions

1. Perform timely and appropriate burn first aid (cool running tap water or wet/damp towels for 20 minutes within the first 1 hour post burn) after the initial ABC’s of first aid are carried out.


3. Provide appropriate analgesia prior to commencement of dressings.

4. Consider risks for infection for the patient; use sterile technique where possible.

5. If the burn is a large wound, it will exudate heavily to moderately, in this case there is no need to moisten* Acticoat™ dressings, apply directly over the cleansed burn area(s) with the dark blue side facing the wound bed. Apply two layers of Jelonet™ followed with dry gauze or padding. Secure with loose bandages or loose stretch netting.

6. * If the wound is not moist enough to activate this product, and is a small burn consider using acticoat underneath a hydrocolloid dressing eg Duoderm CGF

7. If the wound bed is dry, apply a layer of amorphous gel eg Intrasite gel™ over the wound prior to applying the Acticoat™ dressing, followed by two layers of jelonet and dry gauze padding. Amorphous gel will moistened the woundbed and activate the acticoat dressing.

8. Bandaging or stretch netting must be checked frequently for tightness in view of potential swelling as a result of burn oedema.
Evidence for clinical practice:
Why is there a need for topical antimicrobial dressings in the initial stages post burn injury?

- Burn wound cellulitis is commonly observed and is characterised by erythema of the surrounding unburnt skin (1-2cm beyond the wound), pain and oedema extending beyond the usual rim of inflammation are commonly seen within 72 hours of injury.¹ [Level 4]

- Burn wounds are susceptible to infection due to impairment of the skin barrier and reduction in cell mediated immunity.²⁻⁵ [Level 4] ⁶ [Level 3].

- Burns result in destruction of tissue which provide a wound environment at risk of infection and can result in septicaemia ⁷⁻⁸ [Level 4].

- The risk is further exacerbated by immuno-suppression associated with burn injuries ⁹ [Level 4].

What is the evidence for the use of Acticoat™ instead of silver sulphadiazine cream?

- Acticoat™ is a silver impregnated dressing facilitating the delivery of silver to the burn wound surface. It contains nanocrystalline silver which when moistened with sterile water releases silver ions onto the wound surface. The invitro antimicrobial action of silver has been demonstrated to destroy within 30 minutes, both Gram positive and negative bacteria as well as Vancomycin resistant enterococci (VRE) and Methicillin resistant S. aureus.⁶ [Level 3], ¹⁰, ¹² [invitro studies], ¹¹ [Level 1].

- The action is accomplished by the silver ions binding to tissue proteins causing a structural change in the bacterial cell membranes.¹² [invitro studies]. The silver then binds and denatures the bacterial DNA and RNA, thus inhibiting replication.¹²⁻¹⁴ [invitro studies], ¹⁵ [Level 2].

- The action of Acticoat™ is fast in destroying pathogens such as Escherica coli, S. aureus and Methicillin resistant S. aureus and Pseudomonas aeruginosa ¹² [invitro study], ¹⁶ [Level 4], ¹⁷ [Level 3].

- Acticoat™ dressings have been found to be less painful than Silver Sulphadiazine cream dressings. ⁶ [Level 3], ¹⁸⁻¹⁹ [Level 1], ²⁰ [Level 3]

- The reduction of burn wound cellulitis by using Acticoat™ can be attributed to its ability to reduce inflammation. Research revealed that Acticoat™ has an anti-inflammatory effect through metalloproteinases, this has a role in the degradation of extra-cellular proteins in wound sites, allowing optimal epithelialisation. ², ²¹ [Level 4], ¹¹ [Level 2], ¹⁷ [Level 3], ²² [animal study].

- Acticoat™ compared with silversulphadiazine cream reduces burn wound cellulitis, antibiotic usage, improved patent outcomes and reduction in overall inpatient costs.⁶, ¹⁷ [Level 3], ¹⁸, ¹⁹ [Level 1], ²⁰, ²³, ²⁴ [Level 3], ²⁵ [Level 1].

- Silversulphadiazine cream has been found to have pro-inflammatory properties and and shown to cause leucopenia. ²⁶ [Level 4], ²⁷ [Level 3], ²⁸ [invitro study] ²⁹ [Level 4].
- Acticoat™ dressings have been found to be less painful than Silver Sulphadiazine cream dressings. 6, 20 [Level 3], 18, 19 [Level 2].

- The main contraindication of using Acticoat™ is agyria, where silver salts when released in the presence of light precipitates into black silver sulphide. 30-31 [Level 4]. This causes the wound and surrounding skin to become brownish black. However, research states this staining is not permanent. 29, 31 [Level 4]. Silver toxicity in Acticoat™ not well documented and reports of toxicity are low to date. 28 [Level 4]

References


Part 2
Royal Perth Hospital, Surgical Division - Evidenced-Based Practice Guideline

The use of nanocrystalline silver impregnated dressings on burn wounds.
Compiled by: Joy Fong, CNC, Burns; Fiona Wood, Burns Director, RPH March 2009.

Introduction
Acticoat™ is a 3 layered mesh dressing construct containing silver nanocrystals. When moistened with sterile water and placed on the wound, Acticoat™ releases clusters of highly reactive silver cations up to 100 parts per million, causing electron transport and inactivation of bacterial cell DNA, cell membrane damage and binding of insoluble complexes in micro-organisms 1-6 [Level 4].

Acticoat™ produces a controlled release of silver ions onto the wound and has been proven to be effective in reducing exudate and odour, reducing the risk of colonisation, preventing infection. It has an effective bactericidal effect. Several efficacy studies have demonstrated that Acticoat™ is safe to use on wounds 3-7 [Level 4].

Acticoat absorbent™ is an alginate dressing impregnated with silver nanocrystals. It has an absorbent property when in contact with wound exudates and forms a gel which releases nanocrystalline silver cations onto the wound bed. Its antibacterial action is similar to that of Acticoat™ 8 [Level 4].

Dressing application information
- Acticoat™ should be applied on partial and full thickness depth burns in the first 3 days post burn injury. This is to prevent burn wound cellulitis which may occur within this time period. 9 [Level 3].
- Acticoat™ is applied with the dark blue side facing the wound bed. This is followed by two layers of gauze moistened with sterile water, Jelonet™, dry gauze and bandage.
- After 24 hours, if the dressing is copper in colour, it means that all the silver ions have been released onto the wound, the dressing needs to be replaced. Acticoat™ dressings on burn wounds are replaced daily due to the high amount of exudate which will activate the deposition of silver ions.
- After 3 days of Acticoat™ dressings the burn wound should be assessed for dryness and necessity for further topical antimicrobial treatment.
If after 3 days Acticoat™ is still required (based on clinical judgement) and de-sloughing of the wound is needed, then:

1. Acticoat™ may be cut into 1-2cm strips and applied (not to cover the whole burn wound, but a small portion) under a hydrocolloid dressing such as Duoderm™. This dressing will promote de-sloughing of the wound by autolysis, whilst Acticoat™ maintains an antimicrobial effect within the wound environment. This dressing needs to be redressed every 2 or 3 days.

Or

2. Acticoat absorbent™ may be used if the wound is highly exudative. Apply Acticoat absorbent™ onto the wound and cover with a hydrocolloid dressing such as DuodermCGF™ or a foam dressing, secure with retention tape. This dressing needs to be redressed every 2 or 3 days.

Or

3. Continue Acticoat™ dressings with water compresses as described previously.

Note

- Acticoat™ has a drying effect and may be used for exudating burn wounds and as an overlay dressing over a dermal regeneration template dressing such as Integra™. [Level 2]. [Level 4].
- Acticoat™ has an anti-inflammatory effect which may reduce the amount of wound exudate. [Level 4].
- Keep Acticoat™ to size as it stains good skin – agyria is brownish black staining caused by the silver ions (stains can be removed with saline) [in vitro study].
- Apply a layer of lanolin or emollient around the burn wound edges to prevent staining.
- Acticoat™ is activated with sterile water or wound exudate. [Level 4].
- Acticoat™ is applied dark blue side facing the wound bed. [Level 4].
- If the woundbed is dry and Acticoat™ is still required, a layer of water based hydrogel such as Intrasite gel™ may be applied under the Acticoat™.
- Acticoat absorbent™ may be used when the wound bed is highly exudative. [Level 4].
References


3. Orvington L. 2004. The truth about silver. Ostomy Wound Management, 50(suppl 9A); 1S-10S.


Acknowledgements

Working Group for Acticoat™ Guidelines:

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WA Health Networks

Injury & Trauma Health Network Executive Advisory Group:

- Karina Moore, Senior Development Officer
- Jan Phillips, Development Officer
- Dr Andrew Briggs, Senior Development Officer

Companion Documents

Department of Health, Western Australia, Burn Injury Model of Care. Perth: Health Networks Branch, Department of Health, Western Australia; 2009.

Links

Smith& Nephew:


Convatec


Department of Health, Western Australia:

Delivering a Healthy WA