Guidelines on infection control in burns patients

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Overview

- Infection in Burns patients
- Historical background of the prevention of infection in Burns patients
- Why is developing Infection Control guidelines for Burns patients challenging
- Some key issues for infection control in Burns patients?
  - Layout and design
  - Cleaning and disinfection
  - Water
  - Ventilation
British Burn Association (BBA) and Healthcare Infection Society (HIS) Burns working party party

Members

**BBA**

- Val Edwards-Jones
- Becky Martin
- Naiem Moiemen
- Al Scott
- Sarah Smailes
- Clare Thomas
- Amber Young

**HIS**

- Peter Hoffman
- Pauline Jumaa (Chair)
- Louise Teare
- Mike Weinbren
- HIS administrative team
Grenfell Tower 14 June 2017
London UK

- Approx 80 deaths, more than 70 injuries

- Criticism of fire safety building standards in UK including:
  - Use of flammable cladding
  - Lack of internal and external water sprinklers

Burn injuries are preventable
Infection in burns patients

- Infection is the leading cause of mortality and morbidity in burns patients
- Up to 75% mortality in burns patients is from infection
- Infection may occur at multiple sites in burns patients
- The risk of burn wound infection relates directly to the extent of the burn
- Infection of the burn injury may result in permanent scarring, disfigurement and disability
- These can have serious personal and financial implications for both the burn victim and their dependants.
The burns patient and susceptibility to infection

- Immunocompromised especially with burns of >30%
  - Changes in the innate and adaptive immunity lead to susceptibility to colonisation and infection

- Destruction of the skin or mucosal barrier leads to microbial access

- Necrotic tissue and exudate providing an environment which supports microbial growth

- Medical devices for monitoring provide portals for microbial entry

- Use of broad spectrum antimicrobials and risk of multiply-resistant organisms
Infection in Burns - Transmission

- Burns patients are a high risk group for acquiring multidrug-resistant organisms
- Burns patients are a source for dispersal of organisms for other patient groups in the hospital
- Organisms from burns patients can seed the whole hospital
  - Antimicrobial resistant organisms
Infection in burns patients

Burns patients are a unique patient group from the point of view of infection control

Susceptibility to infection

and

Transmission of infection
Infection Control in Burns patients- Historical background
Principles of prevention of infection in Burns Units

Leonard Colebrooke (1883-1967)

‘What a nice fire’

‘Yes, but where is your fireguard?’
Reducing the incidence of streptococcal infection—Colebrooke

- The incidence of streptococcal infection was reduced from 80-90% to 40-50% by aseptic dressing techniques.

- When penicillin cream and an air-conditioned dressing room were added to the procedure that the incidence of infection was reduced to 5.4%


Bourdillon RB and Colebrook L. Air hygiene in dressing rooms for burns or major wounds. Lancet (1946) 1 561, 601

Colebrooke Let al. The control of infection in burns. Lancet (1948) 1 683
Infection prevention and control in Burns patients

Clinical management of the burn injury
- Extent of burn surface area and depth—minor versus severe
- Nature of the burn
- Antimicrobials and dressings

Design and management of the burns unit
- Segregation and containment
- Strict adherence to routine infection prevention control procedures
  - Layout and design
  - Cleaning and environment
  - Water in burns services—hydrotherapy
  - Theatres and Ventilation
  - Isolation rooms
Infection prevention and control in Burns

- Requires the same strict adherence to infection prevention and control procedures as in healthcare.
Guidelines- Why?

• Evidence-based guidelines to be developed to meet national burns care standards and to facilitate standardisation across units

• Staff should be aware of guidelines and trained in their use

• For effective implementation guidelines should be developed with input from users

• Guidelines do not replace clinical judgement
Need for evidence based-guidance

Davies A, Spickett-Jones F, Brock P, Coy K, Young A

Variations in guideline use and practice relating to diagnosis and management of infection in paediatric burns services in England and Wales: A national survey

Burns 2017; 43: 215-222

Staff from less than half the responding services reported that they had guidance for diagnosis and treatment of burns. There was variation both within services and between services about awareness of available guidance.
Principles of design of burns units: report of a Working Group of the British Burn Association and Hospital Infection Society.

Summary: The overall design of burns units will depend on the required size and available finance. The Working Party has considered the optimal location and specific requirements of a unit, including dressing, operating and isolation rooms, intensive care and ancillary facilities. Various possibilities for ventilation systems in these areas have also been discussed.

Keywords: Burns unit; design; isolation; ventilation facilities.
International Society for Burn Injury (ISBI) Practice Guidelines for Burn Care

August 2016 Volume 42, Issue 5, Pages 953–1021
European Burns Association

European Practice Guidelines
for Burn Care

Minimum level of Burn Care
Provision in Europe
3.1.1. THE BC SPACE AND SPACIAL ARRANGEMENT

- Should have access to an operating room with at least 42 m², air conditioning, preferably laminar airflow and wide range temperature settings for acute surgical burn treatment.
- This operating room is equipped with all the needs for burn surgery and a respiratory assistance service on a 24-hour basis.
- A second theatre should be devoted to secondary burn reconstruction.
- Should have at least 5 acute beds specially equipped and designed for the care of a major burn patient, i.e. high room temperature, climate control, total isolation facilities, adequate patient surveillance, intensive care monitoring facilities, etc.
- Have an established current germ surveillance program.
- Include enough regular beds in the adult and/or children’s wards to meet current needs.
- Have enough specialised and equipped spaces for rehabilitation and occupational therapy.
The diagnosis of infection in burn patients is not straightforward

- Based on clinical and laboratory findings but it is not straightforward in burns patients.
- Fever often does not correlate well with infection in burn patients.
- Patients with extensive burn injury have physiological changes associated with hypermetabolism including hypo or hyperthermia, tachycardia, tachypnoea, glucose intolerance and mental status which can be mistaken for signs of infection.
- Blood cultures may be contaminated with skin flora from the burn injury.
American Burn Association (ABA) guidelines for diagnosing sepsis in burn patients.

Expert review of the literature to develop and publish standardized definitions for sepsis and infection-related diagnoses in burn patients.

Standardized definitions are required to improve the capability of performing more meaningful multicenter trials among burn centers.
Correlation of American Burn Association sepsis criteria with the presence of bacteremia in burned patients admitted to the intensive care unit.

- Hogan BK et al.


Retrospective chart review

*Among severe burn patients, the ABA trigger for sepsis did not correlate strongly with bacteremia.*
Challenges for setting evidence-based standards for infection control in burns patients

• Lack of high quality evidence
• Methodological challenges in designing infection control trials
• Challenges with standardised definitions of infection in burns patients (there are none)
Lack of high quality evidence
Systematic reviews on prevention of burns infection

- Prophylactic antibiotics 2013 - Cochrane database
- Antiseptics 2017 - Cochrane database
- Digestive decontamination 2017 - Burns

No firm conclusions
Lack of high quality evidence

Higher quality studies required
No established standards for infection prevention and control in burns patients
Layout and design

- Dedicated facilities and equipment
- Physical separation of patients
- Proximity of theatres and intensive care beds ‘50m’
- Dedicated burns theatre
- Ideally dedicated Intensive Care Unit (ICU) beds separate from other ICU patients and segregation of staff

Probably not practical for most existing units but should be possible for new builds
Cleaning and disinfection

- The challenge of decontaminating the environment between patients to prevent transmission of infection

- Failure to adequately decontaminate the environment can result in onward transmission of organisms and can result in multiply resistant organisms spreading to other areas of the hospital and becoming endemic.
Experience with burns patient infected with multiply resistant organisms and cleaning the environment

*Environmental decontamination following occupancy of a burns patient with multiple carbapenemase-resistant organisms*

Garvey MI, Bradley CW, Jumaa P

*J Hosp Infect 2016 136-140*
Cleaning regimen

Routine clean for infected patient

- Cleaning and disinfection with hypochlorite solution and detergent (Chlorclean Guest Medical, UK)

- 6% Hydrogen peroxide $\text{H}_2\text{O}_2$ misting (Oxypharm UK)

Assessment of room immediately following cleaning

Satisfactory

- Visually clean- ‘Macroscopically clean’

- Cleaning procedure completed in line with local guidance
Was it microscopically clean?

- Sampling of multiple clean touch points in vicinity of patient and communal area surfaces
- 15 surfaces tested
  - Vicinity of patient
  - Communal areas
Results

Vicinity of patient

CPO’s from: Ventilator, drip stands, extract vent, ventilator monitor; floor

No CPO’s Bed frame

Communal areas

CPO’s from: Sink tap handles, Sink, window sill

No CPO’s: Notes trolley; Shower trolley; Door handle of room Handwash sink Door handle of ante room
Second clean before room occupied

- Detergent disinfection/Chlor clean
- Steam cleaning
- Double strength hypochlorite
- Hydrogen peroxide 12%

Resampling

No CPO’s
Learning

- Contaminated ICU room after occupation burn room for approximately 14 hours with an infected patient and who was in theatre for 4 hours (Theatre had been cleaned with the same procedures but no sampling was performed)

- Effective cleaning is key to prevent transmission of multiply resistant organisms

- More resources needed to include routine assessment of cleaning and education of cleaning staff
Extensive colonization with carbapenemase-producing microorganisms in Romanian burn patients: infectious consequences from the Colectiv fire disaster

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Recommendations

- Screening/surveillance of patients on admission (throat, nose, rectum, perineum,) on HRMOs
- Sampling of various burn wound sites
- Molecular characterization of isolates
- Treatment in isolation until cultures are negative for HRMOs
- Proactively testing of antibiotic options
- Antimicrobial stewardship/ No systemic antibiotics as prophylaxis
- Good communication of the microbiological results
- Staff education/ensuring optimal compliance in hand-hygiene and isolation precautions
- Enhanced environmental disinfection and environmental sampling following the terminal cleaning
- Single use or effective decontamination of medical equipment going from one patient to another
Water in burns

Health Technical Memorandum (HTM) Safe water in Healthcare Premises
‘Augmented Care Unit’
Water-assisted dressing changes
‘Hydrotherapy’

- The practice of burn wound cleaning and hydrotherapy varies considerably.

- Opinion is divided on risk versus benefits

Purpose of hydrotherapy in Burns
- Reduce the microbial load
- Facilitate separation of the eschar
- Wash of exudate and topical creams
- Loosen adherent dressings
- Facilitate physiotherapy and improve patient comfort
Risks of hydrotherapy - Equipment

- Outbreaks traced to contaminated hydrotherapy equipment
  - Hand held shower spray
  - Stretcher
Shower head showing contamination

Photo courtesy of M Weinbren, P Hoffman 2017
Water-risk of contamination of equipment

Photo courtesy of M Wei
Hollow plastic bath toys

Photo courtesy of M Weinbren, P Hoffman 2017
Theatres and ventilation for burns

- Conventionally ventilated theatres have positive pressure ventilation
- The dilution of contaminated skin scales from staff in the theatre and prep room to reduce contamination of the wound and on exposed instruments
- To prevent contaminated air from areas surrounding the theatre
Are these factors applicable to burn patients?

- The normal skin flora of staff is not a significant risk to burns patients.
- If the patients are in negative pressure rooms in the adjacent ward, the air will not have significant contamination.
Main infection risks in Burns theatres

- Containment of airborne contamination during procedures to stop contamination of communal areas and patient rooms
- Contamination of sequential patients in theatre

Proposal for the design of new burns theatres?

Negative pressure achieves both of these
Summary

- Prevention of infection is key to improve the outcome of burn injuries

- Multiply resistant organisms from burns patient can spread to other patient groups and become endemic in the hospital

- Burns infection prevention standards are needed

- Because of the lack of high quality evidence, these will be pragmatic based on current experience and what is considered best practice

- The recommendations for the design of burns units are likely to be more applicable to new build burns services rather than existing premises
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