Fire: measurement, metaphor and metamorphosis
Dr Ian McCallum, Psychiatrist and Naturalist, Cape Town

Global burn care challenges
Prof David Mackie, President, The International Society for Burn Injury, Red Cross Hospital, Beverwijk, The Netherlands

The epidemiology of burns in South Africa
Dehran Swart, Robynn Paulsen, Paraffin Safety Association of Southern Africa

The Paraffin Safety Association (PASASA) of Southern Africa is a non-profit organisation established in 1996 to ensure that paraffin/kerosene use is safe for low-income households. PASASA achieves this through strategic partnerships, research and promotion of safe practices through health education and policy interventions. One of the many challenges that PASASA is trying to overcome is the lack of robust burn injury surveillance data related to household energy use. During 2006, the PASASA initiated a pilot project in order to develop a National Household Energy Surveillance System, incorporating Geographical Information System (GIS) technology.

Data collectors at participating health institutions interviewed burn patients and/or their families, and reviewed patients’ records to complete a pre-tested questionnaire.

The questionnaire gathered the demographic profile of patients, data pertaining to the type and severity of the burn injuries, basic clinical data, and treatment outcomes. The ethical considerations of the study include voluntary participation, confidentiality and anonymity.

Currently, eight institutions situated in seven provinces are actively participating in this surveillance project. A total of 7 084 records of burn patients have been entered into the database up until 30 September 2011. This included 3 901 males (57%) and 2 971 females (43%). (The gender classification for 212 records was recorded as unknown). Thirty-eight per cent of burn injuries occurred in children younger than four years. In terms of gender, males have a higher incidence of burn injuries, with 57% of burns occurring within this group. The use of electricity contributed toward the largest proportion of burns (49%), while paraffin contributed to 24% of burns. The majority of burns were categorised as either scalds (56%), or flame burns (27%). Sixty-eight per cent of children younger than 14 years have experienced scalding, and 15% have experienced flame burns. A different pattern was found for adults. The majority of paediatric burns were unintentional (96%), while adults experienced a higher rate of intentional burns (15%), predominantly among males (males: 63%; females: 37%). Ninety-four per cent of burns occurred in the home environment. The leading body parts burned among the sample include the face, upper arm, thorax and forearm. A higher proportion of > 30% total body surface area (TBSA) burns are attributed to flame burns, while a higher proportion of < 20% TBSA burns are attributed to scalds. In this study, 71% of burn victims were admitted into wards, while 26% were treated and discharged. The average length of stay (LOS) in the ward was 16.05 days (median LOS: 9 days). Further analysis indicated that the average LOS for flame burns was 22.75 days, while the average LOS for scalds was 13.02 days.

The existence of health inequities has become evident from the data. Information, with both time and spatial dimensions using maps and graphs, indicate that a variety of interventions need to be implemented in order to prevent, treat and manage burns injuries. Health promotion action is needed to reduce the burden of burn injuries being experienced by those living in low-income households.

The pathophysiology of burns
Andy Zoepke, Clinical Manager, Smith & Nephew

The burn wound is a serious injury, often progressive in nature, and the source of many underlying local and systemic effects. The events observed in a burned patient represent an overlapping continuum, without any clearly defined points of separation.

The skin is the site of initial injury in burn patients, and depending on the temperature and contact time of the source, the thermal injury rapidly produces irreversible injury and cell death in epidermal keratinocytes, in the epidermal appendages, including hair follicles and their attached sebaceous glands, and sweat glands, and in the connective tissue cells of the dermis and in the deeper subcutaneous tissue.
Historically, burns were treated with daily wound dressings and wound irrigation, the removal of loose dead tissue, and application of daily topical wound dressings and antimicrobial preparations, until the wounds healed by themselves, or granulation tissue appeared in the wound bed. These wounds were then grafted. The prolonged and intense inflammatory response associated with these burns made hypertrophic scars and contractures a normal part of burn treatment.

Current experimental evidence indicates that burn wounds often evolve from an initial level to a deeper level of necrosis, or from partial thickness to full thickness, as a result of poor perfusion of the tissue adjacent to the initial burn injury. This process of vascular stasis deep in the burn is due, in part, to the rapid loss of intravascular fluid from the damaged capillaries and venules just below the necrotic burn wound. In addition, there is evidence that neutrophils contribute to this process of burn wound extension, most likely by adhering to endothelium and to each other, resulting in the obstruction of the microvasculature.

Current evidence shows that burns that heal within three weeks generally do so without hypertrophic scarring or functional impairment, although hyper- or hypo-pigmentation may occur. Burns needing longer than three weeks to heal result in the formation of hypertrophic scars, and may form contractures that lead to functional impairment.

To assess the depth of a burn wound, knowledge of skin biology and the pathophysiological changes caused by thermal injury is required.

The standard technique for determining burn depth in the 21st century still remains clinical assessment of the wound by an experienced burn specialist, although devices such as laser Doppler devices are being used to help improve the clinical assessment of burn wound depth.

Management decisions should also take into account the mechanism of injury, as this often influences the healing potential of the wound, and guides the timing and type of surgical intervention.

With few exceptions, state-of-the-art burn care now involves early excision and grafting of all burns that do not heal within three weeks.

The challenge today is to determine which burns will heal spontaneously, which require excision and temporary skin substitutes, and which require early excisions and grafting.

What's new in burn injury management? Resuscitation and wound healing

Prof Bishara Atiyeh, MD, FACS, General Secretary Euro-Mediterranean Council for Burns and Fire Disasters, MRC; Executive Editor, Annals of Burns and Fire Disasters; Clinical Professor Plastic and Reconstructive Surgery, American University of Beirut Medical Center, Beirut, Lebanon

Optimal treatment of burn victims requires a deep understanding of the profound pathophysiological changes occurring locally and systemically after injury. Accurate estimation of burn size and depth, as well as early resuscitation, is essential. Burn shock resuscitation has been extensively studied over the past four decades. Many formulas exist, and many parameters have been suggested to assess the adequacy of resuscitation. The most commonly used formula is the Parkland formula, the most commonly used fluids are crystalloids, and the most commonly used parameter is urine output. However, until now, no conclusive evidence has suggested that one formula is superior to another, or that one parameter is a better predictor than another. In this article, we will review the updated information about the subject, and we will look into new advancements in this field. Good burn care includes also cleansing, debridement, and prevention of sepsis. Wound healing is of major importance to the survival and clinical outcome of burn patients. An ideal therapy would not only promote rapid healing, but would also act as an anti-scarring therapy. The presentation is a review of the most up-to-date modalities applied to burn treatment regarding resuscitation and burn wound healing, without overlooking the numerous controversies that still persist.

Epidemiology of burns presented to the Burns Unit in Inkosi Albert Luthuli Central Hospital, December 2008 to December 2010

Anna Strand, Malin Albert, Daan den Hollander, Burns Unit, Inkosi Albert Luthuli Central Hospital, Durban

Background: A chart review of all admissions to the burns unit at the Albert Luthuli Central Hospital (ALCH) between December 2008 and December 2009 was carried out. The aim was to document the epidemiology of burns in the province of KwaZulu-Natal, as well as to investigate whether the time of referral affected the outcome of patients.

Method: The charts of all patients admitted to the burns unit were reviewed, extracting information about age, gender, percentage (%) of total body surface area (TBSA) burned, presence of inhalation injury, referral hospital, nature of burn injury, time of referral, time of first surgery, total hospital stay, complications, and mortality.

Results: During the study period, 462 patients were seen: 193 adults and 269 children under the age of 13. Children aged 1-4 years made up 34.4%. Male-to-female ratio was 1:1.3. Seventy-two-and-a-half per cent were referred from a regional hospital, and 23.4% from a district general hospital. In the adult group, the most common causes of burns were open flames (132) and scalds (39). In children, scalds (164) and open-flame burns (63) were most commonly seen. Twenty-seven patients had an inhalational injury. The mean TBSA was 18% in the adult group, and 12% in the paediatric group. The median time from burn to admission to the burn unit was eight days for adults, and five days for children. Complications occurred in 32% of adults, and 24% of children. There were 42 deaths (25 adults, 17 children). The mortality for patients with a % TBSA > 30% was 36.5% for adults, and 40% for children. Common causes of death were inhalation injury, multi-organ failure and septicemia. Risk factors for mortality were percentage burn, inhalational injury, and time of admission. Although adults who received early excision had a significantly higher mortality, they also had a significantly higher % TBSA. Corrected figures will be presented.

Conclusion: The epidemiology of burn injury in KwaZulu-Natal follows the general trends observed elsewhere in Southern Africa and worldwide. Patients tend to be referred late, and in particular,
adults. However, this does not seem to have a detrimental effect on outcome.

**Burn injuries in KwaZulu-Natal: epidemiology and the need for public health education**

D Scheven, P Barker, J Govindasamy, Ngwelezana Hospital, Empangeni, KwaZulu-Natal, South Africa

**Background:** Burns remains one of the leading causes of morbidity and mortality from trauma, in South Africa. There is little previously published data on the epidemiology of burns from the KwaZulu-Natal Province in South Africa. The use of such data can demonstrate the areas of focus for burns prevention programmes and for improvement of clinical management.

**Method:** This study examines epidemiological data collected from 423 cases admitted to the Ngwelezana Hospital burns unit from 2008-2010. Data was extracted from the Ngwelezane burns unit database.

**Results:** The most common mechanisms of burn injury were hot water (57.4%), direct flame (19.6%) and foods (12.1%). Hot-water burns were particularly common in under-three-year-olds, whereas the risk of flame burns increased with age. Of the direct flame burns, 21% occurred during an epileptic seizure. Non-accidental injury accounted for eight per cent of burn injuries. Public health awareness was assessed by investigating the use of first aid treatments, and the time delay between burn and presentation to hospital. Only 1.1% of burn victims used running water for 10 minutes or longer. Most applied home remedies such as oil, ice or eggs. The average delay in seeking medical attention was 44 hours, with males presenting earlier than females. For patients arriving directly from home or the local clinic, the average delay from burn to admission was 1.8 days. For patients being referred from district hospitals, the average delay was 24.1 days. This study has also revealed the necessity of improving the quality of burns care at a district hospital level.

**The management of burns at Chris Hani Baragwanath Hospital**

Dr Adelin Muganza, President of South African Burns Society, Burns Unit, Chris Hani Baragwanath Hospital, Johannesburg

**The history of the South African Burns Society**

Peter de Wet, Burns Unit, Red Cross War Memorial Children’s Hospital

**The development and challenges in burn care in an adult burn unit**

Dr Elbie van der Merwe, Burns Unit, Department of Surgery, Tygerberg Hospital, University Stellenbosch

Challenges in burn care were previously related to resuscitation, infections and their consequences, and the replacement of lost skin. Patients falling outside these criteria were lost. Current challenges have a number of explicit differences. Water homeostasis after burns and resuscitation, as well as organ support, are now much better understood, but there are still problems in some patients.

After a few decades of improving microbiological control for most patients, multi-resistance to antibiotics is now growing to be a global nightmare. Burn patients with a compromised immunological system need new approaches to survive systemic sepsicaemia and multi-organ failure. Complete skin replacement is not possible for most patients living in Africa, and extensive injuries to the face and extremities still result in severe and permanent loss of function.

However, slow and overall improved physical results presently focus on improved rehabilitation strategies. Acute, as well as chronic, mental stress, needs special individual attention, so often ignored in the surgical field. Disability and disfigurement have to be correctly addressed. Without social support, an unemployed poor person without skills will have no future and a very short life. “The scope of burn treatment extends beyond the preservation of life and function, and the ultimate goal is the return of burn survivors, as full participants, back into their communities.”

**Feedback from the recent Australia and New Zealand Burn Association (ANZBA) Congress**

Dr Saleigh Adams, Plastic and Reconstructive Surgeon, Red Cross War Memorial Children’s Hospital

**The pattern of electrical burns and their treatment outcomes at Kalafong Hospital**

Nicolaas Doman and Taole Mokoena, Department of Surgery, University of Pretoria, Kalafong Hospital

**Background:** Kalafong Hospital is currently a regional hospital which forms part of the University of Pretoria academic teaching platform, and has the only dedicated burns injury treatment facility (ward) in the region. Although electrical burns are not common, electricity theft might increase their incidence.

**Method:** A retrospective review of adult electrical burn patients was undertaken, based on patient discharge summaries kept in the department of surgery between 1988 and August 2011, and from available hospital patient records to determine the pattern and outcome of electrical burn injuries treatment.

**Results:** Thirty-nine patients were admitted with electrical burns between January 1988 and August 2011. Seventy per cent were treated surgically, while 25% received wound dressings only. Twelve per cent had amputations of multiple limbs, or digits: 8.6%, legs; 4.3%, hands and arms; and 8%, fingers.

Twenty-five patients (64%) had their serum myoglobin or creatinine kinase level recorded, and of these, 20 (80%) were above the threshold for diagnosis of rhabdomyolysis, or 51% of all admissions. Rhabdomyolysis was associated with high tension electrocution in 85%, and low tension in 15%. There were three deaths (7.7%) overall. All had rhabdomyolysis, and their total body surface area burnt was 30%, 52% and 55%.

**Conclusion:** The majority of low tension electrocutions are from domestic appliance accidents while those from high tension are work related. This reflects failure to observe electricity safety...
A survey of burn care and a proposal for a burn centre in East Africa: an international academic burn centre exchange

Katrina Mitchell, Geoffrey Gilli, Vihar Kotecha, James Gallagher, Weill Cornell Medical Center and Weill Bugando Medical Centre

**Background:** Burn injury in low- and middle-income countries is a leading cause of disability-adjusted life years (DALYs), though improving care remains challenging. To address this burden of injury from an academic institutional approach, the burn centre of a United States (US) medical centre partnered with its affiliate hospital in East Africa to consider the development of a burn centre there. It was hoped that the institutional partnership would provide a unique opportunity to promote sustainable academic exchange, and build burn care capacity in the East African region.

**Method:** In August 2011, two US burn surgeons collaborated with the East African department of surgery to conduct a needs assessment of its current burn care capabilities. The in-patient wards, emergency department (ED), operating theatre, burn care, rehabilitation, nutrition, and fire department/outreach were reviewed.

**Results:** The East African hospital is a tertiary, academic, 900-bed regional referral centre serving a population of 15 million. No burn centre exists in the area. In 2009-2010, burn cases represented 36/4 262 (0.8%) adult and 81/2 549 (3.2%) paediatric admissions, and 58/3 800 (1.5%) operative cases. The ED initiates resuscitation and oxygen therapy, but intubation capabilities are limited. Surgeons operate in five rooms with general anaesthesia. Burn surgery instrumentation is limited to a Watson handle without blades and skin meshers, and dermatome in poor condition. Patients’ families perform wound care without pain medication, and burns are managed using the open technique with grafting on granulation tissue. Topicals are cost-prohibitive. One rehabilitation director and two therapists consult as needed. Nurses provide general care to up to 40 patients. Porridge, beans, and milk are provided three times daily, with meat twice a week, and vegetables when available. There is no nutritional supplement and there are no hospital dieticians. Two stations, with 20 paid firefighters and three engines serve the city, and utilise its fire hydrant system. Firefighters receive limited training and protective gear. Public health outreach initiatives are possible through village-based traditional communication networks.

**Conclusion:** Infrastructure to support the development of a burn care centre exists in this academic East African institution, but the clinical attention given to burns is currently limited. Accepted demographic burn data and local surgeons suggest that the low numbers of burn patients in the ward log data may be inaccurate. A multi-disciplinary burn care centre could standardise record-keeping, track and improve outcomes, encourage referrals from district hospitals, and facilitate training and outreach through the fire department and village networks. *Pseudomonas aeruginosa*

Dr Emile Coetzee, Department of Surgery, University of Cape Town

**The use of topical sodium hypochlorite in the management of *Pseudomonas aeruginosa* burn wound infection**

Dr Emile Coetzee, Department of Surgery, University of Cape Town

**Background:** *Pseudomonas aeruginosa* burn wound infection is a major cause of morbidity in the Red Cross War Memorial Children’s Hospital. However, the incidence of *P. aeruginosa* infection in our burns unit is not known, and local resistance patterns, morbidity and cost implications have not recently been studied.

**Method:** A retrospective review of patients with clinically significant *P. aeruginosa* infection was performed between April 2007 and January 2010 in the burns unit of the Red Cross War Memorial Children’s Hospital in Cape Town, South Africa.

In a second method, human fibroblasts were exposed to serial dilutions of unbuffered sodium hypochlorite solutions for 30 minutes and assessed for viability. Isolates of *P. aeruginosa*, *Staphylococcus aureus* and *Streptococcus pyogenes* were exposed to the same dilutions of unbuffered sodium hypochlorite to establish the minimum bactericidal concentration. The pH, osmolality and electrolyte concentrations were measured. These experiments were repeated with solution stored at room temperature for six consecutive days. The aim of this study was to determine the optimum concentration with regard to safety and efficacy, as well as shelf life of an unbuffered sodium hypochlorite solution for the topical management of burn wound infections.

| Table I: Pattern of electrical burn injuries, 1988-2011 |
|-----------------------------|-----------------------------|
| Total number                | 39                         |
| Male:female                 | 34 (87%):5 (13%)           |
| Average age (range) years   | 35.8 (14-65)               |
| High vs. low tension electrocution | 17 (44%) vs. 22 (56%) |
| Electricity theft           | 36% of high tension electrocution |
| Domestic appliances         | 77% of low tension electrocution |
| Pattern anatomical area burnt | Face 15%; upper limbs 33%; hands or fingers 36%; torso 41%; lower limbs 39%; feet or toes 8% |
| Extent of total body surface area burnt | ≥ 50% = 4pts; ≥ 20% = 15; < 19% |
| Myoglobin ≥ 500 mg/l        | 17/25 recorded; 14 from high tension electrocution |
| Creatinine kinase IU/l      | 16/22 recorded; 15 from high tension electrocution |
| Rhabdomyolysis              | 20/25 recorded             |
| Surgical sloughectomy and split skin graft | 75% |
| Amputation rate             | 12% of patients            |
| Death                       | 3/39 (7.7%)               |

measures. Education of the public and drill for workers on electricity safety measures is critical if these injuries are to be avoided.

Electrical burn can inflict major body surface area burns and majority of high tension electrocution is associated with rhabdomyolysis. Rhabdomyolysis and large (≥50%) TBSA carry a high mortality which is worse when combined. Therefore all patients with electrical burns should be screened for rhabdomyolysis by myoglobinemia or serum creatinine kinase levels and if raised appropriate myoglobinemia and rhabdomyolysis treatment regimen instituted.
Results: During the 36-month period, a total of 2,632 patients were admitted, and 34 patients had clinically significant pseudomonas wound infection, with an incidence 1.29%. Of the 2,791 bacteriology samples sent, 906 had an organism isolated and 406 samples were positive for P. aeruginosa, with an incidence of 50.3%. Three patients had loss of Biobrane® or allografts. Twenty-three cases of skin graft loss occurred in 18 patients. There were 45 additional theatre visits. Management of the pseudomonas wound infection resulted in an additional 68 weeks spent in hospital.

Pertaining to the second method, 24% of fibroblasts were viable after exposure to a 0.025% solution, and 98.9% with a 0.003% solution. The MBC for the P. aeruginosa isolates was 0.003%, for S. aureus was 0.006%, and for S. pyogenes was 0.0015%. This remained constant for six consecutive days. The unbuffered 0.0025% solution had a pH of 10, an osmolality of 168, sodium concentration of 89 mmol/dl, and chloride of 84 mmol/dl. This remained stable over 14 days.

Conclusion: P. aeruginosa burn wound infection is a serious condition, with significant morbidity and cost implications. An un-buffered solution of sodium hypochlorite with a concentration of 0.006% would be suitable for the topical management of burn wound infections caused by common pathogens. It has a shelf life of at least six days.

The outcome of treatment in burn patients with human immunodeficiency virus infection and acquired immune deficiency syndrome

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Background: Predicting treatment outcome of burn patients can be difficult. Pre-existing medical co-morbidities have been shown to significantly impact on duration of hospitalisation and survival of burn patients. We consider acquired immune deficiency syndrome (AIDS) to be a significant co-morbidity, and therefore all consenting burn patients are tested for human immunodeficiency virus (HIV) routinely. In the literature, treatment outcomes reports in HIV/AIDS patients with burns have given conflicting results, some report increased risk of death in HIV/AIDS, while others report no significant difference. The aim was to compare treatment outcomes in burn patients with AIDS or HIV infection, and those in their HIV-negative counterparts.

Method: A retrospective study was undertaken on all patients hospitalised for burn injury at Kalafong Hospital, for whom a HIV test result and sufficient data could be found. Patient discharge records between May 2008 and August 2011, kept in the department of surgery, and patient hospital records, where available, were accessed. Patients were divided into three groups, and their treatment outcome compared: HIV-negative, HIV-positive and AIDS.

Results: The HIV status of 149 patients was recorded, and these form the basis of the study.

The prevention of infection at the Beverwijk Burn Centre

Prof David Mackie, President, The International Society for Burn Injury, Red Cross Hospital, Beverwijk, The Netherlands

In recent years, the improved survival of burn patients with extensive burn injuries, has been due to the implementation of measures which
directly or indirectly reduce the incidence of wound infection. Control of infection in burns is to some extent dependent on the availability of essential resources. On the other hand, much can be achieved by adopting a disciplined approach to burn care. The development and implementation of written protocols are a valuable aid in meeting these aims.

This paper will discuss the following aspects of infection control:

• How to identify the nature of the microbiological threat: Surveillance cultures, on a weekly basis at least, are essential to guide the prevention and treatment of infection.
• How to reduce exposure to potentially pathogenic micro-organisms (PPM): Isolation facilities, preferably in well-ventilated single rooms, are a minimum requirement for the care of extensively burned patients. Cross contamination is prevented by the adoption of strict hygiene and clothing protocols.
• How to reduce the susceptibility of wounds to infection: The removal of dead tissue as soon as possible, and early wound closure, are the hallmarks of modern wound treatment. The standard of topical wound therapy remains silver-based. Biological wound dressings may be considered for temporary wound coverage. Frequent dressing changes have a cleansing effect on the wound surface.
• How to reduce the susceptibility of patients to invasive infection: In the absence of infection, major organ failure is prevented by maintenance of fluid and electrolyte balance. Metabolic support, including early enteral feeding to protect gut integrity, is essential to support immune competence. The catabolic response to burn injury can be modified by providing adequate sedation and analgesia, and by maintaining normoglycaemia. Early mobilisation of patients helps to prevent excessive protein loss. Further measures suggested to improve the health status of burn patients include immunonutrition, the use of beta blockers to modify the hypercatabolic response, and the use of oxandralone to promote anabolism.
• How to eradicate endogenous sources of infection: In our burn centre, selective decontamination of the digestive tract is employed to eradicate endogenous sources of PPM.

Using this approach, the incidence of pneumonia and sepsis can be controlled to a large extent. Death from infection is now rare in our burn centre.

**Thermal injury within the first four months of life**

Dr Sharon Cox, Head, Burns Unit, Department of Paediatric Surgery, Red Cross War Memorial Children’s Hospital, University of Cape Town
Prof Heinz Rode, Senior Specialist, Department of Paediatric Surgery, Red Cross War Memorial Children’s Hospital, University of Cape Town

**Background:** The aim was to determine the incidence, magnitude of injury, fluid management, role of surgery and outcome in newborns and infants under four months of age admitted to a burns unit.

**Method:** The method was a retrospective analysis of patient records.

**Results:** Eighty-six patients under the age of four months were admitted over a 37-year period (0.34% of admissions). Their injuries were caused by hot water (45 cases), fire (38), primitive heating devices (2) and non-accidental paraffin burn (1). Twenty-eight sustained superficial partial-thickness burns, 12 deep partial thickness, and 46 full thickness injuries. The total body surface area ranged from 5-55%, with an average of 11.5%. Bacterial contamination of the burn wounds was present on admission in 52.3%, and consisted of both Gram-positive and Gram-negative organisms. The resuscitation formula of 3.5ml/kg% burn on the first day, and 1.5ml/kg% burn on the second day, plus maintenance fluid at 30-120ml/kg/day, was not always adequate in maintaining haemodynamic stability. Three surgical methods were employed in 59 patients (69%). These included early tangential excision in 25, excision with, or without, allograft, and delayed grafting in 27, and conventional therapy with eventual grafting in seven patients. Releasing escharotomies were required in nine children. Nineteen children required amputations. Three craniectomies, two tracheostomies and one colostomy were additional procedures. The mortality was 9.3%. Three causes of death were identified: magnitude of injury, sepsis, and inhalation injury.

**Conclusion:** Neonates and infants are very vulnerable, and preventable environmental factors are often implicated. Fire and hot water are the most common causes, resulting in significant physical trauma. Resuscitation especially during the first few days of life can be problematic. Wound infection and sepsis are common, and surgery should be individualised. Long-term outcome is very satisfactory for those with small burns. However, those with larger burns may remain permanently disfigured.

**An objective and reproducible diagnosis of burn injuries**

Dr Robert Owen, Dr Michael Giretzlehner, Dr Johannes Dimberger, RISC-Software GmbH, Hagenberg, Austria
Dr Herbert Haller, AMA Unfallkrankenhaus, Linz, Austria

**Background:** In recent years, a complete and accurate documentation of injuries, treatment and convalescence has become essential for many reasons, including improvement of treatment, evidence-based medicine and legal requirements. Therefore, an objective burn assessment is essential. Currently, the burned surface area is usually estimated using Lund-Browder charts, rule of nines or the palm rule, whereas burn depth is determined by visual observation, mostly based on personal experience. However, publications state that surface estimations concerning the same injuries have significant variations. In order to tackle this drawback, the overall aim of our long-term research project is to facilitate complete and objective burn assessment and documentation.

**Method:** In order to avoid subjective estimations within the burn assessment process, we have developed a software system which uses an individually adapted three-dimensional model as a basis. Furthermore, this model is used to define areas of burns, surgical procedures or care services. Consequently, the surface of those regions can be calculated accurately. By integrating the processing of false-colour pictures generated by burn depth determination systems, the burns can be automatically transferred to the three-dimensional model. Our system superimposes the digital image and aligns the model and the patient on the picture. A special algorithm automatically projects all false-coloured areas onto the model surface.
**Results:** Our research group provides a system for assessing and documenting burn injuries completely and objectively. It exploits the capabilities of modern computer hardware to improve patient treatment, documentation and research possibilities. Besides the objective burn assessment, relevant medical encodings and various reports can be generated. Furthermore, it offers an interface to the American NTRACS system. The developed system is constantly used, evaluated and improved by a growing number of burn centres.

**Conclusion:** By implementing semi-automatic documentation capabilities, it is possible to generate reproducible diagnoses for burn injuries, and therefore improve the documentation quality. The complete documentation is available electronically, which enables acquired data to be easily queried and used to support physicians in their scientific work. Subsequently, the documentation workload can be reduced, and the quality of burn assessment improved.

**The applicability of research to practice**

The described system is the result of research work conducted over the past ten years in cooperation with numerous medical partners. The combination with burn depth determination systems reduces workload, and at the same time, improves quality of documentation, enabling an objective comparison to be made between burn cases, treatments and outcomes.

**A proposal for a burn data bank in South Africa**

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**Background:** A national burns database would create an invaluable foundation for clinical research, and for accurate evaluation and improvement of current healthcare systems. At present, there is no formalised national collection of medical or epidemiological data regarding burns trauma in South Africa. Compounding this issue is the frequent absence of adequate documentation by doctors managing these patients. Additionally, there is a wide variance in clinical skill and experience among healthcare practitioners. It would be strategic to address this combination of issues.

**Method:** We have developed a series of forms that can be implemented to document the admission, any operations, a summary of the in-patient stay, the discharge, and follow-up of a burns patient. The use of these specifically designed forms fulfils three main purposes. Firstly, it will provide clinical guidelines to assist the clinician in making appropriate management decisions. Secondly, it will to ensure adequate and relevant documentation of clinical encounters. Finally, their use will simultaneously act as a data capture point for an electronic database.

**Results:** The algorithmic design of the forms will serve to guide, even the inexperienced doctor, down clear treatment pathways, without creating any extra workload for “data collection.” The forms presented here can be tailored to suit individual burns units. We would propose a trial across the country to determine firstly, the usability of such forms, and secondly, to reach consensus on the core elements required for both the forms and the burns database.

**Conclusion:** There are numerous and obvious advantages to establishing a national burns database. We submit that it is an achievable goal. The development and implementation of a set of comprehensive burns forms, as described above, would be an essential first step towards accomplishing this successfully.

**Factors that predict mortality in paediatric patients with large burns**

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Dr Monique van Dijk, Department of Paediatric Surgery, Erasmus MC-Sophia Children’s Hospital, Rotterdam, The Netherlands

**Background:** The mortality rate in paediatric patients with large burns [total body surface area (TBSA) ≥ 30%] differs between countries. This may in part be explained by differences in treatment modalities and resources.

Factors contributing to mortality mentioned in literature are TBSA, age, gender, and inhalation injury.

The aim of the study was to evaluate all patients with a TBSA of 30% and higher, and identify factors that contribute to mortality. The design was a retrospective medical records study.

**Method:** From January 2007 to July 2011, medical records of children with TBSA of 30% and more were evaluated. A case record form was used that included background characteristics, as well as variables that were considered potential risk factors for mortality. Survivors and non-survivors were compared using the Mann-Whitney test for abnormally distributed variables, and t-test for normally distributed variables.

**Results:** We retrieved 99 medical charts of the 107 (92.5%) that were eligible. The mortality rate was 24.2%. The median TBSA of survivors and non-survivors was 35% [the interquartile range (IQR) 30-42%] and 67% [IQR 50-84%], respectively. Fourteen of the 24 non-survivors (58.3%) died within four days after admission, and the remaining 10, after eight to 73 days. The age of the survivors and non-survivors was not statistically significantly different, with a mean age of 4.5 years in both groups (p-value = 0.96). Fifty-one per cent of the survivors was male, compared to 58% in the deceased group (p-value = 0.51). Inhalation injury occurred in 17 of the 23 deceased patients (74%) and in 12 of the 74 patients (16.7%) who survived (p-value < 0.001). Overall incidence of septic wounds was 28 of 99 (28.3%), with an incidence of 32% in survivors and 16.7% in non-survivor children (p-value = 0.15). Sixty-four patients received grafting: 57 (76.0%) patients from the survivor group and seven (29.2%) from the non-survivors. Time to complete grafting varied from one to 211 days, with a median of 37 days.

**Conclusion:** The mortality rate is high compared to Western world settings.

**The severity of kettle burns and the dangers of the dangling cord**

Dr William JM Holmes, Dr B Keane, Prof Heinz Rode, Burns Unit, Red Cross War Memorial Children’s Hospital

**Background:** Kettle scalds are a major cause of paediatric burn injury. While preventative measures have been advocated for years,
the incidence of this type of injury is increasing. Information is lacking regarding severity and mechanism of injury.

**Method:** We prospectively analysed all paediatric scald injuries that warranted referral to a tertiary burn centre to quantify severity and outcome, and to research how these burns occurred, with a view to providing information for preventative strategies. We audited the safety features of 19 top-selling kettles.

**Results:** A total of 119 kettle burns were included in the study. Mean age at time of injury was 2 years, 1 month (five months to 12 years). Mean total body surface area was 11.8% (2-30%) and 62% sustained TBSA > 10%. Mean length of stay was 10.4 (1-120) days, and a surgical procedure was required in 62% of all kettle scalds. Grafting was required in 52% of patients. Mean number of surgical procedures was 1.7 (median 1, range 1-9). Pulling the kettle cord was the main cause of injury (74% vs. 37%). “Cord-pullers” were also significantly younger (mean 20 months vs. 51 months p-value < 0.05) and required significantly more grafting in “cosmetically sensitive” areas (69% vs. 23% p-value < 0.05). Four cases of inhalational injury occurred as a result of pulling the kettle cord. Mean kettle cord length was 66 cm (range 45-80), with only 30% employing a coil tidy feature.

**Conclusion:** In view of these findings, we discuss current legislative policy on kettle cord length and report on the current safety of today’s kettles. Areas for future prevention are discussed.

**The use of diverting colostomies in paediatric peri-anal burns**

Dr CE Price, Dr K Adams, Prof H Rode, Prof AJW Millar, Burns Unit, Red Cross War Memorial Children’s Hospital

**Background:** Over a 16-year period, we performed colostomies in 38 paediatric burn patients. These patients all had partial or full-thickness burns of the gluteal area, perineum or upper thighs. The mean total body surface area (TBSA) burned was 35% (range = 3-80% TBSA). Twenty-one patients sustained flame burns, 14 had hot water or scald burns, one had a contact burn, one sustained rectal burns due to a hot water enema, and one patient sustained skin loss from meningococcaemia. We performed prophylactic colostomies in 23 children, therapeutic colostomies in 14 patients, and one colostomy in a cerebral palsy child with a left hemiparesis. Prophylactic colostomy was performed to prevent soiling of wounds by faeces when this was judged by the burns team to pose a direct threat to the child’s immediate survival, threaten imminent wound sepsis, or cause continuous graft loss or donor site infection. Prophylactic colostomy was performed on average on day six after admission (range = 1-25 days after admission). Therapeutic colostomy was performed to counteract deep wound infection and septicaemia with gut-derived organisms. Therapeutic colostomy was performed on average on day 24 (range = 5-74 days after admission).

**Method:** A sigmoid end-colostomy with Hartman’s closure of the distal segment was the preferred method of choice. In all but two children, there was a marked improvement in the clinical appearance of the burn wounds and subsequent graft take and healing. There was a change in the bacterial profile away from predominantly gut-derived Gram-negative organisms to either pseudomonas or no pathological organisms grown. Complications were few. Five children suffered prolapse of their colostomy, which required manual reduction. One child died as a result of sternal dehiscence at 48 days post-colostomy. Another died of multi-organ failure 13 days after admission, but already had established sepsis at the time of faecal diversion. A third child died during the study due to a pulmonary embolus. Reversal of the colostomy was performed an average of six months (range = 0-14 months) after discharge from the burns ward, after all reconstructive procedures had been completed.

**Conclusion:** We advocate the use of diverting colostomies in a highly select group of paediatric burn patients in whom continual faecal soiling poses a threat to both graft and life.

**Burn care in South Africa**

Prof Heinz Rode, Dr Alan Rogers, Department of Paediatric Surgery, Red Cross War Memorial Children’s Hospital and the University of Cape Town

Although burns are largely preventable, Africa carries an extraordinary burden of thermal injuries that have devastating consequences. Annually, 3.2% of South Africa’s population suffers from thermal injuries. Eighty-six per cent have been classified as minor, and are effectively dealt with by nurse practitioners and medical doctors. Other moderate-to-severe burns are treated in general or district hospitals, where there are no specific established facilities for the burnt patient.

Burns are largely environmentally conditioned and preventable. The high incidence is driven by negative impact factors, including an influx of people to urban areas, haphazard urban development, inadequate electrification of homes, paraffin used as a primary energy source, and failure of preventative programmes. Urban migration, poverty and the development of slum areas relates significantly to overcrowding and the risk of burns. The use of faulty kerosene appliances, contaminated fuel, insufficiently regulated supply chains, and violation of standard safety principals are additional factors.

Burn care is variable in terms of organisation, clinical management, facilities, staffing, workload and outcome. It is predominantly emergency-driven, and lacks uniform access to quality services and fiscal restraints. Remedial measures would include the introduction of identifiable intervention programmes, urban regeneration, the provision of safe energy sources, the reorganisation of burn services, legislation to improve building standards, the provision of safe cooking, heating and lighting facilities, effective prevention and education measures, and establishing adequate treatment and rehabilitation facilities.

Injury services need to be developed where patients can receive the appropriate care. Non-complex injuries would be treated by general practitioners and district nurses, at clinic level. For the next level of severity, patients would receive treatment at emergency departments, residing in day hospitals, primary health care facilities and district hospitals. For the next level of burn injuries, patients would be dealt with at regional hospitals, and for major burns, i.e. more than 20% TBSA, including burns of a special nature care, patients would be treated at regional burn facilities or units, of which there are only a few in South Africa.
The challenge of adequate burn care in South Africa predominantly depends on the successful prevention of thermal injuries. This includes uplifting of social standards, the role out of government-supported health education programmes, legislation and public prevention campaigns, the electrification of informal settlement areas, the provision of safe kerosene appliances, and a restructuring of the health services responsible for burn care.

**Psychological issues facing burn survivors and their families**

*Prof Nichola Rumsay, Centre for Appearance Research, Department of Psychology, University of the West of England, Bristol, UK*

Research in this field is not for the faint-hearted. Methodological challenges include the need to recruit participant samples of sufficient size to enable the generalisation of results, variability in the demographic characteristics of the survivors (for example, their age and developmental stage), and in the circumstances surrounding the burn, and the extent and depth of the injury. However, despite these challenges, a more coherent picture of the major psychological issues facing survivors and their families has emerged over the past decade.

Research findings relating to the acute phase, the in-patient stay, the phase immediately prior to, and following, discharge will be summarised. Current understanding of the psychosocial challenges and needs of survivors and their families during the longer outpatient rehabilitation phase will also be described.

**Introducing disability as an axis of social oppression**

*Dr Brian Watermeyer, Department of Psychology, University of Stellenbosch*

This presentation will provide a basic introduction to the sociological analysis of disability as an axis of social oppression. Competing models for approaching disability will be outlined, with critical comments on current relevance. Particular attention will be paid to interdisciplinary difficulties with understanding disability, including the challenge of integrating insights from both medical and social sciences into practice. The unfortunate, fractious relations between the international disability movement and health professionals will be considered, along with possible new directions for constructive cooperation.

**Surviving burns: the psychological factors associated with positive adjustment**

*Prof Nichola Rumsay, Centre for Appearance Research, Department of Psychology, University of the West of England, Bristol, UK*

Despite the many challenges of rehabilitation after burns and of living with burn scars, a substantial number of people adapt and thrive. In recent years, it has become clear that levels of adjustment are not well predicted by the extent and severity of the burn injury. Instead, psychological and social factors contribute significantly to the variance in adjustment between individuals. This presentation will summarise existing research evidence about factors that contribute to positive adjustment to disfigurement, in addition to those associated with higher levels of distress, with a particular focus on factors that are amenable to change through intervention.

The limitations of current knowledge, particularly in the South African context, will be explored with delegates.

**A look at rehabilitation, recovery and reintegration: a case study of a patient with bilateral arm amputations**

*Sascha Archer, Jesse Kumm, Department of Occupational Therapy, Red Cross War Memorial Children’s Hospital*

**Background:** Electrical burns are among the most devastating and extensive injuries that one can sustain. This presentation provides an overview of the road to recovery, rehabilitation and reintegration that William Smith, a 12-year-old boy from the Hex River Valley in the Western Cape has travelled after sustaining such an injury. William lost both his arms after being electrocuted, sustaining full-thickness burns while climbing a high voltage power pylon to reach a bird’s nest.

**Method:** The road to recovery for patients with extensive injuries such as William’s is paved with many professionals. The role of the art therapist will be outlined, and the benefits of art therapy discussed.

**Results:** The art therapist and William developed a close interpersonal relationship, and over time, the art therapist became a voice for William, advocating him to try alternative therapies such as swimming, and organising construction of a specialised prosthesis. Through the expressive nature of art, William has come to accept his new body image, express his anxiety over returning to his home environment, and realise that he is still able to accomplish great things despite his disability. After much research and debate, it was decided that the best place for William to continue his educational career was at his previous school in the Hex River Valley. A fundraising initiative was started by the art therapist, and a laptop computer with head gear controls was purchased for William to allow him to fully participate in class. Adding to this, a documentary about William and his journey of recovery was made, highlighting some of the challenges, and also the triumphs, that he experienced. This documentary aims to continue to raise funds for his ongoing rehabilitation, as well as serve as an educational and inspirational video for patients with extensive burn injuries.

**Conclusion:** Art therapy has given William an outlet through which he can express his fears, anxieties, hopes and desires, by providing him with an activity that he could master in the face of much hopelessness and despair. The role of the art therapist, and auxiliary therapies such as music and aromatherapy, are often overlooked in the burns unit. This presentation hopes to draw attention to the importance of including these therapies in the multidisciplinary team effort to enhance and improve the care that burn patients receive during their recovery, rehabilitation and reintegration into society.

**Adjusting to burn injury: what do we know?**

*Prof Nichola Rumsay, Centre for Appearance Research, Department of Psychology, University of the West of England, Bristol, UK*

The UK’s *National Burn Care Review* (NBCR, 2005) concluded that there was “consistent and incontrovertible evidence” that burn injuries can result in considerable psychosocial distress throughout
the patient journey, and that support and interventions should be available as a matter of routine. The need for interventions for the families of burn survivors has also been highlighted by Phillips (2005) and others. But what interventions should be provided?

Systematic reviews of published research in relation to interventions for adults and young people concluded that there was insufficient good quality evidence from which to draw definitive conclusions. However, both reviews noted that approaches based on cognitive behavioural techniques, i.e., those working directly to influence thoughts and behaviour, and on the social skills of survivors, held promise. Negative body image and social discomfort are common in burn survivors and those with other forms of visible difference, and positive self-perceptions and effective social functioning are key to positive psychological adjustment. Hence researchers at the UK Centre for Appearance Research (CAR) are currently developing a range of interventions for adults and young people that focus, in particular, on the personal and social challenges posed by an appearance which is different from the norm. These interventions vary in intensity, depending on the recipient’s level of distress. They are designed to be delivered either face to face by a therapist with appropriate training, or in the case of Face It (for adults) and YP Face It (for young people), self-administered online. Examples from these interventions will be provided, and their potential in the South African context explored with delegates.

The psychological effects and origins of disability discrimination

Dr Brian Watermeyer, Department of Psychology, University of Stellenbosch

This presentation introduces a critical psychoanalytic approach to understanding the stubborn phenomenon of disablist discrimination. The disabled body’s capacity to evoke universal existential conflicts carried in the unconscious mind contributes to the distorted, oppressive social responses to the impaired population evident throughout the world. Fantasies about the meaning of difference, fuelled by segregation, create disabled people as the cultural custodians of disavowed aspects of the human condition, reinforcing practices of exclusion. Health professionals, disabled persons themselves, and all others, are equally subject to the internalisation of “disablist ideology”, which may masquerade in common-sense accounts as simple medical reality. Careful introspection is required if deeply embedded, often anxiety-ridden assumptions about disabled life are to be shifted. This may only take place in a professional and political context of accepting, open engagement with difference, which avoids stereotyping of both patients and professionals.

Should people with major burns be saved?

Prof David Benatar, Department of Philosophy, University of Cape Town

In this presentation, I shall provide a schema for making decisions about when people with major burns should be saved. I shall argue that in the case of competent patients, the decision should be deferred to them. When burn victims are incompetent, we should determine whether they previously expressed any views about whether they would want to be saved under the relevant conditions. If they did, we should defer to those views. If they did not, or could not previously express a preference, we must resort to the “best interest” standard of proxy decision making. I shall examine some of the difficulties of applying this standard.

Futility in burns care

Dr Daan den Hollander, Burns Unit, Inkosi Albert Luthuli Central Hospital, Durban

“Futility” is a term used to denote treatment that is considered to have a low chance of achieving a specified treatment goal. The concept was originally coined to curb patient autonomy in cases where patients or their surrogates demanded treatment that health care providers deemed unjustified. Futility, however, has proven difficult to define. Recently, attempts have been made to quantify futility, and some have coined the term “evidence-based ethics” for these developments. A number of problems with the concept of futility are discussed, highlighting the difficulty of defining futility without resorting to the patient’s own values and priorities. Particular attention is given to the futility debate in the context of a resource-limited health service.

Inside my skin: a thin slice of the emotional life of a burnt child

May Bleeker-Phelan, The Phoenix Burns Project

Background: The presentation will provide a first-person account of aspects of the emotional life of a burnt child to raise awareness of the child’s experience of being burnt, being treated and recovering from burns.

Method: It will describe the emotional, physical and psychological priorities of the child at various stages of treatment, in comparison to the priorities of the medical team.

Results: It highlights the differences between the two, and will describe the effect it had on the child when the priorities of the medical team overrode and negated those of the child. Furthermore, it describes how a burnt child experienced aspects such as skin grafts vs. other surgical procedures, of wearing a pressure garment, and why the nature and tone of patient-doctor interactions are so important. It will illustrate how routine actions that are of relatively minor importance to medical professionals live on in a child’s “emotional memory”, resulting in a profound and lasting impact on the child’s emotional life, social interactions and well-being. It will indicate areas where the child experiences loss of personal power, and as a direct consequence, will highlight the emotional learning and conditioning that took place within the child, and how it affected the child’s trust of parental and authority figures. It also will indicate the effect that it had on the self-esteem, social confidence and sense of personal power throughout her life.

Conclusion: There is a need for greater awareness of these factors, as well as the importance of support systems and appropriate interventions to address emotional and psychosocial issues, both during treatment of the child, and after physical recovery.
Challenges faced by nurses in managing burns
Victoria Makalima, Johnson and Johnson Burn Treatment Centre, Chris Hani Baragwanath Academic Hospital, Johannesburg

To be burned is to suffer one of the most devastating experiences that a human being can survive. The nurse’s task is to assist the patient and family to cope with the suffering. This is a difficult task, but it must not be neglected.

Method: Nursing management of burns in an ordinary surgical ward is very difficult as nurses’ priorities are to clean surgical wounds before attending to burn patients. This raises a concern as burn patients don’t receive priority care. Adherence to infection control principles becomes questionable, delaying wound healing. Theatre time is allocated to other clean elective patients, then lastly to burn patients. Wound care dressings are not adequate. In a psychiatric ward, burn wounds are attended to by nurses last. The environment for wound care dressing is not conducive. The primary focus is on the haemodynamic state of the patient. Nurses are reluctant to care for a burn patient because it is a challenging task, and the workload has to extend to wound care and monitoring the haemodynamic state of the patient. Nurses do not want to take on patients with burns, and any nurse who is allocated a burn patient perceives herself to be unfairly treated.

In a specialised burn unit, psychosocial nursing care, wound care and critical physiological care are all priorities, so a burn patient is holistically nursed. Adherence to aseptic technique is maintained in a closed specialised burn unit. Staffing a burn unit is a challenge because acuity levels are very high. If accurately calculated, the ratio should be 2 nurses:1 patient; 1:1 is not adequate. It is difficult to anticipate staffing needs for patient care, as the demand for more staff can rise, with no staff available. Availability and functionality of equipment supplies is very important. The unit manager has a considerable challenge with regard to optimal allocation of staffing and support services. Should either of these not be available, it stresses the nurses, and consequently the nurse manager, resulting in a nursing care distribution burden. Infection control principles have to be adhered to: hand washing is of prime importance. Nurses’ contributions are sometimes not acknowledged or rewarded sufficiently at organisational level. Nurses are tasked to contain primary and secondary burn tragedy.

Conclusion: There is a person inside every burned body. This must be remembered at all times.

The optimal use of antibiotics in burns
Prof Adriano Duse, Department of Microbiology, WITS University

Enteral vs. parenteral feeding
Dr Trevor Smith, Department of Gastroenterology, Southampton University, United Kingdom

Nutritional and pharmacological modulation of the metabolic response of severely burned patients
Prof Bishara Altyeh, General Secretary Euro-Mediterranean Council for Burns and Fire Disasters, MBC

Severe burn patients are some of the most challenging critically ill patients, in an extreme state of physiological stress, and suffering an overwhelming systemic metabolic response. Increased energy expenditure to cope with this necessitates mobilisation of large amounts of substrate from fat stores, and active muscle for repair and fuel, leading to catabolism. The hypermetabolic response can last for as long as nine months to one year after injury, and is associated with impaired wound healing, increased infection risks, erosion of lean body mass, hampered rehabilitation, and delayed reintegration of burn survivors into society. Reversal of the hypermetabolic response, by manipulating the patient’s physiological and biochemical environment through the administration of specific nutrients, growth factors, or other agents (often in pharmacological doses) is emerging as an essential component of the state-of-the-art in severe burn management. Early enteral nutritional support, control of hyperglycaemia, blockade of catecholamine response, and use of anabolic steroids, have all been proposed to attenuate hypermetabolism, or to blunt catabolism associated with severe burn injury. The present study is a literature review of the proposed nutritional and metabolic therapeutic measures, in order to determine evidence-based best practice. Unfortunately, the present state of our knowledge does not allow the formulation of clear-cut guidelines. General trends only can be outlined. These will certainly have some practical applications, but above all, will dictate future research in the field.

The Dutch fire disaster plan and implementation in a major café fire
Prof David Mackie, President, The International Society for Burn Injury, Red Cross Hospital, Beverwijk, The Netherlands

Contingency planning for mass burn casualties is essential to prevent scarce burn facilities becoming compromised by an influx of large numbers of inappropriate casualties. The response to this problem in the Netherlands is based on an analysis of past fire disasters, which showed that the majority of burn casualties in such incidents either sustained non-life-threatening injuries, mainly to exposed areas of skin such as hands and face, or became engulfed, sustaining lethal injuries. In some circumstances, patients with fatal injuries survived long enough to reach hospital alive. The numbers of patients with injuries between these extremes was relatively small. The process of selecting these patients for transfer to a burn centre is clearly crucial. Expertise is required, because factors such as age, burn depth, and the presence of additional injuries may be decisive. Therefore, in 1991, the deployment of a team of burn specialists (the B team) was included in Dutch disaster planning contingencies. Victims of a fire disaster would be transported by ambulance to nearby hospitals following a pre-existing patient dispersal plan. Initial assessment and commencement of appropriate fluid therapy would be instituted by general medical staff according to a simple protocol. In the meantime, the nearest burn centre would dispatch a specialised team to these hospitals to conduct expert triage, and to select those patients requiring transfer to a specialised burn facility. Actual triage criteria would depend on bed availability and
the number of casualties presenting. This approach was rigorously
tested on 1 January, 2001, when a café fire resulted in the admission
to hospital of more than 200 casualties suffering burns and
inhalation injury. More than 80 patients required artificial ventilation.
Casualties were primarily dispersed to 22 hospitals in a wide area.
Despite logistic difficulties, secondary redistribution of patients to
hospitals with an appropriate level of care was complete within
24 hours. In conclusion, the existing plan for dealing with large
numbers of burn casualties in the Netherlands proved to be effective.
Hospital mortality following the Volendam fire was low.

General principles for a disaster plan for South Africa

Prof Lee Walls, Division of Emergency Medicine, Universities of Cape Town and
Stellenbosch

The effects of virgin coconut oil on burn healing:
a case report

Dr AJ Bruce-Chwatt, Consultant Plastic and Reconstructive Surgeon, Vincent Pallotti
Hospital/Tygerberg Hospital

Virgin coconut oil (VCO) has been used for many centuries as
dressing and skin care agent. Three patients with extensive
(> 45%) burns were treated with VCO as their burns healed. The
quality of the grafted and secondarily healed skin in all three cases
was remarkably good. The literature on VCO biochemistry and burn
healing will be reviewed, and further research avenues suggested.

The use of Pelnac® for burns reconstruction

Dr Chris Price, Burns Unit, Red Cross War Memorial Children’s Hospital

The role of Biobrane® in the treatment of
extensive burns

Dr Svetozar Nikolov, Burns Unit, Inkosi Albert Luthuli Central Hospital, Durban

**Background:** The use of skin substitutes as a temporary covering
has been a subject of studies for some time. Temporary coverage of
the burn wound can decrease the metabolic rate, fluid loss, pain and
colonisation. It can also serve as a test for further successful grafting.
The aim of this presentation is to review the clinical experience with
Biobrane® at the Inkosi Albert Luthuli Central Hospital burns unit.

**Method:** Twenty patients with total body surface area (TBSA)
< 70% were selected for this study with superficial, partial thickness
and full-thickness burns. The mean TBSA was 31%. The excision
therapy was carried out in stages. In 17 patients, the first excision was
done between the third and fifth day, with TBSA excised up to 35%. Second
excision was done on day eight in three patients, up to 20%
TBSA. All patients were dressed with Acticoat™ on admission to reduce
progressive damage and protected the wounds from desiccation. In
superficial or partial-thickness burns, it allowed full recovery and
faster healing time. In deep dermal burns, it gave us time to allow
certain indeterminate areas to heal fully, and smaller areas to be
grafted in the second stage. In full-thickness burns, it provided
temporary skin cover and protected from infection, while affording
us time to carry out sequential grafting.

**Conclusion:** Application of Biobrane® provided early coverage of
the wounds, prevented infection, reduced pain, and allowed
early physiotherapy and occupational therapy, preventing further
development of contractures and hypertrophic scars. It also avoided
progressive damage and protected the wounds from desiccation. In
superficial or partial-thickness burns, it allowed full recovery and
faster healing time. In deep dermal burns, it gave us time to allow
certain indeterminate areas to heal fully, and smaller areas to be
grafted in the second stage. In full-thickness burns, it provided
temporary skin cover and protected from infection, while affording
us time to carry out sequential grafting.

**Overestimation: an underestimated problem
in burn assessment**

Robert Owen, Michael Grintzlehner, Johannes Dimberger, RISC-Software GmbH,
Hagenberg, Austria
Herbert Haller, AUVA Unfallkrankenhaus, Linz, Austria
Lars-Peter Kamolz, Landeskrankenhaus Wr Neustadt, Austria

**Background:** The determination of the extent of a burn injury is
a complex process. To aid this process, numerous methods and
tools have been developed. Many publications state that there
are significant deviations in estimations of the same burn injury
by different medical experts. The aim of our work is to illustrate
deviations in the estimations made by medical personnel, using
standard methods, the palm rule, rule of nines, Lund-Browder chart,
or others, in comparison to an electronic surface determination
system using three-dimensional (3-D) technology.

**Method:** Two surveys were carried out at the Congress of the
German-speaking Society (DAV) 2010, and the Congress of the
European Burn Association (EBA) 2011. We provided a questionnaire
with three pictures of burned patients, with outlined areas to be
estimated. The participants had to specify the extent of the burns
(percentage of body surface area), the used estimation methods
and their profession. Additionally, we provided sheets with graphical
representations of the palm rule, the rule of nines and a Lund-
Browder chart. The participation of 51 persons has been voluntarily
and without financial payment. We also used a computer-aided
documentation system, using a 3-D model in order to compare the
results of the survey.

**Results:** We analysed the results of the surveys by calculating the
mean value per patient as a basis for statistical variance analysis.
The Lund-Browder chart seems to be more popular in Europe, than
in the German-speaking countries alone. The standard deviation
ranged from 37-62% of the mean value, whereby small distributed
wounds showed higher deviations. The burned surface area
estimations were up to 176% higher than the calculated area on the
3-D model only, showing minor differences depending on profession.

**Conclusion:** The estimation of burn surface areas may be more
difficult when only using pictures. However, as a result of the high
standard deviations, use of objective burn assessment methods
is recommended. In general, visual estimation of surface areas is
questionable, as calculations vary and are significantly higher than
those pertaining to an individually adapted 3-D model. Objective
burn assessment methods should be used in order to improve
estimations, and allow scientific comparisons between diagnosis, burn treatment and convalescence in terms of the paradigm of evidence-based medicine.

Analysis of the causes of burn-related deaths at Kimberley Hospital

M Giaquinto-Cilliers, T Mathe, S Sheik, T van Wyngaard, D Louw, Burns Unit, Kimberley Hospital Complex

Background: The objective was to analyse the causes of deaths resulting from burn injuries at the Kimberley Hospital burns unit. According to the document on Modernisation of tertiary services in South Africa (2003), the average mortality rate for this country is 10.2% for adults, and 4.1% for children. The most common causes of deaths are sepsis related, despite advances in general burn care. There are few burn units in the country, and most of them lack specialised equipment, trained staff, and an adequate number of beds to cope with the demand for burns patient treatment.

Method: A retrospective audit of the forensic reports from June 2005 to June 2011 obtained after the death of patients who sustained burn injuries admitted at the Kimberley Hospital burns unit was carried out. Data collected included the final cause of death and the gender of patients. A detailed analysis of the reports was the basis for this study.

Results: Sixty-three death reports (30 male, 33 female) were analysed. Four reports pertained to children below 18 years of age. The most frequent cause of death was found to be septicaemia with multi-organ failure. The lungs were the organs that were most affected by sepsis, with bronchopneumonia and pulmonary oedema resulting from the macroscopic finding of consolidation of lung parenchyma and congestion.

Conclusion: Septicaemia was the leading cause of deaths at the Kimberley Hospital burns unit, despite an aggressive surgical approach to the treatment of burn wounds. There was a slight trend away from the number of organs involved in the multi-organ failure in the last reports, in comparison to the earliest reports studied.

Burn reconstruction at the Red Cross War Memorial Children's Hospital

Dr AD Rogers, Dr S Adams, Dr K Adams, Prof H Rode, Prof DA Hudson, Burns Unit and the Division of Plastic Surgery, Red Cross War Memorial Children's Hospital and the University of Cape Town

Burn reconstruction, excluding acute burns surgery, comprises about a quarter of the volume of plastic surgical procedures at this hospital. A wide spectrum of surgeries are performed to improve both function and cosmesis.

We present a review of the procedures performed on these children over a 12-month period. Upper-limb burn contracture releases, injections of hypertrophic scars, and tissue expansion for burn scalp alopecia, are some of the procedures that are most commonly performed. Many of these children require several procedures and outpatient visits to achieve the final result.

We have made increasing use recently of skin substitutes. These have given us additional options in the resurfacing of burnt areas. Considerable work is being undertaken to investigate the use and efficacy of fat grafting (stem cells) in this setting, and we anticipate that this will constitute a significant part of our practise in the future. Although increased dedicated theatre time is undoubtedly required to accommodate the volume of reconstructive surgery, it must be emphasised, particularly for limb burns, that the aggressive use of protocols for correct splinting and mobilisation during the acute phase of burn wound healing may eliminate the need for reconstructive surgery.

Optimising the treatment of burns in developing countries

Prof Bishara Atiyeh, General Secretary Euro-Mediterranean Council for Burns and Fire Disasters, MBC, Executive Editor, Annals of Burns and Fire Disasters, Clinical Professor Plastic and Reconstructive Surgery American University of Beirut Medical Center, Beirut, Lebanon

In developing countries, burn injuries are much more common than in the USA and Europe, or other affluent developed countries, and are associated with higher mortality rates due to poverty, overcrowding and illiteracy. The high incidence makes burns an endemic health hazard in these countries. Over 90% of burn-related fatalities occur in developing or low- and middle-income countries (LMICs), with South-East Asia alone accounting for over half of fire-related deaths. Management of burns and their sequelae, even in the well-equipped, modern burn units of advanced affluent societies, remains demanding despite advances in surgical techniques and the development of tissue-engineered biomaterials that are available to these burn centres. Undoubtedly, in a developing country with limited resources and inaccessibility to sophisticated skills and technologies, management of burns constitutes a major challenge. The present review analyses the challenges facing burn management in LMICs, and explores probable modalities to optimise burn management in these countries.

Tissue expansion and management of burn scar alopecia

Prof Don Hudson, Division of Plastic Surgery, University of Cape Town
Dr Merlin Guggenheim, Division of Plastic Surgery and Hand Surgery, University Hospital Zurich, Switzerland

High-voltage injuries represent one of the most serious challenges in burn surgery. When compared to isolated thermal injuries, several distinct differences exist. The acute phase is aggravated by additional extensive soft tissue damage, that is often more problematic to the skin than a thermal injury. Differing treatment approaches are controversially discussed in the literature. In the context of our own experience, the advantages and disadvantages of both schools of thought are addressed.

Compared with conventional thermal burns, high-voltage electrical burns show a more complex trauma pattern, involving a variety of neurologic, cardiac, renal, gastrointestinal, ophthalmologic and psychiatric disturbances. Tissue damage resulting from high-voltage electrical injury stems from three pathomechanisms. Firstly, direct thermal damage and joule heating may cause severe burn injury
of both skin and deeper tissues, depending on the pathway of the electric current. If the current flows through the victim’s body, extensive occult tissue damage involving muscle, tendons and nerves may result. A flow of the current on the outside of the body, especially observed in flash or arc injuries, will cause extensive skin burns due to severe thermal damage. Secondly, the exposure of cellular membranes to an electrical field results in changes of the transmembrane potential, and subsequently to cellular membrane destruction (electroporation). Finally, cellular membrane proteins may become denaturated by electrical current, leading to permanent destructive changes within the cell membrane and cell death (electrodenaturation).

High-voltage electrical burns are associated with a significant morbidity, including high escharotomy and fasciotomy rates, and amputations. This may explain why these injuries lead to severe socioeconomic implications.

Analysis of burns reconstructive procedures in the Northern Cape

M Giaquinto-Cilliers, T Mathe, S Sheik, T van Wyngaard, Burns Unit, Kimberley Hospital Complex

Background: The objective was to analyse the reconstructive procedures performed in the Northern Cape Province in patients who sustained burn wounds and were previously treated in the Kimberley Hospital burns unit. The aim was to improve the rehabilitation process of burn patients in the province. The rehabilitation of burn patients starts in the acute phase of the injury, and includes active and passive physiotherapy, splinting of joints and extremities, and early excision and grafting of the burn wound, among other interventions. Despite the active intervention, minor and major deformities may develop, and further surgical reconstructive procedures must be performed in order to improve functional and cosmetic features, and assist with the reintegration of the burn patients into their day-to-day lives. The role of plastic reconstructive surgery is to perform the procedures using a realistic approach, combining timing and a selection of techniques.

Method: A retrospective audit of surgical reconstructive procedures performed at Kimberley Hospital Complex from January 2006 to July 2011 was carried out. The ratio of reconstructive procedures performed, and the functional or cosmetic outcome was analysed.

Results: Two thousand, four-hundred and seventy-two overall surgical procedures were performed in the period of the study. Sixty-one per cent of the operations related to plastic surgery procedures, and 38.87% to acute treatment of the burn injury, including surgical debridement and skin grafting. From the total reconstructive cases, around 10% related to late reconstruction of burn-related deformities. Among the reconstructive operations, the release of joint contractions was the most frequent, performed in the following order: armpits, elbows, knees and fingers. Other procedures included reconstruction of the eyebrows, ear reconstruction, release of contracted eyelids and lips, and correction of burn alopecia. Despite the efforts taken to prevent deformities resulting from the burn injuries, the occurrence of burn-related deformities at Kimberley Hospital was high.

Surgical management of burns

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Conclusion: To improve the rehabilitation of burn patients in the Northern Cape Province, a better integration between physiotherapists, occupational therapists, burn surgeons and plastic surgeons is essential. The follow-up of burn patients after the injury, and early referral to a plastic or burn surgeon (when deformities which can be corrected are detected), are essential in achieving quality burn reconstruction and rehabilitation of the burned patient.

Surgical management of the burnt face

Dr Saleigh Adams, Division of Plastic and Reconstructive Surgeon, Red Cross War Memorial Children’s Hospital

In the last 10-15 years, there have been many advances in burns management. Artificial skin substitutes and modern dressings have made superficial partial-thickness burns a very treatable condition. Despite all these advances, deeper dermal, and certainly full thickness facial burns, still continue to pose a significant challenge to the treating community. How far have we come, and how has this transformed practice in modern day South Africa?

Reconstructing the burnt skull

Dr Merlin Guggenheim, Dr Walter Kuenzi, Division of Plastic Surgery and Hand Surgery, University Hospital Zurich, Switzerland

Skull defects, as burn sequelae, have a varying prevalence in different regions of the world. Although generally considered rare, they are observed not so infrequently in children, requiring stable reconstruction in order to protect the underlying brain matter. Numerous materials are available for use in cranioplasty, including bone, plastics and metals. Rib grafts, as a construct for cranial reconstruction, offer several advantages: autologous bone source, a formable platform, low infection, regeneration at the donor site and high fusion rates. Criticism of rib graft cranioplasty includes scarring and pain at the donor site, irregular contour at the graft site, and graft reabsorption. Cranioplasty, using a synthetic material, is less than ideal, especially if there is a history of infection at the defect site. Split-rib cranioplasty is a practical approach, even in patients with a positive history of infection at, or around, the defect.

One crucial prerequisite for bone reconstruction is a viable and stable soft tissue cover. If considered less than ideal, it needs to be reconstructed previously, either by means of soft tissue expansion or free flap transfer. The latter technique is also an option for one-step reconstruction of skull defects. We review our own experience and highlight the crucial technical steps.

Burn reconstruction challenges

Dr Wayne Kleintjes, Consultant Plastic and Reconstructive Surgeon, Cape Town

Ex vivo study comparison of MEBO, Melladerm® and PRP on cell cultures

Dr Wayne Kleintjes, Consultant Plastic and Reconstructive Surgeon, Cape Town
**The future of stem cell research in the context of reconstructive surgery**  
Dr Kevin Adams, Division of Plastic Surgery, University of Cape Town

**The salvage of a lower limb in the case of full-thickness burns**  
Dr Alessandro Andreone, Burn Unit, Inkosi Albert Luthuli Central Hospital, Durban

A 37-year-old male was admitted to the Inkosi Albert Luthuli Central Hospital burn unit with a full thickness burn on his right and left lower limbs, due to an open flame injury. On the third day post-injury, the patient presented with severe full-thickness burns on the right leg. He had a partial-thickness burn of the left leg also, with an affected total body surface area (TBSA) of 18%. This presentation will focus on how multiple operative techniques were used to save the right lower limb. On day five post-injury, the patient was taken to theatre and surgical excision was carried out, down to the muscle fascia. The wounds were covered with a temporary skin substitute, Biobrane®. Three days later, the wounds were inspected in theatre and it was found that the right anterior cortex of the tibia was demarcated. Anterior corticotomy was performed, and the bone defect was covered with a combination of flaps, anterior tibialis, right gastrocnemius and soleus, followed by an autologous graft. On the left leg, Biobrane® was adherent, and was left in place. On day five, the patient’s wounds were exposed. Good grafting had taken place on the muscles flaps. A negative-pressure dressing was applied to the residual wounds, followed by staged grafting. All the grafts took well and were stable. The patient underwent early physiotherapy and occupational therapy with good results and was discharged 24 days later, fully ambulated.

**After the burn wound has healed**  
Dr Salathiel Mzezewa, Burns Unit, Pietersburg Mankweng Hospital Complex, University of Limpopo

**Background:** Patients who are managed in burn units represent a fraction of the burn population in our country. Despite rapid urban migration, the majority of South Africans still live in non-urban areas, where the risk of burning is equally high. When they get burnt, the majority are managed at local clinics and hospitals. Because burn units, physiotherapy and occupational therapy departments are concentrated in central and university teaching hospitals, many burn survivors present with post-burn sequelae later on. Plastic and reconstructive surgery can significantly improve the functional and aesthetic appearance of the post-burn patient. It plays a major role in restoring mobility, aesthetic appearance, self-esteem and quality of life. The aim was to demonstrate the role of reconstructive surgery in the care of burn patients.

**Method:** A series of patients with post-burn sequelae, i.e. contractures of extremities and digits, exposed bones, as well as loss of soft tissues, will be presented.

**Results:** Operative correction of these post-burn sequelae will be discussed and shown. The dilemma of soft tissue cover of exposed bones without tissue expanders and microvascular techniques will be highlighted.

**Conclusion:** Reconstructive surgery plays a major role in restoring function and mobility of the post-burn patient. Quality of life is markedly improved, as well as the aesthetic appearance in post-burn disfigurement.

**Thromboelastography in paediatric burn patients: a comparative study of the effect of subcutaneous adrenaline and bupivacaine on intraoperative blood loss and systemic coagulation.**  
Dr Owen Hodges, Dr LG Thompson, Dr J Karpelowsky, Prof H Rode, Prof MFM James, Prof Jenny Thomas, Departments of Anaesthetics and Paediatric Surgery, Red Cross War Memorial Children's Hospital, University of Cape Town

**Background:** This study aims at assessing the impact of subcutaneous infiltration of an adrenaline and bupivacaine mixture (clysis) on blood loss in paediatric burn surgery.

**Method:** We prospectively gathered data during surgery on blood loss, fluid replacement, type of anaesthetic, and duration of surgery in 25 patients during 2009. This forms the historical control group. From 1 January 2010, the departments of paediatric burns and paediatric anaesthesia commenced with the use of a clysis. We prospectively gathered data during surgery on blood loss, fluid replacement, type of anaesthetic, duration of surgery and incidence of adrenergic responses on a group of 25 control patients during 2010. This forms the study group. In addition, we attempted to assess the impact of clysis on systemic coagulation parameters within 30 minutes of commencing the clysis, using threomboelastographic and conventional laboratory screening tests in the study group.

**Results:** We present the findings and outcome of the clysis technique on blood loss and systemic coagulation in paediatric burn patients at Red Cross War Memorial Children's Hospital, Cape Town, South Africa.

**Phantom limb pain in a burn patient**  
Rukaiya Mowzer, Department of Physiotherapy, Red Cross War Memorial Children’s Hospital

**Background:** Phantom limb pain is described as the persistent sensation of the amputated limb, as if it still was attached to the body. Phantom limb pain is an uncommon phenomenon in children who have undergone a traumatic injury, resulting in the loss of a limb or body part. This presentation serves to describe the treatment of phantom limb pain. A 12-year-old male who was involved in an electrical burn, sustained bilateral full-thickness burns to the upper extremities, which resulted in limb amputations: below the elbow on the right, and above the elbow on the left. Three operations were performed on the left side. Seven days post-amputation, he presented with the phenomena of intermittent phantom limb pain in the left arm. The amputated right arm remained asymptomatic. The sensation was that of a painful clenched hand that he was unable to open. This caused constant discomfort, and at times, excruciating pain.

**Method:** The technique of mirror box therapy was utilised. In this process, the patient views the reflection of his “normal” arm superimposed on the phantom side. This allows him to develop the
concept of having two intact arms through cortical pathways, and reorganisation of the somatosensory cortex by using input to “trick” the brain into believing the amputated arm still exists. Mirror box therapy commenced on day 10 post-traumatic amputation. The technique consisted of him sitting on a chair with a stand-alone mirror in front of him, reflecting only one half of his body, with a therapist behind him and utilising her arms to mimic his amputated arm in the mirror. Therapy was commenced. When tilted slightly off centre, and looking into the mirror, the patient was able to view two intact arms in the reflection. The patient was then instructed to look into the mirror. The exercise consisted of him opening his clenched hand, one finger at a time, and constructing imaginary play. This process continued, over a period of 15 minutes.

Results: Within three treatment sessions, the patient was completely healed of phantom limb pain.

Conclusion: Phantom pain is a real entity, but with mirror box therapy and constructive imaginary play, effective treatment can be instituted.

Intensive care in major burns

Prof Andrew Argent, Paediatric Intensive Care Unit, Red Cross War Memorial Children’s Hospital and University of Cape Town

Introduction: The care of the patient with major burns is a multidisciplinary effort, and requires careful integration of the multiple teams responsible for patient care. Holistic care has many aspects, and must be integrated with the technical aspects of burn management.

Resuscitation: The initial resuscitation of patients with major burns can be challenging, but is focused on ensuring adequate airway support, with early intubation where necessary, and attention to the securing of the endotracheal tube (ETT), ventilatory support where necessary, and cardiovascular support. Fluid resuscitation must take renal function into account, and should balance the need for adequate intravascular volumes with the risks of “fluid creep”, and associated complications, such as compartment syndromes. Temperature control is a particular concern where small children are involved.
**Analgesia and sedation:** Although infection may take some time to develop on burns, there are some patients who may present very soon after the burn injury with features of toxic shock. Early antibiotic therapy is essential in these patients, together with other aspects of supportive care. Burn patients are at extremely high risk of nosocomial infection for multiple reasons, and major attention should be paid to prevention of nosocomial infection in the unit.

**Nutrition:** A specific team should be established to ensure that the nutritional requirements of the patient are met throughout the intensive care unit (ICU) stay. Particular challenges include the early initiation of enteral feeding, where possible; elimination of “gaps” in nutritional intake, related to periods where feeds are stopped for procedures; and continuous monitoring of the nutritional status of the patient (which may be very difficult in the ICU environment).

**Analgesia and sedation:** Analgesia and sedation are critical components of burns management. The overall management of patient comfort should not only focus on pharmacological management, but should have a holistic focus. Daily goals should be established and monitored as to the levels of pain and symptom control that need to be achieved. Symptoms such as pruritis may also be particularly troublesome.

**Conclusion:**
Care of critically ill patients with major burns is challenging, and can only take place within the context of well-coordinated and integrated clinical teams.

**Practical pain control for burn patients**

Prof Jenny Thomas, Department of Anaesthetics, Red Cross War Memorial Children’s Hospital

Burn injuries are painful, sometimes excruciating, and cause considerable suffering. Adequate attention to the physical and emotional pain relief for these patients is mandatory. The experience of pain in different individuals varies, and pain itself changes as the burn healing progresses. Especially in children, anxiety and fear complicate pain control. Good pain management in burn patients is often frustratingly difficult to obtain, and the neuropathic element of burn pain is frequently neglected. Itching may complicate this even further. It is an indictment of the medical profession that most burn survivors have a lasting fear and dread of their daily dressing changes. It, from the beginning, pain is poorly managed, anxiety will aggravate the discomfort, and the triad of pain, anxiety and depression will coexist in a vicious circle, which can be very difficult to treat.

Physical pain control is a challenge, but is possible to achieve. Emotional or spiritual pain is much more difficult to manage well. It is also important to recognise that, with severe burns, pain does not decrease over time. Due to secondary hyperalgesia and tolerance to drugs, it increases. It is the nature of the pain that changes, not the degree. In the short and the long term, inadequate or inappropriate treatment of pain and anxiety may result in adverse physiological and severe psychological disturbances, with the development of chronic pain syndromes becoming a reality. Hyperalgesia and allodynia are common, but under-recognised, in this group of patients.

Medications for managing acute pain include paracetamol, nonsteroidal anti-inflammatory drugs (NSAIDs), opioids (morphine and Valeron), tramadol and clonidine. These are usually required in combination therapy. Neuropathic pain is best treated with gabapentin (the preferred option), carbamazepine or tricyclic antidepressants. The challenge with burn pain is that there is often a component of each of these together, so that early, aggressive treatment using a combination of paracetamol, NSAIDs, opioids, clonidine and gabapentin, may be necessary. Anxiolytic drugs are very useful. Non-pharmacological therapies should be introduced very early into patient care of the burn patient. Good and appropriate psychological support will decrease medication requirements. For the burned patient, adult or child, considerate, early and aggressive management of pain and anxiety is essential.

**Summary**
- Treat pain aggressively.
- Pre-empt the need for analgesia and anxiolysis.
- Do not use intramuscular or oral medications for an acute severe burn.
- Anxiety plays a major role in paediatric burn pain management.
- Assess and measure the pain, and the response to therapy.
- Tolerance to drugs remains a challenge, but is not insurmountable. Depending on the need, titrate the drug.
- When opioids and benzodiazepines have been used for longer than two weeks, wean the patient off these drugs. Do not stop them abruptly.
- Do not use NSAIDs for an acute severe burn when resuscitation may be inadequate.
- Avoid prolonged fasting. Give clear oral fluids until two hours pre-procedure.
- Itching continues to be a significant clinical problem, with few therapeutic options. Gabapentin has been shown to improve itching and neuropathic pain.
- Wherever possible, make use of complementary modalities to supplement pharmacotherapy. Do not underestimate the value of distraction, aroma therapy, music, play and art therapies.

**The crouton dressing: an alternative technique to immobilise skin grafts in difficult areas**

Dr S Adams, Dr AD Rogers, CH Pienaar, Dr K Adams, Prof DA Hudson, Division of Plastic and Reconstructive Surgery, Red Cross War Memorial Children's Hospital and the University of Cape Town

Tie-over dressings and negative pressure dressings are standard techniques for securing and immobilising skin grafts in difficult areas. However, both techniques have certain disadvantages, and are not ideal for every wound. For instance, tie-over dressings have been shown to exert only minimal pressure, and additional splinting may be required. Negative pressure dressings require a source of suction and a consistent seal, while commercially available products...
Background: The objective was to utilise the outreach programme via the Air Mercy Services (AMS) to map the quality of care given to burn patients, and train health care professionals in the Northern Cape Province (NCP) on burns prevention and burns management, in order to improve the referral of patients to the Kimberley burns unit, and provide better quality of care to burn patients within the province. The NCP is the biggest province in South Africa in land mass, and the distances between major towns to the referral tertiary centre, Kimberley Hospital Complex, are long. These distances result in delays in patients accessing adequate treatment, as they have to travel far by road transport or in ambulances. The AMS is based in Kimberley. The outreach programme is used to fly out specialists to the major distant towns, and fly in patients who are in need of emergency care. KBU is the only referral centre for burns patients in the NCP, and most referrals reflect health care personnel’s lack of experience in burn injury management. Education on burn injuries is needed in order to improve the referral of patients who need admission to a burns unit, the pre-hospital management of burns, the acute treatment of burns, the outpatient care, and to promote burns prevention.

Method: Between 13 July to 17 August 2011, a team comprising doctors and nurses were taken by the AMS to five main towns in the main districts of the NCP: Calvina and Springbok (Namakwa District), Upington (Siyanda District), Kuruman (John Taolo Gaetsewe District) and De Aar (Pixley Ka Seme District). Nurses were responsible for lectures given to home-based care givers on measures to prevent burns. Doctors were tasked with the training given to emergency medical services (EMS) personnel on pre-hospital management of burn injuries, the acute management of burn injuries, and with outpatient treatment of burns training given to medical and nursing staff. General written guidelines were provided during training.

Results: Ninety-one care givers were trained in burns preventative measures, and requested to implement the measures among their communities. Fourteen staff members from EMS, 12 doctors and 59 nurses were trained, and the sessions were interactive. The mapping of available beds for treatment of burn injuries has shown that in most regional and district hospitals, patients are admitted to general wards with no dedicated equipment or trained staff. One dedicated room for the admission of burn patients was available in Calvinia. A dedicated burn ward, with 10 beds in Upington, and two beds in Kuruman, is planned for 2012-2013. The majority of district hospitals and community health centres in the province lack equipment for the management of burn wounds (electrical and manual dermatomes), the skills to handle the equipment (medical officers trained in skin grafting), and advanced dressings to speed up the wound healing process. The feedback that was received was promising. A communication channel was opened to allow more interaction between personnel in the remote places and those at the Kimberley burn unit. This should result in better triage of patients for further treatment, and should reduce the costs associated with the transport of patients for unnecessary consultations and admission. A blog containing information and documentation was created to strengthen that communication.

Conclusion: This pilot project in the NCP has shown that the training of professionals working in remote areas can be achieved through outreach opportunities, and improvement of care should result in appropriate referrals to the Kimberley burns unit.

Living safely: help save a child from burns

Prof Heinz Rode, Burns Unit, Red Cross War Memorial Children’s Hospital

Burns remain a major external factor of morbidity and mortality, especially among children younger than five years of age. Many specific and general programmes have been developed to prevent burn injuries among children at home and at play. Most of these programmes are based on educational exposure and subsequent changes in attitude and knowledge. To optimise their effectiveness, programmes often need to be modified to adapt to cultural, religious and socio-economic factors. These programmes usually work best with small groups. The aim is distribution of information, increased knowledge and skill, modification of attitudes and individual and group behaviour, coupled with passive intervention methods.

Childsafe South Africa (http://www.childsafe.org.za), together with its partners, has developed and adapted a poster for use as an educational tool for children younger than six years of age. It consists of a colourful, interesting and age-appropriate sequence of events, depicting a potentially dangerous event or activity, followed by a remedial action, and including four essential steps for first aid action.
A burns disaster plan for South Africa

Dr AD Rogers, Dr Christopher Price, Division of Plastic Surgery
Prof Lee Wallis, Department of Emergency Medicine
Prof Heinz Rode, Division of Paediatric Surgery, University of Cape Town

The International Society for Burns Injuries (ISBI) recommends that “each country has, or should have, a disaster planning system that addresses its own particular needs”. The essential elements of any disaster plan are descriptions of how medical facilities should provide appropriate treatment, and how to ensure access to such facilities. In recent times, devastating fires around South Africa have questioned both the prevention strategies and our preparedness to cope with the potential number of burn casualties. Acts of terrorism have highlighted the need for national disaster plans in all countries. The Australian Burns Disaster Plan (Ausburnplan), for instance, was drawn up in the aftermath of the Bali catastrophe. Analysis of major terrorist attacks has revealed that up to 15% of total live casualties sustain severe burn injuries. The incidence of just 10 new major burns would overwhelm most burns units in South Africa. The South African Burns Society (SABS) is being modernised. It aims to assist in evaluating facilities, helping to maintain standards, updating a database of burns practitioners from a variety of disciplines, and formulating and implementing provincial and national burns disaster plans. This study reviews burn disaster planning in other countries, and highlights principles that could be incorporated into a plan for South Africa.

Biobrane®: the definitive dressing of superficial partial thickness facial burns

Dr AD Rogers, Prof Heinz Rode, The Burns Unit and the Division of Plastic Surgery, Red Cross War Memorial Children’s Hospital

Biobrane® has become an indispensible dressing with three established indications in acute burns care at our institution. These are the definitive dressing of superficial partial thickness facial burns, to be used after tangential excision of deep burns when autograft or cadaver skin is unavailable, and for graft reduction.

This paper details our initial experience of Biobrane in the management of superficial partial thickness facial burns in children, and outlines the protocol that was compiled for its optimal use. A retrospective analysis of theatre records, case notes and photographs, was performed to evaluate our experience with Biobrane over a one-year period. End-points included length of stay, analgesic requirements, time to application of Biobrane, healing times, and aesthetic results. Historical controls were used to compare the results with our previous standard of care. During this period, Biobrane was applied to 87 patients with superficial partial-thickness burns of the face. By adhering to the protocol, we were able to demonstrate significant reductions in hospital stay, healing time, analgesic requirements and nursing care, with excellent cosmetic results. The protocol was widely accepted by those responsible for the optimal management of these patients, including parents, anaesthetists, and nursing staff.