CLINICAL GUIDELINE

Statewide Burn Injury Service

NSW Burn transfer guidelines

4th edition

NSW GOVERNMENT

AGENCY FOR CLINICAL INNOVATION

The Agency for Clinical Innovation (ACI) works with clinicians, consumers and managers to design and promote better healthcare for NSW. It does this by:

- *service redesign and evaluation* – applying redesign methodology to assist healthcare providers and consumers to review and improve the quality, effectiveness and efficiency of services
- *specialist advice on healthcare innovation* – advising on the development, evaluation and adoption of healthcare innovations from optimal use through to disinvestment
- *initiatives including guidelines and models of care* – developing a range of evidence-based healthcare improvement initiatives to benefit the NSW health system
- *implementation support* – working with ACI Networks, consumers and healthcare providers to assist delivery of healthcare innovations into practice across metropolitan and rural NSW
- *knowledge sharing* – partnering with healthcare providers to support collaboration, learning capability and knowledge sharing on healthcare innovation and improvement
- continuous capability building – working with healthcare providers to build capability in redesign, project management and change management through the Centre for Healthcare Redesign.

ACI Clinical Networks, Taskforces and Institutes provide a unique forum for people to collaborate across clinical specialties and regional and service boundaries to develop successful healthcare innovations.

A priority for the ACI is identifying unwarranted variation in clinical practice and working in partnership with healthcare providers to develop mechanisms to improve clinical practice and patient care.

www.aci.health.nsw.gov.au

Agency for Clinical Innovation
1 Reserve Road St Leonards NSW 2065
Locked Bag 2030, St Leonards NSW 1590

T +61 2 9464 4666 E aci-info@health.nsw.gov.au
www.aci.health.nsw.gov.au

Further copies of this publication can be obtained from the Agency for Clinical Innovation website at
www.aci.health.nsw.gov.au

SHPN (ACI) 220366, ISBN 978-1-76023-217-7

Produced by: Statewide Burn Injury Service

Further copies of this publication can be obtained from the Agency for Clinical Innovation website at *www.aci.health.nsw.gov.au*

Version: 2.1

Trim: ACI/D17/4419

Date published: 2022. Revised: Feb 2024. Updated email addresses for CHW and RNSH burn units.

Next review: 2025

ACI_5875 [05/22]

Burn transfer flowchart

Retrieval

- intubated patient
- inhalation injuries
- head/neck burns
- >10% in children
- >20% in adults
- burns with significant comorbidities
- associated trauma
- significant pre-existing medical disorder
- circumferential burn to limbs or chest that compromises circulation or respiration
- significant electrical including lightning injuries
- significant chemical, e.g. hydrofluoric acid

Contact retrieval service

Adults: ACC 1800 65 0004
Children: NETS 1300 36 2500

Set up conference call with receiving burn unit and ICU (if required), facilitates communication with primary referral site.

CHW ICU: 9845 1171

CRGH ICU: 9767 6404

RNSH ICU: 9463 2600

AMRS/NETS will coordinate transfer between the primary hospital and the receiving hospital.

Referral

- >5% children, >10% adults
- burns to the hands, feet, genitalia, perineum, or major joints
- chemical burns
- electrical burns
- burns in patients with pre-existing medical conditions
- suspected non-accidental injury including children, assault or self-inflicted
- pregnancy with cutaneous burns (RNSH 2nd & 3rd trimester)
- extremes of ages

Contact registrar on-call for burns

CHW: 9845 0000, then page registrar on-call for burns

CRGH: 9767 5000, then page registrar on-call for burns

RNSH: 9926 7111, then page registrar on-call for burns

The on-call registrar will offer advice and arrange a bed in liaison with bed management and the burns unit. They are responsible for receiving the patient. The referrer will make the ambulance booking.

Minor burns

Burns that do not fit the criteria for retrieval or referral and can be managed in a non-burn unit hospital or clinic, including appropriate management for wounds and pain.

Minor burns can be treated, in consultation with the referring clinician, on an outpatient basis; either locally (at original place of care), or on referral to an ambulatory care burn clinic for assessment.

Contact burn ambulatory care

CHW: 9845 1850 (b/h)
9845 1114 (a/h)
kidsburns@health.nsw.gov.au

CRGH: 9767 7775 (b/h)
9767 7776 (a/h)
slhd-concordburnsunit@health.nsw.gov.au

RNSH: 9463 2108 (b/h)
9463 2111 (a/h)
BurnsRNS@health.nsw.gov.au

Treated locally.

Referred to burn unit.

Acknowledgments

This document was prepared by the Directorate ACI Statewide Burn Injury Service, with consultation and contributions from the broader ACI Burn Injury Network members including the Emergency Care Institute, the Institute for Trauma and Injury Management, and retrieval services.

The 'rule of nines' and 'burn distribution' diagrams are reproduced from the *Emergency management of severe burns course manual* (18th edition; 2016) with permission from the Australian and New Zealand Burn Association.

Glossary

ABG	Arterial blood gas
ACC	Aeromedical Control Centre
ACI	Agency for Clinical Innovation
ACT	Australian Capital Territory
a/h	After hours
ANZBA	Australian and New Zealand Burn Association
ASNSW	Ambulance Service of NSW
AVPU	Alert, verbal, pain, unresponsive - assessment tool for neurological status
b/h	Business hours
BP	Blood pressure
BSL	Blood sugar level
C	Centigrade
Cap	Capillary
CHW	the Children's Hospital at Westmead
Coags	Coagulation test
COHb	Carboxyhaemoglobin
CO	Carbon monoxide
CPR	Cardiopulmonary resuscitation
CRGH	Concord Repatriation General Hospital
CVL	Central venous line
DMSO	Dimethyl sulfoxide
DTP	Diphtheria tetanus pertussis
ECG	Electrocardiogram
EMSB	Emergency Management of Severe Burns course
EUC	Electrolytes urea creatinine
FBC	Full blood count
FM	Fluid maintenance
FR	Fluid resuscitation
HCN	Hydrogen cyanide
HR	Heart rate
hr(s)	Hour(s)
ICU	Intensive care unit
IM	Intramuscular
ISBI	International Society for Burn Injuries

IV	Intravenous
IVC	Intravenous catheter
IU	International unit
kg	Kilogram
LHD	Local Health District
Max	Maximum
mg	Milligram
ml	Millilitre
mm	Millimetre
NETS	Newborn and paediatric Emergency Transport Service
Rhabdomyolysis	The destruction of striated muscle cells
RNSH	Royal North Shore Hospital
RR	Respiratory rate
SBIS	Statewide Burn Injury Service
TBSA	Total body surface area
TIG	Tetanus immunoglobulin
V	Voltage

Contents

Burn transfer flowchart iii

Acknowledgments iv

Glossary v

Contents vi

Introduction 1

- Background 1
- Application of guidelines 1

Retrieval: time critical 2

Referral and non-time critical transfer 3

Other transfer considerations 4

- Age-specific criteria 4
- Pregnancy 4
- Spinal injury 4
- Multi-trauma 4
- Interstate transfers 4

Assessing burn injury: Burn depth 5

- Depth classifications 5
- Epidermal burn – not included in %TBSA assessment 5
- Superficial dermal burn 5
- Mid dermal burn 5
- Deep dermal burn 5
- Full thickness burn 5
- Wound appearance 5

Assessing burn injury: Total body surface area 6

- Rule of nines 6

Stabilisation prior to transfer 8

- Primary survey 8
- Cooling the burn wound 8
- Preventing hypothermia 8
- Respiratory care 8
- Circulatory care 9
- Gastrointestinal care 9
- Pain management 9
- Wound management 9
- Email addresses 9

Fluid resuscitation 10
Paediatrics 10
Example 1: Adult fluid resuscitation 11
Example 2: Child fluid resuscitation and fluid maintenance 11
Special considerations 12
Tetanus prophylaxis 12
Electrical burns 12
Overview of electrical injuries 12
Treatment 12
Chemical Burns 13
General 13
First aid 13
Hydrofluoric acid 13
Treatment 13
Eye burns 13
Inhalation injury 13
Transfer 14
Documentation 14
Minor burns 14
Appendices
Appendix 1: Contact details 15
Statewide burn units 15
Royal North Shore Hospital 15
Concord Repatriation General Hospital 16
The Children's Hospital at Westmead 16
Appendix 2: Recognising burn depths chart 17
Appendix 3: NSW Trauma App 18
Appendix 4: Burn patient emergency assessment & management chart 19
Appendix 5: Paediatric burn referral process 23

Introduction

Background

This document is the fourth edition of the Statewide Burn Injury Service: Burn transfer guidelines, which were first published in August 2004. These guidelines provide the information needed for effective assessment and management and efficient transfer of NSW patients with a burn injury to designated specialty burn units.

Burn injuries can present at any point in the NSW health system. The ability to assess, manage and transfer these patients to tertiary services is fundamental to good patient outcomes in appropriate time frames.

The ACI Statewide Burn Injury Service (SBIS) comprises three statewide burn units. These units are located at the Children's Hospital at Westmead (CHW), Concord Repatriation General Hospital (CRGH) and Royal North Shore Hospital (RNSH). The burn units' criteria for transfer and admission are consistent with those of the Australian and New Zealand Burn Association and the International Society for Burn Injuries.

Burn mechanisms are varied and include: flame, scald, explosion, contact, chemical, electrical, friction, reverse thermal (cold) and radiation.

To determine the requirement for time critical retrieval, in addition to the ensuing burn-specific retrieval criteria in these guidelines, the following should be read:

- Ambulance Service of NSW Protocol T1, PD2010_021 – *Critical care tertiary referral networks & transfer of care (adults)*
- PD2010_030 – *Critical care tertiary referral networks (paediatrics)*.

For the purpose of these guidelines, a child is defined as a person less than 16 years of age.

Application of guidelines

After their initial burn injury assessment, depending on injury severity, the patient may require:

- retrieval, time critical, to a severe burn unit
- referral and non-time critical transfer to a severe burn unit
- advice on management or co-management from a severe burn unit for minor burns.*

Refer to the *Burn transfer flowchart* at the beginning of these guidelines.

* Minor burns are burn injuries that do not fit the aforementioned transfer criteria and can be managed in a non-burn unit hospital or clinic, with treatment that includes appropriate wound and pain management.

Retrieval: time critical

Time critical retrieval criteria
Any intubated patient
Inhalation injury with cutaneous burns
Head and neck burns
Mid dermal, deep dermal or full thickness burns > 10% total body surface area (TBSA) in children
Mid dermal, deep dermal or full thickness burns >20% TBSA in adults
Burns with significant comorbidities
Burns with associated trauma
Deep circumferential burn to limbs or chest that compromises circulation or respiration
Significant electrical including lightning injuries
Significant chemical e.g. hydrofluoric acid

	Retrieval services	Contact
Adults	Aeromedical Control Centre (ACC)	1800 65 0004
Children	Newborn and paediatric Emergency Transport Service (NETS)	1300 36 2500

If a patient fits the above criteria, and immediate time critical retrieval is considered necessary from the referring hospital, a single telephone call to the Aeromedical Control Centre (ACC) or Newborn and paediatric Emergency Transport Service (NETS) is all that is necessary.

The retrieval service will act as the agent for the referring hospital, facilitating appropriate clinical, transport and destination needs for the presenting clinical situation. Expert advice about burn injury management, need for intubation and fluid resuscitation (FR) can be obtained through these services using a multi-party conference call with relevant tertiary clinicians (including a burn surgeon and receiving intensivist).

All follow-up calls should be made via the retrieval service to ensure that all participants (including retrieval staff) are included and that information is shared efficiently.

The need for physician-assisted transfer is determined by the retrieval service (ACC or NETS) in consultation with the receiving burn unit and intensive care unit (ICU).

Referral and non-time critical transfer

All patients with injuries listed in the table below should have early consultation with a burn unit. If local resources are appropriate, some patients may not need transfer. However, in general, patients who fulfil the criteria below will need transfer. These patients should be referred to the registrar on-call for burns at the appropriate hospital. For service contact numbers and geographical (Local Health District) divisions are provided in Appendix 1.

Referral and non-time critical transfer criteria
All dermal burns >10% TBSA in adults
Full thickness burns >5% TBSA in adults
All dermal or full thickness burns >5% TBSA in children
Burns to special areas: face, hands, feet, genitalia, perineum and major joints
Chemical burns
Electrical burns
Burns with concomitant trauma
Circumferential burns of the limbs or chest without imminent compromise
Burns in patients whose pre-existing medical conditions could adversely affect patient care and outcome
Suspected non-accidental injury including children, assault or self-inflicted
Pregnancy with cutaneous burns
Burns at the extremes of age; small infants and frail elderly

If transfer is required from regional and remote facilities, ACC or NETS may be requested to perform the transfer.

Other transfer considerations

Age-specific criteria

Children up to 16 years of age should be referred to the Children's Hospital at Westmead. Persons 16 years or older should be transferred to an adult burn unit.

Pregnancy

Women in their second or third trimester of pregnancy should be referred to Royal North Shore Hospital, where comprehensive obstetric services are available if required. For women in their first trimester, referral should be decided on an individual basis, taking into consideration burn severity, predicted length of stay in hospital, and other relevant factors.

Spinal injury

Refer adult patients with spinal cord injuries or suspected spinal cord injuries to RNSH, where the acute specialist spinal unit is located.

Multi-trauma

Adult patients with major or multiple trauma and burn injuries should be transferred to RNSH, a NSW designated major trauma service.

Interstate transfers

Health care facilities in close proximity to the Queensland, Victoria and South Australia borders may send patients to the closest burn unit, which may be interstate. In these cases, instigate appropriate communication and management with the receiving hospital according to local agreements.

For all transfer, complete a copy of the *Burn Patient Emergency Assessment & Management Chart* – NH700241, and send it to the receiving burn unit.

Assessing burn injury: Burn depth

Burn depth depends on the injury mechanism and length of exposure to the heat source or other agent. Most burn injuries are heterogeneous in depth.

Depth classifications

Epidermal burn – not included in %TBSA assessment:

- damage to epidermis only; skin intact, no blisters present
- erythema; red
- brisk capillary refill
- should heal spontaneously within 3–7 days, with the application of moisturiser or protective dressing.

Superficial dermal burn:

- damage to upper layer of dermis
- pink; blisters present or absent
- brisk capillary refill (under blister)
- should heal within 7–10 days, with minimal dressing requirements.

Mid dermal burn:

- damage into mid dermis
- dark pink
- sluggish capillary refill
- should heal within 14 days
- deeper burn areas may require surgical intervention and referral.

Deep dermal burn:

- burn extends into deeper layers of the dermis, but not through entire dermis
- blotchy red/white
- sluggish to absent capillary refill
- generally requires surgical intervention
- refer to specialist unit.

Full thickness burn:

- destruction of entire dermis, sometimes with underlying tissue involved
- white, waxy, cherry red, brown, black
- no capillary refill
- surgical intervention and long-term scar management required
- refer to specialist unit.

See Appendix 2 for the *Recognising burn depths chart*.

Wound appearance

Aside from obvious epidermal or full thickness burn injuries, initial determinations of burn depth can be somewhat difficult. The burn wound's appearance may change over time. Discernible differences in burn depth may not be apparent until 7–10 days after the injury. Burn wounds are rarely uniform in depth; mixed or heterogeneous burn wounds are common.

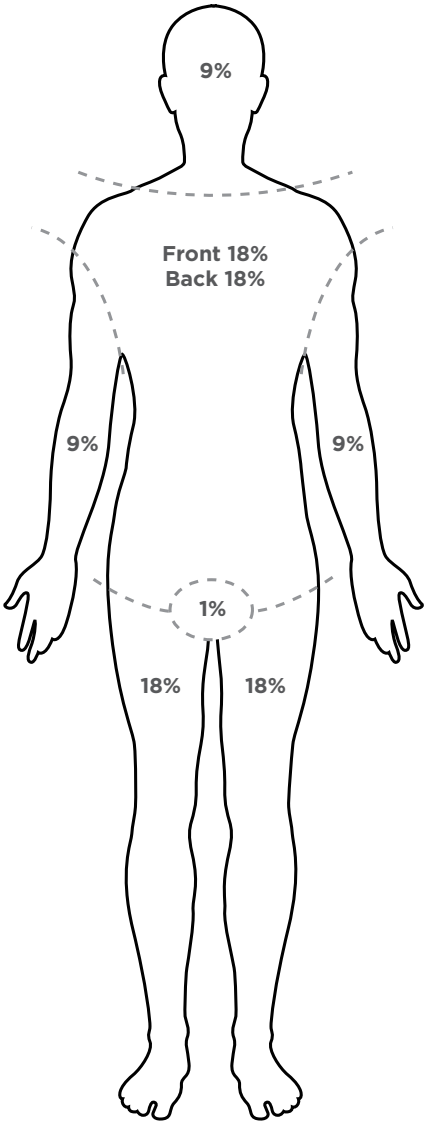
Assessing burn injury: Total body surface area

Rule of Nines

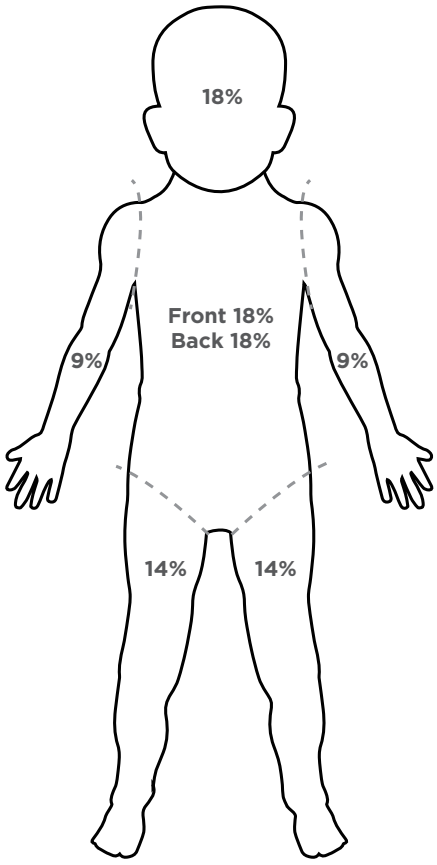
The '**Rule of Nines**' divides the body surface into areas of 9% or multiples of 9%, with the exception of the perineum which is estimated at 1%. This allows the extent of the burn to be estimated with reproducible accuracy.

Additionally small burns may be estimated by using the palmar surface (fingers and palm) of the **patient's** hand, which approximates to 1% body surface area.

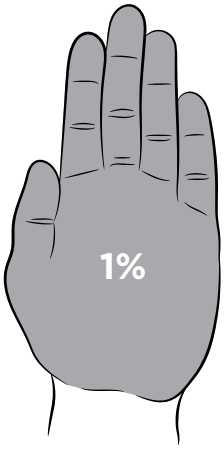
When calculating the TBSA ignore simple erythema.



Adult



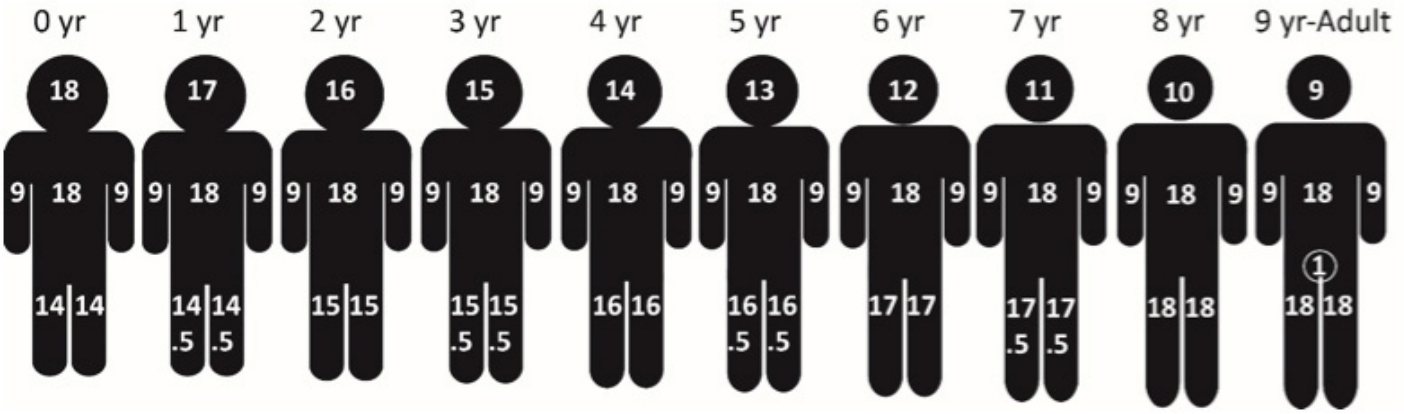
Paedeatric <9 years



Palmar, palm + fingers of patient = 1%

Images reproduced from the *Emergency Management of Severe Burns course manual* (18th ed; 2016) with permission from the Australian and New Zealand Burn Association.

Children's body surface area proportions differ. To estimate the extent of a child's burn injury, use the 'paediatric rule of nines'. *Adjust* for age by subtracting 1% of TBSA from the head and adding 0.5% TBSA to each leg for each year of life for children up to and including eight years. For children aged nine years, 1% is added to the perineum. Thereafter, proportions for calculation purposes are the same as those for adults.



Images reproduced from the *Emergency Management of Severe Burns course manual* (18th ed; 2016) with permission from the Australian and New Zealand Burn Association.

The NSW Trauma App has burn calculators to assist with injury assessment and FR calculations.

Stabilisation prior to transfer

Primary survey

Survey to identify conditions that are immediately life-threatening and begin emergency management. Do not get distracted by the obvious burn injury.

A Airway maintenance with cervical spine control

B Breathing and ventilation

C Circulation with haemorrhage control

D Disability – neurological status

E Exposure and environmental control

F Fluid resuscitation proportional to burn size

Cooling the burn wound

- Cool the burn surface with cool running water. The ideal temperature is 15 °C (range 8–25 °C). Apply for 20 minutes, within the first three hours (hrs) of injury.
- Hypothermia must be prevented. Cool the burn warm the patient.

Never use ice or iced water to cool a burn injury.

Preventing hypothermia

Because burn injuries compromise the body's thermoregulatory system, a patient's body temperature can decrease very quickly. To prevent hypothermia, remove wet packs and soaks, clean off any residual cream or dressing product, and cover the patient in plastic cling wrap or a clean sheet. Then cover the patient with warm blankets, space blankets or patient-warming blankets. Regularly check and document the patient's temperature.

Respiratory care

Give 100% oxygen (preferably humidified) to all patients with burn injuries, except those with minor burns (see section 11). Give 100% oxygen to any patient retrieved from a fire or in a closed space, even if cutaneous burns are not present.

Criteria for intubation

1. Clinical evidence of possible airway compromise:
   - head/neck burns with increased swelling
   - stridor, hoarse voice, swollen lips
   - carbonaceous material around or in the mouth, nose or sputum
   - singed facial, head or nasal hairs
   - intra-oral oedema and erythema
   - possible inhalation injury, for example, flame burn in confined space.
2. Intubate early:
   - if the patient is unconscious
   - if head/neck burns are present, with obvious swelling
   - if the patient is to be transported and has potential airway compromise
   - if there are other clinical symptoms and signs and arterial blood gas results indicate respiratory dysfunction.

If there is any doubt about a patient's airway management prior to transport, consult early with the appropriate retrieval service: ACC (adults) or NETS (children). The retrieval service will set up a conference call with the ICU at the designated burn unit for airway management advice.

Circulatory care

Two peripheral lines should be inserted, preferably through unburnt skin. For adults, use a 16 gauge cannula; for children never use a cannula smaller than 22 gauge.

Follow the fluid resuscitation guidelines in section 8. When fluid resuscitation is commenced, a silastic urinary catheter should be inserted for adults with >20% burns and children with >10% burns. Adjust fluids to achieve recommended urine output.

For circumferential limb burns use ELEVATION in the first instance. Seek advice from the burn unit about the need for escharotomy.

Gastrointestinal care

All patients must remain nil by mouth until after consultation with the designated burn unit. However, early feeding is important, and should be discussed early if transfer is delayed.

A nasogastric tube is required for:

- all adult patients with >20% TBSA burns; paediatric patients with >10% TBSA burns
- all intubated patients
- patients with head and neck burns, after consulting with a burn surgeon.

Pain management

Early pain management is important for patients with severe burn injury. Analgesia is always given intravenously. Morphine is the drug of choice to manage acute pain from burn injuries.

Adult requirements

Administer an initial dose of 0.1 to 0.15 milligrams (mg) per kilogram (kg) of intravenous (IV) morphine; titrate to effect.

Paediatric requirements

Administer a stat dose of IV morphine 0.1 mg/kg; repeat if necessary every 15 minutes, to a maximum of 0.3 mg/kg.

If pain relief is not adequate, escalate to a senior medical officer.

Assess pain score and adjust analgesia to patient requirements.

All medication administered prior to and during transfer must be appropriately documented. Record dose, time of administration, and authorisation signature.

Wound management

Once the patient is stable, plastic film (for example, Cling Film™ or Cling Wrap™) is recommended for patients transferred within eight hours. If the patient's face is burnt, apply paraffin ointment instead of plastic film.

If transfer is delayed beyond eight hours, contact the burn unit for advice on wound management. Silver or paraffin gauze dressings are generally recommended.

Never apply any primary dressing circumferentially because, if the area swells, the dressing may cause constriction.

If limbs are burnt, use elevation where possible to reduce swelling. Patients with head and neck burn injuries should be nursed head-up, to reduce oedema and swelling.

If escharotomy is required, only undertake it after consulting a burn surgeon. See *Clinical practice guidelines: Escharotomy for burn patients*.

Clinical photography has a role in patient treatment. Referring hospitals should clearly identify clinical photographs with patient identification (for example, name and date of birth). Photographs must be accompanied by documentation of informed consent, in line with:

- PD2015_047 – *Photo and Video Imaging in Cases of Suspected Child Sexual Abuse, Physical Abuse and Neglect* if appropriate
- *Guidelines for the use of Telehealth for Clinical and Non Clinical Settings in NSW*.

If sending photos to a burn unit, ensure a consultative phone call takes place to provide relevant patient history.

Email addresses:

- CHW: kidsburns@health.nsw.gov.au
- CRGH: SLHD-concordburnsunit@health.nsw.gov.au
- RNSH: BurnsRNS@health.nsw.gov.au

Fluid resuscitation

Fluid resuscitation is necessary to maintain adequate circulating blood volume and renal function. Fluid resuscitation should be used for adults with burns >20% TBSA and children with burns >10% TBSA. When commencing FR, an indwelling urinary catheter (IDC) should be inserted to monitor urine output.

The NSW Trauma App has burn calculators to assist with assessment and calculations; refer to Appendix 3.

Use the Modified Parkland Formula to calculate fluid volumes required for resuscitation and to generate the desired urine output.

Modified Parkland formula

(Calculated from the time of injury)

3 ml Hartmann's solution x kg body weight x % TBSA

½ given in the first 8 hrs (from time of injury)
½ given in the following 16 hrs

Calculations for fluid resuscitation requirements are based on the time of the burn, not the time of presentation. The fluid resuscitation volume administered should address any deficit.

Patients with delayed fluid resuscitation, electrical conduction injury, and inhalation injury have higher fluid requirements.

For adults, establish and maintain desired urine output at 0.5 ml/kg/hr; for children under 16 years, 1 ml/kg/hr.

Higher target urine output of 2 ml/kg/hr is indicated for patients with haemoglobinuria. Mannitol may be required to achieve this target.

Take care to avoid hyponatraemia, especially in young children and the elderly.

Early review of a patient's urine output and clinical status is essential to evaluate the adequacy of the fluid resuscitation, and make the necessary adjustments to fluids replacement.

The Modified Parkland formula for fluid resuscitation formula is a guide. Fluids may require turning down if urine output and haemodynamics are satisfactory.

Paediatrics

Due to children's limited physiological reserves and susceptibility to hypoglycaemia, fluid maintenance (FM) should be added to the Modified Parkland formula fluid resuscitation calculation. That is, in addition to calculated resuscitation fluid, children should receive maintenance fluid.

Maintenance fluid: 0.9% sodium chloride and 5% glucose.

Use the '4:2:1 rule':

4 ml/kg/ hr – for first 10 kg weight
2 ml/kg/hr – for next 10 kg weight
1 ml/kg/hr – for any additional kg weight

Paediatric fluid formula

FR + FM = total fluid requirements in first 24 hrs

FR = 3 ml Hartmann's solution x kg body weight x % TBSA

plus

FM = Maintenance with 0.9% sodium chloride and 5% glucose

Example 1: Adult fluid resuscitation

70 kg adult patient with 30% burns arriving immediately after the injury

3 x 70 kg x 30 = 6300

Give ½ in the first 8 hrs and ½ in the next 16 hrs

1st 8 hr period	3150 mL
2nd 16 hr period	3150 mL
Total 24 hrs	**6300 mL**

Example 2: Child fluid resuscitation and fluid maintenance

A child weighing 25 kg with a 20% burn will require the following:

Child fluid resuscitation (FR) = Modified Parkland Formula

3 ml x 25 kg x 20 = 1500 ml in 24 hrs

Give ½ in the first 8 hrs and ½ in the next 16 hrs

1st 8-hour period	750 ml
2nd 16-hour period	750 ml

Total FR 24 hrs1500 ml/24 hrs

Plus – Child fluid maintenance (FM) 25 kg child in 24 hours

4 ml x 10 kg	40 ml/hr
2 ml x 10 kg	20 ml/hr
1 ml x 5 kg	5 ml/hr

Total FM 1560 ml/24 hrs = 65 ml/hr

Total fluid requirement = 3060 ml for 1st 24 hrs i.e. 1500 ml (FR) + 1560 ml (FM)

Special considerations

Tetanus prophylaxis

Tetanus status must be assessed for every patient. For follow-up, check the table below (sourced from the *Australian Immunisation Handbook*, 10th Edition).

History of tetanus vaccination	Time since last dose	DTPa, DTPa-combinations, dT, dTpa†, as appropriate	Tetanus immune globulin* (TIG)
≥3 doses	<5 years	NO	NO
≥3 doses	5–10 years	NO	NO
≥3 doses	>10 years	YES	NO
<3 doses or uncertain+		YES	YES

* The recommended dose for tetanus immunoglobulin (TIG) is 250 international units (IU), given by intramuscular (IM) injection using a 21 gauge needle, a soon as practicable after injury. If more than 24 hours has elapsed, 500 IU should be given.

† DTPa: triple antigen, combined diphtheria; dTpa: Diphtheria-tetanus-acellular pertussis;

DT: Diphtheria and tetanus toxoids.

+ Individuals who have no documented history of a primary vaccination course (three doses) with a tetanus toxoid-containing vaccine should receive all missing doses.

Electrical burns

The following information is sourced from the *Emergency management of severe burns course manual* (18th edition; 2016).

Overview of electrical injuries

Electrical source	Likely injuries		
	Skin	Deep tissue	Cardiac arrhythmias
Low voltage <1000 V	Local entrance and exit wounds	No	Immediate cardiac arrest possible, otherwise nil
High voltage >1000 V	Flashover burn, full thickness entrance and exit wounds	Yes, especially muscle. Compartment syndrome, rhabdomyolysis	Transthoracic current may cause myocardial damage and delayed arrhythmias
Lightning	Superficial or dermal flashover burns; exit burns on feet	Eardrum perforation and corneal damage	Respiratory/cardiac arrest; needs prolonged CPR

Treatment

- Primary survey: treat cardiac and respiratory arrest.
- Secondary survey: assess and manage associated trauma.
- Twenty-four hours of electrocardiogram (ECG) monitoring may be required for high voltage injury, unconsciousness, or abnormal ECG on arrival.
- Fluid requirements in electrical injuries are likely to be greater in volume than for a pure cutaneous burn. Concealed muscle damage in limbs leads to fluid loss, which is not factored into the standard formula for fluid resuscitation.
- In patients with deep tissue damage, anticipate haemochromogenuria. Insert a urinary catheter to both detect the earliest sign of urine discolouration and to monitor urine output. If pigments appear in urine, increase the fluid infusion rate to maintain a urine output of 75-100 ml/hr for adults, 2 ml/kg/hr for children.

Chemical burns

The following information is sourced from the *Emergency management of severe burns course manual* (18th edition; 2016).

General

- Acids produce a coagulative necrosis
- Alkalis produce a liquefactive necrosis
- All produce coagulation of protein by oxidising, corrosive or salt-forming effects on protein.

First aid

- Brush away any dry powders
- Apply copious constant running water for more than one hour
- Irrigate bitumen and alkali burns with water for an even longer period than other chemical burns
- Chemical injuries to the eye also require copious irrigation, and referral.

Hydrofluoric acid

- Used in glass etching, metal cleaning, electronics manufacturing
- After penetrating tissue, hydrofluoric acid dissociates into hydrogen and fluoride ions (which bind with calcium ions), causing hypocalcaemia.

Treatment

- Provide prompt water irrigation
- Trim fingernails
- Topical calcium gluconate burn gel (10% with dimethyl sulfoxide [DMSO])
- Local injection with 10% calcium gluconate (multiple injections 0.1–0.2 ml through 30 gauge needle into burn wound). Monitor the number and frequency of injections by pain response
- Intra-arterial infusion of calcium gluconate
- Intravenous ischaemic retrograde infusion (Bier's block) of calcium gluconate.

Eye burns

- Physical signs include blepharospasm, tearing, conjunctivitis and uncontrolled forceful rubbing of the eye
- Treat with copious irrigation of water
- Use topical antibiotics to prevent secondary infection
- All chemical eye burns require urgent consultation with an ophthalmologist.

Inhalation injury

Carbon monoxide (CO) and hydrogen cyanide (HCN) are two common agents, both products of combustion, that can cause systemic intoxication inhalation injuries. Both produce reduced consciousness and may lead to death. Carbon monoxide inhalation injury is relatively easy to diagnose by blood carboxyhaemoglobin (COHb) level. Recognising and treating these inhalation injuries can be lifesaving.

Treatment

- High-flow oxygen
- Hydroxycobalamin should be administered for HCN toxicity as the first-line antidote, as it binds to cyanide.

Transfer

Transfer patients with burn injuries within four hours if possible.

If an intensive care bed is required for time critical transfer, the ACC will organise transfer for adults, and NETS will do so for children.

Documentation

Complete the *Burn Patient Emergency Assessment & Management Chart* – NH700241 (see Appendix 4) for all patients transferred. Fax the chart to the receiving burn unit at the time of initial call, then give a copy to the team for transport, along with any signed consents, history and relevant information.

Send with the patient, as appropriate, a photocopy of the fluid balance chart, information regarding analgesics administered, and any signed consents obtained. Follow up any faxed documents with a phone call, to ensure the appropriate person receives them.

Minor burns

- Many patients who do not meet the burn referral criteria can be managed at their primary referring site. The ACI Statewide Burn Injury Service can support and assist primary health sites to liaise in ongoing burn management.
- The ACI Statewide Burn Injury Service has services to provide burn advice 24 hours a day; see Appendix 1 for contact details.
- Each tertiary referral site has an ambulatory care service for wound management and minor burn review. These services can be contacted during business hours. See Appendix 1 for contact details.
- For minor burn management advice, refer to the *Minor Burn Management Guideline*.

Appendix 1: Contact details

	Retrieval services	Contact
Adults (16 years +)	ACC (Aeromedical Control Centre)	1800 650 004
Children (< 16 years)	NETS (Newborn and paediatric Emergency Transport Service)	1300 362 500 / help@nets.org.au

Statewide burn units

Although Local Health Districts have a designated first point of contact for adults with burn injuries (see below), bed availability will determine which burn unit accepts the transfer.

Note: In NSW areas close to the Queensland, Victoria and South Australia borders, patients may be sent to the closest burn unit, which may be interstate. In these cases, follow local protocols for communication with interstate facilities.

Royal North Shore Hospital

The Local Health Districts in the RNSH catchment are: Northern Sydney, Central Coast, Hunter New England, Northern NSW and Mid North Coast.

	Phone	Fax
Burn unit	02 9463 2111	02 9463 2006
Burn registrar/consultant on-call	02 9926 7111, then page burn registrar	

	Phone	After hours
Intensive care unit	02 9463 2111, then to ICU admitting officer (advanced trainee)	
Ambulatory care	02 9463 2110 business hours	02 9463 2111 after hours

Digital photos can be sent to BurnsRNS@health.nsw.gov.au, but only after consent and contact have been made.

Concord Repatriation General Hospital

The Local Health Districts in the CRGH catchment are: Illawarra Shoalhaven, Nepean Blue Mountains, South Eastern Sydney, South Western Sydney, Sydney, Western Sydney, Far West, Murrumbidgee, Southern NSW and Western NSW. So, too, is the Australian Capital Territory (ACT).

	Phone	Fax
Burn unit	02 9767 7776	02 9767 5835
Burn registrar/consultant on-call	02 9767 5000 then page burn registrar	

	Phone	After hours
Intensive care unit	02 9767 6404	
Ambulatory care	02 9767 7775 business hours	02 9767 7776 after hours

Digital photos can be sent to SLHD-concordburnsunit@health.nsw.gov.au after consent and contact have been made.

The Children's Hospital at Westmead

The CHW will take referrals for all children up to 16 years of age in NSW and the ACT.

	Phone	Fax
Burn unit	02 9845 1114	02 9845 0546
Burn registrar/consultant on-call	02 9845 0000 then page registrar on-call for burns	

	Phone	After hours
Intensive care unit	02 9845 1171	
Ambulatory care	02 9845 1044 business hours	02 9845 1114 after hours

Digital photos can be sent to kidsburns@health.nsw.gov.au, but only after consent and contact have been made.

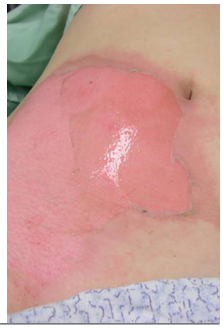
Appendix 2: Recognising burn depths chart

Epidermal burn (erythema)

- damage to epidermis only; skin intact, no blisters present
- erythema; red
- brisk capillary refill
- heals spontaneously within 3–7 days with moisturiser or protective dressing.

Superficial dermal burn

- damage to upper layer of dermis
- pink; blisters present or absent
- brisk capillary refill (under blister)
- should heal within 7–10 days with minimal dressing requirements.



Mid dermal burn

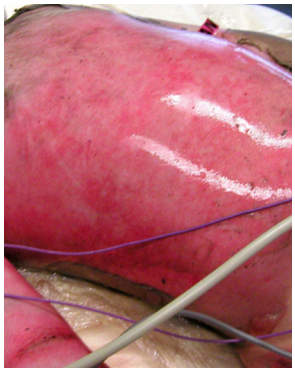
- damage into mid dermis
- dark pink
- sluggish capillary refill
- should heal within 14 days
- deeper areas may need surgical intervention and referral.

Deep dermal burn

- burn extends into deeper layers of dermis, but not through entire dermis
- blotchy red/white
- sluggish to absent capillary refill
- generally needs surgical intervention
- refer to specialist unit.

Full thickness burn

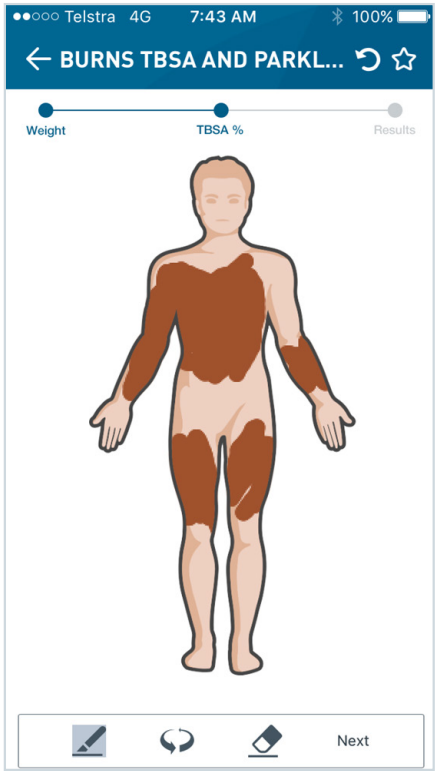
- destruction of entire dermis; sometimes underlying tissue involved
- white, waxy, cherry red, brown, black
- no capillary refill
- surgical intervention and long-term scar management required
- refer to specialist unit.

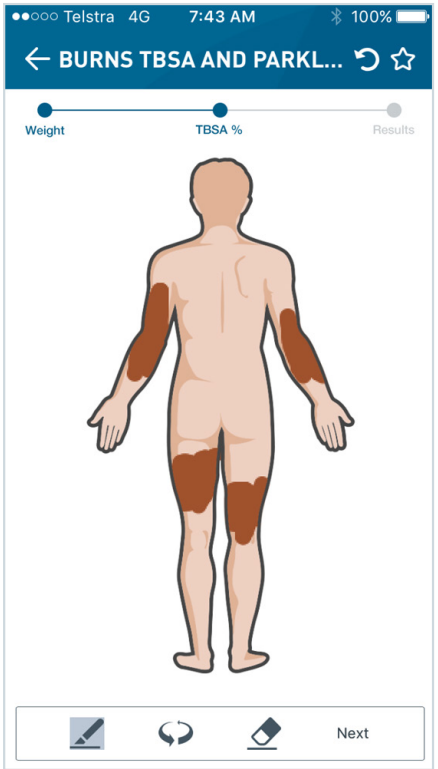


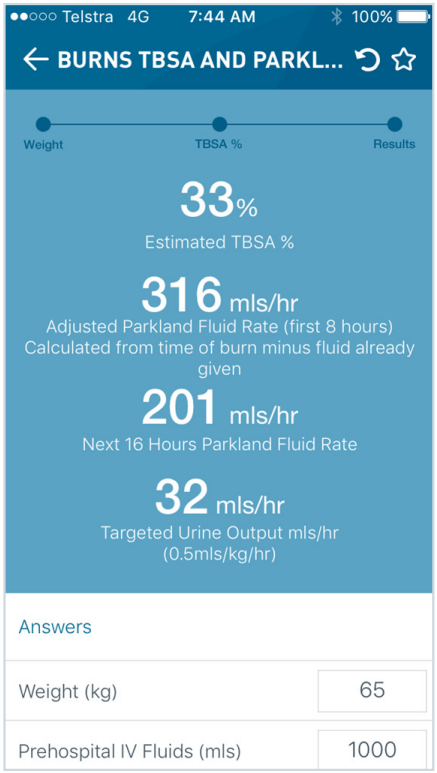
Appendix 3: NSW Trauma App

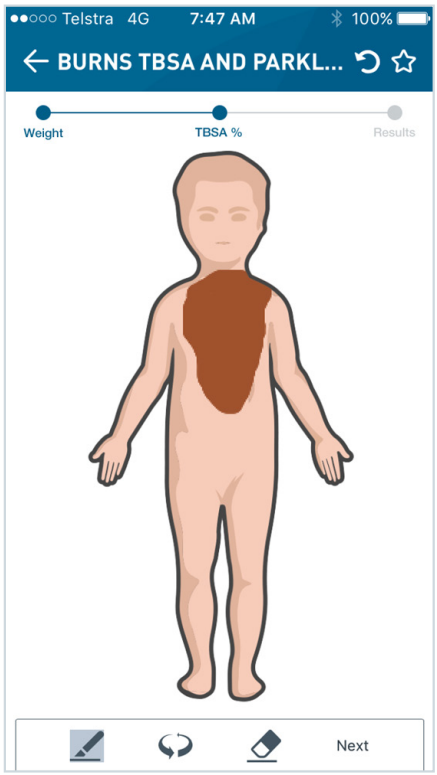
The NSW Trauma App, created by the Institute of Trauma and Injury Management to provide information on traumatic injured patients, includes a section on burn management. The app is available for download from iTunes and Google Play.

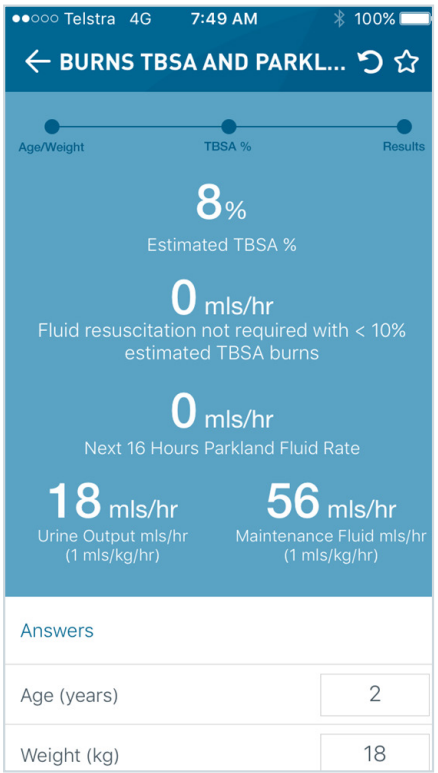
Useful tools in the burn management section include algorithms for recognising and managing specific issues, such as circumferential burns. Also included are calculators to determine burn size and fluid requirements. Sample views of the calculators are given below.











Appendix 4: Burn patient emergency assessment & management chart

NSW GOVERNMENT Health

Facility:

BURN PATIENT EMERGENCY ASSESSMENT & MANAGEMENT CHART

SMR060815

FAMILY NAME	MRN
GIVEN NAME	☐ MALE ☐ FEMALE
D.O.B. ____/____/____	M.O.
ADDRESS	
LOCATION / WARD	
COMPLETE ALL DETAILS OR AFFIX PATIENT LABEL HERE	

Presentation Date: ____/____/____	Time: _____:_____	Trauma Call: ☐ YES ☐ NO
Burn Date: ____/____/____	Burn Time: _____:_____	Triage Category:
Weight (Kg):	Doctor:	

Burn Mechanism:

_____

_____

First Aid given: ☐ **NO** ☐ **YES** Specify _____

Airway
Intubation required? ☐ Yes ☐ No
Size of tube _____ mm

Cervical Spine
☐ Normal ☐ At Risk ☐ Immobilised

Breathing – O_2
RR _____ Air Entry _____
O_2 saturation _____
Burn circumferential around chest / neck?
☐ Yes ☐ No

Circulation
HR _____ BP _____/_____ **2 x IV lines** Size and location _____
Circumferential burns? ☐ Yes ☐ No specify _____
Capillary refill centrally ☐ 1-2 seconds ☐ > 2 seconds ☐ Absent
Capillary refill peripherally ☐ 1-2 seconds ☐ > 2 seconds ☐ Absent

Disability
Level of consciousness (AVPU): _____
AVPU = A – **A**lert, **V** - Response to **V**ocal stimuli,
P - Responds to **P**ainful stimuli, **U** – **U**nresponsive

Pupils: (L) _____ mm (R) _____ mm

Environment
Patient Temp _____°C Temp route _____
Temp date ____/____/____ Time _____:_____
Remove clothing and jewellery
Keep unburnt areas warm
Warm IV fluids ☐ No ☐ Yes ☐ N/A
Warm blankets ☐ No ☐ Yes ☐ N/A

Assess % Total Body Surface Area (TBSA) burnt using Rule of Nines (see page 2)
TBSA body chart completed? ☐ No ☐ Yes By whom? _____ *(Print name)* _____ *(Designation)*

Fluid Resuscitation (see page 3 for specific fluid calculations)
☐ Not required
Large bore IVCs (2 for >20%, 1 for >10%) or CVL inserted? ☐ Yes ☐ No
Bloods taken: ☐ FBC ☐ EUC ☐ BSL ☐ Coags ☐ COHb ☐ Drug screen
IDC inserted? (if > 10% TBSA or perineum) ☐ Yes ☐ No
Nasogastric tube inserted? (if > 10% children; >20% adult) ☐ Yes ☐ No

Co-existing injuries? ☐ Yes ☐ Possible (e.g. blast / electrical injury) ☐ No
Specify _____

Pain Management
Morphine (alternative if allergic)
Adults Stat IV 2mg, repeat every 5mins as required
Max. 0.2mg/Kg
Children Stat IV 0.1mg/ Kg, repeat every 15mins as required
Max. 0.3mg/Kg

Minor burn oral analgesia (e.g. paracetamol +/- codeine / oxycodone, etc.) may be adequate

Immunisation
Immunisations up to date? ☐ No ☐ Yes
Specify _____
Tetanus status: ☐ Primary course given
☐ Last dose of booster _____/_____/_____
☐ Give Immunoglobulin if < 3 doses
☐ Give booster if last booster > 5yrs ago

Holes Punched as per AS2828.1: 2019
BINDING MARGIN - NO WRITING

BURN PATIENT EMERGENCY ASSESSMENT & MANAGEMENT CHART
SMR060.815

NH700241 120220

NO WRITING

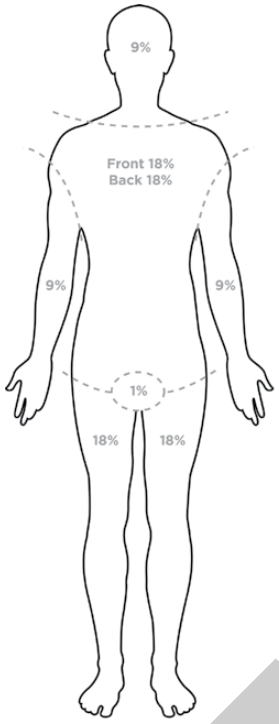
NSW GOVERNMENT Health

Facility:

BURN PATIENT EMERGENCY ASSESSMENT & MANAGEMENT CHART

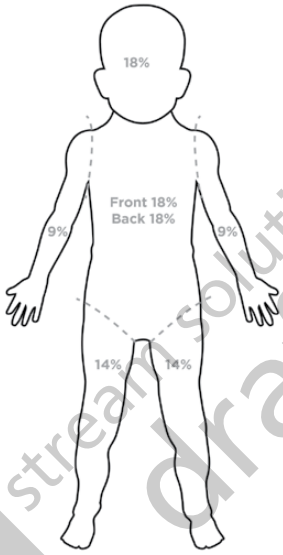
FAMILY NAME	MRN
GIVEN NAME	☐ MALE ☐ FEMALE
D.O.B. _____ / _____ / _____	M.O.
ADDRESS	
LOCATION / WARD	
COMPLETE ALL DETAILS OR AFFIX PATIENT LABEL HERE	

BURN DISTRIBUTION (shade affected areas on diagram below)



Adult

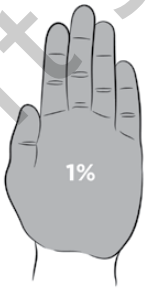
Paediatric
For every year of life take 1% from the head and add ½% to each leg, until the age of 9 years when adult proportions



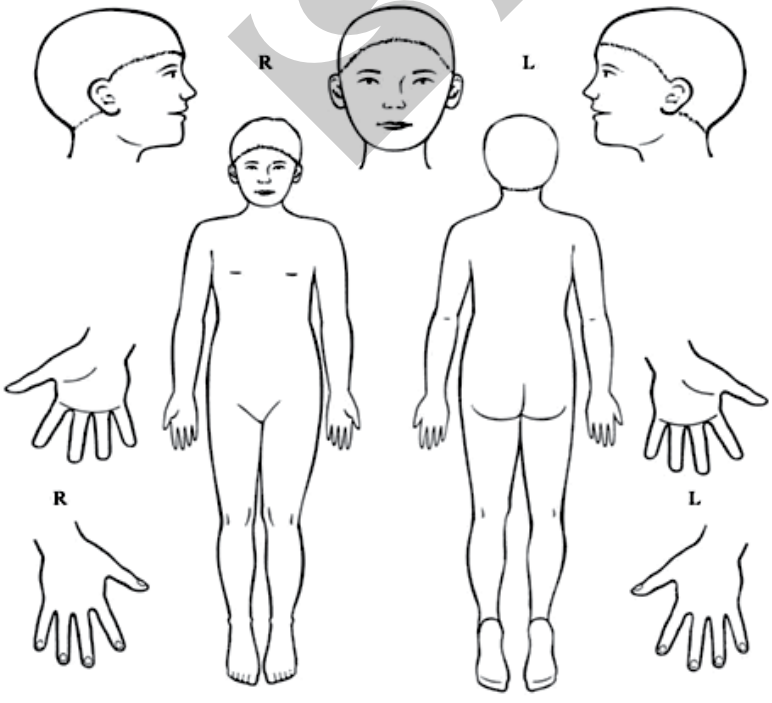
Paedeatric <9 years

Palmar
Palm + fingers = 1%

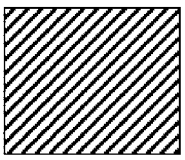
(Patient's hand)



Palmar, palm + fingers of patient = 1%



Shade affected area



Total % TBSA = _____

NB Faint erythema not included in % TBSA assessment

NB Difficult to accurately assess burn depth within the first 24 - 48 hrs post injury

NO WRITING

NSW GOVERNMENT Health

Facility:

BURN PATIENT EMERGENCY ASSESSMENT & MANAGEMENT CHART

FAMILY NAME	MRN
GIVEN NAME	☐ MALE ☐ FEMALE
D.O.B. _____ / _____ / _____	M.O.
ADDRESS	
LOCATION / WARD	
COMPLETE ALL DETAILS OR AFFIX PATIENT LABEL HERE	

SMR060815

Holes Punched as per AS2828.1: 2019

BINDING MARGIN - NO WRITING

RESUSCITATION FLUIDS (if >10% TBSA for children, >20% for adults)

Weight _____ Kg

Modified Parkland Formula = 3 mLs x weight (Kg) x % TBSA burn

to be given as **Hartmann's** solution in 24 hrs following the injury (see Transfer Guidelines)

3 mLs x _____ Kg x _____% TBSA = total fluids for first 24 hrs

NB This is a guide only - Titrate fluids to urine output

Total resuscitation fluids in 24 hrs	_____ mLs	**Start time** ____:____ **Finish time** ____:____
50% Replacement in first 8 hrs following injury	_____ mLs	
Total fluid given prior to admission	_____ mLs	
Subtract fluid already given = fluid to be given to complete first 8hrs	_____ mLs	
Hourly rate for replacement (within first 8 hrs)	_____ **mLs/hr**	**Start time** ____:____ **Finish time** ____:____
Remaining 50% of replacement in next 16 hrs	_____ mLs	
Hourly rate for replacement (in subsequent 16 hrs)	_____ **mLs/hr**	**Start time** ____:____ **Finish time** ____:____
Maintenance fluids (for children < 30 Kg only)	_____ mLs/hr	

MAINTENANCE FLUIDS (Not applicable for adults)

Children require maintenance fluids (0.9% sodium chloride and 5% Glucose) in addition to resuscitation fluids

4 mL/Kg/hr	For first 10 Kg weight
2 mL/Kg/hr	For next 10 Kg weight
1 mL/Kg/hr	For any additional Kg weight

URINE OUTPUT

- Children 1 mL/Kg/hr
- Adults 0.5 mL/Kg/hr
- 2 mL/Kg/hr required for pigmented urine such as myoglobinuria / haemoglobinuria

REFERRAL CRITERIA

Refer to Transfer Guidelines ("Referral" meaning contact with not necessarily transfer to Burn Unit)

- Mid-dermal, deep dermal or full thickness burns in children >5% TBSA, in adults >10% TBSA.
- Any priority areas are involved, i.e. face/neck, hands, feet, perineum, genitalia and major joints.
- Caused by chemical or electricity, including lightning.
- Any circumferential burn.
- Burns with concomitant trauma or pre-existing medical condition.
- Burns with associated inhalation injury.
- Suspected non-accidental injury.
- Pregnancy with cutaneous burns.

DRESSING

For transfer to specialist unit within 8 hrs apply cling film to burnt areas (Vaseline gauze/white paraffin for face). **Do not wrap circumferentially.**

For delayed transfer > 8 hrs apply antimicrobial dressing such as silver dressing or Vaseline gauze, after discussion with burn unit.

For burns not requiring transfer to specialist unit

- Give pre-med analgesia 30mins prior to procedure (e.g. paracetamol +/- codeine / oxycodone, etc.)
- Clean wound with chlorhexidine 0.1%, saline or clean water
- Apply appropriate dressing such as silver dressing or Vaseline gauze (see Minor Burn Management)
- Make follow-up appointment and advise on care and analgesia for home usage and pre-dressing

BURN PATIENT EMERGENCY ASSESSMENT & MANAGEMENT CHART SMR060.815

NH700241 120220

NO WRITING

NSW GOVERNMENT Health

Facility:

BURN PATIENT EMERGENCY ASSESSMENT & MANAGEMENT CHART

FAMILY NAME	MRN
GIVEN NAME	☐ MALE ☐ FEMALE
D.O.B. _____ / _____ / _____	M.O.
ADDRESS	
LOCATION / WARD	

COMPLETE ALL DETAILS OR AFFIX PATIENT LABEL HERE

HISTORY OF INJURY

How did the burn happen? (see page1)

Who saw it / who else was there?

What was done?

MEDICAL HISTORY

Past Medical History _____

_____

_____

Co-morbidities? _____

_____

Allergies? ☐ No ☐ Yes

If YES specify?

Medications? ☐ No ☐ Yes

If YES specify?

Last oral intake?

Social History _____

_____

SOCIAL ISSUES

Any features of concern? E.g. non-accidental injury/self-harm/abuse? ☐ No ☐ Yes

If YES specify? _____

_____

Child Protection Service notified? ☐ No ☐ Yes Reference Number _____

Action taken _____

Signature: _____ **Date:** _____/_____/_____ **Time:** ____:____

Print name: _____ **Designation:** _____

CONTACT NUMBERS

Retrieval (refer to Transfer Guidelines for Retrieval Criteria)	**Transfer and consultations** (Burns Registrar via Hospital Switch)	**Minor Burn Management** Burn Ambulatory Clinics
ACC (adult retrieval) 1800 650 004 NETS (paediatric retrieval) 1300 362 500	RNSH 02 9926 7111 (adult) CRGH 02 9767 5000 (adult) CHW 02 9845 0000 (paediatric)	RNSH 02 9463 2108 CRGH 02 9767 7775 CHW 02 9845 1850

Digital Image Referral

NB Digital images can be emailed to Burn Units only after consent and contact has been made

RNSH – BurnsRNS@health.nsw.gov.au

CRGH – SLHD-concordburnsunit@health.nsw.gov.au

CHW – kidsburns@health.nsw.gov.au

RNSH: *NSLHD, CCLHD, HNELHD, NNSWLHD & MNCLHD*	**CRGH:** *ISLHD, NBMLHD, SESLHD, SWSLHD, SLHD, WSLHD, FWLHD, MLHD, SNSWLHD, WNSWLHD & ACT*	**CHW:** *all children <16 yrs in NSW & ACT*

NO WRITING

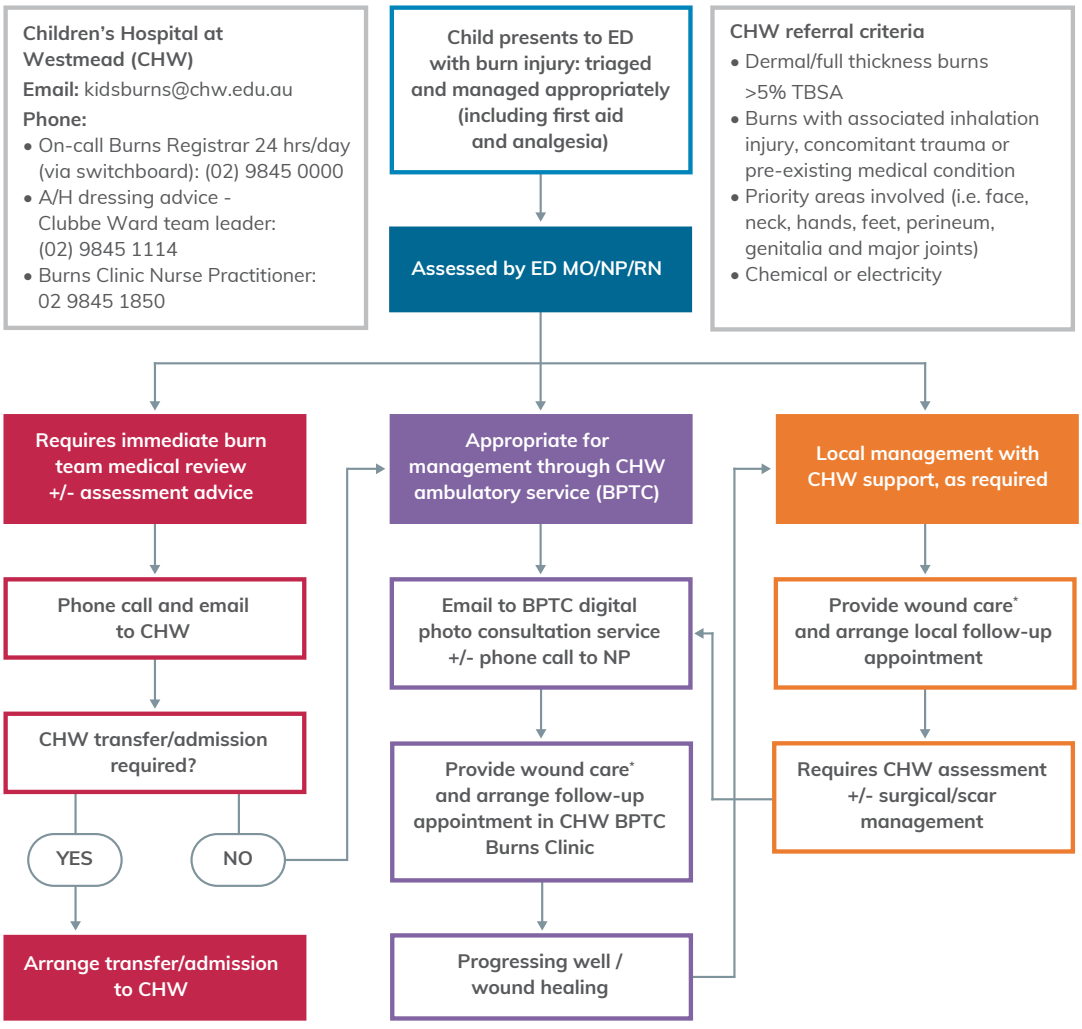
Appendix 5: Paediatric burn referral process

The Children's Hospital at Westmead

The Children's Hospital at Westmead (CHW) is the tertiary referral centre for paediatric burns in NSW.

All children, from birth to 16 years of age, with a burn that meets the referral criteria, as per the NSW Statewide Burn Injury Service (SBIS) Transfer Guidelines are referred to CHW. Referral does not necessarily mean immediate call or admission/transfer to a burn unit.

- Patients requiring transfer, or meeting referral criteria requiring timely discussion with the CHW tertiary burns service, will be discussed with the on-call registrar for burns on (02) 9845 0000 (switchboard).
- Clinical images of the burn injury (with consent) will be sent to kidsburns@health.nsw.gov.au.
- Potential inpatients are assessed in the CHW emergency department (ED) and may be admitted to the Clubbe ward or paediatric intensive care unit (PICU), depending on severity of injury.
- For ambulatory care patients, the Burns Service at CHW offers a nurse practitioner (NP)-led clinic and a supportive outreach service with regional Paediatric Ambulatory Clinics.
- A digital service is available for consultation, referral, and to facilitate local management of the patient with support from the CHW Burns Unit staff. This operates Monday to Friday from 8am to 4.30pm. The nurse practitioner can be contacted on (02) 9845 1850 or email kidsburns@health.nsw.gov.au.
- If non-urgent advice is required outside of these hours, or a follow-up appointment is required in the Burns and Plastics Treatment Centre (BPTC), an email referral can be sent to kidsburns@health.nsw.gov.au and a response will be received the next business day (within 72 hours).
- For timely dressing advice after-hours, please email digital images to kidsburns@health.nsw.gov.au and call the Clubbe Ward team leader on (02) 9845 1114.



* For dressing advice, contact the Clubbe Ward team leader on 02 9845 1114.