सत्यमेव जयते
Ministry of Health & Family Welfare

Standard Treatment Guidelines for Management of Burns

A Guidance Document for Clinical Management and Rehabilitation of Burn Injuries in India

Trauma and Burn Division

Directorate General of Health Services

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Government of India

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जगत प्रकाश नड्डा
JAGAT PRAKASH NADDA

सत्यमेव जयते

मंत्री
स्वास्थ्य एवं परिवार कल्याण
व रसायन एवं उर्वरक
भारत सरकार

Minister
Health & Family Welfare
and Chemicals & Fertilizers
Government of India

MESSAGE

Burn injuries remain one of the most serious public health challenges in India, with devastating consequences that extend far beyond initial physical harm. In addition to high mortality, these injuries inflict profound psychological trauma, leaving survivors with lifelong scars—both physical and emotional. The recovery process is often long, painful, and fraught with challenges, including disfigurement, chronic pain, limited mobility, and social stigma.

The economic and social toll is immense. The cost of medical care, rehabilitation, and lost income places a significant financial strain on families, often pushing them into poverty. Moreover, burn injuries disproportionately affect women and children, particularly in low-income households, where they are often the result of accidents involving cooking fires, gas stoves, and flammable liquids. This makes prevention of burns and care of burn patients a critical issue of social equity.

Recognizing the scenario, the Ministry of Health and Family Welfare is firmly committed to improving outcomes for burn injuries. A key strategy in this endeavour is the nationwide implementation of Standard Treatment Guidelines (STGs) for burn care. These guidelines are designed to ensure that every individual affected by burns receives timely, appropriate, and high-quality medical attention, regardless of where they seek treatment.

Crucially, these guidelines acknowledge that burn care is a long-term journey that extends far beyond the initial treatment. This holistic approach, which combines rehabilitative care with psychological support, aims to rebuild physical capability, enhance mobility, and regain independence, thus enabling survivors to rejoin their communities and resume productive roles.

Contd....

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सत्यमेव जयते

The Ministry of Health and Family Welfare strongly encourages all healthcare professionals and institutions to adopt and diligently follow these Standard Treatment Guidelines. The commitment to their implementation is crucial in strengthening our healthcare system's response to burn injuries and making a tangible difference in the lives of those affected. Together, we can work towards a future where the burden of burn injuries is significantly reduced.

(Jagat Prakash Nadda)

राष्ट्रीय स्वास्थ्य मिशन

प्रतापराव जाधव

PRATAPRAO JADHAV

सत्यमेव जयते

आज़ादी का अमृत काल

राज्य मंत्री (स्वतंत्र प्रभार)
आयुष मंत्रालय
व
राज्य मंत्री
स्वास्थ्य एवं परिवार कल्याण मंत्रालय
भारत सरकार

MINISTER OF STATE (INDEPENDENT CHARGE) OF MINISTRY OF AYUSH AND MINISTER OF STATE OF MINISTRY OF HEALTH & FAMILY WELFARE GOVERNMENT OF INDIA

MESSAGE

Recognizing the immense health challenge posed by burn injuries, the Ministry of Health and Family Welfare is steadfast in its commitment to improving outcomes. A cornerstone of this commitment is the nationwide adoption of Standard Treatment Guidelines (STGs) for burn care. These guidelines are meticulously designed to facilitate that every burn victim receives timely, appropriate, and high-quality medical attention, regardless of their location or socioeconomic status.

These STGs offer a unified framework encompassing the entire spectrum of burn management, from critical initial interventions like first aid and resuscitation to specialized care including advanced wound management, effective pain control, comprehensive rehabilitation, and essential psychological support. By consistently applying evidence-based protocols outlined in these guidelines, our objectives are clear: to significantly reduce mortality rates, minimize the occurrence of complications, promote enhanced and lasting functional recovery, and ensure equitable access to the highest standards of care for all burn survivors across the nation.

Government of India under the visionary leadership of Hon'ble Prime Minister Shri Narendra Modi ji and able guidance of Hon'ble Union Minister of Health and Family Welfare, Shri Jagat Prakash Nadda ji, is committed to ensure the safety and well-being of citizens in India.

The Ministry of Health and Family Welfare earnestly urges all healthcare professionals, medical institutions, and relevant stakeholders to wholeheartedly embrace and diligently implement these Standard Treatment Guidelines in their practice. Your dedication to this crucial endeavor will be instrumental in fortifying our healthcare system's capacity to effectively respond to burn injuries and, most importantly, in making a tangible and positive difference in the lives of individuals and families affected by these devastating injuries. By working together with a shared commitment to these guidelines, we can collectively strive towards a future where the burden of burn injuries in India is substantially alleviated.

सर्वे भवन्तु सुखिनः। सर्वे सन्तु निरामयाः।

(Prataprao Jadhav)

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राष्ट्रीय स्वास्थ्य मिशन

अनुप्रिया पटेल
ANUPRIYA PATEL

सत्यमेव जयते

राज्य मंत्री
स्वास्थ्य एवं परिवार कल्याण
व रसायन एवं उर्वरक
भारत सरकार

MINISTER OF STATE
HEALTH & FAMILY WELFARE
AND CHEMICALS & FERTILISERS
GOVERNMENT OF INDIA

Message

Injuries due to burns represent a critical public health challenge worldwide, resulting in significant mortality and morbidity, and placing immense strain on healthcare systems. Recognizing the profound burden of burn injuries, prevention, timely intervention, and effective management are paramount.

To address this pressing issue, the "Standard Treatment Guidelines for Management of Burn" has been developed as a comprehensive resource for clinical management across India.

This essential guide is the result of collaborative efforts by top experts in burn care. It provides clear, actionable steps and a framework for timely and effective intervention, emphasizing that professional collaboration is key to saving lives.

This document is more than just a resource; it's a blueprint for a safer India. By working together-healthcare professionals, policymakers, and community members-we can reduce the number of preventable injuries and ensure that every burn case receives the care it needs.

By empowering stakeholders at all levels, we aim to ensure swift and effective responses to burn cases.

Let us unite to create a safer India. By working together, we can substantially reduce preventable injuries, alleviate the burden on individuals and families, and forge a healthier future for all our citizens. This document is a call to action, urging all healthcare professionals, policymakers, and community members to actively participate in the implementation of these guidelines. Your commitment is essential to saving lives and building a resilient nation.

(Anupriya Patel)

September 29, 2025
New Delhi

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सत्यमेव जयते

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स्वास्थ्य एवं परिवार कल्याण मंत्रालय
Government of India
Department of Health and Family Welfare
Ministry of Health and Family Welfare

Message

Burn injuries continue to pose a significant public health concern in India, affecting an estimated 6–7 million individuals annually. The challenge is particularly severe in resource-limited settings, where timely and standardized care can make a significant difference in patient recovery and complication rates.

The Standard Treatment Guidelines for the Management of Burns offer a structured, evidence-based approach for ensuring consistent care across the health system — from emergency response to specialized treatment in tertiary care facilities. These guidelines highlight the need for swift interventions and establish a clear referral pathway to facilitate seamless coordination of care throughout the healing process.

I deeply appreciate the expertise of health professionals who contributed to shaping these guidelines. By strengthening our healthcare infrastructure and fostering a proactive approach to burn injury management, we can collectively reduce their impact and improve the quality of life for affected individuals.

Punya Salila

Dated 3rd October, 2025

(Punya Salila Srivastava)

#SwasthNariSashaktParivar
#StopObesity
टीबी हारेगा देश जीतेगा / TB Harega Desh Jeetega

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Government of India
Ministry of Health & Family Welfare
Directorate General of Health Services

Message

Despite being largely preventable, burn injuries continue to impose a disproportionately high burden, particularly on vulnerable populations across the country. These injuries often result in significant physical disabilities, psychological distress, and prolonged economic hardship on affected individuals and their families.

To address this pressing challenge, the Standard Treatment Guidelines for the Management of Burns serve as a vital resource for healthcare professionals. By integrating best practices in clinical care, infection control, nutritional support, rehabilitation, and psychological intervention, these guidelines ensure a holistic, patient-centered approach to burn management across all levels of care.

The successful implementation of these guidelines depends on active collaboration among all stakeholders. Through a shared commitment to improving the quality, accessibility, and consistency of burn care services nationwide, we can work together to reduce the impact of these injuries and enhance patient outcomes.

Sharma.

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Acknowledgement

Burn injuries represent a profound and persistent global public health challenge, a leading cause of morbidity and mortality, particularly in low- and middle-income nations. In India, the burden is especially acute, with millions of cases occurring annually. This crisis disproportionately affects vulnerable populations, including women and children, and is associated with significant long-term physical, psychological, and socioeconomic consequences. The complexity of burn pathology, ranging from local tissue damage to systemic inflammatory responses, necessitates a highly coordinated and evidence-based approach to care.

To address this pressing need, the Standard Treatment Guidelines for Management of Burns has been developed as a scholarly and scientific resource. This document is a testament to the power of multidisciplinary collaboration, integrating the expertise of leading specialists in burn care, plastic surgery, psychiatry, and rehabilitation. It provides a structured framework for effective care delivery across the entire healthcare system—from pre-hospital and primary care interventions to advanced management in secondary and tertiary centers. The guidelines define clear responsibilities at each level, ensuring seamless continuity of care and promoting prompt, specialized intervention for complex cases such as chemical and electrical injuries.

The successful implementation of these guidelines requires the dedicated commitment of all stakeholders. We are profoundly grateful to the distinguished experts who contributed their invaluable knowledge and time to this critical project. Their insightful contributions, were foundational to this work.

I wish to express my sincere gratitude to Dr. Sunita Sharma, DGHS, MOHFW for her invaluable guidance and steadfast encouragement throughout the course of this work. My special thanks to Dr. RP Joshi, Addl DGHS, MOHFW for his through guidance. I extend a special note of thanks to Ms. Vandana Jain, Joint Secretary, MOHFW for her unwavering support, which was instrumental in advancing this endeavor.

I also convey my heartfelt appreciation to the NPPMT&BI team members at Dte.GHS, Dr. Manas Pratim Roy, Dr. Sushma Adappa, Dr. Priya Redhu, and Dr. Swati Sharma, for their remarkable perseverance and dedicated efforts in bringing this document to completion.

This document is a scientific and professional tool that will not only guide clinical practice but also serve as a blueprint for policy and resource allocation, ultimately advancing our collective mission to reduce the burden of burn injuries and improve the quality of life for survivors across India.

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Abbreviations

ABG	Arterial Blood Gas
ADL	Activities of Daily Living
ASD	Acute Stress Disorder
ASQ	Ask Suicide-Screening Questions
BSA	Body Surface Area
BSHS-B	Burns Specific Health Scale-Brief
CAM	Confusion Assessment Method
CBT	Cognitive Behavioural Therapy
CHC	Community Health Centre
CHEOPS	Children's Hospital of Eastern Ontario Pain Scale
CIQ	Community Integration Questionnaire
CPK-MB	Creatine Phosphokinase Myocardial Band
CPR	Cardiopulmonary Resuscitation
CT	Computed Tomography
CVC	Central Venous Catheterization
DNS	Dextrose Normal Saline
DVT	Deep Vein Thrombosis
ECG	Electrocardiogram
EMT	Emergency Medical Technician
EN	Enteral nutrition
GAD	Generalized Anxiety Disorder
HCN	Hydrogen Cyanide
HO	Heterotopic ossification
HR	Heart Rate
I /M	Intramuscular
I P	Interphalangeal
I/V	Intravenous
ICU	Intensive Care Unit
IES-R	Impact of Event Scale-Revised

MAP	Mean Arterial Pressure
MBSR	Mindfulness-Based Stress Reduction
MCP	Metacarpophalangeal
MMSE	Mini-Mental State Examination
MO	Medical Officer
MPHW	Multipurpose Health Worker
MRI	Magnetic Resonance Imaging
NCW	National Commission for Women
NSAIDs	Non-Steroidal Anti-Inflammatory Drugs
PC-PTSD	Primary Care Post-Traumatic Stress Disorder Screen
PEEP	Positive End-Expiratory Pressure
PFA	Psychological First Aid
ph	Potential of Hydrogen
PHC	Primary Health Centre
PHQ	Patient Health Questionnaire
PIC	Peripheral Intravenous Cannulas
PN	Parenteral Nutrition
PRAFO	Pressure Relief Ankle Foot Orthosis
pre –op	preoperative
PTSD	Post-Traumatic Stress Disorder
RASS	Richmond Agitation-Sedation Scale
RL	Ringer's Lactate
ROM	Range of motion
RR	Respiratory Rate
SIMV	Synchronized Intermittent Mandatory Ventilation
SSD	Silver Sulfadiazine
SSRIs	Selective Serotonin Reuptake Inhibitors
STG	Standard Treatment Guideline
SWAP	Satisfaction with Appearance Scale

TBSA	Total Body Surface Area
TENS	Transcutaneous Electrical Nerve Stimulator
TF-CBT	Trauma-Focused Cognitive Behavioural Therapy
TT	Tetanus Toxoid

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Chapter 1: Overview of Burn Management

Definition:

Burn is a tissue injury that results from thermal application (hot/cold) and from application of physical or chemical energy.

They are caused by dry heat, moist heat, cold injury, chemical burns, electrical burns, ionizing radiation and friction.

Introduction:

Burns are the second most common trauma after road traffic accidents. In India, with a population of over 125 crores, there are about 60-70 lakh burn cases annually, out of which the annual mortality is 1 to 1.5 lakh. India, being a developing nation, is still showing a rising trend for burn injuries, unlike the developed nations, where the incidence is on the decline. In fact, burn injury is classified as a chronic disease as it requires long-term management, supervised rehabilitation and psychological support.

Keeping in view the magnitude of the problem and to standardize the management, there is a need to make standard treatment guidelines (STG) for burn care in India. The main aim of this document is to provide the best and most cost-effective treatment in a country where the burn load is very high and resources are limited, in terms of trained personnel, supplies and equipment.

The Standard Treatment Guidelines are structured in an escalatory frame and have four sections. It includes:

- Pre-hospital care at the community level
- Primary care at PHCs and dispensaries
- Secondary care at district hospitals and
- Tertiary care at medical colleges and multi-speciality hospitals

This mode of presentation of this document will ensure objective indications of referral to the next higher centre, while maintaining continuity of care through all levels of care.

In this document, the burn care, after the patient reaches a medical facility, is outlined under the following headings.

A. Primary survey
B. Secondary survey
C. Admission criteria to a burn unit
D. Airway management
E. Fluid resuscitation
F. Burn wound management

G. Surgical management of burn wound
H. Use of antibiotics
I. Analgesia
J. Prophylaxis for venous thromboembolism
K. Nutrition in burn patients
L. Rehabilitation in burn patients is important and included at each level in the document.

The management should follow in this sequence, irrespective of where the patient is received or referred to the next level.

Chapter 2: Pre-Hospital Care at the Community Level

This entails the initial response, assistance or treatment given by the first responders to a victim for any injury before the arrival of ambulance or qualified personnel.

Pre-Hospital Care by Whom

Non-professionals, i.e., friends, relatives, bystanders, etc., at the accident site.

Hence

People in the community should be aware of First aid for burns

and

They should be able to administer the same, immediately, at the site of the accident.

Responsibilities of a First Responder: Assess situation quickly & safely

- Summon appropriate help
- Protect casualties and others at the scene from further injury
- Identify, as far as possible, the nature of the injury
- To give early and appropriate treatment, treating the most serious condition first

Priority of First Responder

- Attention to the conscious casualties before the unconscious ones, as they have a higher chance of recovery.
- Attend to the young before the old
- Not to jeopardize his or her own life while rendering First Aid.

Remember:
The aim is to preserve life and not endanger your own in the process of rendering First Aid.

Premise of Immediate Pre-Hospital Care in Burns

- A burn accident can happen at any place, at any time and medical personnel are usually not around.
- Immediate care affects the extent and depth of the wound.
- The care the victim receives within the first few minutes after sustaining a burn injury largely determines the outcome of the management.

Importance of Pre-Hospital Care

- No time to wait for seeking expert help.
- Every second is precious, and the quicker the first aid is provided, the less the extent of damage.

Pre-Hospital Care should

- Begin at the scene of the accident and conclude when specialised medical care is obtained.
- Be easy to use by the general public.
- Halt the progression of the injury.
- Not hinder professional examination or treatment of the wound at a later date.

Remember

First responders must not get injured while providing first aid to the burn casualty.

Firefighting is not the job of the person administering the first aid.

Thermal burns:

Measures to be taken:

- Rescuing the victim from the burning premises: The victim should be removed from the heat source and moved to a safe place.

- Stopping the burning process on the victim: mandatory to prevent further damage
  - The victim was put on the ground with the burning side uppermost and flames extinguished by a heavy cotton cloth (blanket/rug/dari/coat). Once that is done, the blanket should be immediately removed as it tends to retain heat. Nylon or other inflammable cloth material is not used
    - *"STOP and DROP and ROLL policy"* should be followed only to douse the flames, or water can be used if available close by.
    - Preventing the victim from running, which fanned the flames and made them burn faster.

Figure 1: STOP, DROP and ROLL policy

- ➢ <u>Positioning the victims</u>

- Lying flat prevents flames from
  - ✓ Involving face, head and scalp hairs
  - ✓ Fire from going around the body.
  - ✓ Turning from supine to prone position extinguishes the flames.

- Unconscious victim:
  - ✓ Lie supine on the floor
  - ✓ Both upper limbs are placed extended by the side
  - ✓ Drag the victim out of the room holding his/her legs.

- ➢ <u>Rescuing from a smoke-filled enclosed area</u>

- The rescuer ties a rope around his waist so that another bystander can pull him to safety, if needed.
- Stay low/crawl on the floor to minimise the inhalation of the toxic fumes.
- The visibility is comparatively better at the floor level as the smoke and hot air tend to rise.

Use a wet cloth over the nose and mouth, and breathing should be done through the wet handkerchief or cloth to filter out the fumes, carbon and other toxic particles.

➢ Cooling the burn wound

- For small burns, the victim or the burnt part can be put under the running tap/shower, or hosepipes can be used.
- The water stream should not be directed over the burnt face.
- High-pressure stream increases the pain and can damage the eyes.

Figure 2: Cooling process

How cooling helps

- To dissipate the heat: Immediate cooling of burn wounds with cool tap water is effective.
- Continuous cooling for the first 10 minutes dissipates heat, reduces pain, limits the depth of burn injury and minimises the extent of burn oedema.

Precautions while cooling the burn wound

- In infants, young children and in adults with extensive burns [> 25% total body surface area (TBSA) burn], prolonged irrigation/cooling can lead to hypothermia, so the body should not be immersed under water
- Application of ice/ice-cold water - numbness and intense vasoconstriction, causing further damage to the tissues. Hypothermia is also a major risk with ice-cold water.
- Cooling of the burn wound should be done at the site of the incident.

➢ Remove clothes and attire

- All the burnt clothes (including belts, socks and shoes) were removed from the victim's body.
- Ornaments should be removed as they retain heat and cause prolonged tissue damage.
- Rings around the fingers and toes should be removed immediately as they can cause a constrictive tourniquet-like effect, compromising distal circulation.

➢ Don't disturb the wound

- Do not break any blisters: Decision to de-roof/puncture/aspirate left to the burn specialist.

- Do not apply any medications locally.

DO NOT APPLY

Any ointments, creams, lotions, powders, grease, ghee, gentian violet, calamine lotion, toothpastes, butter, colouring and other sticky agents, etc., over the burn wound.

They make the formal assessment of the nature, depth and extent of the burn wound difficult.

➢ Cover the burn wound

- Wrap in a clean, dry sheet/cloth. Pillow cover/ plastic bags/cling films, Al wraps
- It minimises contamination by shielding the burn wound from secondary infection,
- It reduces pain due to exposure of damaged nerve endings to the air currents.
- It protects during transport.
- It prevents hypothermia

➢ Recognition of the associated injuries

- Fractures should be immobilised/splinted
- Control bleeding by compression.
- Patients with suspected injury to the head and spine should not be moved much, as this could worsen the damage to the spinal cord.

➢ Pain relief and reassurance

- Prompt and continuous cooling of the burnt areas for 10 minutes and covering them helps a lot in providing pain relief.
- Formal oral analgesics are usually not recommended in the pre-hospital phase.
- Reassurance and consolation to the victim and the family are important to allay the apprehension.

Special Burns

Smoke Inhalation Burn

- Removing the victim from the fire/smoke area.
- Assessment for response, Airway, Breathing and Circulation.
- Commence CPR at the scene, if needed
- Calling for help
- The victim should be made propped up and given 100% oxygen as soon as available, even during transport.

ARRANGING TRANSFER DIRECTLY TO THE BURN CENTRE/ BURN ICU IMMEDIATELY:
Direct transfer to the tertiary care centre is recommended

Chemical burns

- Rescuers must protect themselves (wear protective gloves, mask, eye protectors, etc.), from coming in contact with the chemical.
- Clothing/ornaments/watch/belt/socks/shoes, etc., impregnated and contaminated with chemicals, should be immediately and completely removed.
- Immediate Irrigation should be done by keeping the
  - ✓ Affected area under running tap water/shower to neutralise/flush away the noxious chemical.
  - ✓ The affected area should be kept dependent.
  - ✓ It should continue for 30 minutes to 2 hours after confirming with a litmus paper test in case of acid burns.
- Burns caused by sodium, potassium and calcium
  - ✓ Water is contraindicated: Exothermic reaction with water
  - ✓ Brush off/pick out particles
  - ✓ Covering remaining particles with oil to prevent combustion
- Chemical burns of the eye
  - ✓ Immediate copious irrigation of the involved eye with normal saline or water
  - ✓ Use of a high-pressure stream of water
  - ✓ Tilt the head of the victim towards the side of the affected eye to prevent the chemical from entering the canaliculi, nasolacrimal ducts and the other eye.
  - ✓ It may be necessary to hold the eyelids open by a second person.
  - ✓ Solid particles of lime need to be removed with forceps.
  - ✓ The irrigation of the affected eye should be continued during the transport.
  - ✓ It is recommended to flush the affected eye with a minimum of 2 litres over 30 minutes to 1 hour.

THE VICTIM SHOULD BE SEEN BY AN OPHTHALMOLOGIST AT THE EARLIEST:
Direct transfer to the Tertiary Care Centre is recommended

Electrical Burns

- The rescuer should not become a victim
- First, turn off the source of the electric supply.
- A victim should be removed with a non-conducting material like a dry wooden stick/pole/wooden chair.
- Once the area is safe, check response, Airway, Breathing and Circulation.

- If there is no response or respiration, the victim most likely has suffered cardiac arrest, and CPR should be started immediately at the scene.
- Call for help immediately.
- Examination for associated injuries (head/chest/ abdomen/limb injuries), especially if there has been a fall from a height from an electric pole/rooftop, etc.

ARRANGING TRANSFER DIRECTLY TO THE BURN CENTRE/ BURN ICU IMMEDIATELY: Direct transfer to a tertiary care centre is recommended

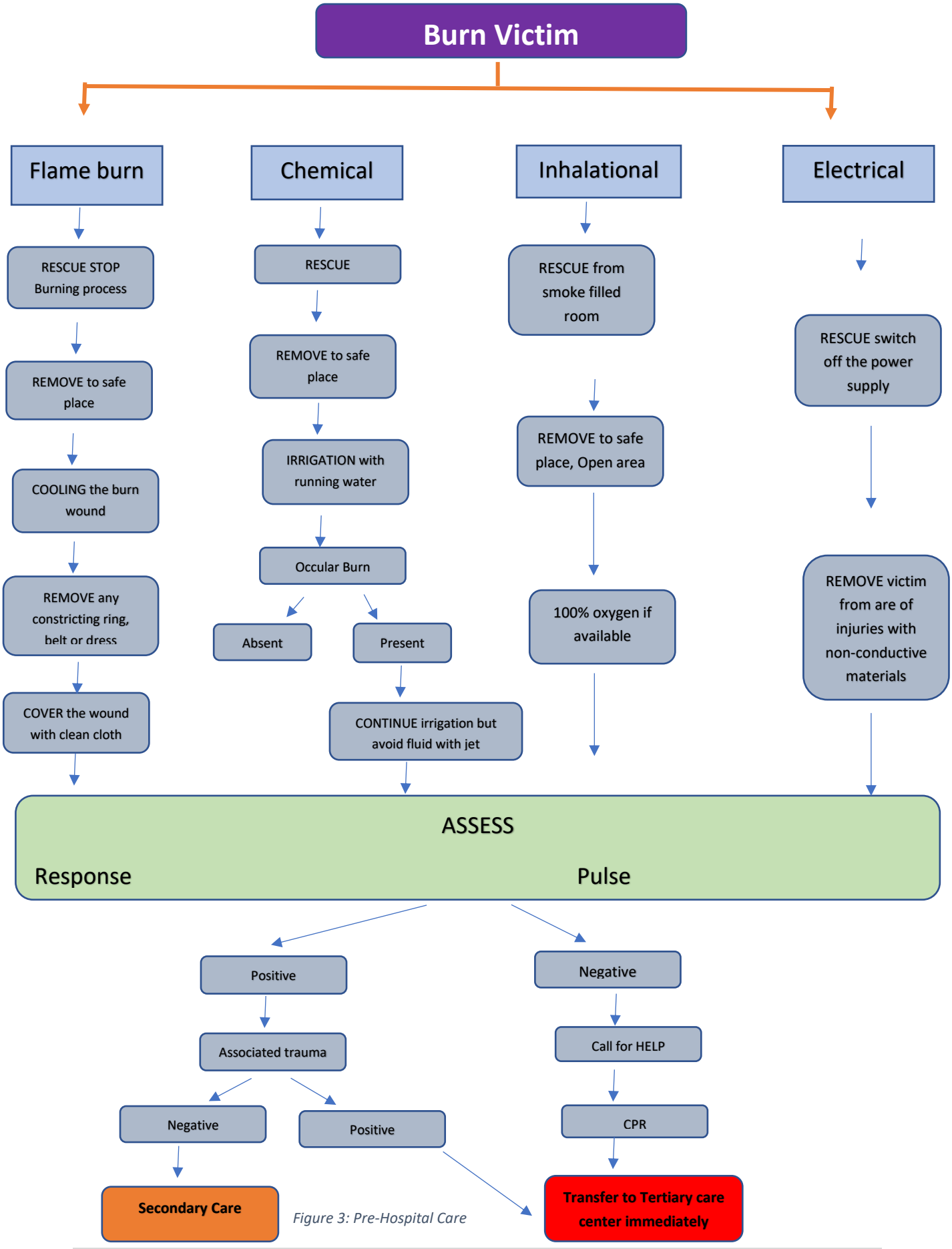

Figure 3: Pre-Hospital Care

Rehabilitation management is important in burn injury and is described at various levels.

Rehabilitation management of burn injuries at the community level

Usual Role: Immediate response to burn injury, first aid, stabilisation, and transport

Rehabilitation interventions: While providing first aid and preparing for transferring and even while transferring to a burn treatment centre, it is required to maintain

- Proper positioning of the patient – Anti-contracture and anti-oedema positioning of the burn-affected area, taking care of the effects of burns and associated injuries.
- Supports for affected body parts
- Psychological support

Chapter 3: Primary Care at PHCs and Dispensaries

Most burn injuries do not represent a mortal threat within the first "golden" hour from injury. Rather, the most likely cause of death within the first hour is due to other injuries like abdominal, chest or head trauma or severe inhalational injury due to carbon monoxide poisoning or electrocution. Hence health care provider should preferably be aware of the basic principles of trauma management when dealing with burn injury.

Be it the primary, secondary or tertiary level, depending upon where the patient is received first, the care of burns should commence with Primary assessment followed by Resuscitation based on primary assessment. Secondary assessment, along with definitive assessment related to burn injury, is done while the resuscitation is on.

The burn patient also has the same priorities as all other trauma patients.

Assess:	**Considerations:**
AIRWAY	Rapid airway compromise
BREATHING	Beware of inhalational injury
CIRCULATION	Fluid replacement
DISABILITY	Compartment Syndrome
EXPOSURE	Percentage area of burn

Burns greater than 15% surface area (adult), greater than 10% (child) or any burn occurring in the extremes of age are considered serious

A. PRIMARY SURVEY

The primary survey must include the **ABCDE** evaluation:

- **Airway** with cervical spine protection:
  - Assess airway stability and presence of inhalational injury
  - Stabilise the cervical spine
  - Direct transfer to a tertiary centre is considered if the following is present:
    - unprotected airway
    - decreased consciousness
    - Signs of airway obstruction.

    These patients may need intubation and ventilator support.
- **Breathing and ventilation**
  - Assess for
    - Respiratory rate
    - Chest expansion, effort, breath sounds
    - Monitor oxygen saturation
  - Administer humidified high-flow oxygen via mask or endotracheal tube.

If **deep circumferential chest injury**, **Transfer to TERTIARY CARE CENTER: May need ESCHAROTOMY.**

- **Circulation and Cardiac Status**
  - Haemorrhage control
  - Check heart rate, blood pressure and neck veins.
  - Intravenous Fluid resuscitation: Start with insertion of two wide-bore intravenous cannulas

If IV resuscitation is not possible, Transfer to the SECONDARY CARE CENTER

- **Disability**:
  - Check for Neurological Deficit and Gross Deformity
  - Check for level of consciousness, assess pupils
  - Measure blood glucose levels

  If the Patient is Unconscious, Transfer to the TERTIARY CARE CENTER
- **Exposure:**
  - Completely undress the patient and take off all jewellery, especially any constricting objects such as rings and bracelets.
  - Cover to prevent hypothermia.
  - Examine from head to toe for any associated injuries.
  - Assessment of Burns (as given in Secondary Survey)

Criteria for care at the Primary Level:

- Partial thickness burns < 5 per cent TBSA in patients younger than 10 years or older than 50 years of age
- Partial thickness burns < 10 per cent TBSA in all other age groups: Treatment at Primary Centre
  - Injection Tetanus Toxoid 0.5ml I/M
  - Wound dressing (As per Section F)
  - Pain relief: Oral Analgesics

Follow up on OPD basis at the Primary Centre if the facility of regular dressing is available

IF FACILITY OF REGULAR DRESSING IS NOT AVAILABLE IN THE PRIMARY HEALTH CENTRE, THE PATIENT SHOULD BE REFERRED TO A SECONDARY CARE CENTRE

Burns that must be referred to a Secondary Care hospital are:

- Partial thickness burns > 5 percent TBSA in patients younger than 10 years or older than 50 years of age
- Partial thickness burns > 10 percent TBSA in all other age groups
- All full-thickness burns in patients of any age
- All burns involving hands, feet, face, genitalia, perineum and any joint
- Burns with a component of inhalational injury

- Chemical burns
- Electrical burns, including lightning injuries
- Circumferential burns of the chest or extremities
- Burns in patients with pre-existing medical conditions may adversely affect the recovery
- Burns in patients with concomitant trauma, in which the burn poses a greater threat to life

Rehabilitation management of burn injuries at the Primary Health Centre and Community Health Centre levels

The role and rehabilitation team are described at various levels.

Primary Health Centre (PHC) Level

Usual Role: First aid, early intervention, basic treatment, and if required, referral.

Rehabilitation Team: In the absence of any trained rehabilitation staff at the PHC, a Medical Officer (MO), Nurse, Multipurpose Health Worker (MPHW), and Community Health Worker may take the responsibility for the following rehabilitation management:

(a) If the patient is being referred to a higher centre, care of the patient's posture, positioning of limbs, support to the injured body part, and care of the burn wounds should be taken.

(b) If the burn treatment criteria permit and it is decided that the patient would be treated at the primary health centre level only, the above-mentioned staff may assess the patient and decide regarding the use of the following rehabilitation interventions, which are detailed under tertiary care centre rehabilitation management and may also be applicable at PHC level:

- Pain management
- Proper positioning and early mobilisation
- Edema management
- Encourage passive and active range of motion (ROM) exercises.
- Positioning and splinting to prevent contractures.
- Wound Management
- Psychological support

Primary health centre staff may also play their role in continuing the rehabilitation management prescribed by the higher centre at the time of the patient's discharge from the higher centre.

Community Health Centre (CHC) Level

Role: Early interventions, basic treatment, specialized dressings, minor surgical interventions, possible rehabilitation management, and, if required, referral.

Rehabilitation Team: Physiatrist (visiting), Medical Officer, Physiotherapist / Occupational therapist, Nurse

If the burn treatment criteria permit and it is decided that the patient would be treated at the community health centre only, the above-mentioned staff may assess the patient and decide regarding the use of the following rehabilitation interventions, which are detailed under tertiary care centre rehabilitation management and may also be applicable at the CHC level:

Key Rehabilitation Interventions

- Pain Management
- Proper positioning and early mobilisation
- Edema Management
- Range of motion (ROM) exercises – Passive, Active-assisted, Active
- Proper positioning & splinting to prevent contractures.
- Early mobilisation
- Strength maintenance exercises
- Psychological support

Community health centre staff may also play their role in continuing the rehabilitation management prescribed by the higher centre at the time of the patient's discharge from the higher centre.

Chapter 4: Management at Secondary Care Centre

Care starts with Primary Survey (As mentioned previously), followed by Secondary Survey.

B. SECONDARY SURVEY

Secondary Survey is carried out either at the **SECONDARY CENTER** or the **TERTIARY CENTER.**

Secondary survey begins after the primary survey is completed, the patient is stabilized and transferred to a medical facility. It includes:

- Detailed history:
  - **AMPLE History**:
    - **A**: Allergies
    - **M**: Medications
    - **P**: Past medical history
    - **L**: Last meal or other intake
    - **E**: Events leading to presentation:
      - Injury circumstances
      - Date and time of injury
      - Mechanism of injury
      - History of a burn in a closed space
      - Details of first aid
      - Concomitant injuries

- Accurate weight estimation before dressing.
- Determination of the percentage of Total Body Surface Area burned using
  - Wallace Rule of Nine for adults

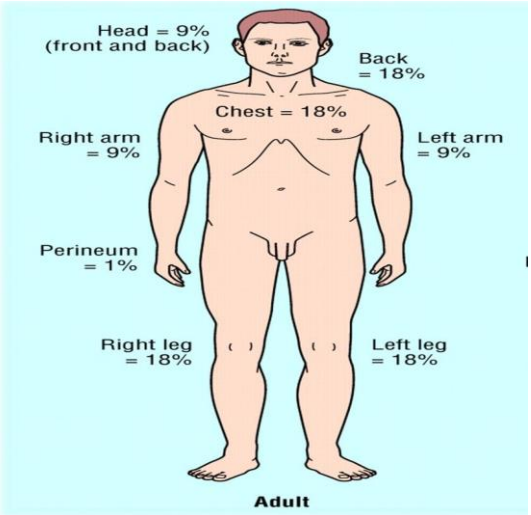

Figure 4: Wallace Rule of Nine

- Lund and Browder's chart for children.

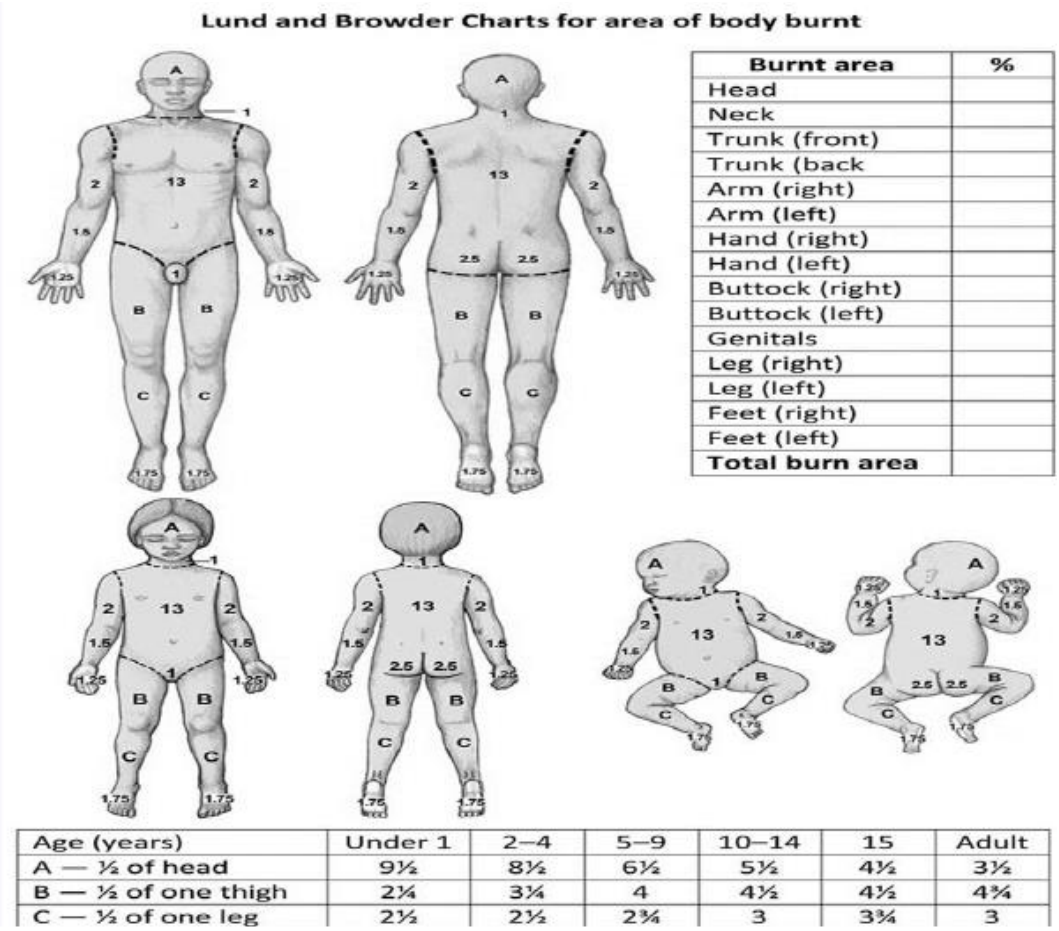

Figure 5: Lund and Browder chart for children

- Rule of Hand: For assessment of small and patchy burns, the palmar surface of the patient's hand with fingers closed is considered as 1%.

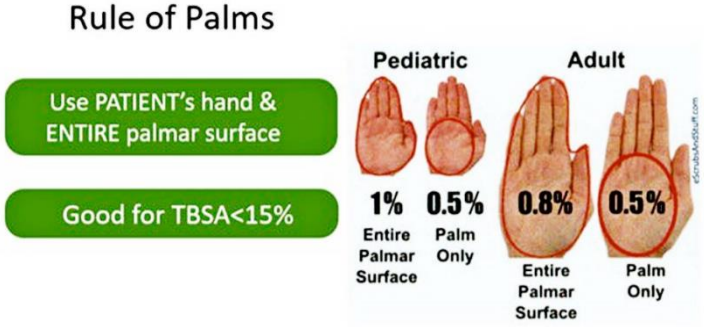

Figure 6: Rule of hand

- Assessment of the depth of burns

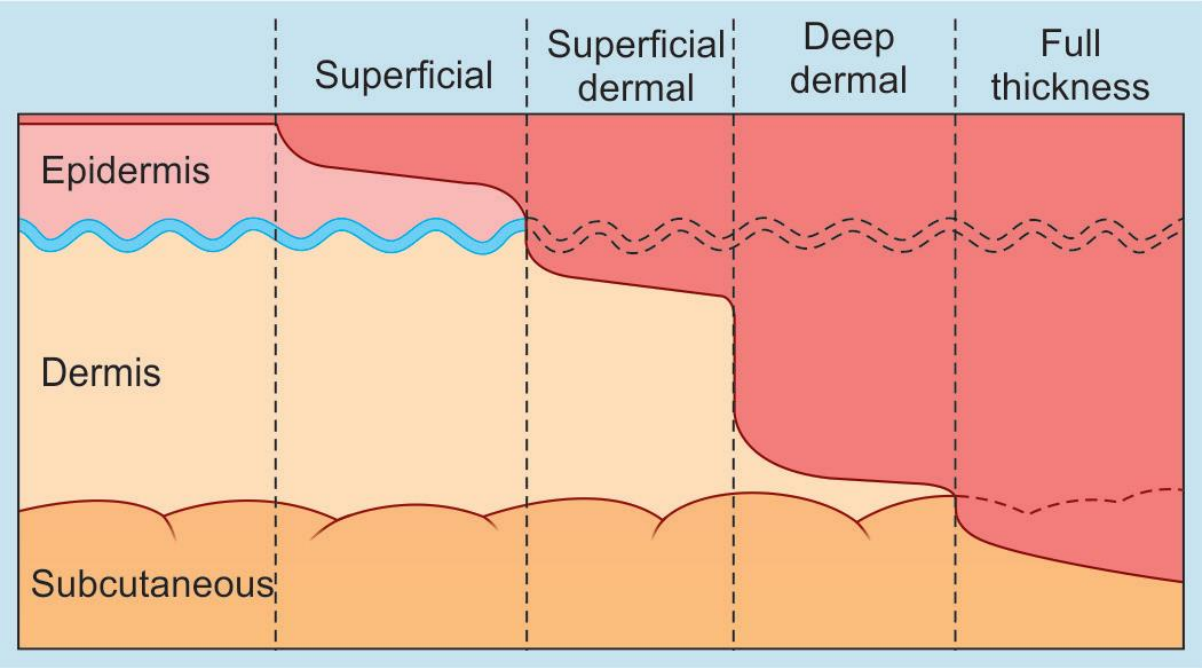

Figure 7: Assessment of depth of burns

Depth of Burn	Layer	Clinical appearance	Tenderness	Healing
1st degree (Fig 8)	Epidermis	○ Red ○ Erythema (Resembling Sun Burn) ○ Complete blanching ○ Dry ○ No blisters	Extremely tender	Heal without scarring in 3-5 days
2nd degree Superficial or Superficial partial thickness burn (Fig 9)	Epidermis + Papillary dermis	○ Glistening pink/Red, ○ Moist ○ Blanching ○ Blisters present	Tender	Heal without scarring in 2-3 weeks
2nd Degree Deep Burns or Deep Partial Thickness (Fig 10)	Epidermis + dermis (Papillary + Reticular)	○ Waxy surface ○ Mottled white to pink ○ Some areas of fixed staining, some blanching ○ occasional Blister	Less tender	Heal with scarring in 4-8 weeks
3rd degree Full Thickness (Fig 11)	Upto subcutaneous tissue	○ Dry inelastic, Parchment like to be charred appearance ○ Waxy white to dark brown eschar ○ Thrombosed veins under eschar ○ Fixed staining	Painless	Never (Require excision + STSG)
4th degree (Fig 12)	Upto muscle	○ Black and charred ○ Fixed staining	Painless	Never (Require excision + STSG)

Table 1: Assessment of depth of Burns

Figure 8: First degree burn

Figure 9: Second degree Superficial or Superficial partial thickness burn

Figure 10: Second Degree Deep Burns or Deep Partial Thickness

Figure 11: Third Degree Burn

Figure 12: Fourth Degree Burn

C. CRITERIA FOR ADMISSION

Simple flame and scald burns that can be managed at the secondary level are

- Partial thickness burns >10 percent TBSA in patients younger than 10 years or older than 50 years of age
- Partial thickness burns >20 percent TBSA in all other age groups
- Full thickness burns >5 percent TBSA in patients of any age involving hands, feet, face, genitalia, perineum, any joint, are not circumferential burns of the chest or extremities.

In order to manage the simple flame and scald burn, the secondary health setup must be manned by a doctor (medical graduate) and have the facility for dressing in an aseptic condition.

D. AIRWAY MANAGEMENT

Management of Inhalational Burn

The diagnosis is essentially based on Clinical suspicion:

- History of exposure to fire or smoke in an enclosed space
- Diminished consciousness
- Facial burns
- Presence of soot in the oral cavity
- Carbonaceous deposits in sputum
- Wheeze
- Dyspnoea
- Hoarseness of voice

Management, if possible, must start during the initial reception at the secondary centre and/or in an ambulance during transfer to the Tertiary care centre.

- Propped up position with moderate elevation of head and trunk
- Oxygen therapy if oxygen saturation falls below 95%.
- Give humidified oxygen through nasal canulae/ face mask/ venturi mask/ non-rebreathing mask, depending on the FiO2 requirement.
- Titrate oxygen therapy according to oxygen saturation, partial pressure of oxygen and clinical parameters such as work of breathing, respiratory rate and accessory muscle usage; to maintain oxygen saturation of 92-95% and a pO2 of more than 60mm Hg.
- The patient can be weaned off oxygen therapy if stable and maintaining oxygen saturation in the target range.

E. FLUID RESUSCITATION

It is indicated for all burns more than 15 per cent in adults and ≥ 10% in children.

For < 15 % burns, patients have to be advised to drink plenty of fluids (at least 2 L) so that they have adequate output of clear urine.

- Intravenous access (IV)
  - Important role in:
    - Resuscitation
    - Monitoring
    - Medication
    - Nutritional delivery
  - Limited non-burn sites are available for gaining IV access
  - Potential portal for bloodstream infections
  - Full aseptic precautions are to be taken while inserting vascular access devices.
  - All vascular access devices are to be placed through unburned skin or as far from the wound as possible, to avoid contamination of the insertion site.
  - Two large-bore IV cannulas are to be placed for fluid resuscitation.
  - Upper limbs, if unburnt, are to be preferred over lower limbs as this reduces the chances of deep vein thrombosis.
  - Vascular access devices:
    - Central venous catheterization (CVC)
    - Peripheral intravenous cannulas (PIC)
    - Peripheral venous cutdown is the cornerstone of burn management.

In extensive burns:

- Attempt central access if peripheral access is unavailable.
- For CVC, a subclavian site, if unburnt, is preferred over a femoral site.
- Vascular catheter rotation:
  - To reduce the risk of bloodstream infection
  - Practised at regular intervals.
  - Limited venous access in most burn patients' routine replacement might not be possible.
  - Frequent clinical examination of the insertion site is to be carried out for early detection of any signs of infection.

- Planning of Fluid Resuscitation
  - Fluid resuscitation should be prompt and adequate.
  - The key is to neither over- nor under-resuscitate.
  - Resuscitation formulas act only as a guide, and fluid should be titrated according to physiological demands of the individual patient.
  - Paediatric patients require more fluid, and a source of glucose is to be added to the resuscitation fluid.
  - Patients with delayed presentation, inhalational injury or electrical burns need more fluid
  - Choice of fluid:
    - **Isotonic crystalloid fluid** is the **fluid of choice** in most burn patients.
    - Patients with massive burns, inhalational injury, and paediatric patients may need a combination of fluids for adequate resuscitation, including the use of hypertonic saline or colloid.
    - Children should have a dextrose-containing fluid as a maintenance fluid.
  - Formulas for estimating fluid requirement in adult burn patients:
    - Safdarjung formula or Modified Brooke's formula: 2ml/kg/% TBSA RL + maintenance fluid 2500ml DNS. This fulfils the requirement for resuscitation as well as maintenance calories and electrolyte balance. (*This formula not only allows fluid replacement but also prevents hyponatremia and takes care of calorie requirements in the immediate postburn period.)*

    - **Modified Parkland Formula**: 3 mL Ringer's lactate/ kg /% TBSA burn. In the second 24 hours, the plasma volume deficit is replaced with colloid.

	RINGER'S LACTATE	DNS
First 24 hours	2ml/% TBSA burns/kg	50ml/kg/day
Second 24 hours	1ml/% TBSA burns/kg	50ml/kg/day

Half of the total calculated volume is given in the first 8 hours, and the remaining is over the next 16 hours.

- Formulas for estimating fluid requirement in paediatric burn patients in the first 24 hours:

	RINGER'S LACTATE	N/2 DNS OR ISOLYTE P
First 24 hours	2ml/% TBSA burn/kg	4ml/kg/hr for first 10 kgs, add 2ml/kg/hr for next 10 kgs and additional 1ml/kg/hr for every kg thereafter
Second 24 hours	1ml/% TBSA burn/kg	Same as above

- In addition to the above, administration of colloid can be considered in the second 24 hours, in patients with low serum oncotic pressure at 0.3-0.5ml/kg/%TBSA, which can be clinically diagnosed by low urine output despite adequate crystalloids for resuscitation.
- The formulas are only a guide to resuscitation.
- Fluid needs to be titrated according to hourly urine output.
- Regular clinical monitoring of the patient is required to assess the adequacy of the fluid replacement.
- Target a urinary output:
  - 0.5-1mL/kg/hr in adults
  - 1ml/kg/hr in children
- If the facility is available, blood lactate levels provide an accurate guide for adequacy of fluid resuscitation. Normal levels are 0.5-1mmol/L.
- Maintain optimum temperature (28-35 degree C) and humidity (55-60%) in the patient's cubicle / ICU.

Maintenance fluid replacement once the patient is resuscitated:

- Adults:
  - Maintenance fluid is calculated according to the formula:

    basal (1500ml/m^2) + evaporative water loss [(25 + %TBSA burn) x m^2 x 24] = total maintenance fluid per day.

    Or

    50ml/kg + evaporative losses (4ml/kg x 20 x % TBSA)/ 100

It is given as 50% normal saline through intravenous or enteral route with potassium supplementation (around 120 mg/day in adults)

- Urine output to be maintained around 1500-2000ml per day.

➢ Children:

- Maintain a urine output of 3- 4 mL/kg/hr

F. BURN WOUND MANAGEMENT

Healing of Burn Wound:

- A 2nd degree superficial or superficial partial thickness burn heals by epithelialisation and takes 7 to 10 days to heal
- A 2nd degree deep or deep partial thickness burn heals by both wound contraction and epithelialisation
- A 3rd degree or full-thickness burn heals only by contraction after eschar separation

Aim of burn wound management

- Promote wound healing,
- Prevent conversion to a deeper wound
- Prevent infection
- Minimize discomfort

Characteristics of an ideal burn dressing

- Protect neo-epithelium:
  - Well padded
  - Non-adherent
- Provide a moist environment:
- Absorbent
- Antiseptic

Conservative Burn wound management

- Managing the wound with regular dressing
- Gradual and sequential debridement
- Promote spontaneous healing in a 2nd-degree burn
- Skin grafting in a 3rd-degree burn after complete debridement

- Steps of Dressings
  - Adequate analgesia
  - Clean the burn area under aseptic conditions

Figure 13: Burn wound after cleaning and preparation for dressing

- Management of blisters:
  - Preferably to surgically debride and drain fluid from blisters, which are:
    - Over joints
    - Large
    - Ruptured
- Very small blisters (<5 cm) may be left intact.
- Cover the wound with non-adherent paraffin (Prevent shearing of the newly formed epithelium in the next dressing).

Figure 14: Application of non-adherent paraffin gauze

- Apply topical antimicrobials:
  - Silver formulations:
    - Silver-containing dressings are effective topical agents in burns as there is no resistance to silver and it is active against all microorganisms, including bacteria , fungus and viruses.
    - The commonest formulation is 1% silver sulphadiazene cream
    - Other silver dressings:
      - Combination of Silver and chlorhexidine
      - film, ointment, hydrogel

- Advanced silver dressing with sustained Silver release mechanism, thus, reducing the frequency of dressing changes to once in 3-5 days.

- 1 % framycetin sulfate
- Ointment combination of Bacitracin zinc, Neomycin sulfate and Polymyxin B sulfate

Figure 15: Application of topical antimicrobials

- Absorbent padding: Cotton wool in bilayer gauze (Gamzee Pads)

Figure 16: Absorbent padding

- Compressive bandaging

Figure 17: Compressive bandaging

- Dressing changes:
  - Frequent enough to control exudate
  - Not so frequent that they interfere with epithelialization.
  - Vary from daily to once a week, depending upon the amount of exudate and choice of dressing material.
  - Showering is the best way to clean and debride a burn wound before every dressing.

Other measures:

- Inj TT 0.5ml if not already given should be given
- Analgesics can be given orally or I/V (Details in Pain management section)
- Prophylactic antibiotics are not recommended initially except if some surgical intervention has been done in the form of escharotomy or fasciotomy. In that case 1 1st generation cephalosporins can be given.

If burn patients are to be treated at the secondary care hospital, they must have a general surgeon and an anaesthetist and have OT facilities and a dressing room. In case these are not available, it is recommended that the burn patients be referred to a tertiary care centre after initiating fluid resuscitation as mentioned in Section E. The cases requiring emergent airway management must be referred to a tertiary care centre without delay. If the secondary care hospital lacks facilities for intubation **and ventilation, the fluid resuscitation can continue in the ambulance during transfer.**

After stabilisation, burns that are recommended to be referred to **the TERTIARY CARE CENTRE** are:

- Deep partial thickness >40% TBSA
- Full thickness burn > 10% TBSA
- Extensive electrical burn with vascular compromise
- All burns involving hands, feet, face, genitalia, perineum and any joint
- Suspected inhalational injury
- Chemical burns with ocular damage
- Burns with poly trauma

Rehabilitation management of burn injuries at the District Hospital levels

Role: Multidisciplinary care, surgical interventions, rehabilitation management.

Rehabilitation Team: Physiatrist, Plastic Surgeon, Physiotherapist, Occupational Therapist, Clinical Psychologist, Social Worker, etc.

Key Rehabilitation Interventions

- Perform passive, active-assisted, and active ROM exercises multiple times daily.
- Stretching exercises to prevent contractures and improve flexibility.
- Early mobilisation and ambulation
- Strengthening exercises include isometric and progressive resistance training.
- Posture & Contracture Prevention: Proper positioning and splinting.
- Post-surgical immobilisation and early mobilisation
- Breathing exercises
- Scar prevention
- Scar management
- ADL Training: Grooming, dressing, eating, and toileting.
- Gait & Balance Training: Weight-bearing exercises, treadmill walking.
- Pain Management: Multimodal pain relief, hydrotherapy, and TENS therapy.
- Assistive Technology: Mobility aids and smart assistive technologies.

Depending on the expertise of the rehabilitation staff more interventions mentioned under tertiary care centres/ Burn units may be done at district health centre level as well.

District hospital staff may also play their role in continuing the rehabilitation management prescribed by the higher centre at the time of the patient's discharge from the higher centre.

Chapter 5: Management at Tertiary Care Centre

If the patient is received at the **Tertiary Care Centre** directly, the management should commence with **Primary Survey** (as detailed in section A), **Secondary Survey** (Section B), Airway Management (Section D) and Fluid Resuscitation (Section E). If received from the **Secondary Care Centre** after stabilisation, the patient should be reassessed to confirm the findings of the survey conducted at the **Secondary Care Centre.**

AIRWAY MANAGEMENT (AS IN SECTION D)

If the patient is referred for management of inhalation injury, the definitive airway management will be done at the **Tertiary Centre**.

- **Initial airway and breathing assessment**
  - Propped up position with moderate elevation of head and trunk
  - Oxygen therapy if oxygen saturation falls below 95%.
    - ✓ Give humidified oxygen through nasal canulae/ face mask/ venturi mask/ non-rebreathing mask, depending on the FiO2 requirement.
    - ✓ Oxygen therapy according to oxygen saturation, partial pressure of oxygen and clinical parameters such as work of breathing, respiratory rate, and accessory muscle usage; to maintain oxygen saturation of 92-95% and a pO2 of more than 60mm Hg.
    - ✓ The patient can be weaned off oxygen therapy if stable and maintaining oxygen saturation in the target range.

In case of Inhalational injury

The diagnosis is essentially based on Clinical suspicion:

- ✓ History of exposure to fire or smoke in an enclosed space
- ✓ Diminished consciousness
- ✓ Facial burns
- ✓ Presence of soot in the oral cavity
- ✓ Carbonaceous sputum
- ✓ Wheeze
- ✓ Dyspnoea

Figure 18: Facial burn with inhalational injury

Hoarseness of voice

In burns, the insult to the respiratory tract results is due:

- Thermal damage: limited to the upper airway, till the vocal cords
  - Leads the tongue to fall back,
  - Oropharyngeal: tongue falls back
  - Laryngeal oedema: hoarseness and stridor.
- Damage due to Irritants and intoxicants in smoke: Damage to the lower airway leading to
  - Bronchospasm
  - Atelectasis,
  - Bronchorrhea
  - predisposes the risk to Pneumonia
- Histotoxicity due to Intoxicants: Carbon monoxide and Hydrogen cyanide poisoning
  - Hypoxia

- **Investigations**

- Chest X-ray:
  - It may be normal in an early phase, but 24- 36 hours
  - Later may show:
  - Patchy atelectasis,
  - Pneumonitis
  - Peri bronchial oedema

- ABG analysis

- Fiberoptic bronchoscopy: "Gold Standard" investigation with immense therapeutic value

- Pathognomic features seen through bronchoscope: mucosal erythema, oedema, erosion, ulceration & sloughing and carbon particles.
- Bronchoscopy is performed after hemodynamic stabilization and before upper airway oedema sets in.
- Bronchoscopy is done after loading the scope with a wide endotracheal tube, and in case severe damage is seen, intubation is done immediately.
- Serial bronchoscopy for broncho-alveolar lavage
- ECG is important in diagnosing CO & HCN poisoning

- **Management**
  - The upper airway is examined, and an oropharyngeal sweep is done
    - Remove any foreign body
    - If tongue fall back is a possibility, an oropharyngeal airway is inserted.
  - Endotracheal intubation is indicated in:
    - Unconsciousness & failure to maintain the airway
    - Severe CO or HCN intoxication
    - Stridor Oedema of pharynx/larynx
    - Facial burns with circumferential burns of the neck

  Intubation is done with bronchoscopic aid, and pulmonary lavage is done in the same sitting to remove irritant particles.
  - Tracheostomy
    - Life-saving when intubation is not possible, when a patient comes late, and the upper airway is grossly edematous and severe stridor is present.
    - It is also indicated if prolonged ventilator support is expected.
  - Propping up by 30 degrees: Reduce upper airway oedema and diaphragmatic splinting.
  - Restrictive circumferential eschar over chest escharotomy
  - Ventilatory support

    Indicated in
    - Impending airway obstruction is anticipated
    - Respiratory rate more than 30 per minute
    - $PaO_2 < 70$ mmHg
    - $PaCO_2 > 50$mm of Hg.
    - Severe dyspnoea
    - Stridor with hoarseness
    - Poor consciousness level.

    Benefits of Ventilatory Support:
    - Minimizes small airway closure

- Recruits' lung more volume
- Improves oxygenation
- Inhibits pulmonary oedema.

Modes of ventilation:

- Initially Positive End-Expiratory Pressure (PEEP): Opens up obstructed closed alveoli and improves functional residual capacity of the lungs.
- Later switched to SIMV.
- Use of the lowest possible inflation pressures and tidal volumes

- Adjunctive respiratory care
  - Therapeutic coughing
  - Nasotracheal suctioning
  - Chest physiotherapy
  - Early ambulation.
- Pharmacological adjuncts:
  - Bronchodilators: salbutamol 2.5-5mg every 6 hours
  - Mucolytics: 20% N-acetylcysteine, 3ml of every 4 hours
  - Heparin: 5000-10,000 U in 3 mL NS every 4 hours
  - Nebulisation Budesonide 0.5/2ml suspension twice daily
- Antibiotic cover for staph. and Pseudomonas.
- Continuous monitoring and periodic reassessment of airway patency, breathing and ABG

Treatment of suspected or confirmed CO poisoning:

- Oxygen inhalation via a non-rebreathing mask at 8- 15L/min for 6 hours or more, depending on the symptoms (given in the table below).
- Intubation is to be determined by the level of consciousness.

Signs and symptoms of CO poisoning	
COHb level (%)	Clinical manifestations
5-10	Mild Headache, Confusion
11-20	Throbbing headache, blurred vision, flushed skin
21-30	Nausea, disorientation, impaired manual dexterity
31-40	Vomiting, dizziness, syncope, irritability
41-50	Tachycardia, tachypnoea
50 and above	Coma, seizure, respiratory failure, death

Table 2: Signs and symptoms of CO poisoning

Treatment of Cyanide poisoning:

- High-flow oxygen inhalation. If available, a specific antidote such as hydroxycobalamin to be administered immediately to be effective.

BURN WOUND MANAGEMENT (AS IN SECTION F)

In a **Tertiary care centre,** sustained-release silver dressings and biological skin substitutes can be used, if available.

G. SURGICAL MANAGEMENT OF BURN WOUND

The surgical management of burn wounds should be done preferably in a tertiary care centre with a dedicated burn unit.

Escharotomy:

Indications: Full thickness circumferential burn of chest and limbs

Fasciotomy:

Indications: Electrical contact burns of limbs

Key points for escharotomy and fasciotomy
• Remove constricting objects • Immediate elevation of burned extremities • Perform early escharotomies on circumferential full-thickness burns • Consider early fasciotomies for electrical burns involving extremities • Decreasing Doppler flow signal with adequate blood pressure or tissue pressure > 25 mm Hg means escharotomy/fasciotomy is needed • Escharotomy is performed without anaesthesia, while fasciotomy requires regional anaesthesia • Escharotomy must extend completely through the burnt tissue • Hemostasis is obtained with pressure, cautery, or micro-crystalline collagen application in burns with compartment syndrome

Burn wound Excision surgery.

Indications:

- 2^{nd} degree deep or deep partial thickness burn
- 3^{rd} degree burn
- 2^{nd} degree deep or 3^{rd} degree burn over functional areas: over joints, dorsum of hand
- Less than 50% TBSA burn

Benefits

Improve patient survival, functional recovery, and aesthetic results.

Done within 3-5 days post-burn decreases the risk of wound infection

The decision to perform wound excision is guided by:

- Depth of burns
- Burn wounds over joint surfaces,
- Early excision and grafting should be done within 3-5 days
- After resuscitation is complete, and the patient is hemodynamically stable
- Adequate provision of blood and blood products.
- Peri-operative antibiotics.

Type of excision

- 2^{nd} degree deep burns: Tangential excision till viable dermis
- 3^{rd} degree burn: Fascial excision

Minimise blood loss during excision, use

- Tourniquet,
- Topical haemostatic agents
- Direct pressure
- Electrocautery

Key points: Excisional Surgery

- 15-30% BSA excision is considered safe in one sitting
- Cover the excised wounds with meshed split-thickness skin autograft
- Cover face, neck and hands with non-meshed split thickness skin autograft
- Lay the graft perpendicular to the long axis of the limb, especially across the joints, to prevent contracture
- Secure the grafts with quilting sutures or bolster dressing
- A flap cover may be needed in case of exposed tendons, joint capsule and bone.
- Strictly monitor the patient throughout the surgical procedure and in the post-operative period. Assess the need for blood transfusion.
- Change dressing on the 5^{th} to 7^{th} post-operative day if there is no suspicion of infection or hematoma formation.

Biologic dressings or skin substitutes

Role:

- Maintain wound viability
- Reduce infection
- Pain relief
- Reduce metabolic demand

Characteristics of Skin Substitutes

- Adheres to the wound
- Prevent evaporative loss
- Closes the wound
- Reduces catabolism
- Reduces pain

Components of Skin Substitutes

- Dermal component: Collagen
- Epidermal Component: Silicon

Uses

- Temporary wound coverage after burn wound excision
- Coverage of a partial thickness burn

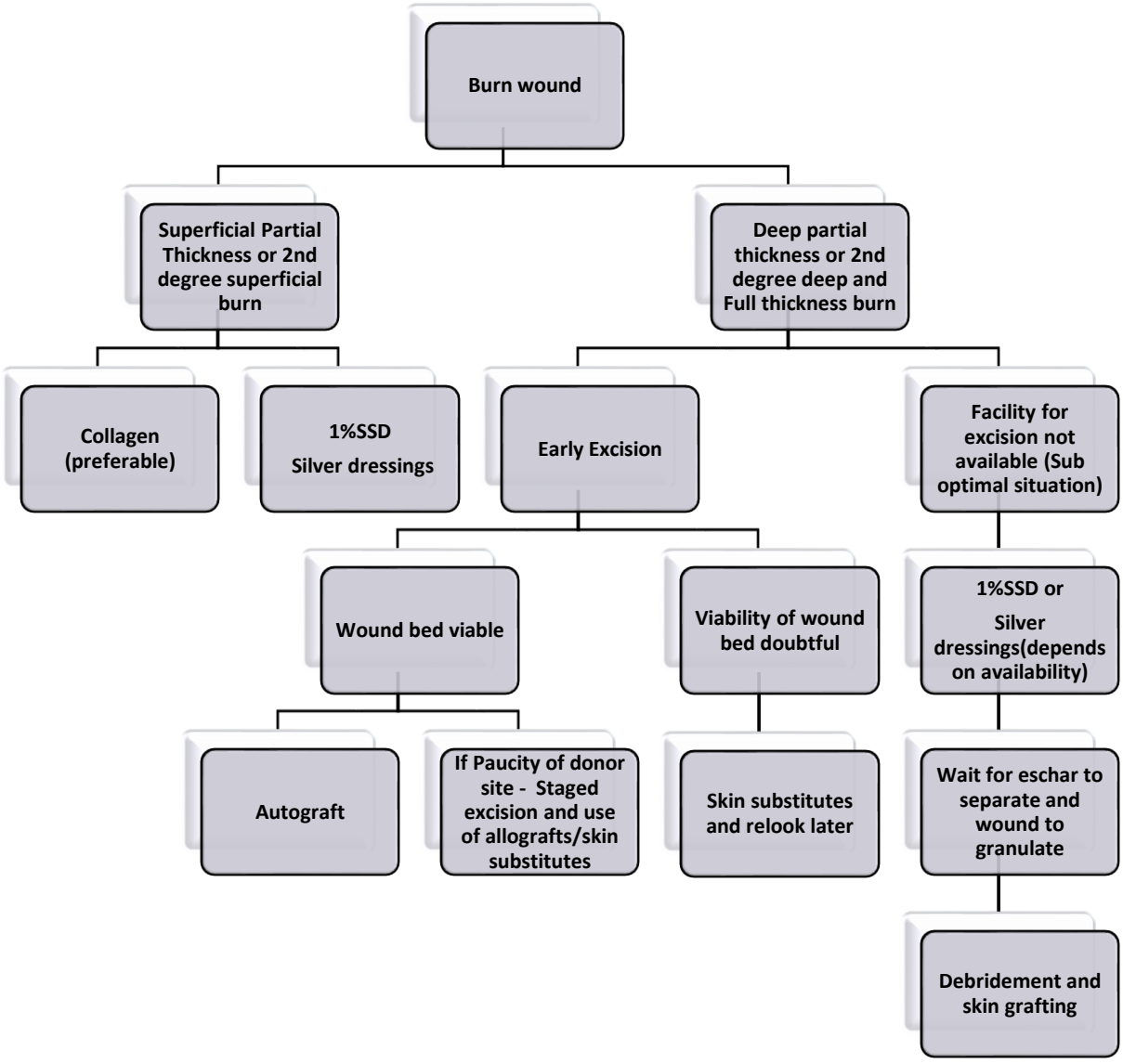

Figure 19: Surgical wound management

H. USE OF ANTIBIOTICS

In acute burns, prophylactic use of systemic antibiotics is best avoided. Burn wound should be clinically monitored, and regular wound cultures sent for early identification of any wound infection.

Local signs of burn wound sepsis:

- Focal areas of discoloration,
- Conversion of partial thickness wounds to full thickness wounds,
- Formation of micro-abscesses
- Foul smell and purulent discharge
- Increased inflammation around the wound
- Rashes in the surrounding skin
- Friable granulation tissue
- Loss of grafts.
- Yellow-green exudate, an indication of Pseudomonas colonization
- Haemorrhagic areas of discoloration,
- Indicative of fungal infections:
  - Necrosis and saponification of sub-escchar fat
  - Cheesy yellow appearance or black growths

Sepsis in burns is suspected when there is the presence of three or more of the following signs:

- Temperature >39 °C or <36.5 °C
- Progressive tachycardia >110 beats per minute
- Progressive tachypnoea >25 breaths per minute or minute ventilation >12 L/min
- Thrombocytopenia <100,000/mcL (does not apply until 3 days after burn)
- Hyperglycaemia in the absence of pre-existing diabetes mellitus

  (Untreated plasma glucose >200 mg/dl or intravenous insulin >7 units/hr IV, significant resistance to insulin [>25% increase in insulin requirements over 24 h])
- Inability to continue enteral feedings >24 h (Abdominal distension, enteral feeding intolerance [two times feeding rate], uncontrollable diarrhoea [>2500 ml/day])

A documented burn sepsis should be identified as:

- Culture-positive infection or
- Pathologic tissue source identified or
- Clinical response to the antimicrobial agent

When and how to initiate antibiotic therapy:

- Initiate antibiotic therapy immediately on diagnosis of infection and/or sepsis.
- Initially, start an empiric (if culture report is not available) broad-spectrum antibiotic that will cover the likely pathogen, and re-assess therapy after 48-72 hours. Change is made according to the wound culture and sensitivity report, when available.
- All burn units should develop an indigenous protocol for the use of empiric antimicrobial agents and escalation/de-escalation of therapy according to culture and sensitivity reports routinely obtained in that unit. Below are mentioned a few antimicrobials that can be of use as empirical therapy:

Burns Condition	**Empiric antibiotics** **1st line**	**Comments**
For burns wound that is clinically or microbiologically not infected	Prophylactic parenteral antibiotics in burns are NOT indicated	Exceptions: Surgical procedure, Gangrene of body parts, Associated trauma
For burns wound that are clinically or microbiologically infected	Ampicillin Amoxycillin-clavulanic acid Cephalosporins Aminoglycosides Piperacillin-tazobactum Quinolones Carbapenems If suspicion of Gram +ve: add Cloxacillin/ Linezolid/Vancomycin/ Clindamycin When extensive burns and patient not responding to antibiotics: start anti fugal therapy Hemodynamically stable: Fluconazole Hemodynamically unstable: Caspofungin	Antibiotic choices should be moderated based on the unit's antibiogram pattern.
Burns (early excision and grafting)	At induction: amoxicillin-clavulanic acid Or Cephalosporin IV	Antibiotic choices should be moderated based on the unit's antibiogram pattern
Burns (late grafting)	Can be targeted antibiotic therapy as per pre -op culture reports.	Always get a wound swab culture sensitivity report prior to taking up the patient for grafting. Presence of beta-haemolytic streptococcus is an absolute contraindication of grafting the burn wound.

Table 3: Antibiotic use in burn patients

I. ANALGESIA

- Pain should be monitored and measured on standardised scales such as the visual analogue or numeric scale for adults and CHEOPS for young children.
- Injectable analgesics are to be given intravenously in the acute phase. Intramuscular or subcutaneous injections for pain relief are to be avoided during the hypotensive shock phase.
- For severe pain, intravenous opioids are the drug of choice for background as well as procedural pain.
- In addition, anxiolytics and NSAIDs can be given orally.
- In the rehabilitative phase, mild opioid analgesics or NSAIDs are to be used for background or procedural pain.
- Consider the use of tricyclics, oral antihistaminic agents or centrally acting agents such as gabapentin and pregabalin for the treatment of neuropathic pain.

J. PROPHYLAXIS FOR VENOUS THROMBOEMBOLISM

- Reported incidence of DVT in burns ranges from 1 to 23%
- The standard of care remains controversial
- Although the incidence of DVT is high in burn patients, chemoprophylaxis should be used selectively in high-risk groups as it has its own complications.
- Patients should be mobilized as early as possible.
- Use of graded compression stockings in patients whose lower limbs are spared
- For prophylaxis, Low molecular weight heparin (Enoxaparin) is used at a dose of 30mg twice daily for adults, given subcutaneously, but the dose may need adjustment according to target anti-Xa levels.
- Signs and symptoms suggestive of DVT include swelling, pain or tightness, reddish or bluish discoloration, warmth, and positive Homan's sign in the involved extremity. A definitive diagnosis is made on duplex ultrasonography.

K. NUTRITION IN BURN PATIENTS

- Early feeding is preferred, i.e., within 6 hours of the start of resuscitation.
- Once the patient is hemodynamically stable, a liquid diet is started followed by semisolid diet, when the bowel movements return.
- This reverses hormonal derangements and catabolism and prevents translocation of bacteria through.

Objectives of nutrition therapy:

  - Adequate calories to match catabolism and prevent weight loss
  - Maintenance of positive nitrogen balance
  - Replenishment of depleted stores of vitamins and minerals

- Assessment of nutritional status: clinical assessment including body weight, anthropometry, and serum proteins.

- Nutritional requirement calculation:
  - Dietician consultation to be sent.
  - Indirect calorimetry is a very reliable technique for calculating the calorie requirement in burn patients, but it is not feasible in most settings.
  - Standardized formulas are most often used for estimating the calorie requirement.

ADULTS			Total calorie requirement
	Harris Benedict formula	Men	66.5 + 13.8(weight in kg) + 5(height in cm) − 6.76(age in years)
		Women	655 + 9.6(weight in kg) + 1.85(height in cm) − 4.68(age in years)
	Curreri formula	16–59 years	25(weight in kg) + 40(% TBSA burn)
		>60 years	20(weight in kg) + 65(% TBSA burn)
CHILDREN			
	Galveston formula	0-1 year	2100(body surface area m^2) + 1000(body surface area burn in m^2)
		1-11 years	1800(body surface area m^2) + 1300(body surface area burn in m^2)
		12-18 years	1500(body surface area m^2)+1500(body surface area burn in m^2)
	Curreri junior	<1 year	recommended dietary allowance + 15(% TBSA burn)
		1-3 years	recommended dietary allowance + 25(% TBSA burn)
		4-15 years	recommended dietary allowance + 40(%TBSA burn)

Table 4: Total calorie requirement in adults and children

  - Of these total calories, 60 – 65% should come from carbohydrates, 20-25% from proteins and 15-20% from fats.
  - Protein requirement is estimated 1.5-2 gm/kg/day for adults and 2-3gm/kg/day for children.
  - Non-protein calorie to nitrogen ratio should be 150-100:1, i.e 150 K cal/gm of nitrogen.
  - Repletion of vitamins and trace elements such as vitamin C, thiamine, zinc, copper, along with others, is to be given due importance.
  - Water requirement = Baseline water requirement + 30-35 ml/kg/day
  - Additional consideration is to be given to Glutamine supplementation.

Route of nutrition delivery:

- Oral route: always preferred. Small, frequent feeds with high-protein food.
    - Enteral nutrition (EN): when the patient is unable to eat/ is intubated/ has dysphagia/ unable to maintain an oral diet that fulfils at least 60 per cent of the calculated nutritional requirements.
    - Maximum calories by this method ---3000 Kcal/day
- Parenteral nutrition (PN): Indications:
    - Paralytic ileus
    - Sepsis,
    - Inhalational injury
    - Abdominal compartment syndrome
    - Traumatic bowel perforation
    - On very high vasopressor support)
    - Enteral feeds are not tolerated by the patient,
    - Unable to reach the goal rate on enteral nutrition by the end of the week.
    - Parenteral formulas are
        - Two-in-one (without lipid emulsion)
        - All-in-one (with lipid emulsion)
    - Central veins are preferred over peripheral veins for PN delivery
    - Calculation of TPN:
        - In adults: 30-40 ml/kg
        - In children: < 20 kg - 1.7 ml/kg/hr
          >20 kg - 1.5 ml/kg/hr
    - Start TPN at 60 ml/hr and increase to 80-100 ml/hr after 4-6 hrs. To be given within 24 hrs. Isolated lipid emulsion is given within 12 hrs.
    - Wean off PN, once a patient starts oral feeds.

Micronutrient supplementation:

	Oral	Intravenous
Multivitamin with minerals	One tab/day	10 ml/day
Vitamin C	500 mg twice a day	500 mg/day
Zinc	Zinc sulfate 220 mg/day	Children 0.1 mg/kg/day and in adults 0.5 mg/ kg/day
Copper	Copper gluconate 2-4 mg/day if on prolonged zinc supplementation	Cupric chloride 9 mg/day //3 mg
Vitamin A	10,000 IU/day for 10 days, higher dose if confirmed deficiency	None
Vitamin K	10 mg/week	
Sodium (Na)	1-2 mmol/kg/day	
Potassium (K)	0.5 mmol/kg/day	
Calcium (Ca)	0.2- 0.3 mEq/kg/day	
Phosphate	20-30 mmol/day	

Table 5: Micronutrient supplementation

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Chapter 6: Special Cases of Burn

CHEMICAL BURNS

- Ensure complete and immediate removal of the agent.
- Remove all potentially contaminated clothing.
- Carry out copious irrigation of the involved area, especially the eyes, with running water for 30 minutes to 2 hours.
- pH monitoring of the effluent can be done to assess the adequacy of the lavage.
- Do not immerse any part of your body in a tub or bucket, as it can spread the injurious agent to unaffected areas of the body.
- There are some exceptions to water lavage as first aid for chemical burns. These include: phenol, dry lime and powdered chemicals.
- Phenol is to be wiped off the skin first with sponges soaked in 50% polyethylene glycol.
- Dry lime and powdered chemicals should be dusted off the skin before lavage.
- Monitor and correct any systemic disturbance in pH and electrolytes.
- Conventional dressings are used to dress chemical burns.

ELECTRIC BURNS

- ECG is recommended in all cases of contact with electric current, whether low or high voltage.
- Continued monitoring is indicated in the presence of
    - History of loss of consciousness
    - Abnormal findings on ECG
    - History of CPR after sustaining burn injury
- Patients with Low-voltage electric contact burns with the absence of the above-mentioned criteria can be discharged if there is no other indication for admission.
- Cardiac markers (Troponin I, Troponin T, CPK-MB) to be done if recommended by a physician
- The usual formulas used for resuscitation fluid calculations may be insufficient, as the area of contact may be very small in high-voltage injuries. Intravenous fluids have to be adjusted according to the patients' clinical condition and output. The fluid requirement may vary and may reach 5- 7 mL/kg/hour.
- In the presence of myoglobinuria, maintain urine output at 2- 5 mL/kg/hour in adults. Use mannitol (50-200 gm over 24 hours) for osmotic diuresis and sodium bicarbonate (50-150 mEq diluted in 1 L of 5% dextrose infused intravenously over one hour) for alkalinisation of the urine.
- In the absence of myoglobinuria or once the urine is clear, the goals of resuscitation are the same as previously stated.

- Clinical signs of compartment syndrome should be identified early, and fasciotomy carried out in the extremities.
- CT scan/ MRI may be indicated in cases with a history of a fall from height and/or loss of consciousness.

Chapter 7: Rehabilitation of Burn Patients

Early initiation of a rehabilitation program is essential to maintain the functional ability of the patient.

This chapter will mainly focus on rehabilitation at the TERTIARY HEALTH CENTRE/BURN UNIT.

Role: All phases of burn management, including surgical management, long-term care, and burn rehabilitation.

Burn Rehabilitation: The main goals of burn-related Physical Medicine and Rehabilitation management are to maximise functional and cosmetic restoration, considering physical, mental and social aspects. Burn rehabilitation should be started as soon as the patient's medical condition allows, and it is extended over the whole period of indoor as well as outdoor treatment. The management includes the use of Physical medicine, Rehabilitation therapies, psychological counselling, aids and appliances, rehabilitation surgeries, cognitive and behavioural therapies, etc.

Rehabilitation Team: Physiatrist (Team Lead), Physiotherapist, Occupational Therapist, Speech Therapist, Prosthetist and orthotist, Nutritionist, Psychologist, Medical Social Worker, any other medical or allied health professional as required.

(i) Acute Rehabilitation Phase

Acute rehabilitation begins immediately upon the patient's admission to the medical facility and continues during the days of necrotic tissue removal and skin grafting until the initiation of burn wound healing.

1st Assessment

Assessment includes the mechanism and severity of burn damage, along with other aspects that may affect the patient's recovery, such as inhalation injury, musculoskeletal injuries, and exposed tendons.

Management:

(a) Control of pain

The pain may be because of burns, associated musculoskeletal injuries, or neuropathic pain. The following may be used to treat pain:

- Paracetamol
- Non-steroidal anti-inflammatory drugs
- Tramadol, and slow-release narcotics, etc.

- Physical modalities may be used to treat different types of pain. One or more of the following modalities, which are appropriate for the type and cause of pain may be used either in isolation or in combination with medicines for pain treatment.

➢ transcutaneous electrical nerve stimulation (TENS),

(b) Inhalational injury

If inhalation injury is suspected, prophylactic aggressive chest treatment is started. If the patient has developed a reduced level of consciousness, efforts should be made to remove lung secretions, normalise the breathing mechanism and prevent complications like pneumonia.

Normalisation of breathing mechanics— the following may be helpful in normalising the breathing mechanism

- Provide Intermittent positive pressure breathing
- Use a positive expiratory pressure device, if required
- Make the patient sit out of bed
- Proper positioning of the patient
- Improving the depth of breathing and collateral alveolar ventilation, such as by

➢ ambulation or,

➢ When that is not possible, use

❖ a tilt table

❖ Inspiratory holds.

❖ Facilitation techniques: facilitation techniques like deep breathing exercises, vibrations, percussion, postural drainage, coughing and suctioning

If the patient has sustained a burn injury to the chest area

The beginning of the recovery journey for critically ill burn patients involves a set of therapeutic techniques and exercises aimed at promoting early mobilisation and rehabilitation. Among these techniques are purse lip breathing, chest expansion exercises, coughing techniques, oral suction, ankle toe movements, active-assisted movements, and relaxation methods. Chest percussion and vibrations should be avoided.

During the acute phase of rehabilitation, psychological counselling is used to allay psychological responses such as fear, anxiety, and anger. Additionally, emotional distress is a common occurrence, necessitating supportive or psychological intervention.

(c) Immobilisation

The injured part requires immobilisation when there is injury to bone or tendon, or when the tissue has been repaired to allow skin graft get adhered. The part may require to be splinted or kept in the immobilised anti-deformity position for the minimum time required for adherence of the graft or healing.

The time periods for which the injured part should be immobilised for different types of skin reconstructions are:

1. **Any (preferably not full thickness) burn on biological dressings**, the immobilisation time may be less than 24 hours.
2. **Superficial to intermediate depth burn, on cultured epithelial autograft (suspension),** immobilisation time may be 24-48 hours.
3. **Intermediate to deep partial thickness burn with Split skin graft,** immobilisation time may be 3-5 days.
4. **Deep partial thickness to full thickness burns on dermal substitutes** may require immobilisation for 5-7 days.
5. **Full thickness burns on Fascio-cutaneous or mucocutaneous flaps**, the immobilisation time may be 7-14 days.

(d) Movements and functions

- Instruct the patient to maintain movement to the greatest extent possible from the time of admission to the hospital.
- Instruct the patient to participate in self-directed exercises and daily life activities whenever possible.
- In cases of tendon damage resulting from burns, meticulous motions and use of splints may be executed.
- Joints affected by burns must be moved to their maximum range many times daily by the patient, therapist, or caretaker. If the joint is exposed, the decision regarding movements should be carefully assessed.
- Evaluate the state of tissues before deciding on the suitability of active or passive motions.
- Parents need to encourage children to pursue activities that promote normality, ideally in their company.
- The patient should be educated on the kind and frequency of motions, along with the allowable force.
- Games that include therapeutic goals, such as extending to retrieve a ball according to the injured site and therapy needs, have to be advocated.

2nd Baseline assessment

The 2nd Baseline examination is done to assess range of motion (ROM), muscular strength, sensations, and the ability to perform activities of daily life. The findings are recorded, providing a reference for future rehabilitation progress and effectiveness and patient-centred rehabilitation goals, both short-term and long-term, are formulated.

(d) Positioning and Splinting

- Maintenance of the patient's position and splinting are done to reduce contractures and joint deformities, preserve range of motion and tissue elongation, enhance joint alignment, promote adhesion remodelling, avert pressure points and sores, safeguard surgical sites (skin grafts and flaps), support weakening muscles, and diminish oedema via elevation. The preferred positions and the assistive devices that can be used for maintaining the positions are:

Joint/Body Region	Preferred Position	Positioning Devices
Upper Extremity and Trunk		
Neck	Slight extension	Neck collar, splint that conforms to the neck, no pillows under the head
Axillae	Horizontal adduction 15 degrees, Abduction 80 degrees	Airplane splint, wedge for positioning to abduction, bedside table, side boards/bedside extensions
Elbow	Extension 5 degrees	Arm trough splint, elbow extension splint
Forearm	Supination	Arm trough
Wrist	Neutral or slight extension	Wrist cock-up splint, part of resting hand splint
Hand	I, P joints: full extension, MCP: 70–80 degrees flexion, Abducted from palm, Thumb opposition	Resting hand splint, soft web spacers, intrinsic plus hand splint, C bar for thumb
Chest and Trunk	Neutral with level hips	Figure of eight device to reduce protraction
Lower Extremity and Trunk		
Hip	Neutral extension, Abduction 20 degrees	Wide soft straps to avoid frog-leg position, especially in children
Knee	Extension	Knee extension splint, immobilizer
Ankle	90 degrees (neutral), Dorsiflexion, plantar flexion, Inversion/eversion	Posterior shell with ankle in neutral
Foot	Neutral forefoot, Supination/pronation; toes extended	L/Nard; PRAFO-like devices
Prone Position	Shoulders in abduction, external rotation, and flexion.	
Side-Lying Position	30°–40° tilt	Pillows for support.

Table 6: Positioning and splinting

- Splinting must be complemented with consistent exercise regimens to avert the development of contractures.
- Splinting is executed in ideal postures when a patient is continually immobilised and restricted to that posture.

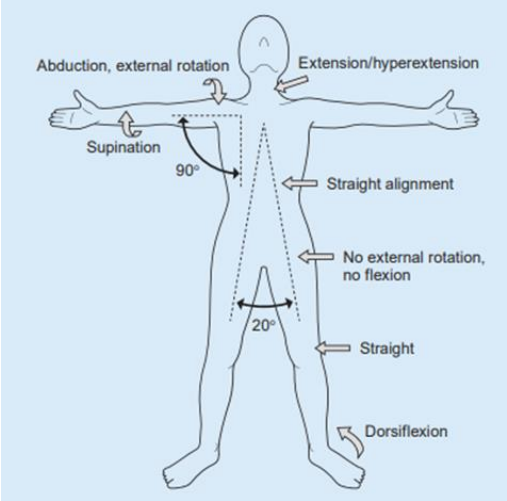

Figure 20: Ideal postures for immobilisation *s*

- Patients should be encouraged to ambulate, even while using splints if required.
- The presence of dressings may hinder the evaluation of the skin, hence affecting the sustainability or improvement of skin grafting outcomes.
- To maintain the proper alignment of areas impacted by circumferential, cross-joint, and deep burns.
- To maintain the attained increase in range of motion.

(e) Splints and their applications:

- Splints may include cut foam, serial casting, strapping, or the insertion of surgical pins to maintain certain joint alignments.
- Specialised splints may be used to accurately position and prevent early contractures of the mouth, ear, nose, neck, shoulder, axilla, elbow, hip, knee, ankle, and foot. The ankle equinus deformity manifests early, has considerable resistance to therapy, and should be proactively addressed with joint fixation if possible.
- The wrist and hand are especially prone to early contracture and should be immobilised at 0 to 30 degrees of flexion during the first 24 to 72 hours to prevent claw hand. The authors recommend immobilising MCP joints at 70 to 80 degrees of flexion, whereas IP joints should be kept in full extension. The thumb is fixed in a state of palmar and radial abduction, with the MCP and IP joints exhibiting mild flexion.
- The splint-wearing schedule and the checklist of skin problems may be attached to the patient's bedside. The monitoring intervals vary from hourly to every 4 to 6 hours, depending on the kinds of splints and skin conditions. In some cases, it may need 10 hours of operation followed by 2 hours of relaxation.
- The splint must be worn constantly, except for clothing changes, skin assessments, and exercise.
- Any unusual dermatological condition arising from splints must be immediately communicated to the rehabilitation and clinical personnel.
- Following the removal of the splint, active and/or passive range of motion exercises must be conducted. However, if the sporadic use of splints significantly affects or

limits the joint's active mobility, the advantages and disadvantages of the splinting method must be carefully assessed.

- Application only at night-time or during rest - This method is specifically designed for patients who can do everyday activities with a full range of motion but need maintenance of a certain posture during rest.

Figure 21: Splinting methods

(f) Management of Oedema

- Oedema management should commence upon admission. All rules for the reduction of oedema must be strictly adhered to, rather than partly applied.
- Dressings, compression techniques, such as oedema gloves
- Motion characterised by rhythmic and pulsating attributes.
- Elevation or placement of extremities promotes gravity-assisted drainage of oedema fluid.
- Improvement of lymphatic function
- Splinting does not control oedema; instead, it channels fluid to a fixed area.

(g) Prevention of deep vein thrombosis (DVT)

- Early mobilisation, range of motion exercises, activities of daily life, and the use of compression stockings are efficacious techniques for the prevention of deep vein thrombosis (DVT).

(h) Pressure sore prevention

Frequent relief of pressure from the pressure-bearing areas helps in prevention of pressure sores. Maintaining proper nutrition is also helpful.

(i) Exercises

- Start rehabilitation exercises at the earliest, as part of both conservative as well as operative treatment regimens.
- Start exercises from the major joints and proceed to other joints. The exercises may be active, active assisted, or passive. Frequency and duration of exercises are decided based of assessment of tolerance of the patient and condition of the burn and other trauma.

- Start with short-duration high-frequency exercises with full ROM, preferably allowing the patient to do them himself.
- Start exercises even if debridement, fasciotomy, placement of synthetic dressing material or heterograft has been done.
- Minimise bed rest and encourage sitting out of bed and early ambulation.
- Continue ROM exercises of all joints. If grafting has been done, the ROM may be performed gently and carefully or may be discontinued for about 5 days to allow the graft to be taken up properly. Splints and bandages may be used to protect the graft during exercises, ambulation, and ADL.
- Exercises of the donor limb or sites may be started from the first day of operation.
- If pain is severe but exercises can be started, exercises may be permitted under the pain control of analgesics or anaesthetic drugs.
- Consciousness sedatives can be used if protective reactions that can increase damage need to be prevented, or the exercises can be done under anaesthesia. Intraoperative ROM assessment could also be performed.
- If the patient is critically ill, intubated, medicated or otherwise unable to move fully and actively, assisted active ROM exercises are the treatment of choice, followed by passive complete ROM if no active movement is possible
- Isometric exercises started early to prevent muscle weakness and should be replaced by exercises to increase strength, proprioception and coordination.
- Continuous feedback during exercises helps in a better general feeling of well-being and a sense of confidence and achievement.

(j) Hydrotherapy

In addition to reducing discomfort and itching, hydrotherapy helps patients' range of motion and heart health. Depending on the health of the patient and the particulars of each burn unit, different facilities may be employed.

Precautions:

- Specialists should oversee the whole procedure.
- In order to prevent cross-infection and the deterioration of wounds or patients' overall health, patients with open wounds should receive very attentive care.

Hydrotherapy should not be administered to patients who have unstable vital signs or who are in an infectious state.

(k) Ambulation

- Ambulation should begin immediately after the burn patient is considered medically stable. Walking provides cardiovascular fitness, avoids pressure ulcers, preserves muscular strength and function, stimulates hunger, and reduces the risk of pulmonary embolism and deep vein thrombosis. Moreover, it lowers the length of hospitalisation for patients with lower extremity skin transplants who are mobilised promptly after surgery.

- The Unna Boot, a semi-rigid bandage containing impregnated materials, is used alongside lower extremity skin grafts, facilitating quicker ambulation and permitting use for up to 7 days post-grafting.

Readiness Criteria for Mobilisation of Burn Patients
1. Hemodynamic Stability
a. Mean Arterial Pressure (MAP) ≥ 60 mmHg
b. Heart Rate (HR) ≤ 120 bpm
c. No high inotropic support (Dopamine ≤10 mcg/kg/min or equivalent)
2. Respiratory Stability
a. FiO ≤ 60%
b. PaO / FiO_2 ratio ≥ 200
c. Positive End-Expiratory Pressure (PEEP) ≤ 10 cm H_2O
d. Respiratory Rate (RR) ≤ 40 breaths per minute
3. Temperature Regulation
a. Core body temperature between 36 - 40°C
4. Neurological Readiness
a. Richmond Agitation-Sedation Scale (RASS) between -2 and +2
b. Patient is alert and follows commands
5. Wound and Pain Management
a. Adequate pain control (Visual Analog Scale ≤ 4/10)
b. No unstable grafts or significant wound dehiscence
6. Medical Clearance
a. Approval from treating doctor

Table 7: Readiness criteria for mobilisation

Progression Flow for Burn Patient Mobilisation

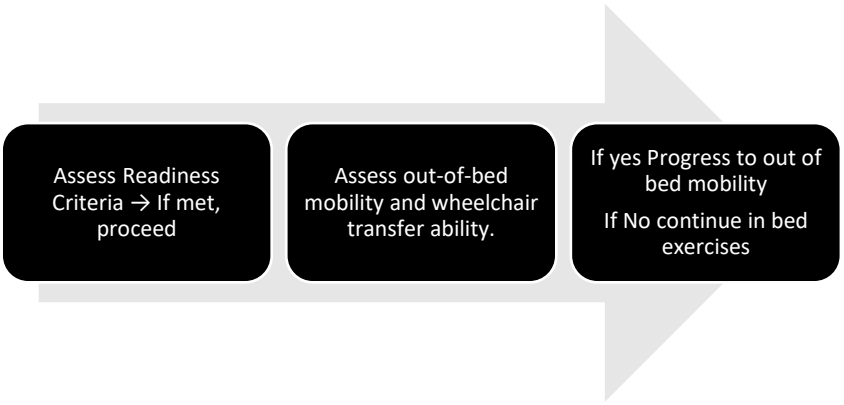

Figure 22: Progression flow of patient mobilisation

Post Grafting

- Patients are instructed to assume lower extremity-dependent postures 5 to 7 days post-grafting operation.
- Dangling the lower extremities is a preliminary exercise that evaluates the graft's tolerance to a dependent position.
- The hanging protocol must be executed for five minutes, two to three times each day.
- If the assessment of the graft after suspension shows no signs of intolerance, the duration is progressively extended.
- Once the graft exhibits tolerance to dependency, ambulation is initiated.
- The period of walking is progressively increased as the graft acclimatises, akin to the process of suspension.
- Initially, using ambulatory devices such as crutches and walkers to protect injured areas, reduce pain, or assist with weight-bearing.
- Elastic wraps or comparable elastic devices are used to diminish venous pooling and decrease the likelihood of graft loss.
- Supportive dressings, such as crepe bandages, may be used.
- If yes, proceed with out-of-bed activities (leg press, knee flexion, aerobic exercise on bicycle/treadmill).

II. Intermediate (Sub-acute) Rehabilitation Phase

This phase extends from the initial healing phase to complete wound closure. The patient has recovered from the critical phase. So, during this phase, rehabilitation focus shifts to stretching of contracting skin tissue, preserving movement coordination, endurance and strengthening exercises and promoting functional independence.

Management during this phase includes:

- Proper positioning
- Splinting
- Breathing exercises
- Range of motion exercises – active/ passive, or both.
- Strengthening exercises
- Stretching exercises
- Ambulation training – supported or independent
- Endurance training
- Training in ADL
- Progressive increase in activities.
- Pain during the phase may be treated using one of the following:
  NSAIDS, Tramadol, and slow-release narcotics, transcutaneous electrical nerve stimulation (TENS), Hydrotherapy

III. Long-term Rehabilitation

After completion of wound healing or discharge from acute hospitalisation into the outpatient setting, the burn patient is subject to long-term rehabilitation, which includes:

- Upon the completion of wound healing or discharge from acute hospitalisation to the outpatient setting, the burn patient engages in prolonged rehabilitation that includes:
- Customised, patient-focused exercise regimens.
- Shift from workouts reliant on a trainer or therapist to independent exercises.
- A synthesis of aerobic and resistance exercise
- If this phase continues, therapy should prioritise enhancing the range of motion, since even well-conditioned muscles have shown insufficient capacity to independently stretch scar tissue and contractures.
- Independent ambulation is further encouraged at neighbourhood distances.
- Gait irregularities may be ameliorated to increase efficiency and mitigate pain and the long-term effects of scar contractures.

(i) Scar management

Management techniques

(a) Pressure therapy

Pressure therapy is the principal treatment for scars, especially in severe burn situations. The most often used items are pressure garments, pressure pads, elastic bandages, rigid transparent facemasks, and splints.

Custom-fabricated pressure garments are designed for the individual, providing a consistent level of pressure when applicable.

- It should begin immediately at the completion of epithelialization.
- Pressure garments are the primary technique in scar management.
- Ideal pressure - 25-40 mm Hg
- Conventional scar therapy takes around six months.
- For moderate to severe burns on the neck or face, temperature-responsive thermoplastic materials and liquid silicone elastomers may be used to fabricate facial orthotics.
- Pressure therapy is recommended for areas that have healed for 2–3 weeks post-burn to prevent and mitigate scar formation.
- Areas that have recovered for over three weeks post-burn, grafted regions, and donor sites of split-thickness skin grafts should receive pressure therapy.
- Pressure treatment does not need to be postponed until wound healing is complete; for areas that take longer than two weeks to heal, it may be begun using elastic bandages over wound dressings, starting with reduced pressure while observing the healing process.

- Pressure therapy should be administered incrementally to reduce the likelihood of skin deterioration from friction or excessive pressure on newly healed, sensitive skin, while also improving patient tolerance and compliance.
- If the newly healed skin is too fragile to endure increasing pressure, elastic bandaging, which permits simple pressure modification, may be regarded as an alternative option.
- Applying pressure to a burn is thought to reduce scarring by hastening scar formation and facilitating the reorientation of collagen fibres into homogeneous, parallel configurations, as opposed to the whorled pattern seen in untreated scars.

(b) Pressure garments

The following factors are essential for assessing the use of pressure garments:

- Apparel must be tailored to accommodate patients' requirements and is often dictated by the specifics of the medical treatment conducted.
- Patients must be measured for garments five to seven days after grafting surgery, and fittings should be conducted immediately upon availability.
- A pressure garment endures for around three months; subsequently, it is advantageous to re-measure patients consistently to accommodate the changing dimensions of the scar.
- For moderate to severe burns on the neck or face, the use of an acrylic face mask should be considered. This applies consistent pressure to the face and cervical areas.
- Pressure garments should be worn continuously for more than 23 hours each day, only removed for clothing changes, bathing, and scar therapy. Pressure therapy must be maintained until scar maturity is achieved, indicated by a decrease in colour intensity and a change to a soft, flat, and pliable condition. This treatment often takes one to two years or more.
- Therapists must regularly evaluate the condition of pressure items. As elasticity decreases, it needs to be changed every 2 to 3 months.
- Pads may be used on irregular or concave body regions to ensure therapeutic effectiveness.
- Pressure garments may be used with anti-scarring lotion and silicone sheets.
- Children need continuous supervision throughout treatment, since improperly fitted pressure items may lead to considerable body deformities.

(c) Alternative techniques for scar management

For areas of persistent scarring that have shown insufficient response to pressure garments, other scar treatment techniques may be considered. These include

- Massage promotes the relaxation of constricted scar tissue bands, improving the flexibility of scarred areas.

- Silicone gel sheets (contact media) operate via an uncertain mechanism; they may impede scar contraction by hydration, occlusion, and low molecular weight characteristics. silicone
- Elastomer moulds (contact media)—Employed to refine damaged areas where silicone treatment proves ineffectual, especially in regions such as toes and the interstitial spaces between them.
- Hydrocolloids (contact media) are similar to silicone sheets but may be retained for up to 7 days. Massage may be conducted via thin layers.
- Moisturising creams—utilised with massage to alleviate reduced secretory functions of the skin; protect against complications resulting from skin fissures.
- Ultrasound—Low pulsed dose designed to accelerate the inflammatory process.
- Air compression therapy
- Cold therapy
- Laser therapy

(ii) Cardiopulmonary dysfunction

The patient requires assessment of cardiovascular and muscular endurance, and progressive resistance training should be started as needed.

(iii) Dysphagia

Dysphagia is known to be a prevalent condition in the burn population. Dysphagia can lead to adverse events such as aspiration pneumonia, dehydration, and malnutrition. Dysphagia can be secondary to burn injury or invasive clinical procedures.

Rehabilitation of a burn patient with dysphagia includes:

- Prevention of Oro-facial contractures
- Management of tracheostomy
- Intervention for communication disorders
- Swallowing
- Length of speech-language pathology intervention varies with the severity of dysphasia, which is usually 1 month or more.
- Efforts should be started early to return the patient to normal fluid consistencies.
- Resumption of normal diet textures is more protracted and may take a longer time.

(iv) Heterotopic ossification

Heterotopic ossification (HO) which often leads to restricted joint mobility, severe pain, and even nerve entrapment, may require investigation using X-rays, Estimation of Alkaline phosphatase, bone scan etc. Once a burn patient develops HO, it must be arrested, which may require pain and inflammation control using indomethacin and agents for preventing the progress of new bone formation.

(v) Serial Casting

- Serial casting may be used as a method of minimising or correcting burn scar contractures.
- Precautions need to be taken to avoid pressure that may harm the underlying tissues. The duration of application of cast should be kept to the minimum.
- Exercises, both ROM and strengthening, should be done whenever possible to avoid wasting and weakening of muscles.

(vi) Rehabilitation Surgeries

- A Burns & Plastic Surgeon and Physical Medicine and Rehabilitation specialist may decide and perform the surgical procedures needed for the rehabilitation of the patient. Post burn contractures may be effectively released with or without grafting/ flaps to improve joint movements, which in turn help muscle excursion, and that is helpful in activities of daily living. Improved activities of daily living, and then the occupation-related activities play a significant role in the psychological and social rehabilitation of the patients.
- Neuromuscular involvement may require rehabilitation surgeries, including deformity correction, soft tissue and /or bony surgeries, tendon transfers, etc.

(vii) Amputations

Burns may lead to amputations. Elective amputations may be required for better post-burn rehabilitation of patients. Wherever possible, prostheses should be used by the patient. A proper prosthesis making for the limb with post-burn tissues may be a challenge. Using a prosthesis requires a good pre-fitment exercise programme and post fitment training.

Orthosis and prosthesis

- Prescribe the required prosthesis or orthosis early, as it will help in making the appliance available when the time comes.
- Assess the requirement of therapies or surgical interventions as preparation for the fitment of the appliances.
- Start exercises to increase strength and endurance, which may be the pre-requisite for ambulation training with the appliance.

(viii) Psychosocial counselling

The visible impact of burn injuries on appearance and aesthetics cannot be understated, influencing an individual's body image and their ability to reintegrate into society and professional life. Disfigurements may lead to social stigma and participation restrictions. Psychological counselling plays a significant role in overcoming feelings and psychological and social rehabilitation.

(ix) Activities of daily living

Burn patients often feel a sense of loss of role and ability to participate in normal activities of life. Activities of daily living play an extremely important role in a burn patient's successful outcome. If a patient can accept the responsibility of self-exercise and activities of daily living, then the most difficult aspects of rehabilitation are easily achieved.

(x) Family support

Family support emerges as a significant component, facilitating therapy and reintegration into the home environment. While acknowledging the empowering role of family support, the PMR specialist also stresses the importance of ensuring that family members are informed about treatment goals and encouraged to promote independence in everyday tasks.

(XI) Information to be shared with the patient and /or attendants before discharge

(a)Explain the components of comprehensive rehabilitation to the patient and attendants.

(b) Inform the patient about the complications of burn injury and their management.

(c) Explain the post-discharge rehabilitation management.

(XII) Applications before discharge

(a) Evaluate the patient for problem identification and comprehensive rehabilitation planning.

(b) Periodically re-evaluate the progress and modify the rehabilitation plan as required.

(c) Make a patient-specific post-discharge home program for rehabilitation.

(d) Refer the patient to a centre where guided rehabilitation management is available.

(e) Demonstrate use of relevant functional and/or quality of life outcome measures.

(f) Analyse the management outcomes periodically and discontinue the therapeutic interventions which is no longer providing benefit.

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Chapter 8: Psychological Care in Burn Injury Patients

Burn injuries not only cause severe physical trauma but also lead to profound psychological distress. Patients often experience acute stress reactions, post-traumatic stress disorder (PTSD), depression, anxiety, and body image disturbances that significantly affect their quality of life and social reintegration.

Given the high burden of burn-related psychological morbidity, it is essential to ensure integrated mental health care within burn management protocols. This will establish a standardised, evidence-based approach for psychological assessment, intervention, and rehabilitation of burn patients in India, ensuring alignment with global best practices.

Psychological Impact of Burn Injuries [1-7]

Phases of psychological response to burn injuries:

1. Acute Phase (0-72 hours post-injury): Psychological shock, dissociation, acute stress disorder (ASD), delirium.
2. Subacute/Post-Acute Phase (1-4 weeks post-injury): Emerging PTSD (Intrusive memories, flashbacks), depression, anxiety, adjustment difficulties, sleep issues.
3. Rehabilitation Phase (1 month- 1 year post-injury): Chronic PTSD, body image issues, social withdrawal.
3. Long-Term Phase (Beyond 1 year): Reintegration challenges, employment issues, body image disturbances, and suicidal ideation in severe cases.

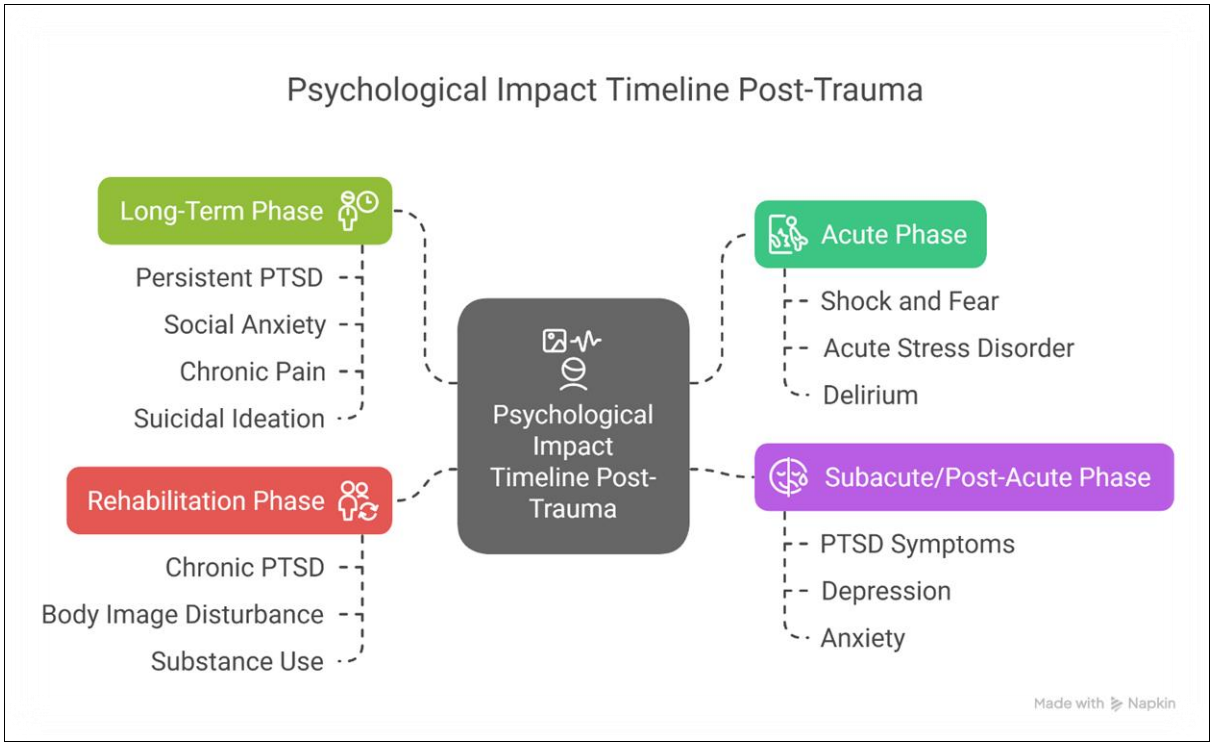

Figure 23: Common Psychological problems over different phases post-burn

High-risk psychological populations:

- Patients with severe burns (>30% TBSA) and facial disfigurement.
- Paediatric burn survivors with developmental trauma.
- Women burn survivors of domestic violence or acid attacks.
- Elderly burn patients face functional dependence.
- Patients with pre-existing mental illness/substance Abuse exacerbated by trauma.

Recommended psychological assessment protocols [3-4, 8]

Phase of Care	Assessment Tools	Responsible Specialist
Acute Phase (0-72 hrs)	• **CAM-ICU (Confusion Assessment Method for ICU*)***: Used every shift to detect delirium in ICU patients • **IES-R (Impact of Event Scale-Revised)** {48–72 hrs}: Assesses acute stress symptoms (if patient is alert). • Continuous observation for signs like nightmares, panic, dissociation, or pre-existing psychiatric conditions.	• ICU Nurse (for delirium checks) • Consulting Psychiatrist or Psychologist (for acute stress screening)
Post-Acute Phase (1-4 weeks)	• **PC-PTSD-5(Primary Care PTSD Screen):** Screens for PTSD. • **PHQ-9(Patient Health Questionnaire-9):** Screens for depression (≥10 warrants referral). • **GAD-7 (Generalized Anxiety Disorder-7):** Screens for anxiety. • Repeat assessments at discharge if done early.	• Clinical Psychologist or Psychiatrist (assessment & interpretation) • Nurses/Physicians (observation)
Rehabilitation Phase (1 month - 1 year)	• **PCL-5 / IES-R**: Monitors PTSD symptoms. • **PHQ-9**: Tracks depression severity. • **GAD-7**: For anxiety.	• Rehabilitation Psychologist/Psychiatrist • Therapy providers (PT/OT) and Nurses (report concerns between assessments)

	• **BSHS-B (**Burns Specific Health Scale-Brief): Assesses psychosocial recovery. • **SWAP (Satisfaction with Appearance Scale*)***: Evaluates body image issues (~3–6 months). • **PSQI**: Screens for sleep issues.	
Long-Term Follow-up	• **PHQ-9 / GAD-7**: Annual check for depression/anxiety. • **CIQ / Work Reintegration Scale**: Assess social/occupational functioning. • **SWAP**: Ongoing body image issues. • **ASQ (Ask Suicide-Screening Questions*)* / clinical interview**: Screens for suicidal ideation in vulnerable individuals.	• Psychiatrist/Psychologist or Primary Care Provider • Social Worker (family/community adjustment)

Table 8: Recommended psychological assessment protocol

Psychological interventions at different stages of burn management

1. Immediate psychological support (Acute Phase: 0-72 hours post-burn injury) [1, 6, 9]

Application within burn units:

- Psychological first aid (PFA): Immediate crisis intervention by trained nursing staff.

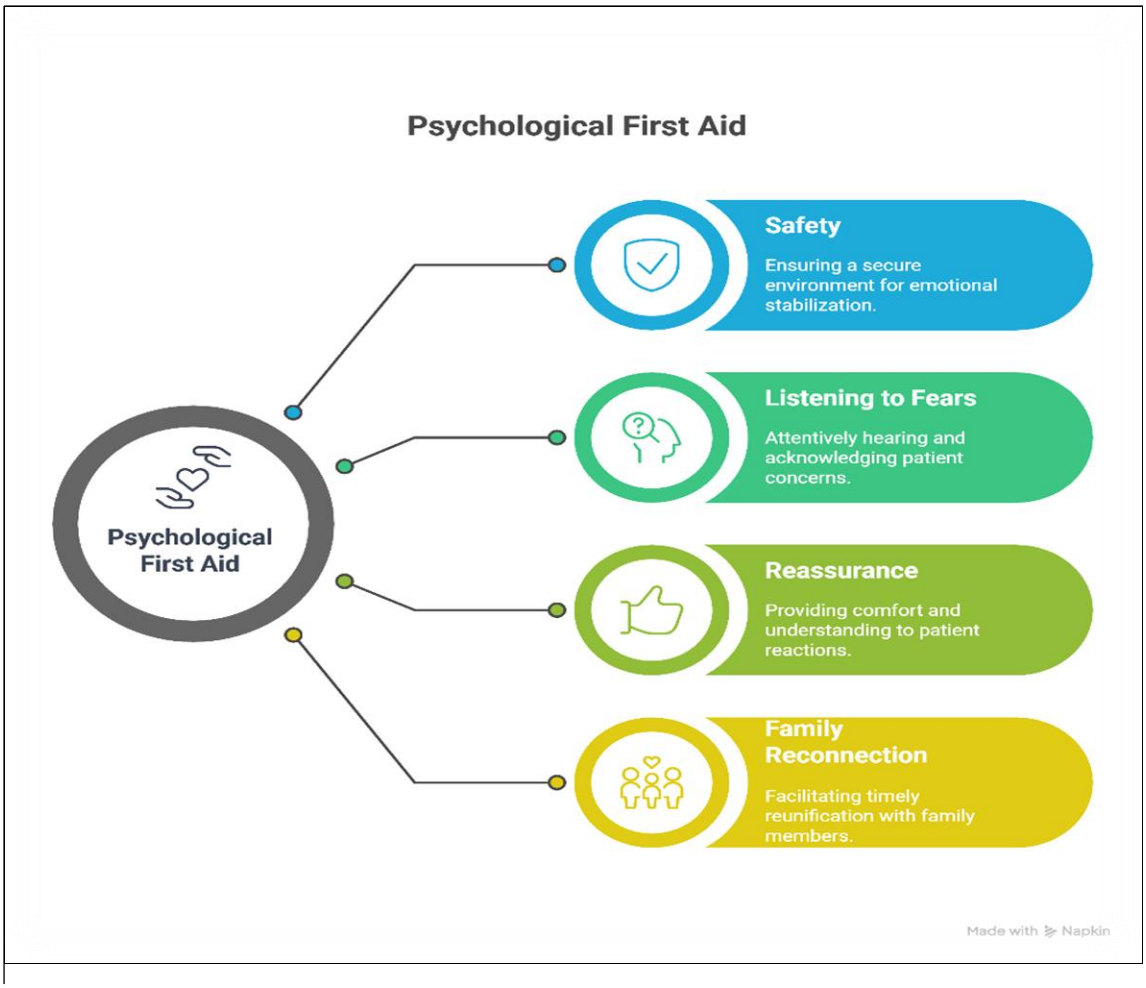

Figure 24: Key elements of Psychological First Aid

- Early trauma counselling: Prevention of PTSD through structured psychological debriefing.
- Pain-focused psychological interventions: Use of hypnosis, mindfulness-based stress reduction (MBSR), and virtual reality distraction techniques.
- Family psychoeducation: Counselling sessions for caregivers to manage emotional distress and avoid secondary trauma. It emphasises the therapeutic value of their sustained and supportive presence in the patient's recovery journey.
- Trigger thresholds: Immediate psychiatric referral if suicidal ideation, severe agitation, or self-inflicted burns are present
- Bereavement Support: Follow-up bereavement counselling and timely referral to specialist services as needed.

2. Short-term psychological care (Post-Acute Phase: 1-4 weeks post-injury) [3, 8-10]

Implemented in hospitals and rehabilitation centres:

- Structured screening for PTSD using the PCL-5 and for depression using the PHQ-9, with referrals triggered by moderate-to-severe symptoms.
- Cognitive behavioural therapy (CBT): To address PTSD, depression, and anxiety symptoms.
- Mindfulness-based cognitive therapy (MBCT): For pain and stress reduction.
- Pharmacotherapy:
    - ✓ Selective Serotonin Reuptake Inhibitors (SSRIs) for PTSD and depression.
    - ✓ Short-term benzodiazepines for acute anxiety management.
    - ✓ Gabapentinoids for neuropathic pain and associated distress.
    - ✓ Inpatient therapy and peer support integration to enhance emotional readiness for discharge.

3. Long-term rehabilitation (Chronic Phase: 1 month- 1 year post-injury and beyond) [3-4, 11-12]

Strategies for community-based integration and long-term reintegration include:

- Body image therapy and psychosocial rehabilitation: Training burn survivors in social adaptation skills.
- Vocational training & workplace reintegration: Ensuring employment opportunities for survivors.
- Medication review and adjustment for chronic symptoms and insomnia, coordination with pain specialists.
- Community-based mental health interventions: Establishing regional burn survivor rehabilitation networks.
- Tele-mental health (Tele-MANAS Integration): Providing remote psychological support for burn patients in rural areas.
- Family and Educational Support: Offer family counselling and coordinate with schools to support survivor independence, reintegration, and continued education, especially for children and adolescents.
- Monitoring and Follow-Up: Refer persistent cases for specialised care and continue monitoring stable patients for relapse and provision of self-monitoring tools along with a defined re-referral pathway.

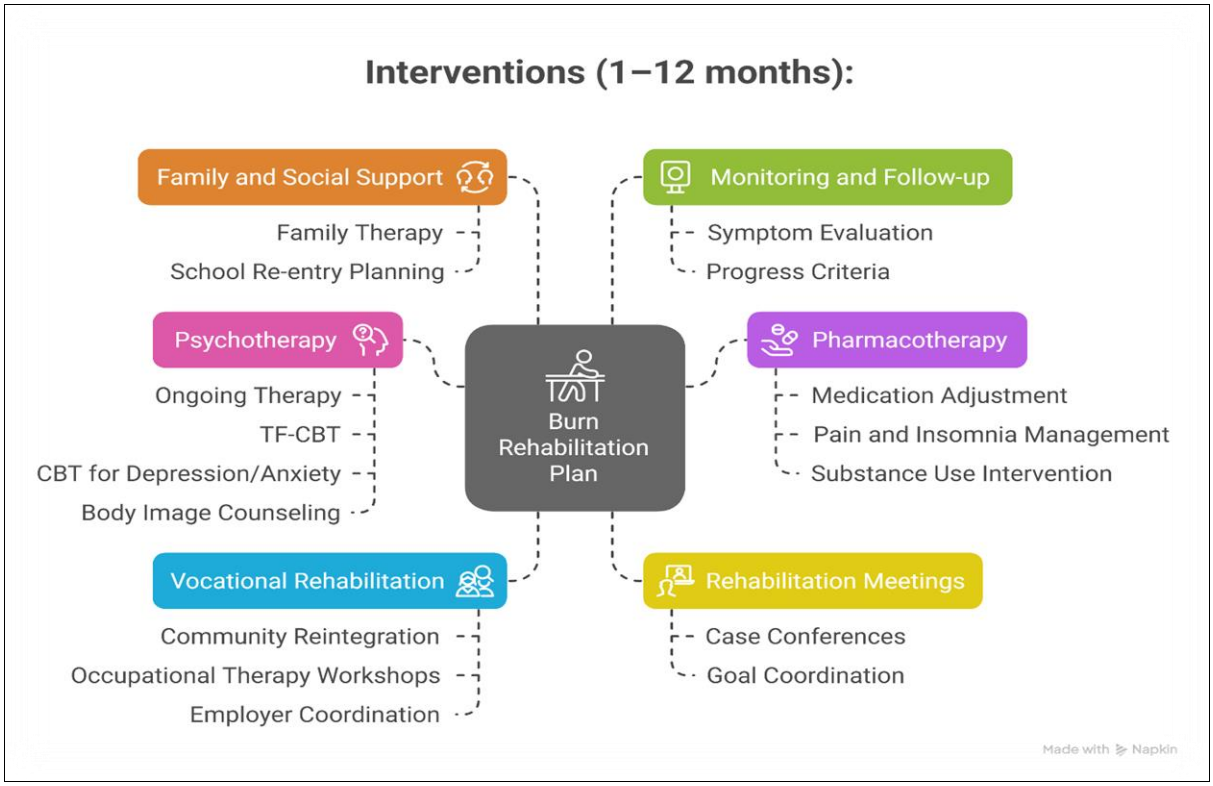

Figure 25: Chronic Phase Management and Intervention Strategies

Psychological Care Personnel across the Health System for Burn Injury Management [2, 12]

Healthcare Level	Key Health Personnel
District Hospital / Sub-District Hospital	Psychiatrist, Psychologist/counsellor, Medical Social Worker, Staff Nurse
Community Health Centre	Medical Officer, Staff Nurse
Primary Health Centre	Medical Officer, Staff Nurse

Table 9: Human Resources at Various Levels of Health Care

Psychological support at District Hospitals (Secondary Level of Care) [1,3,12]

Integrating structured psychological care into burn management at the district level is crucial for early emotional stabilisation, improved patient recovery, and reduced burden on tertiary care facilities. These interventions should be trauma-informed, culturally sensitive, and designed to prevent long-term psychiatric morbidity. They also strengthen patient-family engagement and support comprehensive rehabilitation.

A. Human Resources and Roles

Resources	Key Responsibilities
First Responders (EMT)	Provide calm orientation, avoid triggering language and deliver Psychological First Aid (PFA). Use trauma-informed principles during initial interactions.
Medical Officers	Identify signs of emotional distress, counsel caregivers, screen patients and facilitate referrals for advanced psychological care when required. Conduct basic PTSD screening using validated tools (e.g., IES-R).
Nursing Staff	Provide day-to-day emotional reassurance, observe behaviour, deliver PFA during care routines and coordinate with caregivers. Maintain a record of behavioural changes and report to supervising staff.

Table 10: Key Resources and Responsibilities – District Hospital

B. Patient Management Protocol

1. Arrival and Triage Phase

- Ensure a calm, secure, and supportive environment upon the patient's arrival.
- Use clear, empathetic, and non-technical language to reduce anxiety.
- Initiate Psychological First Aid (PFA) by trained and supervised emergency staff.
- Limit exposure to distressing stimuli such as noise, crowding, and traumatic visuals.
- Apply trauma-informed care to reduce the risk of psychological re-traumatisation.

2**. Treatment Phase**

- Continue delivery of PFA during medical procedures such as dressing changes and wound care.
- Provide anticipatory information on pain management and healing progress.
- Encourage patients to express emotional concerns verbally or through behaviour.
- Where appropriate, involve caregivers to offer consistent emotional reassurance.
- Document emotional responses during procedures for continuity of psychological care.
- Use age-appropriate communication, especially for paediatric and geriatric patients.

3. **Rehabilitation Phase**

- Offer basic counselling on body image and visible changes as recovery progresses.

- Empower patients by involving them in personal care decisions and rehabilitation planning.
- Validate concerns related to reintegration, appearance, and future functioning.
- Facilitate informal peer support (where feasible) to promote shared recovery experiences.
- Introduce self-esteem enhancement strategies such as journaling or mirror exposure therapy.
- Encourage realistic goal setting to foster motivation and reduce helplessness.

4. **Discharge and Aftercare Phase**

- Educate caregivers on providing continued emotional support, routine, and structure at home.
- Share clear written and verbal guidance on identifying early warning signs of psychological distress (e.g., withdrawal, nightmares, aggression, irritability, poor sleep, hypervigilance).
- Promote gradual reintegration into family, school, or community settings with positive reinforcement.
- Provide referral contacts for community-based mental health support or helplines.

Figure 26: Post-Discharge Support Framework

C. Training and Capacity Building [2-3]

Under this component, surgeons, medical officers, paramedical staff, and other multidisciplinary personnel shall undergo structured, hands-on training in "*Psychological Care and Burn Injury Management"* at designated Central and State Training Centres.

The training curriculum will encompass modules on:

- Identification of emotional trauma
- Delivery of Psychological First Aid
- Effective patient-caregiver communication
- Management of burn-specific psychological distress.
- Use of screening tools such as the Impact of Event Scale (IES-R) and PTSD Checklist (PCL-5)
- Recognition and prevention of caregiver burnout and compassion fatigue

Special considerations for vulnerable groups [6-7, 10, 13-16]

- Paediatric burn survivors:

  - ✓ Use therapeutic play and storytelling to help children externalise trauma and fears in a safe, non-verbal manner.
  - ✓ Reinforce routines such as schoolwork, meal times, and sleep, and involve caregivers to build emotional safety.
  - ✓ Coordinate with schools to ensure non-discriminatory reintegration, involving peer sensitisation and flexible academic arrangements and and preventing educational dropouts.
  - ✓ Parental counselling and support programs to mitigate child trauma.

- Women burn survivors (Acid Attacks & Domestic Violence Cases):
  - ✓ Crisis intervention centres & safe houses for women burn survivors.
  - ✓ Ensure linkage with legal aid, women protection services, and compensation schemes under the Criminal Law Amendment Act (2013) and NCW guidelines.
  - ✓ Deliver trauma-informed therapy (e.g., TF-CBT, narrative therapy), cosmetic counselling for body image recovery, and empowerment programs through survivor networks.
  - ✓ Facilitate peer-led support, group counselling, and vocational skill-building to restore self-worth and economic independence.

- Elderly burn patients:
  - ✓ Psychogeriatric services in burn units to prevent cognitive decline post-burn trauma.

- ✓ Regularly screen for delirium and cognitive impairment using CAM or MMSE, especially during hospitalisation.
- ✓ Provide grief and loss counselling tailored to bereavement, disability, or reduced independence. Educate caregivers on the elderly's psychological needs.
- ✓ Adjust psychological goals and physical rehabilitation plans to match the mobility, cognition, and social participation needs of the elderly.

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