Optum

The types, treatments and care of burns

August 24, 2022

Disclosure

No planner, presenter or content expert has a conflicting interest affecting the delivery of this continuing education activity. Optum does not receive any commercial advantage nor financial remittance through the provided continuing education activities.

Medical disclaimer

Medicine is an ever-changing science. As new research and clinical experience broaden our knowledge, new treatment options and approaches are developed. The authors have checked with sources believed to be reliable in their efforts to provide information that is complete and generally in accord with the standards accepted at time of publication.

However, in view of the possibility of human error or changes in medical sciences, neither Optum nor any other party involved in the preparation or publication of this work warrants the information contained herein is in every respect accurate or complete, and are not responsible for errors or omissions or for the results obtained from the use of such information. Readers are encouraged to confirm the information contained herein with other sources.

This educational activity may contain discussion of published and/or investigational uses of agents that are not approved by the Food and Drug Administration (FDA). We do not promote the use of any agent outside of approved labeling. Statements made in this presentation have not been evaluated by the FDA.

Disclaimer

The display or graphic representation of any product or description of any product or service within this presentation shall not be construed as an endorsement of that product by the presenter or any accrediting body. Rather, from time to time, it may facilitate the learning process to include/use such products or services as a teaching example.

Accreditation of this continuing education activity refers to recognition of the educational activity only and does not imply endorsement or approval of those products and/or services by any accrediting body.

CE credits for this course are administered by the CEU Institute. If you have any issues or questions regarding your credits, please contact rosters@ceuinstitute.net.

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Presenter

Dr. Kathleen Fink
Associate Medical Director

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Agenda

1. Overview of skin and burns
2. Evaluation and assessment
3. Factors for assessing and treating burns
4. Challenges and prevention

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Overview of skin and burns

© 2022 Optum, Inc. All rights reserved.

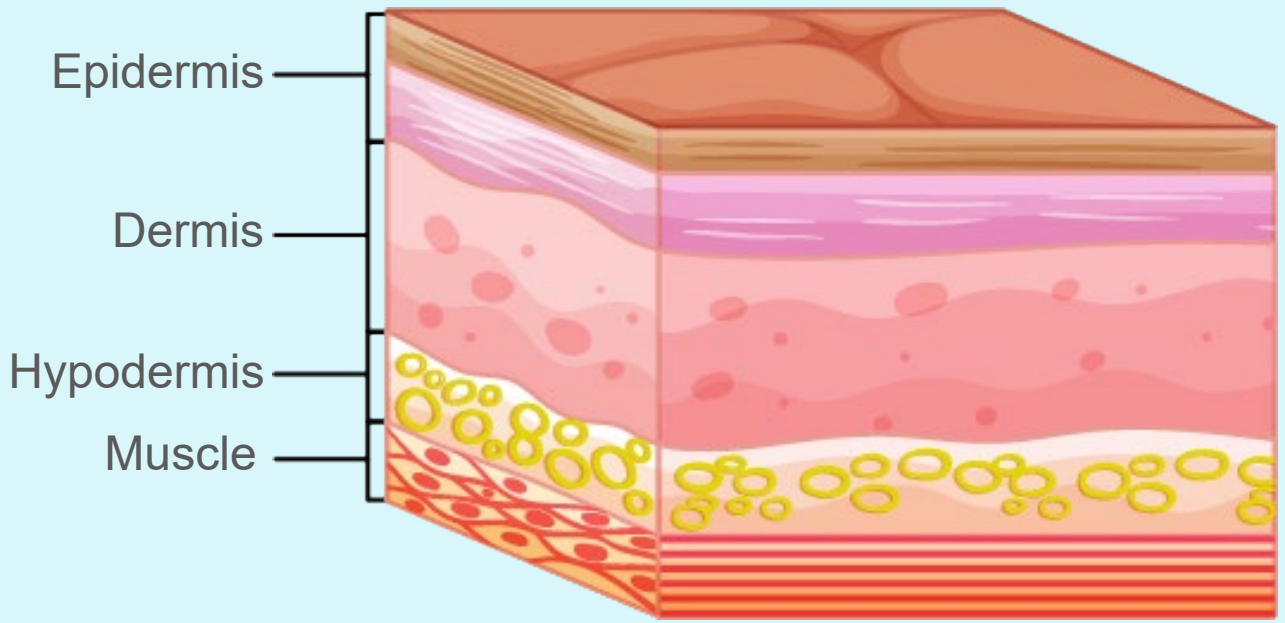
CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Skin

Skin is the largest organ of the body

16% of total body weight

Layers of the skin



Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Incidence of burns

4th leading cause of death due to trauma

2nd leading cause of death in children ages 1-4

Worldwide
300,000 die annually

486,000 receive medical treatment in U.S.

40,000 hospitalizations

3,275 deaths/year in the US burns or complications

Direct costs estimated at $1 billion

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Most common burn types

Thermal 86%

- Steam, flame, flash
- Risks - children, males (occupation related)
- Alcohol use
- Lack of smoke detectors

Electrical 4%

Chemical 3%

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Burns in the work place

10-45 %
of all burns

>5,000 burn injuries in U.S. caused by work-related fires and explosions each year [1]

~10% of fatalities related to burns
(Electrical most common)[2]

Highest risk group

Young male worker

High-risk occupations

Firefighting

Food processing

Construction

Compared to non-work-related burn patients...

- Fewer co-morbidities
- Decreased TBSA burns
- Decreased risk of inhalation injury
- Shorter time of intensive care treatment
- Shorter lengths of hospital stay
- Lower treatment cost

[1] OSHA

[2] National Census of Fatal Occupational Injuries

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Evaluation and assessment

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

On-site evaluation

- Stop the burning process
- Remove all burned clothes
  Hot clothing may cause a deeper injury. If clothing sticks to the skin, cut or tear around it.
- Pour cool water over burned areas.
  3 to 5 minutes (30 to 40 minutes for a chemical burn)
- Do not pack the burned areas in ice
  May cause more damage and hypothermia
- Remove all jewelry, belts, and tight clothing
  Burned areas will swell immediately. If the victim's neck is burned, make sure nothing is around it.
- Do not apply ointments or other home remedies
  These may cause serious infections.
- Cover burns with a clean, dry bandage or sheet
- Keep the victim warm
- Seek medical attention immediately

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Minor burns: Follow the “Cs”

Cooling

Small areas of burn can be cooled with tap water or saline solution to prevent progression of burning and to reduce pain.

Cleaning

- Mild soap and water or mild antibacterial wash.
- Debate continues over the best treatment for blisters.
- Large blisters are debrided while small blisters and blisters involving the palms or soles are left intact.

Covering

Topical antibiotic ointments or cream with absorbent dressing or specialized burn dressing materials are commonly used.

Comfort

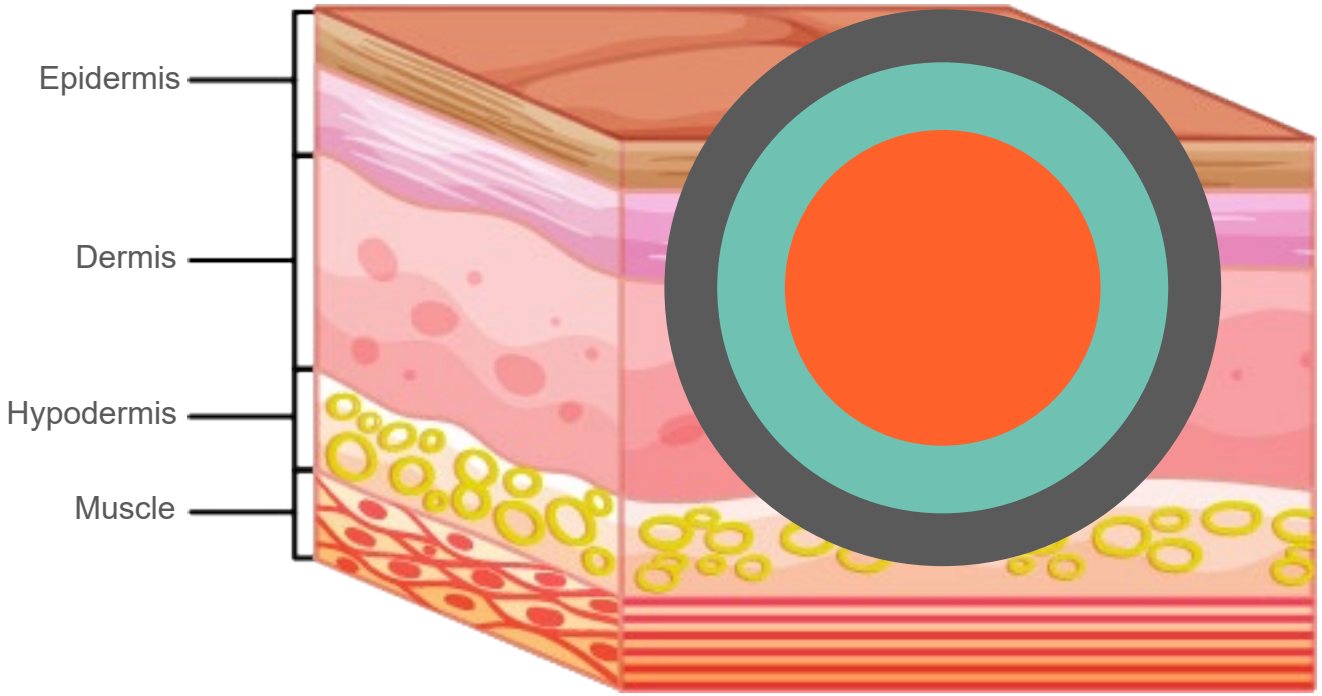
- Over-the-counter pain medications or prescription pain medications when needed.
- Splints can provide support and comfort for certain burned areas.

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Assessment: Three zones Jackson's model



Zone of coagulation

Initial area of injury and cell death

Zone of stasis

- Area at risk with inflammation and low perfusion
- Frequently area of damage increases into this zone over the first 48 hours

Zone of hyperemia

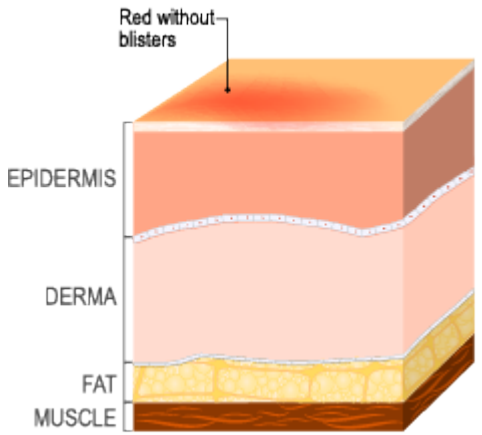
- Increased area of perfusion
- Red areas surrounding burn

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

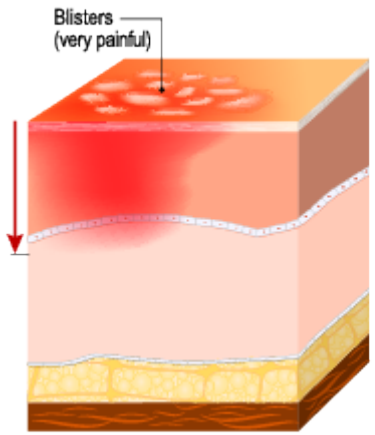
Burn classification



1st degree

- Superficial
- Warm, painful, red, soft
- Usually do not blister
- Will blanch when touched

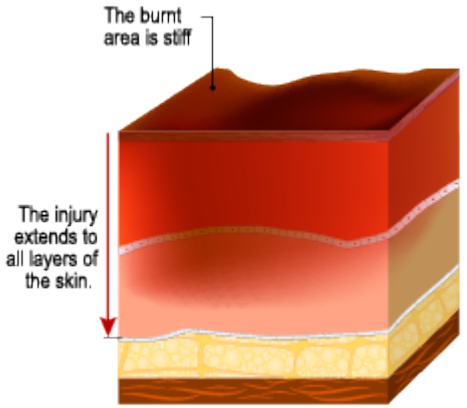
Example: Sunburn
Heals within days



2nd Degree

- Partial thickness
- Very painful, red
- Blistered, moist, soft
- Will blanch when touched

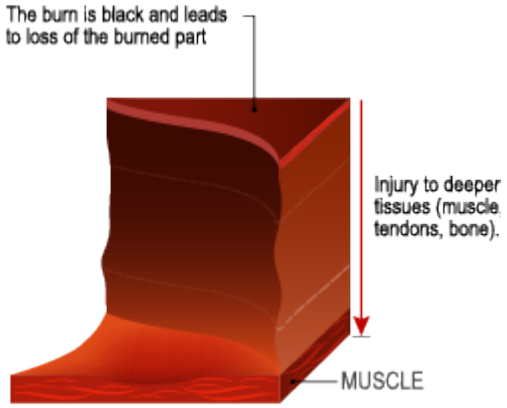
Examples: Hot surfaces or liquids
- Heals usually from both bottom up and outside in
- Generally heals in 2-3 weeks



3rd degree

- Full thickness
- Little or no pain
- Can be white, brown, or charred
- Feel firm and leathery when touched
- Will not blanch

Examples: Hot oil, flames, or superheated steam
- Heals only from outside in
- May take month to heal



4th degree

- Full thickness + muscle/bone
- Frequently requires grafts and amputations
- Healing prolonged and higher risks of complications

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Biphasic response

Phase 1

Pro-inflammatory

- Cellular level
  - Histamines, Macrophages, Hypermetabolism leads to cytokines IL-1/IL-6
  - TNF and other factors lead to proapoptosis (cell death)
- Release of inflammatory markers
- Increase vascular/capillary permeability
- Fluid shifts out of intravascular compartment
- Response exceeds those seen in trauma or sepsis
- Cardiac output is decreased
- Vascular resistance increased

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Biphasic response

Phase 2

Anti-inflammatory

- Cellular level
  - T lymphocytes
  - Cytokines IL4/IL-10
  - TGF
  - Kinins – bradykinin
    - increased vascular permeability
    - smooth muscle contraction
    - Can stimulate pain fibers
- Growth factors initiate migratory and proliferative responses.
- Keratinocytes re-epithelialize the wound
- Endothelial cells and fibroblasts initiate granulation tissues
- Free radicals - some are good but not too much

Optum

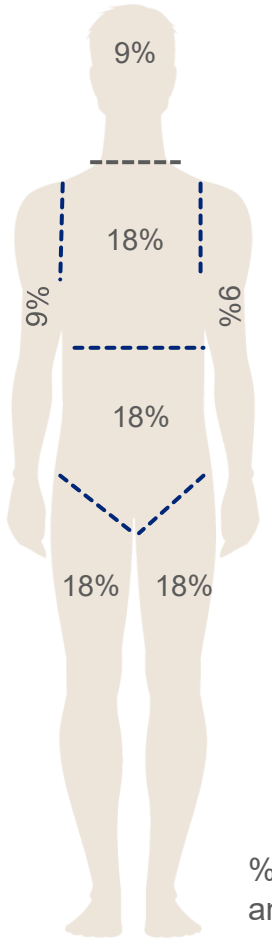
© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Wallace's rule of 9 as it relates to Total Body Surface Area (TBSA)

- Head and neck: 9% of TBSA
- Each arm: 9% TBSA
- Each leg: 18% TBSA
- Anterior trunk (front of the body) 18% TBSA
- Posterior trunk (back of the body) 18% TBSA

Rule of 9s does not apply for children.(Lund-Browder)



%s are for front and back of body.

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

American Burn Association

Minor	Moderate	Severe
• <15% TBSA adults; <10% children • Face and perineum not involved • Outpatient management	• Partial thickness 15-20% TBSA adults; 10-15% children • Full thickness 2-10% TBSA adults • Minimal face and perineum • Admission but possibly not burn center	• Partial thickness >25% TBSA; >20% children • Full thickness >10% TBSA • Face perineum or extremities • Admit to burn center

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Urgent evaluation

- Inhalation injuries possible intubation
- Carbon monoxide and cyanide measures
- Metabolic acidosis
- Oxygenation
- Circumferential full thickness burn escharotomy
- Shock

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Factors for assessing and treating burns

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Fluids

- Early resuscitative phase
- Action needed quickly
- Mortality increased if fluids delayed longer than two hours post burn
- Caution on overload
- Rhabdomyolysis and/or acute renal failure 1ml/kg/h

Burns involving 15-20% TBSA will result in hypovolemic shock

Goals for fluids

- Urine output (UOP) between 0.5ml – 1ml kg/h
- SBP > 90

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Fluids

Crystalloid

Low molecular weight and size

Pros: Move faster and easier into vascular areas 20-30 min

Cons: Flows into 3rd spaces

Examples:

- Saline
- Ringers lactate solution
- 5% dextrose

Colloids

High molecular weight and size substances; similar to plasma

Pros: Good capillary perfusion, maintains osmotic pressure

Cons: Slow 2-8 hours, expensive

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Fluid formulas

Evans 1952

Use some crystalloid and some colloid

Pediatric formulas are different and used <30kg

Brooke 1953

Use some crystalloid and some colloid

Pediatric formulas are different and used <30kg

Parkland 1968
Dr. Charles Baxter

- Most widely recognized formula
- 2 to 4 ml of Ringer's Lactate/kg/%BSA
- First half given over the first 8h; remainder given over the next 16 hours
- Unique as it recommended higher volumes of fluid

Monitor UOP adjusting fluids to keep it 0.5-1ml/kg/h

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Oxygenation

Supragolottal (above vocal chords)

- Normal - Reflexive airway closure
- Loss of airway via edema or loss of reflex (i.e., TBI or carbon monoxide)

Tracheobronchial

- Bronchospasms – inhaled irritants
- Mucosal edema

Pulmonary parenchymal

Edema, loss of ciliary clearance, effusions

Chest/Abdominal Wall

Circumferential burns
Mechanical trauma

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Wound management

Benefits of early excision and grafting within 24-48 hours

Split thickness grafts – Autograft

- Provides coverage and low risk of rejection
- Donor sites are painful and have wound healing burden

Allograft (human), Xenograft (other species), or other substitutes

- Studies show similar effectiveness in allograft and xenograft
- Substitutes are available for both dermal and epidermal layers
- Studies on regenerative dermal scaffolds and stem cells

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Wound management: Dressings

US Army Burn Center	• Traditional approach • Mafenide acetate cream AM and silver sulfadiazine PM with gauze dressings
Silver impregnated and other dressings	Alginate, Antimicrobial, Hydrocolloid, Hydrogel, Polyurethane foam
Cell based coverage	• Culture based use small biopsy of patients skin keratinocytes expanded over 2-3 weeks • ReCell mixture of keratinocytes, melanocytes, and stem cells in liquid for spraying
Keratinocytes and Stem Cells	Clinical studies in progress

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Wound management: Technology

Computer Software programs

Calculate and track size and healing

Biomarkers for wound healing

Under investigation to try to predict healing

Laser Doppler imaging

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Nutritional support

- Metabolic rate (MR) increased approximately 180% above resting MR
- Weight loss of greater than 10% is associated with poorer outcome
- Adults, 25 kcal/kg plus 40 kcal per each percent of burn area; for children, 1,800 kcal plus 2,200 calories per m^2 of burn area.
- Individualized nutrition assessment for burns > 20% of TBSA
- High protein, high carbohydrate, low fat
- Watch for hyperglycemia: Nearly all burn patients experience insulin resistance as part of their hypermetabolic response

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Nutritional Support: Supplements

- Omega 3 FA may help reduce risk of hyperglycemia
- Glutamine supplementation at 25 g/kg/day
  - Reduced incidence of infections, hospital stays, and mortality.
- Fat soluble vitamin levels fall
- Vitamin D synthesis impaired acutely and long term
- Trace element deficiencies
  - Selenium, Zinc, Copper

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Medication management

Pain management

- Bonica identified five phases of pain
- Managing through interventions like dressing changes, excision, grafting, therapy

Higher pain levels

- Long term anxiety
- PTSD
- Delayed healing

  Study showed 14% delay when pain scored as a 10 on first dressing change

Other medications

- Anesthesia
- Opioids
- Ketamine
- Anxiolytics

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Medication management: Other Considerations

Acute injury phase

- Cardiac output goes down even with aggressive volume resuscitation
- Elimination of some drugs by the kidney and liver may be decreased

Hyperdynamic phase

- Cardiac output increases
- Increased clearance of drugs dependent on organ blood flow for elimination

Chronic phase

- Hyperalgesia versus tolerance
- NMDA receptor modulation
- Neuropathic pain

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Complications

- Fluid “creep” (Over resuscitation pulmonary and/or cerebral edema)
- Multi organ involvement
- Malnutrition
- Delayed healing
- Infections
- Contractures

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Rehabilitation: Acute

- Days to months
- Pain control essential
- Positions of comfort foster flexion contractures
- Early intervention, start day one
  - Educate team, family and patient
  - Positioning, elevation of all limbs, splinting anti contracture positions
  - Avoid pressure area breakdown
  - PROM for those not able to move
  - Coordinate with dressing changes if possible

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Rehabilitation: Sub Acute

- Careful to wait until cleared after surgery or grafting
- Splinting accompanied by regular exercise
- Games to encourage movement
- Encourage ADLs – discourage family from “helping”
- Education and encouragement ongoing
- Psychological impact
  - Permanence sets in results in depression, anger, grief/loss
  - Children can show regression in development
  - Return to work issues, particularly if injury occurred at work

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Rehabilitation: Chronic

- Scar management - months
- Ongoing positioning, splinting and exercises!
- Massage and moisturizing (Helps collagen alignment, Desensitization, Acceptance of touch/feel)
- Hypertrophic scars
  - Greater risk for healing >21 days
  - Most active 4-6 months post
- Pressure therapy – 23h/day once skin closed
  - Reduces thickness, redness, swelling, itching, contractures
  - Silicone pads over hypertrophic areas

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Ancillary needs

Home health care needs

- Nurse
- PT/OT
- Home health aid
- Respiratory therapy
- Nutritionist
- Other services – i.e. infusion, dialysis

Transportation

Equipment needs

Psychological support

- Return to work issues, particularly if injury occurred at work
- Smartphone and VR studies in pediatrics

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Challenges and prevention

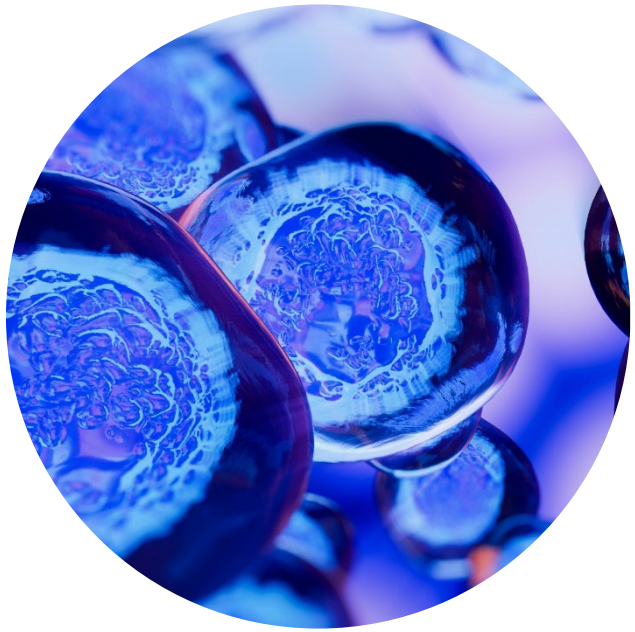
© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Future challenges

Population demographics

Obesity, aging



Stem cell uses

Hyperbaric Oxygen

more data needed

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Prevention at work

- Prevention through risk recognition
- Focus on young males, construction sites
- Dangerous behavior, carelessness, lack of protective equipment, and failure to follow instructions were frequent causes of injury
- Occupational experience was under 5 years in majority of the cases
- Ensure your workplace is safe
- One study showed only 15% experienced an unavoidable accident

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Prevention at home

- Set your water heater to 120°F.
- Test the water temperature before you or your child gets into the tub or shower.
- Turn handles of pots and pans toward the back of the stove, or use back burners.
- Use smoke alarms in your home and check batteries every six months.
- Check electrical cords every few months. Throw out any that are frayed or damaged.
- Put covers on electrical outlets that are within a child's reach.
- If you smoke, never smoke in bed. Fires caused by cigarettes, pipes, and cigars are the leading cause of deaths in house fires.
- Be careful when using space heaters. Keep them away from blankets, clothes, and other flammable materials. Never leave them unattended.

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.

Thank you!

You will receive an email from the CEU Institute on our behalf within 48 hours after the webinar. This email will contain a link that you will use to submit for your CE credits. (Make sure you check your junk mail!)

You must complete this task within 72 hours.

CE credits for this course are administered by the CEU Institute. If you have any issues or questions regarding your credits, please contact rosters@ceuinstitute.net.

Optum

© 2022 Optum, Inc. All rights reserved.

CE credits are only available for those who qualify during the LIVE version of this webinar held from 2:00-3:00 p.m. ET on 08/24/2022.