



Improving People's Lives Through Innovations in Personalized Health Care

## Burn Prevention for the Community

Rebecca Coffey MSN CNP  
November 20, 2015



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### Objectives

- Describe the common home fire and burn hazards
- Identify 5 prevention measures for burn prevention
- State how to prevent scald injuries in the home
- State kitchen safety to prevent burns



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### Epidemiology

- 4,500 fire and burn deaths per year
- More than 1 million burn injuries per year
- 45,000 hospitalizations for burn injuries
- 700,000 annual ED visits
- Majority of burn injuries occur in the home



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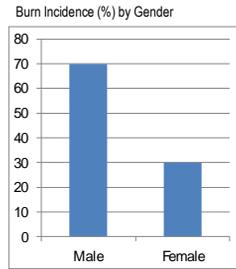
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### Statistics from Burn Admits 2005-2014

- Survival Rate = 96.4%
- A majority are Caucasian
- 66% of all burn injuries occur in the home



American Burn Association National Burn Repository (2014 report)



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### Risk Factors: Age

- Young children have thinner skin = deeper burn
- Children's developmental age is a factor in the etiology of burn – children age 6 months to 2 years are at higher risk for burn injury
- Hot tap water scald burns cause more deaths and hospitalizations than any other hot liquid burns.
- <http://www.safekids.org>



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### Risk Factors: Age

- The elderly have impaired senses and reaction times and tend to incorrectly assess risk.
- They have thinner skin, with decreased microcirculation and increased susceptibility to infection.
- These factors put them at greater risk for burn injury and lead to greater morbidity and mortality.



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## Ohio Disability Burn Injuries Epidemiology

Ohio Medicaid Claims from 2002 data for disabled and non disabled children less than age 12

- 4,307 burn injuries were identified
- Incidence of burn injuries for disabled children was significantly higher than nondisabled children
  - (103.00 per 10,000 vs. 77.41 per 10,000)
- Children aged 1 or 2 had the highest incidence of burn injury regardless of disability status
- For non-disabled children the incidence of burn injury decreased until 6 year of age
- The risk of burn injuries was significantly higher for disabled than non disabled children (Odds Ratio 1.80)

[J Trauma](#), 2007 Mar;62(3):682-6. Incidence and pattern of burn injuries among children with disabilities. [Chen G](#), [Smith GA](#), [Ranbom L](#), [Sindjar SA](#), [Xiang H](#).



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## Mechanisms of Burn Injuries

- Thermal Burns
  - Scalds
  - Flames
  - Contact
  - Grease
- Chemical Burns
- Electrical Burns
- Cold Injuries



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## Thermal Burns



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### Thermal Burns



- Flame, hot water scald, contact with hot objects
- Temperature and duration of contact
- Stop the burning process

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### Thermal Burn Flame



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### SCALD INJURIES

TEMPERATURE	TIME
120	5 min
125	1.5 - 2min
130	30 sec
140	5 sec
150	1.5 sec
155	1 sec

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## Chemical Burns

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## Chemical Burns

- Chemical and petroleum burns account for only 6% of all burns
- ♦ Injury extent related to interval between injury & institution of appropriate medical therapy
- ♦ Duration and concentration of the chemical
- ♦ Initial appearance may be deceptive
- ♦ Refer to burn center



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## Chemical Burns

- Alkalis
  - Oven cleaners, drain cleaners, fertilizers, concrete
- Acids
  - Bathroom cleansers, sulfuric acid, drain cleaners
- Organic compounds
  - Gasoline, petroleum based products



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### Acid Burns

- Common household items
  - ✓ Hydrochloric acid in bathroom cleansers
  - ✓ Oxalic and hydrofluoric acid in rust removers
  - ✓ Hydrochloric and muriatic acid for pools
  - ✓ Sulfuric acid in drain cleaners
- Tissue damage by coagulation necrosis and protein precipitation
- Limits the depth of tissue damage



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### Alkali Burns

- Hydroxides, carbonates, caustic sodas of sodium, ammonium, lithium, barium, calcium
- Oven cleaners, drain cleaners, fertilizers, industrial cleaners
- Cement and concrete (wet pH = 12)
- Tissue damage by liquifaction necrosis and protein denaturation
- Allows for spread of the chemical and more severe burns



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### Alkali Cement



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### Ammonia Burns

- Type of alkali burn
- Common examples – due to exposure to urine
  - ✓ Diaper rash - ?abuse and neglect
  - ✓ Elder abuse and neglect

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### Methamphetamine The Chemicals

- Ephedrine or Pseudoephedrine Cold Tablets
- Red Phosphorus (Match Heads)
- Methanol (Heet)
- Rubbing Alcohol
- Lithium (Batteries)
- Iodine Crystals
- Sulfuric Acid (Drano)
- Solvents (Camp Stove Fuel, Acetone, etc)
- Kitty Litter
- Salt
- Sodium Hydroxide (Lye)
- Toluene (Break Cleaner)
- Ether (Starting Fluid)



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### Petroleum injuries

- Gasoline & diesel fuel
- Tissue injury by delipidation
- Full-thickness skin damage
- Often in motor vehicle crashes
  - May be overlooked
  - Check back, buttocks, and lower extremities
  - Toxicity seen in 6 – 24 hours post exposure
  - May get lead toxicity



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### Petroleum burn



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### Gasoline

- One of the major cause of burns in US
- Most injuries occur in the home
- Over 6,000 residential fires
- Nearly \$ 5 million in damages



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### Gasoline

#### Proper Use



#### Improper Use

- An accelerant (to a cooking grill or any fire)
- A solvent
- A cleaning solution
- A weed or insect killer
- A mind-altering substance
- A fuel in devices designed for kerosene

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### Gasoline

- Vapor 3-4 times heavier than air
  - Can explode at any temperature close to room air
  - Explosions occur
  - Carburetor-Contact of gasoline or vapors with hot metal
- Ignition from spark



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### Gasoline

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### Burn From Throwing Gas on Fire



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### Treatment

**Protect yourself**  
**Protect yourself**  
**Protect yourself**

- Remove saturated clothing
- Brush off powder agents
- Continuously irrigate area with copious amounts of water
- Neutralizing chemicals contraindicated—may generate heat

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# Electrical Injury



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## Electrical Burns

- Low voltage—home currents
- High voltage—power lines, industrial, work related
- Surface appearance does not indicate extent of tissues damage
- Deep tissue and bone damage
  - May result in amputations
- Cardiac arrhythmias



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## Mechanisms of Electrical Injury

- Current
- Arc
- Flash
- Ignition of clothing
- Lightning



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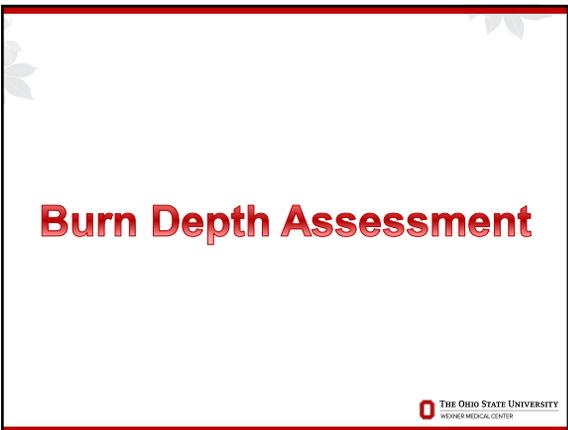
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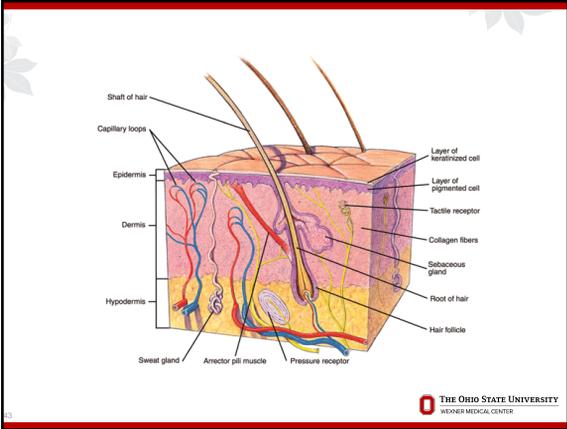
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### First Degree Burn

- Superficial - Epidermis only
- Pink or red
- Painful
- Heals in few days, injured epithelial cells peel

The photograph shows a close-up of a person's arm with a large, well-defined area of redness and swelling, characteristic of a first-degree burn. The skin appears tender and slightly raised. The logo for The Ohio State University Wexner Medical Center is in the bottom right corner.

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### Second Degree Burn

- May be partial or deep partial thickness - Entire epidermis and portion of dermis
- Red, moist
- Capillary refill present
- Blisters
- Painful
- Heals in 2-3 weeks
- Prone to scarring
- Skin grafting may improve outcome
- Hair follicles may remain intact

The photograph shows a person's arm with a large, red, and moist area of injury. There are visible blisters and the skin appears raw and tender. The logo for The Ohio State University Wexner Medical Center is in the bottom right corner.

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### Third Degree Burn

- Full thickness - Entire epidermis and dermis
- White, gray
- Dry, leathery
- No hair
- May have decreased capillary refill
- Less pain
- Small area heals by epithelial ingrowth
- Require surgical skin grafts



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### Common Home Burn Injuries

- Scalds
- Flame
- Chemical
- Electrical

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### SCALDS



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### High Risk Populations for Scalds

- Young Children 60 % of all scalds
- Elderly
- People with disabilities



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### Sources

- Hot tap water
- Hot Beverages
- Hot food
- Steam



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### Why young kids get scalds

- Curiosity
- Limited understanding of danger
- Limited ability to react quickly to hot contact
- Thin skin = deeper burn



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### Elderly and Scalds

- Thin skin
- Reduced mobility, agility
- Reduced ability to feel heat, due to health conditions or medication



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### People with special needs and scalds

- Sensory impairment
- Mobility or other physical impairment
- Diminished mental capacity



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### Where scald injuries occur in the home

- Kitchen or dining area
- Spills while handling or moving hot foods and liquids
- Often involving children
- Bathing area
- Inability to remove self from hot water



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### Scald history

- Length of contact with hot substance
- Temperature of substance
- Nature of substance
  - Is it thick or sticky?
  - Does it retain heat?
- Extent of body area scalded
- Location of scald




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### Preventing scald injuries

- **Household modifications Kitchen and Dining area**
- Mark and explain a "kid-free zone"
- Put away tablecloths
- Use spill-resistant "travel mugs"
- Keep friends, relatives, and sitters informed
- Turn pan handles away from stove front
- Observe safe microwave oven practices
- Protect electric cooking appliances and cords




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### Prevention – Kitchen

- **Scald-safe child supervision**
- Supervise young children **at all times**
- Encourage use of "kid-safe" zone
- Never hold a child in your arm:
- While preparing or serving hot food
- While drinking a hot beverage
- Keep hot food and liquids high and out of the reach of young children
- Test temperature with cooking thermometer




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### Stay by your pan

- Stay nearby in kitchen to fry, broil or boil
- Stay in the home to bake, simmer or roast  
Use timer as reminder to check frequently
- For a grease fire, put on oven mitt and extinguish by smothering with matching pan lid, not by using a fire extinguisher
- For an oven fire, turn off oven, close door and wait until oven has cooled down



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### Stand By Your Pan



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### Kitchen Safety

- Kid Safe zone
- No dangling cords
- Keep stove area clear flammable items such as dish cloths
- Do not wear loose clothing or sleeves



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### Microwave safety



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### Bathroom scald prevention

- **Household Modifications**
- Establish safe hot water temperature - 120 degrees maximum residential Nursing homes and child care facilities 110 degrees
- If this is not possible, install tempering valve or safe faucet and shower heads
- Install non-slip bath, shower mats
- Install grab bar in shower stall



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### Bathroom Safety

- Run hot water up to two minutes at tap
- If initial test temperature is above 120° F (48° C), lower heater thermostat setting
- Initial test temperature below 120°F/48°C may not prove safety
- Retest several times until safe temperature setting is assured



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### Prevention

- For single control faucet, always turn on and off in the "cold" position
- For dual control faucet, always turn "cold" faucet on first, and off last
- Make sure all household members and caregivers understand these controls



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### Prevention

- **Indirect** (fall prevention)
- Grab bars
- Non-slip mats in tub/shower, on floor
- Shower/bath seat

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### Prevention

- Bath thermometers
- Check water temperature before placing child in tub or shower
- Instruct carefully any older siblings who help bathe young children
- Young children should never be left alone in the tub



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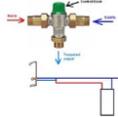
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### Equipment for Bathroom scald prevention

- Tempering valve
  - on water line
- Anti-scald valves
  - on shower heads and faucets



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### Keep appliances away from water in the Kitchen and Bathroom



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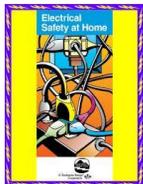
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### Electrical burn prevention in the home



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### Where GFCI outlets are needed

- Kitchen counter top
- Bathroom
- Near a wet bar sink
- Swimming pool, spa, hot tub
- All outdoor receptacles
- Work area
- Garage
- Crawl space
- Unfinished room in basement or storage area



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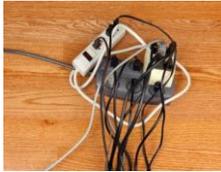
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### Hazards



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### Safety Plugs



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- **Heating Pads and Electric Blankets** Never place anything heavy on pads or blankets  
Never sit or sleep on them
- Turn off after leaving bed
- **Heating pads**
- Never sit or sleep on one
- Limit use to 15-20 minutes Use automatic switch or timer to control use




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### Fireplace Safety

- Have your chimney or wood stove inspected and cleaned annually by a certified chimney specialist.
- Clear the area around the hearth of debris, decorations and flammable materials.
- Leave glass doors open while burning a fire..
- Close glass doors when the fire is out to keep air from the chimney opening from getting into the room.
- Always use a metal mesh screen with fireplaces that do not have a glass fireplace door.
- Install stovepipe thermometers to help monitor flue temperatures.
- Keep air inlets on wood stoves open, and never restrict air supply to fireplaces. Otherwise you may cause creosote buildup that could lead to a chimney fire.
- Use fire-resistant materials on walls around wood stoves.

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### Fire Place Safety




**WARNING**

HOT GLASS WILL CAUSE BURNS.  
DO NOT TOUCH GLASS UNTIL COOLED.  
NEVER ALLOW CHILDREN TO TOUCH GLASS.

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### Candles in the Home

- On average, a candle fire in the home is reported to a U.S. fire department every **40 minutes**.
- **More than one-third of home candle fires started in the bedroom.**
- **More than half of all candle fires start when things that can burn are too close to the candle.**



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### Candle Safety

- Use heavy, sturdy, heat-resistant candleholders, big enough to collect wax
- Keep candles away from window coverings, other flammables, children
- Keep wick cut to ¼ inch
- Extinguish before leaving a room or going to sleep



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### Space heater

- Responsible for 25,000 residential fires a year
- Keep 3 feet away from combustibles
- Refuel kerosene heaters outside
- Use only special kerosene fuel cans
- Turn off when you leave the room
- Do not leave children unattended



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### Home heating safety

- Keep flammables away from the house heater, outside the residence
- Keep combustibles 3 feet away from heat source
- Do not use aerosol cleaning products nearby
- Service home heating systems annually



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### Gasoline Safety

- Always store Gasoline in an outdoor shed or garage
- Store in an approved container
- Never use gasoline as a cleaning agent
- Let small motors cool before you refuel
- Never fill gasoline motors in an enclosed space

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### Cigarette Smoking

- Average age of cigarette fire death: 55+
- Careless discarding
  - in beds, chairs, trash
- Increases with alcohol, prescription drugs
- Visitors, caretakers, neighbors also at risk
- Don't Allow Smoking in Your Home



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## Home Oxygen

- 800,000 people are using Home oxygen Therapy (HOT)
- Standard of care for people with hypoxemia related to COPD
- Burn injuries related to HOT therapy have increased



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## Oxygen

- Oxygen is nonflammable BUT it greatly accelerates the rate of combustion.
- More oxygen in the air means that hair, plastics, furniture can catch fire at lower temps.
- Safe use of oxygen demands that all flammable materials and potential ignition sources be removed from the area.



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## Smoking and Home Oxygen

THE SINGLE MOST  
IMPORTANT THING YOU  
CAN DO IS NOT TO  
SMOKE WHILE USING  
HOME OXYGEN



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## Smoking and Home Oxygen

**No-smoking signs** should be posted in your home or on exterior doors to alert visitors that oxygen is being used and/or stored in the home



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## Smoking and Home Oxygen

- **Store your oxygen** system in a clean secure area away from flammable items. Oxygen cylinders should be secured to prevent accidental falling.
- Have a **fire extinguisher** close by, and you may wish to notify your fire department know that you have oxygen in your home.
- **When using an oxygen concentrator:**
  - Avoid using an extension cord
  - Store in an area that will allow proper air circulation and prevent overheating (not a closet)
  - Store 12-18 inches from drapes or walls



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## Smoking and Home Oxygen

Stay at least 5 feet from open flames including:



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### General Safety

- Install, maintain smoke alarms
  - on all levels of a residence
  - outside each sleeping area
  - in bedrooms if sleeping with door closed
- Install carbon monoxide detector
- Test alarms on schedule
- Change the batteries
- Replace if older than 10 years old
- Vacuum to keep free of dust
- Display home address outside




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### Fire Escape Plan




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### Fire escape plan

- A working Smoke detector
- Never ignore a fire alarm
- Know 2 ways out
- Practice your plan
- Let fire department know if some one is disabled and may have difficulty getting out
- Have a meeting place
- Never go back into a burning building

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### Home Fire Plan

- Practice your plan
- Crawl low and go
- Stop drop and roll



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### Frostbite / Cold Injury

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### Frostbite Hands

Frostbite Day #2



Frostbite Day #8



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# Wound Care and Dressing

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THE OHIO STATE UNIVERSITY  
WEXNER MEDICAL CENTER

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- ## Goals of Wound Management
- Promote healing/preserve viable tissue
  - Prevent/control infection
  - Maintain function
  - Patient comfort and relief of pain
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### Wound Healing

- Superficial partial thickness
  - Will heal in 10-14 days
  - Dressings done until healing occurs
- Deep partial and full thickness
  - Require surgical management
  - Dressings done before, between, and after surgical procedures until healing occurs
- Time to healing variable based on patient

Hermans, M.H.E. (2005). General overview of burn care. *International Wound Journal*, 2, 206-220.




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### The Ideal Dressing...

- Cost-effective
- Simple to administer
- Least discomfort to patient
- Prevents infection (anti-microbial properties)
- Keeps wound bed moist
- Preserve function
- Provides effective and timely wound healing

Hermans, M.H.E. (2005). A general overview of burn care. *International Wound Journal*, 2, 206-220.

Jeffrey, S.J. A. (2009). Current burn wound management. *Trauma*, 11, 217-228.




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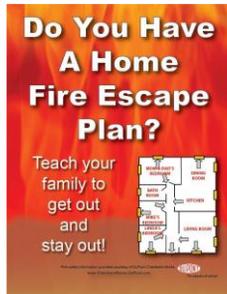
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### Questions???

- Thank you




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