

Adult Response Resources for Burn Surge Facilities

MINNESOTA BURN SURGE PLAN

CENTER FOR EMERGENCY PREPAREDNESS AND RESPONSE

July 2019

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Background

Burn treatment is specialized and requires expertise. However, after initial fluid resuscitation there is a period of 48 hours or more before definitive burn management is required. The major focus during this time period is supportive care for the patient. Minnesota burn surge resources are available at the [MDH Burn Surge website](#). [Patient Care Strategies for Scarce Resource Situations](#), including burn supply and triage recommendations are also available at MDH Crisis Standards of Care website.

Basic Treatment Considerations

First Aid

- Apply cool tap water for 20 minutes to the burned area to stop the burning process. This is effective up to 3 hours post burn.
- Do not use ice.
- Remove clothing, jewelry and anything constricting.
- After cooling, cover with cling wrap and warm the patient. Elevate limbs.

Vital Signs

Vital signs can be of some help in determining priority, however the normal ranges, by age, are wide, and thus, clinical correlation to the injuries/symptoms is required. Persistent tachycardia or tachypnea exceeding the ranges below, after appropriate analgesia, should prompt a careful evaluation for severe illness/injury.

Respiratory Rate and Heart Rate Range by Age	Respiration Rate (per minute)	Heart Rate (per minute)
6 to 12 years	18 – 30	70 – 120
12 years and up	12 – 18	60 – 100

Nutrition

- Nutrition should be considered early in the treatment phase.
- Keep patient NPO (nothing by mouth) until all assessments have been done.

Triage

When there is a large volume of patients, [START](#) is a method of triage for adults. Additionally, the Minnesota Department of Health's Science Advisory Team has created [Patient Care Strategies for Scarce Resources Situations](#), which includes a Burn Therapy Resource Card and a Burn Therapy Triage Card.

However, the table below may be used in conjunction with clinical assessment and guidance from a Burn Center to determine which patients may be too gravely injured to warrant full resuscitation and

BURN SURGE **ADULT** RESPONSE RESOURCES

support. In all cases, patients should be provided with appropriate medications for comfort even if other interventions are not warranted based on the prognosis.

Table reflects **SURVIVABILITY**—so ‘very high’ is an excellent prognosis.

Survivable	Survivable and good outcome expected without requiring initial admission.
Very High	Survival with good outcomes highly expected.
High	Survival and good outcomes expected with limited/short term initial admission and resource allocation (LOS less than or equal to 14 days. 1-2 surgical procedures)
Medium	Survival and good outcomes with aggressive care and comprehensive resource allocation, including initial admission (greater than/equal to 14 days), resuscitation, and multiple surgeries.
Low	Survival and good outcome low even with long-term, aggressive treatment and resource allocation.
Very low	Survival and outcome poor even with unlimited resources.
Expectant	Survival less than 10% even with unlimited, aggressive treatment.

Survival rate by age and total percent of body surface area burned (+10 for inhalation injury)

Age	0 -10%	11 – 20%	21 -30%	31 - 40%	41 - 50%	51 - 60%	61 - 70%	71 - 80%	81 - 90%	91+%
< 2 years	Very High	Very High	Very High	High	Medium	Medium	Medium	Low	Low	Very Low
2 - 5 years	Survivable	Very High	Very High	High	High	High	Medium	Medium	Low	Low
5 - 19 years	Survivable	Very High	Very High	High	High	High	Medium	Medium	Low	Low
20 - 29 years	Survivable	Very High	Very High	High	High	Medium	Medium	Low	Low	Very Low
30 - 39 years	Survivable	Very High	Very High	High	Medium	Medium	Medium	Low	Low	Very Low
40 - 49 years	Survivable	Very High	Very High	Medium	Medium	Medium	Low	Very Low	Very Low	Expectant
50 - 59 years	Survivable	Very High	Very High	Medium	Medium	Low	Very Low	Very Low	Expectant	Expectant
60 - 69 years	Very High	Very High	Medium	Medium	Low	Very Low	Very Low	Expectant	Expectant	Expectant
70+ years	Very High	Medium	Medium	Low	Very Low	Expectant	Expectant	Expectant	Expectant	Expectant

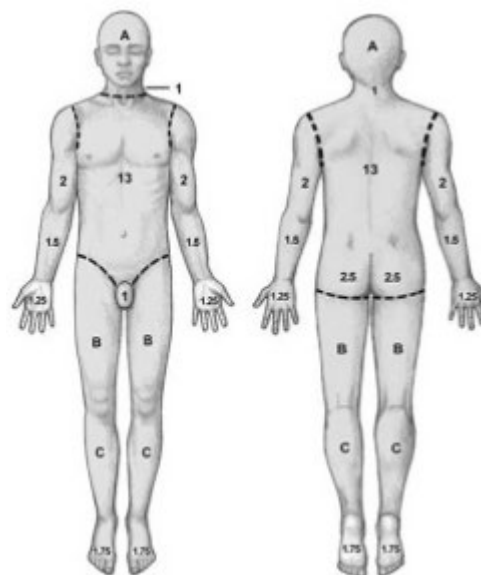
Assessment

Lund-Browder Chart for determining Total Body Surface Area

The Lund-Browder chart is the gold standard for measurement of Total Body Surface Area (TBSA). It compensates for the change of body shape as humans grow. For patients under 15 years old, see the [Pediatric Response Resources for BSFs](#) on the Minnesota Burn Surge website.

Directions: Locate the patient's age in the chart below. Identify the areas that are covered by burns. Add the percentage of each area to obtain TBSA. Ignore simple erythema. *Use the TBSA to determine the patient's required fluid resuscitation (see Nurse Driven Fluid Resuscitation Protocol at end of this document).*

		% of Body		Superficial	Deep	Total %
Area		15 years	Adult			
Anterior (front)	Head (A)	4.5	3.5			
	Neck	1	1			
	Trunk	13	13			
	Genitalia	1	1			
	R. upper arm	2	2			
	L. upper arm	2	2			
	R. lower arm	1.5	1.5			
	L. lower arm	1.5	1.5			
	R. hand	1.25	1.25			
	L. hand	1.25	1.25			
	R. thigh (B)	4.5	4.75			
	L. thigh (B)	4.5	4.75			
	R. lower leg (C)	3.25	3			
	L. lower leg (C)	3.25	3			
	R. foot	1.75	1.75			
	L. foot	1.75	1.75			
Posterior (back)	Head (A)	4.5	3.5			
	Neck	1	1			
	Post. Trunk	13	13			
	R. buttock	2.5	2.5			
	L. buttock	2.5	2.5			
	R. upper arm	2	2			
	L. upper arm	2	2			
	R. lower arm	1.5	1.5			
	L. lower arm	1.5	1.5			
	R. hand	1.25	1.25			
	L. hand	1.25	1.25			
	R. thigh (B)	4.5	4.75			
	L. thigh (B)	4.5	4.75			
	R. lower leg (C)	3.25	3			
	L. lower leg (C)	3.25	3			
	R. foot	1.75	1.75			
	L. foot	1.75	1.75			
		Total				



Regions Hospital[®]Hennepin County
Medical Center

Adult Order Set for Burn Patients

MINNESOTA BURN SURGE FACILITIES

DISCLAIMER: These materials were developed by the Minnesota State Burn Centers—Hennepin County Medical Center and Regions Hospital—in conjunction with the Minnesota Department of Health. ***They are recommendations for patients being treated for burns at a Burn Surge Facility.*** If, at any time a provider or nurse needs to consult with a Burn Center, please contact them. All prescribing providers at the BSF have authority to prescribe treatment they deem appropriate in their facility.

INSTRUCTIONS: These are recommended orders by Minnesota State Burn Centers for the treatment of burn patients. Prescribing providers at the BSFs should check the boxes on orders they deem appropriate for patient care. If the BSF has electronic order entering, the appropriate staff member should enter all checked orders into the electronic medical system. If, at any time a provider or nurse needs to consult with a Burn Center, please contact them.

On Admission:

- ☐ Height and Dry Weight
- ☐ Record amount of fluid patient has received
- ☐ Calculate Modified Parkland Formula (See Nurse Driven Resuscitation Protocol) and obtain order for IVF
- ☒ ABO Rh and Antibody Screen (Type & Screen)
- ☐ Tetanus toxoid 0.5 mL IM now (if > 5 years since last immunization)
- ☐ Albumin, Prealbumin
- ☐ AST, ALT, Triglycerides, Bilirubin
- ☐ Basic Metabolic Panel, Magnesium, Phosphorous
- ☐ Blood Gas, Arterial (Inhalation injury/Intubated)
- ☐ Blood Gas, Venous, if unable to obtain ABG (Inhalation injury/Intubated)
- ☐ Carbon Monoxide, Blood (Inhalation injury/Intubated)
- ☐ Hemogram with Platelets
- ☐ Lactate
- ☐ UA
- ☐ Ethanol Level and Drugs of Abuse Screen
- ☐ Urine Pregnancy Screen for females ages 10-55 years if not already done

Standing Orders: Consults

- ☐ Call the referring Burn Center daily for assistance with pain medications, sedation, wound care, nutrition, and other questions.

HCMC: 1-(800) 424-4262 or 612-873-4262

Regions Hospital: 1-(800) 922-BURN (2876)

Vital Signs and Monitoring

- ☐ Vital signs Q ____ hour(s)
- ☐ Continuous Cardiac Monitoring
- ☐ Continuous Pulse Oximetry

Wound Care

- ☐ Wash wounds daily with soap and water
- ☐ Apply dressings per Burn Center recommendation

Oxygen Therapy

- ☐ Oxygen Therapy as needed to maintain SpO₂ ≥ 92%
- ☐ Carbon Monoxide inhalation patients: 100% humidified O₂ x 4 hours

Lines/Drains

- ☐ IV access
- ☐ Nasogastric/Orogastric Tube to Low Continuous Suction for intubated patients
- ☐ Indwelling Urethral Catheter Insertion and Maintenance for NPO patients or patients requiring IVF

IV Fluid Resuscitation

- ☐ Titrate IVF per UOP (See Nurse Driven Fluid Resuscitation Protocol)

Activity

- ☐ Bedrest—Turn Q2 hours
- ☐ Spinal Precautions until cleared
- ☐ Up in chair
- ☐ Ambulate with Assistance
- ☐ Elevate effected extremities

Nursing Assessment and Interventions

- ☐ Weigh Patient Daily
- ☐ Strict Intake and Output (every 1 hour for ICU patients, every 4 hours for telemetry/step-down patients)
PATIENTS TAKING PO FLUIDS, GOAL: ≥ 500 ML/8HR
- ☐ Bladder Pressure Assessment Q4 hours
- ☐ Peripheral Pulse Checks Q1 hour (Circumferential Burns)
- ☐ Fingerstick/Blood Glucose Monitoring **AC & HS** (Maintain Fasting Serum Glucose [FSG] between 90-150)
- ☐ Fingerstick/Blood Glucose Monitoring **Q4** hours (Maintain FSG between 90-150)
- ☐ Oral Care for Intubated Patients every 2 hours with peroxide or Chlorohexidine Gluconate (CHG)

Nutrition

- ☐ Regular Diet, high protein
- ☐ Consistent Carbohydrate Diet
- ☐ Customized Diet (i.e. renal, diabetic, cardiac):

Nutritional Supplement

- ☐ Supplement shakes TID: _____
- ☐ Enteral Feedings: _____
start at _____ mL/hr via **OGT / NGT** increase to goal of _____ mL/hr.

Medications

Pain

- ☐ Patient Weight ≥ 51 kg:
Acetaminophen 1000 mg **PO / NGT / OGT** Q8 hrs x 3 days
- ☐ Patient Weight ≤ 50 kg:
Acetaminophen 650 mg **PO / NGT / OGT** Q8 hrs x 3 days

Breakthrough Pain

Oral Administration

- ☐ OxyCODONE (ROXICODONE) tablet
5-10 mg **PO** Q4 hrs PRN

Enteral Administration

- ☐ OxyCODONE (ROXICODONE) oral liquid 5-10 mg **enteral** Q4 hrs PRN

Intravenous Administration

- ☐ MORphine 1-10 mg **IV** Q1 hr PRN—DO NOT ORDER if on continuous infusion or patient age greater than 60 y.o. or with renal insufficiency
- ☐ HYDROmorphine (DILAUDID) 0.1-1 mg **IV** Q1 hr PRN—DO NOT ORDER if on continuous infusion or patient age greater than 60 y.o. or with renal insufficiency

Medications (continued)

Dressing Change/Wound Care

- ☐ MORphine 1-10 mg **IV** Q1 hr PRN for dressing change/wound care—DO NOT ORDER if on continuous infusion or patient age greater than 60 y.o. or with renal insufficiency
- ☐ FentaNYL (SUBLIMAZE) 25-100 mcg **IV** PRN for dressing change/wound care
- ☐ Midazolam (VERSED) 1-5 mg **IV** PRN for dressing change/wound care

Agitation/Delirium Medications

- ☐ Haloperidol (HALDOL) 2-5 mg **IV** Q2 hr PRN positive CAM score
- ☐ Diphenhydramine (BENADRYL) 25-50 mg **IV** Q6 hr PRN extrapyramidal side effects
- ☐ Seroquel 25-50 mg **PO** Q8 hr PRN
DO NOT CRUSH

Itching

- ☐ Diphenhydramine (BENADRYL) 25-50 mg **IV** Q6 hr PRN itching
- ☐ Diphenhydramine (BENADRYL) 25-50 mg **PO** Q6 hr PRN itching

Endocrine

- Consider Insulin drip if indicated, otherwise treat for blood glucose outside of 90-150 per hospital policy

Gastrointestinal

- ☐ Chemical GI prophylaxis and Bowel regimen per hospital policy

VTE/DVT Prophylaxis

- ☐ Lovenox 40 mg **SQ** BID (consider heparin for renal patients)

Vitamins

Oral Administration

- ☐ Multivitamin-minerals (CERTAVITE, MYADEC) 1 tablet **PO** daily
- ☐ Ascorbic acid (VITAMIN C) 500 mg **PO** BID
- ☐ Vitamin A 10000 units **PO** daily
- ☐ Zinc sulfate (ORAZINC) 220 mg **PO** daily

Enteral Administration

- ☐ Pediatric multiple vitamin (MULTI-DELYN) 10 mL **enteral** BID
- ☐ Multivitamin-minerals (CERTAVITE, MYADEC) 1 tablet crushed **enteral** daily
- ☐ Ascorbic acid (VITAMIN C) 500 mg **enteral** BID
- ☐ Zinc sulfate (ORAZINC) 220 mg **enteral** daily

Miscellaneous

- ☐ Carboxymethylcellulose (REFRESH PLUS) 0.5% eye gtt 1-2 drop(s) in both eyes Q4 hrs
- ☐ Carboxymethylcellulose (REFRESH PLUS) 0.5% eye gtt 1-2 drop(s) in both eyes Q4 hrs PRN dry eyes
- ☐ Lidocaine (XYLOCAINE) 1 dose, local anesthetic for Foley catheter placement

Daily Labs/Imaging

- ☐ Blood Gas, Arterial (Inhalation injury/Intubated)
- ☐ Blood Gas, Venous, if unable to obtain ABG (Inhalation injury/Intubated)
- ☐ Hemogram with Platelets
- ☐ BMP, Magnesium, Phosphorous
- ☐ XR Portable Chest 1 View daily (Intubated)

Nurse Driven Fluid Resuscitation Protocol

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Burn Center Contact Information

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Indications for Fluid Resuscitation

- Children with >15% Total Body Surface Area (TBSA)
- Inhalation Injury
- Electrical Injury

Burn Diagram should be completed by Admitting Provider

- Determine TBSA using the Lund Browder method (see above) or the Wallace Rule of Nines.¹

Initial Fluid Resuscitation Calculations for Burns

1. Modified Parkland Formula → 24 hour total

Patient Weight (kg)	
TBSA (%)	

$$2 \text{ mL} \times \underline{\hspace{2cm}} \text{ kg} \times \underline{\hspace{2cm}} \% \text{ burn} = \underline{\hspace{2cm}} \text{ mL} = 24\text{-hr total}^2$$

2. Calculate Hourly Resuscitation Volumes

Half ($\frac{1}{2}$) of the 24-hour total should be given in the *first eight (8) hours*.

$$24\text{-hr total} \underline{\hspace{2cm}} \text{ mL} \div 2 = \underline{\hspace{2cm}} \text{ mL} \div 8 \text{ hrs} = \underline{\hspace{2cm}} \text{ mL/hr}$$

The other half ($\frac{1}{2}$) of the 24-hour total should be given over the *remaining sixteen (16) hours*.

$$24\text{-hr total} \underline{\hspace{2cm}} \text{ mL} \div 2 = \underline{\hspace{2cm}} \text{ mL} \div 16 \text{ hrs} = \underline{\hspace{2cm}} \text{ mL/hr}$$

3. Obtain a provider order for fluids and titration. Have provider DOUBLE CHECK all calculations.

¹ The Lund Browder method is the gold standard of practice to determine TBSA.

² 24-hour fluid total is a starting point **only**. Titrate fluids based on urine output (see page 13).

Example Fluid Resuscitation Calculations

Patient Weight	TBSA	Calculation	Estimated 24-hour Resuscitation Total	Fluid Type
50 kg	20%	2 mL x 50 kg x 20%	2000 ml	LR
	40%	2 mL x 50 kg x 40%	4000 ml	LR
	60%	2 mL x 50 kg x 60%	6000 ml	LR
	80%	2 mL x 50 kg x 80%	8000 ml	LR
60 kg	20%	2 mL x 60 kg x 20%	2400 ml	LR
	40%	2 mL x 60 kg x 40%	4800 ml	LR
	60%	2 mL x 60 kg x 60%	7200 ml	LR
	80%	2 mL x 60 kg x 80%	9600 ml	LR
70 kg	20%	2 mL x 70 kg x 20%	2800 ml	LR
	40%	2 mL x 70 kg x 40%	5600 ml	LR
	60%	2 mL x 70 kg x 60%	8400 ml	LR
	80%	2 mL x 70 kg x 80%	11,200 ml	LR
80 kg	20%	2 mL x 80 kg x 20%	3200 ml	LR
	40%	2 mL x 80 kg x 40%	6400 ml	LR
	60%	2 mL x 80 kg x 60%	9600 ml	LR
	80%	2 mL x 80 kg x 80%	12,800 ml	LR
90 kg	20%	2 mL x 90 kg x 20%	3600 ml	LR
	40%	2 mL x 90 kg x 40%	7200 ml	LR
	60%	2 mL x 90 kg x 60%	10,800 ml	LR
	80%	2 mL x 90 kg x 80%	14,400 ml	LR
100 kg	20%	2 mL x 100 kg x 20%	4000 ml	LR
	40%	2 mL x 100 kg x 40%	8000 ml	LR
	60%	2 mL x 100 kg x 60%	12,000 ml	LR
	80%	2 mL x 100 kg x 80%	16,000 ml	LR

Types of IV Fluid

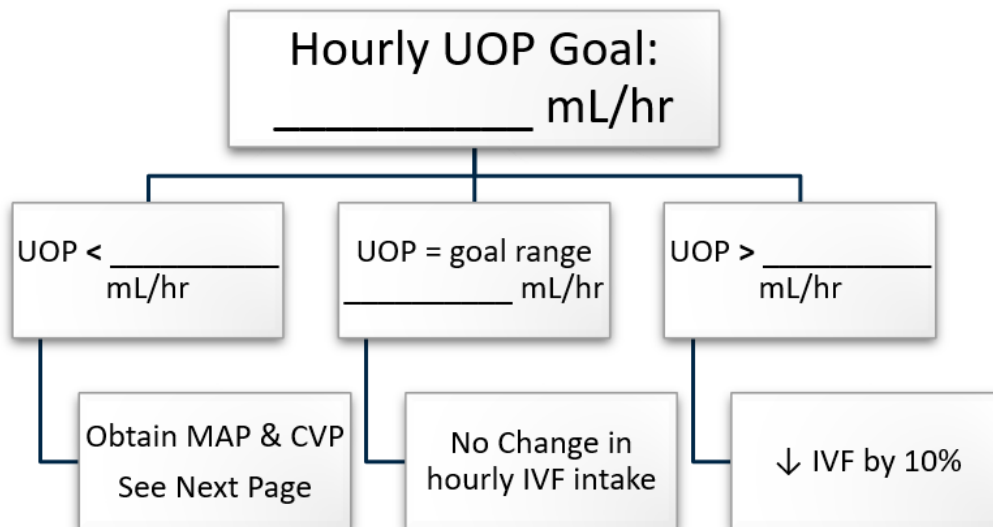
- Recommended **crystalloid** is **Lactated Ringer's or D5 Lactated Ringer's** for small patients.
- Administer **colloid (FFP or Albumin)** once the patient has received **100 mL/kg** of **total IVF** (including pre-admission). Colloid should be given over 8 hours.
- NO crystalloid boluses** (Normal saline, half-normal saline, Lactated Ringer's, D5W, or D5NS).

Titrate IV fluids to Hourly Urine Output (UOP)

Hourly fluid volume should include ALL IV fluids
(sedation, medication, vasopressors, electrolyte replacement, etc.)

- Electrical Injury ONLY**
 - Child:** keep UOP **2 mL/kg/hr** until urine is clear and yellow
- Other Burn Injuries** (circle appropriate goal range and fill in chart below)

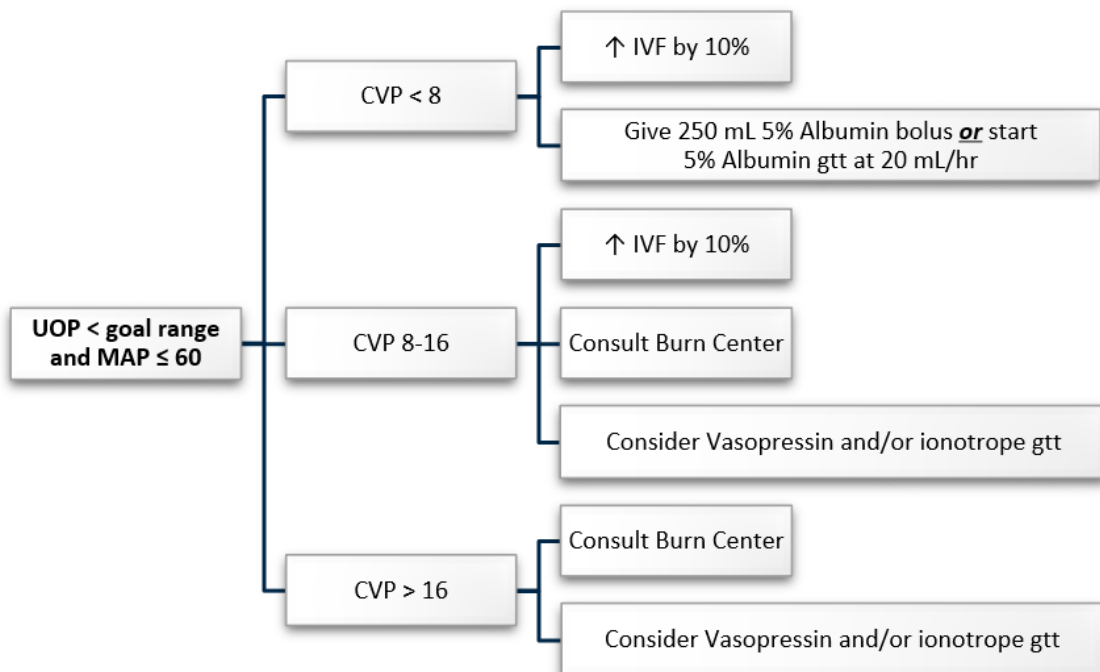
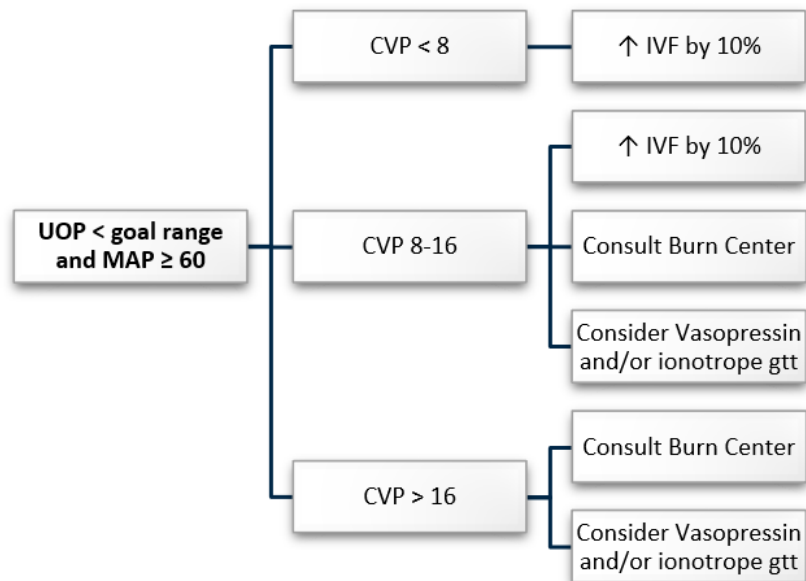
Weight (kg)	UOP Goal Range (mL/hr)	Weight (kg)	UOP Goal Range (mL/hr)
≤ 5 kg	5—8 mL/hr	40—44 kg	15—20 mL/hr
6—10 kg	5—10 mL/hr	45—54 kg	15—25 mL/hr
11—15 kg	8—15 mL/hr	55—64 kg	20—30 mL/hr
16—20 kg	12—20 mL/hr	65—74 kg	20—35 mL/hr
21—25 kg	11—25 mL/hr	75—84 kg	25—40 mL/hr
26—30 kg	13—30 mL/hr	85—99 kg	25—45 mL/hr
31—35 kg	15—35 mL/hr	> 100 kg	30—50 mL/hr
36—39 kg	18—39 mL/hr		



- To **decrease IVF by 10%**
 - Total Hourly IVF x 10% = _____ mL
 - Total Hourly IVF – **10%** = New Total Hourly IVF
- To **increase IVF by 10%**
 - Total Hourly IVF x 10% = _____ mL
 - Total Hourly IVF + **10%** = New Total Hourly IVF

When UOP is Less Than Goal Range

- Obtain MAP and CVP on patient



Clinical Manifestations of Dehydration

	Mild (<5%)	Moderate (5-10%)	Severe (>10%)
Heart Rate	Normal	Slightly increased	Rapid, weak
Systolic Blood Pressure	Normal	Normal to orthostatic >10 mmHg change	Hypotension
Urine Output	Decreased	Moderately decreased	Marked decrease, anuria
Mucous Membranes	Slightly dry	Very dry	Parched
Anterior Fontanel	Normal	Normal to Sunken	Sunken
Tears	Present	Decreased, eyes sunken	Absent, eyes sunken
Skin	Normal turgor	Decreased turgor	Tenting
Skin Perfusion	Normal capillary refill (<2 seconds)	Capillary refill slowed (2-4 seconds); skin cool to touch	Capillary refill delayed (>4 seconds); skin cool, mottled, gray

Burn Patient Inputs and Outputs Tracking Record

Patient Name:		Date/Time of Injury:	
Mod. Parkland Formula:	mL/hr in first 8 hrs	Initial Fluid Rate:	mL/hr
	mL/hr over 16 hrs	Switch from crystalloid to colloid³ when patient receives: 100 mL x _____ kg = _____ mL	
Patient Weight (kg):	kg	Goal Range Hourly UOP:	mL

[illegible]

³ See page 11