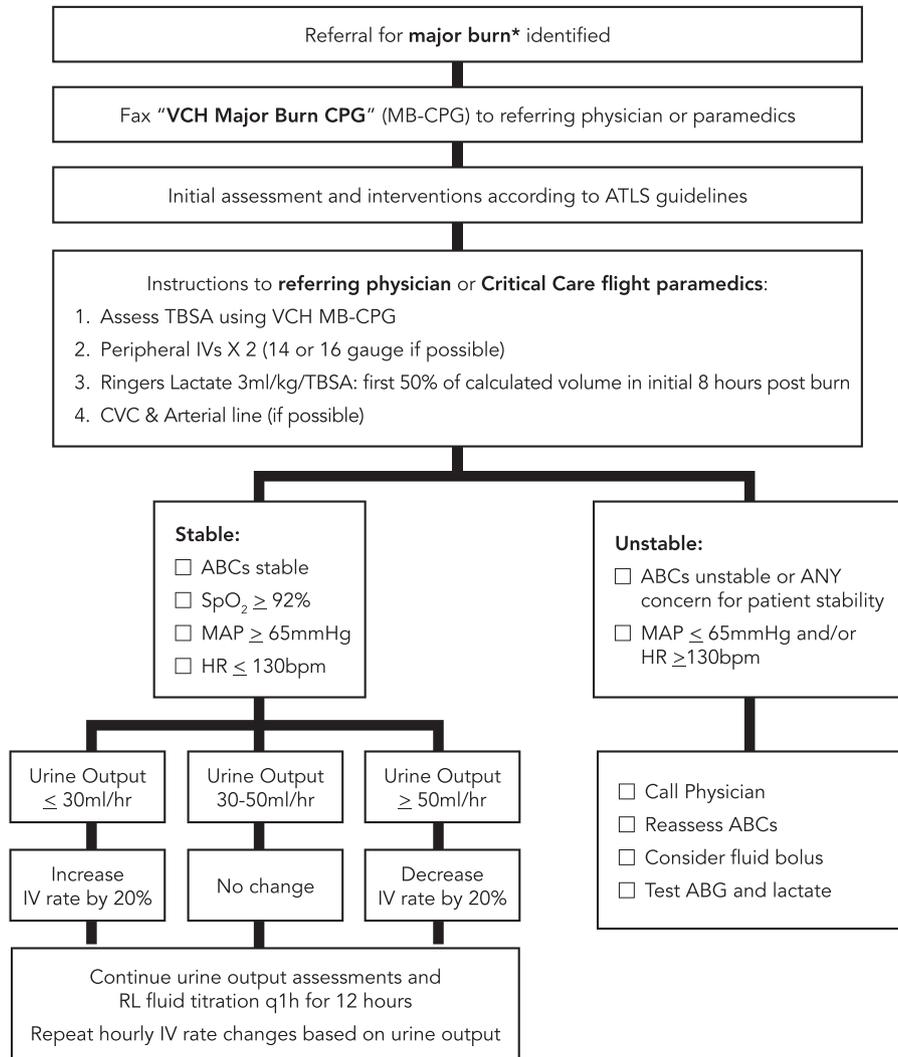


## First 12 Hours Post Burn Adult Major Burns Clinical Practice Guidelines

Please note that this is a guideline only, not a substitute for clinical judgement.



**\* Major Burn:**

- ≥ 20% TBSA partial and/or full thickness any age
- ≥ 10% TBSA partial and/or full thickness age ≤ 10 or ≥ 50
- Burns to hands, face, feet, genitalia, joints
- Full thickness burns ≥ 5% TBSA any age
- Electrical burns
- Chemical burns
- Inhalation injury
- Burns associated with major trauma

**Figure 1. First 12 Hours Post Burn.**

This guideline outlines an initial approach to fluid resuscitation for major burn trauma. Note that the resuscitation formula recommended in step 3 (Ringers Lactate 3 mL/kg/%TBSA) is to be titrated according to clinical end points (i.e., urine output).



Patient Label

## 12 Hour Assessment

Adult Major Burns Clinical Practice Guidelines

To be completed 12 hours post burn. Please note that this is a guideline only, not a substitute for clinical judgement.

Calculate total fluid given in first **12** hours (since time of burn):

**Equals [A] \_\_\_\_\_ ml**

Multiply **[A] x 2** for projected fluid administration in 24 hours:

**Equals [B] \_\_\_\_\_ ml**

Calculate projected fluid administration for 6ml/kg/TBSA:

**Equals [C] \_\_\_\_\_ ml**

If **[B]** is larger than **[C]**:

- Alert burn/ICU physician
- Consider albumin protocol\*
- Check bladder pressures q4h
- If urine output > 50ml/hr, decrease IV fluid administration rate by 20% (measure q1h)

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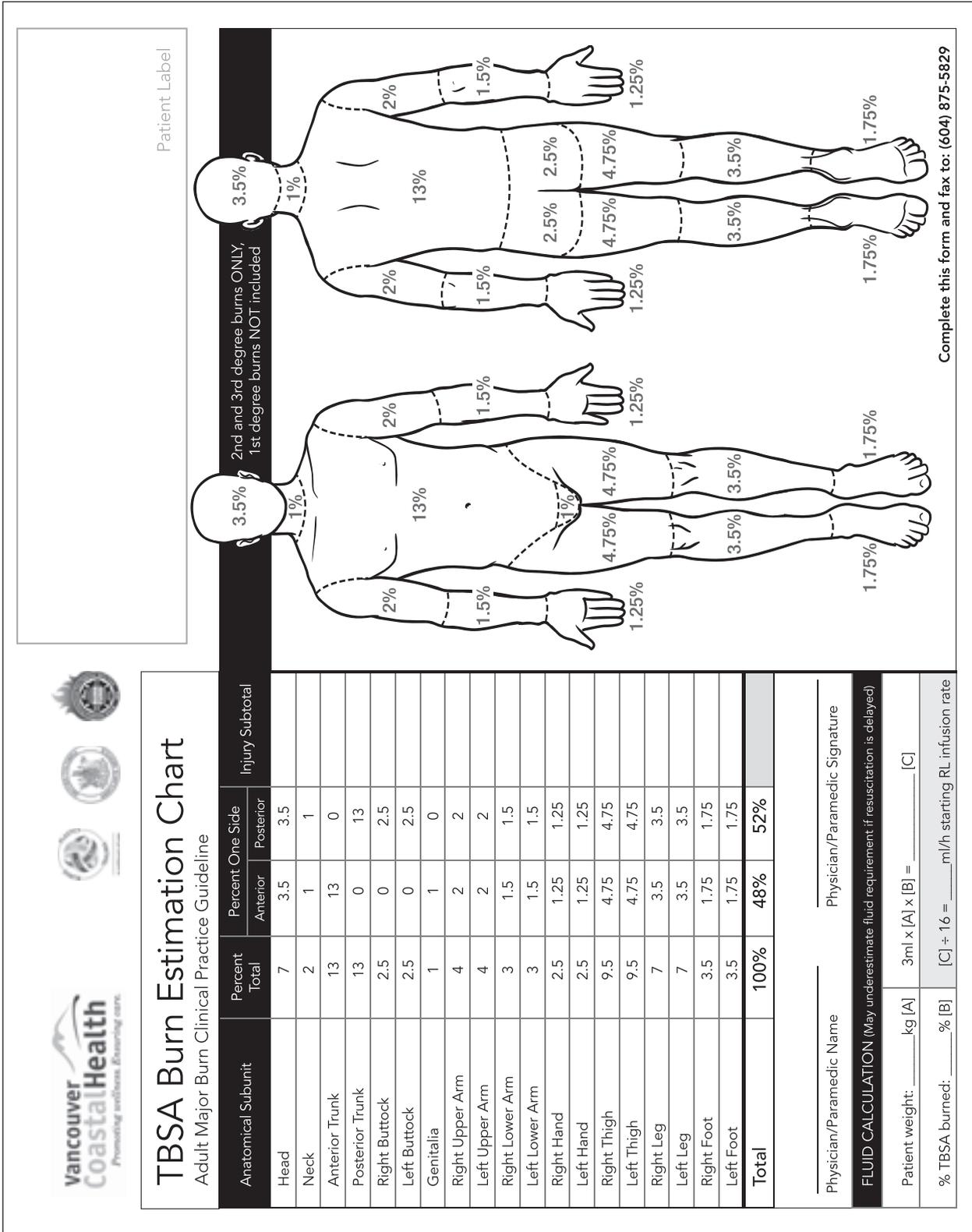
If **[B]** is less than **[C]**: continue resuscitation according to Major Burn CPG.

\*Albumin protocol: Albumin 5% at 1/3 current rate plus RL at 2/3 current rate

**Figure 2. 12 Hour Assessment.**

This worksheet is designed to assist with early identification of over-resuscitation with fluids.

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**Figure 3. TBSA Burn Estimation Chart.**

This chart is based on the Lund-Browder TBSA assessment chart,<sup>10</sup> which has high inter-user reliability. When used as the standard TBSA assessment tool, the chart can reduce the variability of resuscitation fluid volumes administered.

Provincial clinical practice guidelines for the management of major burn trauma






Patient Label

Resuscitation Flow Sheet Adult Major Burns Clinical Practice Guidelines

Date	Name	PHN
Injury Date + Time	Initial Treatment Facility	Initial Treatment Time

Pre-Burn Estimations		Estimated Fluid Volume Patient Should Receive		
Weight (kg)	% TBSA	1st 8hrs	2nd 16hrs	Est. Total 24hrs

Tx Site/Team	After Burn	Local Time	Crystalloid	Colloid	TOTAL	Urine Output	Lactate	MAP
	1st hr							
	2nd hr							
	3rd hr							
	4th hr							
	5th hr							
	6th hr							
	7th hr							
	8th hr							
	9th hr							
	10th hr							
	11th hr							
	12th hr							
				Total Fluids:		Fluid Balance:		
	13th hr							
	14th hr							
	15th hr							
	16th hr							
	17th hr							
	18th hr							
	19th hr							
	20th hr							
	21st hr							
	22nd hr							
	23rd hr							
	24th hr							
				Total Fluids:		Fluid Balance:		

**Figure 4. Resuscitation Flow Sheet.**

This worksheet records resuscitation details for the first 24 hours posttrauma. Note that the two “stop checks” to assess total resuscitation fluids administered at 12 and 24 hours are designed to assist with early identification of over-resuscitation.

				Sol N. Gregory, MD David D. Sweet MD FRCP(C)	
<b>ICU</b>					
<b>Monitoring</b>		<b>General Management</b>		<b>Initial Goals</b>	
<input type="checkbox"/> Intravascular arterial blood pressure <input type="checkbox"/> CVC (preferably supradiaphragmatic) <input type="checkbox"/> ScvO <sub>2</sub> q3h X 24h then R/A <input type="checkbox"/> CVP as per ICU protocols <input type="checkbox"/> Lactate q3h X 24-72h <input type="checkbox"/> ABGs as per ICU protocols <input type="checkbox"/> Bladder pressures q6h from 12-72h post burn <input type="checkbox"/> Increase frequency if pressures $\geq$ 15mmHg <input type="checkbox"/> For facial burns or inhalational injury: - Consult Ophthalmology - Consider Bronchoscopy (if suspicion of inhalational injury)		<input type="checkbox"/> HOB $\geq$ 30° <input type="checkbox"/> Gastric prophylaxis <input type="checkbox"/> DVT prophylaxis <input type="checkbox"/> Burn dressings as per Plastic Surgery <input type="checkbox"/> Elevate all burned body parts when possible <input type="checkbox"/> Start uninterrupted enteric feeds as early as possible (as per Dietitian) unless legitimate concern of splanchnic hyperperfusion or abdominal compartment syndrome <input type="checkbox"/> Fecal containment system for perineal burns as directed by ICU or Burn physician <input type="checkbox"/> Attempt to minimize opioid infusion administration and utilize prn opioids as soon as feasible		<input type="checkbox"/> Urine output minimum 30ml/h maximum 50ml/h <input type="checkbox"/> Temperature $\geq$ 37°C <input type="checkbox"/> MAP $\geq$ 65mmHg <input type="checkbox"/> ScvO <sub>2</sub> $\geq$ 70% <input type="checkbox"/> Lactate $\leq$ 4mmol/L <input type="checkbox"/> Hgb $\geq$ 70g/L <input type="checkbox"/> Plt $\geq$ 50 (Actively bleeding or imminently going to OR) <input type="checkbox"/> INR $\leq$ 1.5 (Actively bleeding or imminently going to OR)	
<b>Initial Fluid Resuscitation</b>		<b>Recommendations for Hypotension</b>			
<b>STEP 1</b> Calculate initial 24h resuscitation fluid requirements = (3ml of Ringers Lactate)/(kg (% TBSA from Plastics consult) / 24h, 1/2 of this IVF is administered in the first 8 hours (post burn) and the second 1/2 is delivered in the remaining 16 hours.		<b>True hypotension MUST BE correlated with urine output.</b> If MAP is consistently $\leq$ 65mmHg and there is evidence of poor end-organ perfusion (urine output $\leq$ 30ml/hr, lactate $\geq$ 4mmol/L, ScvO <sub>2</sub> $\leq$ 70%) the following steps are recommended: I) <b>Volume Status:</b> If CVP $\leq$ 5mmHg or pulse pressure variation $\geq$ 15mmHg and patient is not breathing spontaneously, administer a fluid bolus of 0.5-1L RL in attempt to improve MAP (it is UNCOMMON to achieve CVP goals of 10-12mmHg in severe burn patients). II) <b>Vasopressors:</b> If MAP is persistently $\leq$ 65mmHg initiate Levophed at 1-20 ug/min to maintain MAP $\geq$ 65mmHg (massive burn patients commonly require Levophed 1-5 ug/min due to extensive vasodilatory shock secondary to the massive systemic inflammatory response associated with severe burns). III) <b>MAP Goal:</b> If persistently requiring levophed (1-5ug/min) consider a MAP goal of $\geq$ 55mmHg as long as urine output $\geq$ 30ml/hr, ScvO <sub>2</sub> $\geq$ 70% and lactate $\leq$ 4mmol/L. IV) <b>Ca<sup>2+</sup> and Cortisol (discuss with ICU fellow/attending before initiation of treatment)</b> If patient exhibits catecholamine-resistant shock (defined as SBP $\leq$ 90mmHg after 1 hour of aggressive IVF and vasopressor administration), consider adrenal insufficiency (check a random cortisol and start hydrocortisone 100mg IV q8h) or hypocalcaemia (maintain ionized calcium $\geq$ 1.1 mmol/L). (1-5)			
<b>STEP 2</b> Determine the administered pre-hospital IVF volume, subtract this from your above calculation, and adjust your treatment appropriately.		1. Azzopardi EA, McWilliams B, Iyer S, Whitaker IS. Fluid resuscitation in adults with severe burns at risk of secondary abdominal compartment syndrome—An evidence based systematic review. Burns. 2009 Nov 1;35(7):911-20. 2. Ennis JL, Chung KK, Renz EM, Barillo DJ, Albrecht MC, Jones JA, et al. Joint Theater Trauma System implementation of burn resuscitation guidelines improves outcomes in severely burned military casualties. J Trauma. 2008 Feb 1;64(2 Suppl):S146-51; discussion S51-2. Care Res. 2010 Jan 1;31(4):551-8.			
<b>STEP 3</b> Monitor urine output hourly and decrease or increase the RL infusion by 20% to maintain urine output between 30-50ml/hr. Avoid boluses if possible. <b>NOTE:</b> Hour to hour fluid resuscitation is critical, particularly during first 24 hours. <b>OVER-RESUSCITATION IS AS HARMFUL AS UNDER-RESUSCITATION.</b>		3. Latenser BA. Critical care of the burn patient: the first 48 hours. Critical Care Medicine. 2009 Oct 1;37(10):2819-26. 4. Saffle JL. The phenomenon of "fluid creep" in acute burn resuscitation. J Burn Care Res. 2007 Jan 1;28(3):382-95. 5. Cantotto R, Zhou A. Fluid creep: the pendulum hasn't swung back yet! J Burn Care Res. 2010 Jan 1;31(4):551-8.			
<b>STEP 4</b> If urine output is $\leq$ 15ml/hr for two or more consecutive hours despite increasing fluid rate OR patient requires twice current calculated rate for more than two hours: <b>CALL ICU FELLOW OR ATTENDING.</b> flush urinary catheter, assess breath sounds and bladder pressure. Consider initiating 5% albumin infusion at 1/3 of current resuscitation rate and make up the remainder of rate with RL. Titrate rate as above based on urine output.		1. Azzopardi EA, McWilliams B, Iyer S, Whitaker IS. Fluid resuscitation in adults with severe burns at risk of secondary abdominal compartment syndrome—An evidence based systematic review. Burns. 2009 Nov 1;35(7):911-20. 2. Ennis JL, Chung KK, Renz EM, Barillo DJ, Albrecht MC, Jones JA, et al. Joint Theater Trauma System implementation of burn resuscitation guidelines improves outcomes in severely burned military casualties. J Trauma. 2008 Feb 1;64(2 Suppl):S146-51; discussion S51-2. Care Res. 2010 Jan 1;31(4):551-8.			
<b>STEP 5</b> At 12 hours post-burn, calculate the <b>PROJECTED</b> 24 hour resuscitation if fluid rates are kept constant. If the projected 24 hour resuscitation requirement exceeds 6ml/kg/% TBSA burn or 350ml/kg total, the following steps are recommended: I) <b>Initiate 5% albumin infusion</b> at 1/3 of current resuscitation rate and make up the remainder of rate with RL. Titrate infusion to urine output as described above. After 24 hours post burn, titrate infusion down to maintenance and continue albumin until 48 hours post burn. II) <b>Watch for signs of Intra-Abdominal Hypertension</b> (bladder pressure $\geq$ 15mmHg, increased airway pressures, decreased urine output, hypotension) and extremity compartment syndromes (absent doppler signal or pulses that are diminishing on serial exams q30-60 minutes should prompt consideration of escharotomy)		1. Azzopardi EA, McWilliams B, Iyer S, Whitaker IS. Fluid resuscitation in adults with severe burns at risk of secondary abdominal compartment syndrome—An evidence based systematic review. Burns. 2009 Nov 1;35(7):911-20. 2. Ennis JL, Chung KK, Renz EM, Barillo DJ, Albrecht MC, Jones JA, et al. Joint Theater Trauma System implementation of burn resuscitation guidelines improves outcomes in severely burned military casualties. J Trauma. 2008 Feb 1;64(2 Suppl):S146-51; discussion S51-2. Care Res. 2010 Jan 1;31(4):551-8.			

Figure 5. ICU.

This clinical tool for fluid resuscitation and monitoring in the intensive care unit provides step-by-step instructions for management in standard and more complex major burn trauma. Note that some patients may require large fluid resuscitation volumes, or may be hemodynamically unstable and require colloid administration and/or vasoactive medications. Note also that early contact with an on-call burn physician is encouraged.