

MAINE EMS 2019 PROTOCOL LESSON PLAN

GREEN SECTION		
SLIDE #	LESSON	NOTES
1	1. Title slide	
2	2. Changes to Green <ul style="list-style-type: none"> a. There are 8 modifications to the Green Section to review: <ul style="list-style-type: none"> 1. The Chest Trauma protocol has been updated to reflect current literature/evidence/practice regarding location of needle thoracostomy (i.e. needle decompression) 2. The Head Trauma Section has been updated to include guidance surrounding recognition and treatment of herniation. 3. The Hemorrhagic shock protocol was updated for clarity 4. The Burn Protocol was updated with the help of the State’s Burn Program leadership 5. The Universal Pain Management Protocol was updated to include pediatrics 6. The Ophthalmology protocol was updated and moved to the green section and, 7. Two new protocols have been created and added to the green section, a Crush Injury Protocol, and a Face and Dental Protocol 	
2	<ul style="list-style-type: none"> b. These changes were made collaboratively with the Trauma Advisory Committee or specific specialty Surgeons, as in the case of the Burn Protocol. 	
4	3. Chest Trauma <ul style="list-style-type: none"> a. The Chest Trauma has been updated to prioritize the anterior axillary line as the preferred location of needle thoracostomy (needle decompression) for suspected tension pneumothorax. While either location, anterior axillary line or 2nd intercostal space in the mid clavicular line, are acceptable, the anterior axillary line location is less likely to fail (24-54% in the mid clavicular line and 8-22% in the anterior axially line). The protocol also acknowledges that all needle decompression sites may fail, either in achieving entry into the thoracic cavity or kinking/clotting even if the device reaches the thoracic cavity. In the case of suspected failure, the protocol calls for repeating the procedure, and if the initial site chosen was the mid clavicular space, consider choosing the anterior axially line. Please recall, the proper location of insertion in the anterior axially line is either the 4th or 5th intercostal space – i.e. above the 5th or the 6th rib. Please also recall: the insertion site in any needle thoracostomy is SUPERIOR to the rib that is initially targeted. THIS IS A CRITICAL STEP to ensure proper placement location, avoidance of the neurovascular bundle beneath each rib, and represents a known safe starting position, from which the provider can control precise placement and insertion depth. 	

5	b. SLIDE SHOWS CHEST TRAUMA PROTOCOL AND PEARL i. For instructor/student reference	
6	4. Head Trauma a. Head Trauma – The Head Trauma Protocol has been updated to include goals of oxygenation (i.e. between 94-99%). Additionally, the protocol has evolved to include a slightly higher blood pressure goal of 110-120 mmHg The protocol has also be updated to include guidance on the recognition of herniation and suggested treatment should any of these signs be recognized: i. Evidence of head trauma AND a decreased level of consciousness PLUS any of the following: 1. Abnormal Respiratory pattern 2. Asymmetric/unreactive pupils 3. Decorticate or decerebrate posturing, or 4. Cushing’s Response (bradycardia and hypertension). ii. If these signs are recognized, the most available temporary response to perform hyperventilation targeted to an End Tidal CO ₂ of 30-35. Hyperventilation causes a mild respiratory alkalosis which in turn causes cerebral vasoconstriction. This cerebral vasoconstriction decreases blood flow to the brain – which may help reduce increased intracranial pressure. This comes at the cost of oxygenation of the brain and should only be performed for a short period of time and, because this patient is very sick, the MDPB asks that you contact the receiving hospital whenever operationally feasible to allow the hospital to prepare for this patient.	
7	iii. AEMT 1. Item #9 a. BP minimum in presence of shock now 110 mmHg	
8	iv. Paramedic 1. Item #11 a. Monitor for, and manage seizures 2. Item #12 a. Signs of herniation i. Monitor for signs of herniation (see PEARL) b. Hospital "H" symbol i. If concern for herniation arises, alert receiving hospital and hyperventilate to EtCO ₂ reading of 30-35 mmHg. THIS IS FOR SHORT TERM. ii. Hyperventilation should only be performed for severe head	

trauma with signs of herniation present

3. PEARLS

- a. Signs of herniation
 - i. decreased LOC PLUS
 - ii. Abnormal respiratory pattern
 - iii. Asymmetric/unreactive pupils
 - iv. Posturing
 - 1. Decorticate
 - 2. Decerebrate
 - v. Cushing's Syndrome
 - 3. Elevated BP
 - 4. BRADYCARDIA
- b. Hyperventilation is short term Tx
 - i. Causes vasospasm to keep cerebral BP up
 - ii. limits blood flow to brain
 - iii. decreases oxygenation
- c. Hyperventilation MUST BE PERFORMED WITH ETCO₂ MONITORING
- d. Alert hospital with signs of herniation

9

- b. The MDPB wants to take a moment to clarify another part of the Head Injury Protocol. The protocol asks providers to consider placing the patient in a 30-degree position when severe head injury is suspected, while maintaining spinal immobilization. The 30-degree position is optimal and balances treatment of the patient's head injury as well as maintaining spinal precautions. Positions greater than 30 degrees should be avoided whenever possible, unless other conditions dictate (active oral-pharyngeal hemorrhage and need to manage the airway, severe dyspnea, etc.)

10

- 5. Hemorrhagic Shock
 - a. **Hemorrhagic Shock** – The hemorrhagic shock protocol was updated for clarity. The MDPB heard questions about the exclusion criteria – in particular, head injury and wanted to clarify that TXA is INDICATED in multi-trauma patients, who also have a head injury. AT THIS MOMENT, the MDPB is NOT advising the use of TXA in ISOLATED head injury. Presently, an international study is being performed to consider if TXA is helpful in this population. Once completed, the MDPB plans to update the Hemorrhagic Shock protocol as appropriate. The MDPB also added a comment in both the Hemorrhagic Shock protocol as well as the Medical Shock Protocol, that current evidence suggests there may be a benefit in choosing LR over Normal Saline as the resuscitation fluid of choice when encountering patients in shock. The reasons for this are multiple, including the possibility of potentiating a hyperchloremic acidosis when using saline, the possibility of increasing levels of inflammation or even renal injury (reference

Semier M, et. al. *Balanced Crystalloids versus Saline in Critically Ill Adults*, N Engl J Med, March 2018). At this time, this consideration is limited to the resuscitation of patients in shock. It is less clear that this is essential in patients NOT in shock.

11

- b. AEMT
 - ii. Item #7a
 - 1. **(NEW)** Pediatric intervention
 - a. If shock is present in the pediatric patient, give fluid bolus 20 mL/kg IV
 - b. Standing order for repeat

12

- 6. Burn Protocol
 - a. Burn Protocol – MDPB members worked closely with the State’s Burn Program leadership to update the prehospital Burn protocols. The first major change is that the Burn Physicians advocate for using dry sterile dressings (including sterile sheets or commercial dressings) on all burns. They also suggested to **ONLY** include the partial (aka second degree) and full thickness (aka third degree) burns when counting the body surface area involved. Superficial (aka first degree) burns are not included in this calculation. Additionally, if needed, the patient’s palm **PLUS** **FINGERS** are an estimation of 1% of their BSA. Finally, the MDPB added the following pearl “It is preferable to establish IV access in non-burned tissue, but if necessary, burned tissue may be used as a site for IV access”

13

- 7. Universal Pain Management
 - a. The Universal Pain Management Protocol is largely unchanged with the exception that pediatric patients are now included in the protocol, including the pediatric scoring systems (FLACC and Wong Baker FACES).

14

- 8. Crush Injury
 - a. NEW protocol for 2019
 - i. Includes pediatric interventions, medications, and dosing
 - ii. It also includes Calcium Gluconate for the treatment of hyperkalemia in crush syndrome.
 - 1. This is a new medication for the protocols in 2019

15

- b. The Trauma Advisory Committee reviewed a case in which there was uncertainty regarding the management of patients suffering from crush injuries and in turn, asked the MDPB to consider creating a Crush Injury protocol. The protocol focuses on three important therapies:
 - i. First – all patients should have IV access established and receive boluses of normal saline.
 - ii. Second – if significant crush injury is suspected or in circumstances of prolonged entrapped extremity, consider 1 mEq/kg of Sodium Bicarbonate to a max of 50 mEq.

	<ul style="list-style-type: none"> iii. Third – place all patients on a cardiac monitor before removing the crushing object. Any patient with evidence of hyperkalemia should receive 1 gr of Calcium. 	
16	<ul style="list-style-type: none"> 9. Recognizing Hyperkalemia – <ul style="list-style-type: none"> a. Hyperkalemia may be recognized by any of the demonstrated findings on cardiac monitoring or 12 lead ECG. Patients suffering crush injuries have disruption of cellular membranes. As most of the body’s potassium stores are located intracellularly, this can lead to an elevated potassium AKA hyperkalemia. As the serum potassium increases, predictable findings occur on the patient’s cardiac monitor or 12 lead including: <ul style="list-style-type: none"> i. Peaked T waves ii. Loss of P waves iii. Widening of the QRS Complex and lengthening of the QT interval iv. These findings continue until the cardiac rhythm degrades to Sine Waves or even VF 	
17	<ul style="list-style-type: none"> 10. Hyperkalemia Treatment <ul style="list-style-type: none"> a. Should any of the above findings be noted on cardiac monitoring or 12 lead, the patient should receive 1 gram of Calcium Gluconate. Calcium stabilizes myocardium in the context of elevated potassium. Other options for treatment include additional doses of bicarbonate or 5 ml of nebulized albuterol. Both of these treatments SHIFT potassium intracellularly, effectively decreasing the SERUM potassium level. Calcium Gluconate may come in various concentrations, including 1 gr in 10 ml, 1 gr in 50 ml as well as other concentrations. Please note, Ca Gluconate is glucose rich and therefore highly osmotic and thus should be diluted in a minimum of 50 ml of saline. Calcium Gluconate does not routinely need to be filtered. At this time, the MDPB prefers Calcium Gluconate over Calcium Chloride, as CaCl can be caustic to veins and tissue. 	
18-20	<ul style="list-style-type: none"> 11. Calcium Gluconate in Hyperkalemia <ul style="list-style-type: none"> a. SEE SLIDES <ul style="list-style-type: none"> i. Pharmacology slides for Calcium Gluconate b. CALCIUM GLUCONATE VS CALCIUM CHLORIDE <ul style="list-style-type: none"> i. Calcium CHLORIDE has a higher percentage of elemental calcium as does Calcium Gluconate <ul style="list-style-type: none"> 1. This means the dosing for Calcium Gluconate can be twice as much as a roughly equivalent dose of Calcium Chloride 2. If consulting OLMC, ENSURE YOU ARE BOTH TALKING ABOUT GLUCONATE 3. Dosing errors have been made in the past because the paramedic and OLMC each had different medications in mind for administration. 	
20		

		<ul style="list-style-type: none"> ii. Calcium Chloride is more irritating hand has more potential to be necrotic to tissue if extravasated <ul style="list-style-type: none"> 1. For this reason, MDPB chose to go with Calcium Gluconate 	
21	12.	Crush Injury Protocol Review <ul style="list-style-type: none"> a. EMT/AEMT/Paramedic <ul style="list-style-type: none"> i. Refer to the following protocols as appropriate: <ul style="list-style-type: none"> 1. Severe hemorrhage- Green 12 2. Airway management- Blue 3 ii. O₂ to saturation 94-99% 	
22		<ul style="list-style-type: none"> b. AEMT <ul style="list-style-type: none"> i. IV saline bolus 10-15 mL/kg, Normal Saline 	
23		<ul style="list-style-type: none"> c. Paramedic <ul style="list-style-type: none"> i. Consider Bicarb for prolonged entrapment of extremity ii. ECG iii. Pain control per protocol 	
24		<ul style="list-style-type: none"> iv. Post-extrication <ul style="list-style-type: none"> 2. Fluid resuscitation with Normal Saline <ul style="list-style-type: none"> a. Adult: 500-1000 mL/hr b. Peds: 10 mL/kg/hr 3. Hyperkalemia- consider calcium gluconate solution (in 50-100 mL) <ul style="list-style-type: none"> a. Adult: 1g IV over 5 mins b. Peds: 20 mg/kg over 5 mins; MAX 1 g. c. DO NOT ADMINISTER CALCIUM AND SODIUM BICARBONATE IN THE SAME IV LINE.¹ 	<p><i>1. There is a risk of precipitate formation in the IV line caused by mixing of Calcium and Sodium Bicarbonate.</i></p>
25		<ul style="list-style-type: none"> 4. If not already administered, for significant crush injury with ECG indicative of hyperkalemia: <ul style="list-style-type: none"> a. Sodium Bicarbonate 1 mEq/kg IV over 5 minutes; MAX 50 mEq b. Also consider albuterol 5 mg via nebulizer v. PEARLS-- Signs of hyperkalemia² <ul style="list-style-type: none"> 1. Peaked T waves 2. Widened QRS 3. Lengthened QT interval 4. Loss of P waves 	<p><i>2. This was covered by a previous slide.</i></p>
26	13.	Facial/Dental Injury <ul style="list-style-type: none"> a. Protocol Cover slide <ul style="list-style-type: none"> i. New section ii. Topics covered <ul style="list-style-type: none"> 1. Tooth avulsion 2. Unstable mandible 3. Epistaxis 4. Nose/ear avulsion 	
27		<ul style="list-style-type: none"> b. The Facial/Dental Injuries Protocol is a new protocol, intended to focus on the basic management of injuries to the face and teeth. The protocol focuses on 4 injuries: 	

- i. Avulsed Teeth – An avulsed tooth is a tooth that has been forced out of its socket. Please recall, a small ligament surrounds the tooth, anchoring it in the socket. Once the tooth is avulsed, it is essential to pick it up only by the crown (which is the visible part of the tooth) as the ligament is very fragile and, if touched, can be damaged. The protocol also focuses on proper storage of the tooth, in either milk or saline, or, in patients who are cooperative and able to manage their airway, the tooth may be placed in the patient’s mouth
- ii. Unstable Mandible Fractures – This section of the protocol focuses on the potential difficulty a patient may have in managing secretions or hemorrhage in the context of an unstable mandible fracture. Please remember to have suction available and consider transporting in a sitting position in the absence of suspected spinal injuries. Should concern for spinal injuries exist, the patient could be transported in the **30-degree position** with suction available.
- iii. In the context of epistaxis, ask the patient to squeeze their nose tightly and continuously for 10-15 minutes.
- iv. Finally, in the context of facial tissue avulsion, recover tissues if possible and this step does not delay care, transport the tissue wrapped in a sterile gauze, placed in a plastic bag, on ice, and dress the wound with moist sterile dressings.

*The slide photo depicts the patient cot bending at the knees. The **intent** was to show the angle of the torso on the cot. **THE COT SHOULD NOT BE BENT AT THE KNEES FOR PATIENT TRANSPORT***

28

14. Ophthalmology – The Ophthalmology section has been moved to the Trauma (Green) Section as the majority of conditions covered in this protocol are traumatic in origin. The protocol was updated, but continues to focus on common injuries to the eye, namely:
- a. Assisting the patient in removal of contact lenses and checking for gross visual acuity
 - b. Flushing the eyes for chemical exposure
 - c. Placing cool saline gauze in the case of thermal injury,
 - d. Securing impaled objects,
 - e. Shielding for significant injuries or penetrating injuries, and
 - f. Management of avulsed globes
 - g. Please recall, patients with ocular injuries and nausea should receive ondansetron as vomiting increases intraocular pressure which can be dangerous for patients with eye injuries.
 - h. Finally, patients without penetrating injuries but with ocular trauma
 - i. The MDPB also added a new pearls section that focus on the following:
 - i. Normal vision does not rule out significant eye injuries
 - j. The presence of chemical burns to the face raises the possibility of respiratory involvement at well

29

Questions???

