

Johns Hopkins EM Survival Guide 2023-2024

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CONTACTS AND NUMBERS

The EM residency uses the website www.hopkinsEM.org to provide information to residents.

Interns: Please log-in using your JHED email account (jhed@jhmi.edu). The first time you log-in, a website administrator will need to approve your request.

Off-service residents: from www.hopkinsEM.org, click on the header to the right titled “Off-Service Rotators”; Password is “bolus”.

Chief Residents

There are three EM chief residents who can be reached at the shared chief’s email account:

jhemchiefs@gmail.com. If you have questions about the schedule, making shift changes, or duty hours, please email the chiefs account and the Scheduling Chief will respond. The Scheduling Chief’s phone number is also listed at the bottom of the schedule, in the footer of all chief emails, and on www.hopkinsEM.org.

Prefixes to JHH phone numbers

- JHH ED Jabber phone number: 667-776-**** (your 4 digit number)
- JHH Phone Numbers -- Prefixes (Area code 410)
 - 0 is 550
 - 2 is 502
 - 3 is 283
 - 4 is 614
 - 5 is 955
 - 7 is 443-287

Radiology Numbers

3rads.jhmi.edu – use this website to find contact information for anyone in radiology.

Resident Lounge

The resident lounge is in the administrative offices of the ED, near the EACU. Please use the access codes below. There is also a general staff lounge nearby that has a microwave. You should bring food/snacks with you and leave them in the lounge, as it is often not possible to leave the ED during a shift to purchase food.

Room Access

JHH ED	JHH Peds ED	Bayview ED
Resident Room: 3-1981 Food/Water by Rm 34/35: 1123 IV cart: 1212 or 0911 Pyxis: 1st + last initial + last 4 digits of your SSN	Staff bathrooms 5680 Nutrition room 5680 Pyxis room 5680 Carts in pt rooms 1212	Ambo doors: 201* Staff break room: 0325 Supply room code: 0325 ED lounge/office: 1322 Staff bathroom: 2430 3rd floor break room: 1322

LAYOUT AND ROLES OF NORTH POD PROVIDERS

North Pod is used as our high acuity pod and can be conceptualized as a square divided into four quadrants, which consists of two teams, namely, the **Blue Team** and the **Red Team**. Each quadrant has paired RNs and techs. Each team is also assigned psychiatric patients.

Blue Team	Red Team + PGY4
EM PGY-3 (Blue Team Lead) Room Assignment: 20-26	EM PGY-2 (Red Team Senior) Room Assignment: 18-19, 39-43
EM PGY-1 or Off-Service (Blue Team Junior) Room Assignment: 27-32	EM PGY-1 or Off-Service (Red Team Junior) Room Assignment: 33-38

ACUITY LEVELS

We use the HopScore -- a novel outcomes-based electronic ED triage tool designed at Johns Hopkins Hospital -- to increase patient safety and drive more efficient distribution of ED resources. The HopScore is distinctly different from the commonly used Emergency Severity Index (ESI). The HopScore classifies patients into 5 levels with Level 1 being the most acutely ill.

- **Level 1:** A patient that requires immediate life-saving intervention. These will be paged overhead as critical cares or delta traumas (see above) and appear in red on the tracking board.
- **Level 2:** A patient with significant vital sign abnormalities (tachycardia, hypoxemia, hypotension, hypertension with symptoms), or they are confused, lethargic, or in severe distress. All pulmonary hypertension patients on continuous infusions are also in this category. You must see any Level 2 patient within 10-20 minutes of being roomed. Of note, suspected stroke patients who are out of the window for tpa administration may be triaged as Level 2 patients - they may still be in the window for thrombectomy, so do NOT delay seeing them. *Level 2 patients will be paged overhead for department situational awareness.*
- **Level 3:** Stable patients who are expected to require significant resources.
- **Level 4:** Patients who are not acutely ill and are expected to require only one resource (e.g., chest x-ray).
- **Level 5:** Patients who are not expected to require any resources.

Cautionary tale: your Level 4 or Level 5 patient may turn into a Level 2 patient once you evaluate them. Do not anchor on the upfront acuity designation.

Eye Patients -- use the "Eye Room" in EACU 53/54 or South B-9, which houses the closest slit lamp to the North area and can be used to perform detailed eye exams. There is also a tonopen in these Eye Rooms.

- Each eye patient needs a full eye exam, which includes:
 - Inspection, pupil assessment (including APD), EOM, visual acuity, peripheral fields, intraocular pressure w/ tonopen (unless open globe suspected), corneal assessment w/ Fluorescein using slit lamp, anterior chamber assessment w/ slit lamp
 - The iOS/Android app "Eye Emergency Manual" is good for making a differential diagnosis for eye patients.
 - If needed, place EPIC order for Fluorescein strips and tetracaine eye drops. Nurses can check visual acuity with the order "Visual Acuity"
 - When you receive a chat message about an eye patient, please **reply to acknowledge**.
 - **If an eye patient is a level 2 patient, they also need to be seen within 10-20 minutes**

Psychiatry patients -- These patients are formally YOUR patients. Please give them the same level of attention

you give your other patients. The psychiatry team serves as a consultant. Psychiatric patients are located in our dedicated psychiatry ED which is adjacent to North Pod. Please call the psychiatry nurse when assigned and ask if there are any emergent concerns for the patient. Review the vitals, and order labs through the “psych” order set in EPIC. Ideally, lay eyes on the patient as soon as possible to screen them for any medical emergencies, and start a note. If a disposition is communicated to you by the psychiatry consultant (resident, attending or APP) or a psychiatry RN, especially if the recommendation is to discharge the patient, please discuss this with your attending PRIOR to discharging the patient, as the ED attending is ultimately responsible for the patient’s care. When going to see these patients, please check in with the psychiatric nurses before seeing new patients (or reassessing potentially agitated boarding patients) in order to have situational awareness about the safety milieu; the RNs can inform you if security should accompany you to the room. Additionally, if appropriate, you should avoid wearing things around your necks that could be used as weapons (lanyards without safety features, stethoscopes, etc).

Level 2 -- charge nurse will notify the entire ED when a Level 2 patient is being roomed in order to provide situational awareness to all providers. See your Level 2 patient within 10-20 minutes, as described above.

Vulnerable populations:

- 1) Patients with limited English proficiency or other communication barriers: interpreter services are available on your Jabber phone. In-person Spanish interpreters are also often available during the daytime (message the JHH ED Spanish Interpreter group on Epic Chat). Please do not act as an interpreter yourself unless you have officially gone through this process through the hospital. It is not sufficient to rely on a family member for interpretation, unless extraordinary circumstance of immediate life threat or no available interpreter for a specific language
- 2) Patients with substance use disorders: Ensure they are being monitored for withdrawal and discuss with your team regarding the appropriate orderset for management. If discharge is anticipated for these patients, alert the Peer Recovery team (via **paging the social work/case management team** in EPIC) so they may assess the patient to offer resources for detox or outpatient care.
- 3) Patients without stable housing: If discharge is anticipated, please **consult the social work/case management team** to ensure we can identify a safe place or shelter for discharge.

CRITICAL CARES

In general, a “critical care” is paged overhead with an estimated time of arrival and is seen in the critical care bays by **all providers** on either the red or blue team. Critical cares are either “medicals” or “traumas”. Critical cares are typically “led” by the team’s senior EM resident. Junior residents, interns, and off-service rotators provide critical support with ABCs, primary and secondary surveys, history taking, vascular access (PIVs, Central Lines, Arterial Lines, IOs), other procedures (lac repairs, chest tubes, *etc.*), ordering labs, *etc.*

Please see team assignments below:

Red Team

- Trauma Critical Cares on Monday, Wednesday and Friday
- Medical Critical Cares on Tuesday, Thursday, Saturday and Sunday

Blue Team

- Medical Critical Cares on Monday, Wednesday and Friday
- Trauma Critical Cares on Tuesday, Thursday, Saturday and Sunday

Medical Critical Cares

Examples include incoming cardiopulmonary arrest, acute respiratory distress, HATs (Heart Attack team for STEMI evaluation), BATs (Brain Attack Team for stroke evaluation), and SATs (Sepsis Attack Team for

severe sepsis or septic shock evaluation).

Trauma Critical Cares

- **Delta Trauma:** Adult high priority (shooting/stabbing, high speed motor vehicle collision, low GCS)
- **Echo Trauma:** Adult lower priority who are Level 2 patients (below) and assigned regular North rooms. See these patients within 10-20 minutes similar to a Hopscore level 2
- **Alpha Trauma:** Pediatric high priority (similar to Delta Trauma)
- **Bravo Trauma:** Pediatric lower priority

Please note: the paging system will alert the entire team for situational awareness, but only EM senior residents (PGY-3 on Blue, PGY-4 on Red) go to Alpha and Bravo traumas on the day their team responds to traumas, where they are head of bed physician and responsible for airway management (more below).

Medical Critical Care Intubations: Adult medical critical care airway management is **always done** by the EM team, usually the EM senior residents (PGY2/PGY3/PGY4). Interns and off-service rotators can only intubate if they have completed an airway rotation in residency, and at the discretion of the Attending. EM Interns are prioritized in these situations.

Trauma Critical Care Intubations:

- Adult trauma airway management is **always done** by the EM team.
- Pediatric trauma airway management: either PEM fellow or EM senior resident, never PICU fellow
 - Senior EM Resident responding to the trauma from the AED
 - Even Days = Head-of-bed (H.O.B.) and Advanced Airway Management
 - Odd Days = H.O.B. unless PEM fellow requests H.O.B. role

Admissions and Consults

Once you and your team have determined that a patient needs to be admitted and have determined an appropriate level of care, you should “post” the patient for a bed. A list of how to contact consultants and admit to different services is described in the extensive table below.

Initiating Admissions, Determining Level of Care

Prior to the entry of an admission order, please ensure that the Emergency Medicine Attending or EM PGY4 has heard the case and agrees to the admission. Prior to transport out of the ED, please ensure the ED attending has seen the patient and signed off on the chart.

For general medicine admissions, please use “Service Attending” as the attending to which the patient is being admitted to under the “Internal Medicine” service.

For general psychiatry admissions, please click the “ED intent to admit” in the admission order and then use “Service Attending” as the attending to which the patient is being admitted under the “Adult Psychiatry” service.

Monitored bed – be sure to click ‘monitored bed’ on the admission order if the patient will require continuous cardiac monitoring (chest pain rule out, syncope, electrolyte repletion with Long QT). You should know that a monitored bed does not include pulse oximetry. If your patient will need frequent or continuous pulse oximetry, you should request an IMC/MPC bed. All questions or concerns regarding level of care or admitting service should be discussed as early as possible with the EM attending and/or EM 4, as well as the ED shift coordinator. The Hopkins Policy and Document Library can be found here for admission criteria for different services / floors of the hospital:

<https://hpo.johnshopkins.edu/hopkins/?event=public.view>.

Any request from the admitting team to **change the level of care or delay admission due to requests for additional tests or imaging** MUST be discussed with the EM attending to determine if this is an appropriate request or use of resources, respectively. Your attending should call the **Hospital Command Center** to help facilitate admission delays due to:

- Inability to contact an admitting attending or an admitting provider
- Disputes as to the admitting service that would best serve the patient
- Delays in care due to additional requests for imaging or procedures that can be accomplished inpatient

Please escalate to your attending **early** in order to minimize delays for the patient’s disposition as there is an entire waiting room waiting to see a provider.

To update the level of care or the admitting service, use the “**ED Update Level of Care**” order and type in the comment section the admitting attending name if you have one.

Where to admit to? Nuances on the admissions process at Johns Hopkins Hospital

- **Medical patients with psychiatric needs** -- Discuss with the EM Attending the best location and service for admission. If a medicine admission is needed with a sitter, please use the “Comment” section in the admission order indicating this need, and then ensure the patient has been searched by security. *Please note:* If a patient is primarily being admitted for a medical diagnosis, psychiatry in the ED does NOT need to see these patients and does not serve as a consulting service for the inpatient teams. The inpatient teams will need to formally consult psychiatry when the patient is admitted.
- **HIV/AIDS patients** seen at the JHH Bartlett Clinic with any medical problem are admitted to the Polk service (Infectious Disease). The Polk service also may take HIV patients that have not previously

been seen at the Bartlett Clinic. You do not need approval to admit patients to Polk.

- **Non-medicine services** (neurosurgery, neurology, orthopedics, and other surgical services) require the admitting attending name to be entered into EPIC. Don't forget to ask the admitting consultant who the admitting attending is!
- **MICU candidates** – page the MICU resident for a MICU consult. Together, you will decide whether the MICU or IMC/MPC (step-down unit) would be most appropriate for the patient. As a rule, all intubated patients and almost all patients on vasoactive agents will go to the MICU. As with all consults, please ensure your attending and/or EM4 are aware and are in agreement with any recommendations made by the consulting MICU resident. Ultimately, the ED team decides the appropriate level of care.
- **CCU candidates** – please consult the EB Guidelines in the patient chart by typing “Cardiology Hospitalization Guidance” to find the algorithm for contacting the CCU resident, CCU fellow, and CCU charge nurse via JABBER
- **Cardiology / PCCU candidates / Cardiomyopathy** - Indicate “PCCU appropriate” in the comments section of the admission order; Bed Management will assign based on bed availability. **You do NOT need to consult cardiology to admit to cardiology or PCCU.** *The only exception are patients known to the Cardiomyopathy service, including LVAD patients. Please page the Cardiomyopathy fellow prior to admission via Corus.*
- **Non-specialty medicine patients** (including cards, pulm (also called CJ), and ID) are admitted under the “Service Attending,” as described above.
- **Specialty medical services that need approval**
 - **Oncology patients** – you need permission to admit from the oncology triage attending. There is a different attending for **solid tumors** (lung, pancreatic, brain, etc.) and **hematological tumors** (leukemia, lymphoma, multiple myeloma).
 - Oncology (solid or heme) will take established patients for admission.
 - Hematological malignancy will also take established patients for admission, and will also take new blast crisis or clear myeloproliferative disease. Please consult them for any sign of blast crisis even if not an established patient.
 - The service pager can be found under “orders” in EPIC.
 - It is important to note that even if the patient is “overflow” to medicine because Oncology has no beds, the patient’s admission order in Epic should still indicate Oncology unless instructed by the Medical Shift coordinator to do otherwise.
 - **GI patients** - known liver transplant patients who are greater than 6 months s/p transplant or who have a known liver pathology that are followed by the GI team at Hopkins can be admitted to the GI (aka MEG) service without consulting the fellow. Other GI patients are admitted to general internal medicine.
- **General Surgery** - There are many teams within the General Surgery umbrella (including Halsted, Cameron, Ravitch, Eckhauser, etc. See below chart for more information). **Halsted is the acute care surgery and trauma surgery team and is the only team within General Surgery that has a resident team AND an attending on call IN-HOUSE all the time. Thus even if the patient ultimately is a Cameron (hepatobiliary) patient, if they are having a surgical emergency, please consult Halsted.**
- **Transplant patients** – if less than 6 months out from their transplant or have an immediate complication as a result of their surgery, contact the transplant surgery team service pager.
 - If more than 6 months from transplant, the corresponding transplant team in internal medicine usually admits these patients after you have consulted and received permission from the triage attending.
 - For renal transplant patients, you need to speak directly to the renal transplant attending for permission to admit (as opposed to the nephrology fellow). The best way to find out who the renal transplant attending is to call the HAL line (5-9444) to get their name and request the HAL operator reach them to call you back. You may also CORUS them or secure-chat but

HAL is preferable.

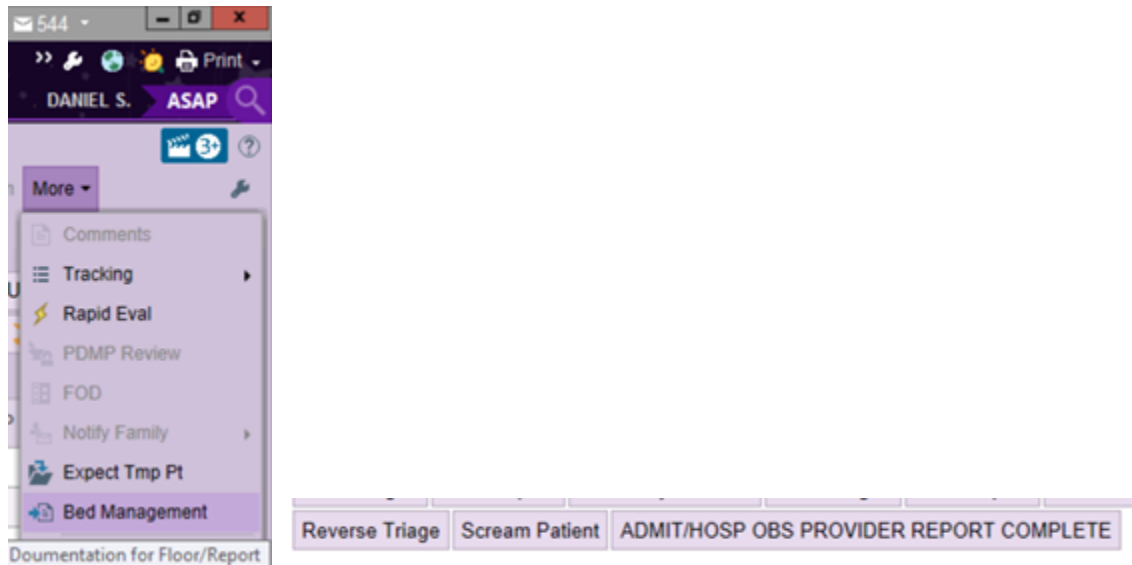
- **Patients with vascular injuries** – if their vascular injury was the direct result of trauma (i.e. stab wound to the forearm with a radial artery injury), first consult Trauma. Trauma will then determine if they want to get Vascular involved, but Trauma (aka Halsted) must be included if there was trauma involved.
 - If the injury is below the elbow and vascular gets involved, they might defer to whoever is covering for Hand that day (plastics or orthopedics).
- **Delta trauma patients** – any patient suffering multiple traumatic injuries when more than one surgical sub-specialty team needs involvement, clarify with the Halsted resident WHO will be calling the consult (i.e. if the Halsted resident is calling the neurosurgical consult while the ED resident is calling the orthopedics consult; don't assume that they are making the phone calls).
 - While a Delta trauma patient is in the department, the Halsted team and Emergency team are both considered the "primary" team, but the ED team is still responsible for putting in all orders for imaging/labs/medications (though many are done verbally in the critical care bay).
 - Delta traumas with single organ injury (ie, isolated orthopedic injury) may be admitted to whichever surgical subspecialty is responsible for managing that organ.
 - Delta traumas with multi-system injury, or who achieved ROSC post-traumatic arrest will be admitted to Halsted.
- **Aortic Dissection patients** – for patients with ascending aortic dissections (type A), consult Cardiac surgery; for patients with descending aortic dissections (type B), consult Vascular surgery. For those with both consult Cardiac surgery and discuss with them if they request Vascular surgery involvement. If you are unsure which service to consult, do not delay discussing with the PGY4 and EM attending..

Contacting the inpatient admitting provider for sign-out:

- Once the shift coordinators have found a bed for the patient, a green smiley face will appear on the tracking board. Additionally, you will receive an EPIC chat with information regarding the bed the patient is assigned to, and may include name and phone number of the assigned resident or hospitalist.

t...	0...	1						JHH - Moni...	A...	03:57	6.46	O...	✓		
il...	1...	1		Neg...				***Assigned 1235*** Clean Bed: Nelson 6: 410-955-8402: Dr. Neel Koyawala (Longcope)				18.53	O...	✓	
lit...	2...	1		Neg...							24.95	O...	✓		

- If the inpatient provider's number is provided, please call this number ASAP to provide a report, which is **provided by phone** for all non-ICU or step down patients, non-surgical patients, and non-neurology patients. (If no number is provided, please provide your phone number in the chat ASAP and indicate you are ready to sign out to the inpatient team; add the ED shift coordinator to the chat so they are aware you are attempting to contact the inpatient provider.)
- After the phone call is made for NON-ICU patients the patient can go upstairs.
- You will need to click "Provider Report Given" in EPIC to indicate provider handoff has occurred. Click Bed management on the Trackboard, then click Admit/Hosp Obs provider report complete.



- Documentation for Floor/Report
- If you receive messages in EPIC from shift coordinators or admitting providers questioning the service, level of care, or timing of transport to admission bed, please involve the EM Attending and EM4 (if applicable) immediately by adding them to the EPIC chat.

Quick note regarding admission process at Bayview ED

The attending places all admission orders. However, for subspecialty services and surgical services, the admitting service's attending name is still required so please ask for that from your consultant and pass it on to your ED attending.

Consulting and Admitting in EPIC at JHED

Service	CORUS Y or N	Epic Y or N	Comment on process
Renal	Y	Y	Place EPIC order Consult to Nephrology and then EPIC chat the JHH Nephrology Consult group in EPIC chat.
Renal Transplant	N	N	For RENAL TRANSPLANT patients after 6 months post transplant who are followed by medical renal transplant teams and need ADMISSION: call the HAL line to ask for the Medical Renal Transplant attending on call. For questions regarding non-ESRD patients with solid organ transplants, consult the Renal Transplant team via EPIC order.
Cardiology - Electrophysiology	Y	N	Type "EP1" and use "JHH Electrophysiology EP Consult Service EP1 Pager"
Cardiology (CCU/PCCU)	N	N	Please consult the EB Guidelines in the patient chart by typing "Cardiology Hospitalization Guidance" to find the algorithm for contacting the CCU residents, CCU fellow, and CCU charge nurse. For PCCU, type "PCCU appropriate" in the admission order comments section to notify Bed Management. No longer need to call PCCU directly. Only exception is patients established with the Cardiomyopathy team and LVAD patients (see Cardiology section above).
Gastroenterology/liver Transplant	Y	Y	No longer need to consult to admit to the MEG service for <u>liver patients</u> (see note about GI patients in the last section). Consult in EPIC via Consult to Gastroenterology-Service Pager for other consult questions.
Pulmonology	Y	Y	EPIC order – Consult to Pulmonology-Service Pager. This is especially necessary for patients with pulmonary hypertension or lung transplant patients. Can always call the HAL operator and ask for "Pulm fellow on call".
Critical Care - MICU	Y	Y	EPIC order - Consult to MICU service pager
Dermatology	Y	Y	EPIC order - Consult to Dermatology service pager (8am-5pm only)
Rheumatology	Y	Y	EPIC order - Consult Rheumatology (not a Service Pager) and then CORUS the Rheumatology team.
Endocrinology	Y	Y	EPIC order - Consult to Endocrinology. You can also type in "Adult Endocrinology Consult" in CORUS but EPIC is preferred. Please page the fellow on call through HAL directly M-F 6pm-7am and on weekends.
ID/HIV	Y	Y	EPIC order - Consult Infectious Disease (not a Service

			Pager) and then CORUS the Infectious Disease team
Hematology	Y	Y	EPIC order - Consult to Hematology service pager. For ADMISSION, page the Hematology attending through HAL.
Halsted/Acute Care/Trauma	Y	Y	EPIC order - Consult to General Surgery Halsted service pager
Transplant Heart	Y	N	EPIC order - Consult to Cardiac Surgery service pager for operative complications; for established post-transplant patients without an operative complication, admit to cardiomyopathy (see above)
Transplant (Kidney/Pancreas/Liver)	Y	N	If < 6 months from transplant surgery, use EPIC order -"Consult to Transplant surgery Service Pager" for the surgical transplant team. If >= 6 months from transplant surgery, use EPIC order "Consult to Renal Transplant" or page HAL for the Renal Transplant Triage attending (see Transplant section above).
Cardiac Surgery	Y	Y	EPIC order - Consult to Cardiac Surgery service pager
Vascular	Y	Y	EPIC consult - Vascular Surgery service pager
Thoracic	Y	N	EPIC consult - Thoracic Surgery service pager
Handelsman GI	Y	N	The Handelsman GI team takes care of all patients with non-colorectal cancer, including stomach cancer, metastatic peritoneal disease on HIPEC, appendix tumors, carcinoid tumors, etc. For Handelsman GI, use EPIC order - Consult to Handelsman GI Service Pager. Please refer to the EB guideline "Surgery Consult Information" for more information.
Handelsman Breast/Endocrine/Melanoma (BEM)	Y	N	The Handelsman BEM team takes care of breast surgery patients (breast abscesses, breast cancer, etc with the exception of breast implant complications, which goes to plastic surgery), endocrine surgery, or melanoma patients. For Handelsman BEM, use EPIC order - Consult to Handelsman BEM Service pager. Please refer to the EB guideline "Surgery Consult Information" for more information.
Cameron (Red, yellow, blue, green)	Y	Y	The Cameron teams are in charge of patients who have hepatobiliary cancer and other hepatobiliary surgical pathology with the exception of transplant patients and patients with simple acute cholecystitis. Patients with acute cholangitis usually will go to medicine and receive an elective cholecystectomy later. Please refer to the EB guideline "Surgery Consult Information" for more information on which Cameron team is on call that day.
Ravitch GI Foregut	Y	Y	The Ravitch GI Foregut/Minimally Invasive Surgery

			(MIS) team is in charge of bariatric surgery, foregut surgery that is not related to GI cancer (i.e. paraesophageal hernias, fundoplication). Please refer to the EB guideline "Surgery Consult Information" for more information.
GI Hindgut	Y	Y	The Eckhauser hindgut team and the Ravitch Colorectal team alternate in taking care of patients with colorectal cancer and IBD requiring surgical care. Please refer to the EB guideline "Surgery Consult Information" for more information.
Orthopedics	Y	Y	EPIC order - Consult to Orthopedic Surgery Service Pager
CVDL/IR	Y	N	Pager is 3CVDL/ if unable to reach, 443-540-5165. For emergent/urgent procedures (i.e. embolectomy), call HAL to discuss with IR attending.
Neuro Rads	N	N	Phone: 75470/1; 54652 (5-8p weekdays)
Body Rads	N	N	Phone: 75443, 75442; 52174 ext #2 -phone for general ED CTs
Nuclear Medicine	Y	?	From 11 PM to 8 AM on weekdays and from 8:30 PM to 8:30 AM on weekends and holidays, please page 3-RADS (3-7237).
Ultrasound	N	N	Call 73375
Neurology	Y	Y	EPIC order - Consult to Neurology Service Pager
Psychiatry	Y	Y	Phone: 78012; psychiatry are not consulted in the ED for patients who are admitted to a medical or surgical service; they are automatically consulted for those who are seen in the PES/psychiatry overflow/patients who require psychiatric evaluation/admission primarily
Plastics	Y	Y	EPIC order - Consult to Plastic Surgery Service Pager
Neurosurgery	Y	Y	EPIC order - Consult to Neurosurgery Service pager
Solid Onc	Y	Y	EPIC order - Solid Tumor Triage Attending; please note you will be speaking to onc attending
Liquid Onc	Y	N	EPIC order - Consult to Hematologic Malignancies Triage Attending
Ophthalmology	Y	Y	EPIC consult - Consult to Ophthalmology Service Pager
ENT (otolaryngology)	Y	Y	EPIC consult - ENT Service Pager
Urology	Y	Y	EPIC consult - Urology Service Pager
OB	Y	Y	Call L&D for OB questions/issues for pregnant patients; patients with ectopic pregnancy are managed by GYN consultants (see below)
GYN	Y	Y	EPIC order - Consult to Gyn Service Pager
Gyn/Onc	Y	N	EPIC: Consult to Gyn Oncology Service Pager
"Face Consults"	Y	N	Even days (7a-7a): ENT; Odd days (7a-7a): Plastics

"Hand Consults"	Y	N	Varies by week (plastics and ortho alternate call for 1 week at a time) - easiest to call operator at 55000
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Hospitalizations Admission Guidelines

Please note: surgical services DO admit patients even if they do not have a surgical indication. You may also refer to these official guidelines under "JHH Admission/Hospitalization Guidelines" in the EB guidelines.

Operative wound complications needing admission should return to the service under which the procedure was performed up to one month post-op (or, 6 weeks post-delivery).

<u>General Surgery</u> Small bowel obstruction Cholecystitis or r/o cholecystitis Human or animal bites Wound infections Polytrauma	<u>Urology</u> Renal colic w/ complications Obstruction of urinary tract Operative complications w/in 1 month
<u>Cardiac Surgery</u> All post-op complications	<u>Gyn/Gyn Oncology</u> Gynecologic infection Complication of gynecologic malignancy
<u>Neurosurgery</u> Shunt complications All post-op complications Cord-impingement syndromes Back pain with neurological deficits Intractable* back pain on even weeks of month	<u>Obstetrics</u> All pregnant patients > 16 weeks (without mitigating circumstances, e.g., major trauma) Obstetric complication during 6 weeks postpartum
<u>Orthopedics</u> Extremity fractures - excluding carpal bones/ hand ("Hand Service") MSK Trauma > 24 hours Compartment syndrome All orthopedic post-op complications Back pain w/ spine fracture Intractable* back pain on odd weeks of month Hand cellulitis ("Hand Service")	<u>Neurology</u> Acute non-traumatic, non-aneurysmal ICH Any primary suspected neurologic condition - e.g., CVA, TIA, meningitis, myopathy, transverse myelitis, M.S., neuropathy, gait d/o, movement d/o Epileptic seizure or seizure NOS Prolonged postictal care (> 6 hours)
<u>Plastic Surgery</u> Hand cellulitis ("Hand Service") All post-op complications	<u>Oncology / Hematology (patients known to service)</u> Newly tissue-diagnosed neoplasm (if open beds) Cancer-related complications New cancer patient in cancer-related crisis New blast crisis or clear myeloproliferative disease
<u>Transplant Surgery</u> Solid organ rejection or complication Complications of dialysis access	<u>Psychiatry</u> Patients whose primary condition is psychiatric (excludes delirium), even with co-morbid conditions, unless co-morbid condition independently warrants admission
<u>Otolaryngology/Head and Neck Surgery</u> Posterior epistaxis, if packed Post-op ENT complications	<u>Vascular Surgery</u> Diabetic foot care Limb ischemia
<u>Adult Trauma</u> Patients > 15yrs w/ trauma < 24h since the injury	<u>Ophthalmology</u> Select ocular d/o in the absence of systemic illness

*Intractable = unresponsive to NSAIDs/opiates/muscle relaxants

Follow-up Appointments After Discharge

Please DO NOT click discharge on any of your patients without first confirming this plan with your attending. Prior to discharge, ensure your patients do not have outstanding tests or orders, and that they do not have abnormal vital signs. Have your EM4 or attending review your discharge instructions. For patients with limited English proficiency, ensure any ad-lib instructions you enter are written in English (**please do not use Google translate**) and that they are communicated to the patient through an interpreter.

The most frequent follow-up appointment will be either to our After Care Clinic or JHOC Internal Medicine. Often, consultants will provide information on who to follow-up with, where, and when.

After Care Clinic: opens Mondays, Wednesdays, and Thursdays from 4:30 p.m. – 7:00 p.m.

- Targeted for ED patients without medical homes or who cannot get timely appointments (within 7 days).
- The clinic has significant social work/case management and onsite pharmacy/phlebotomy resources embedded in it, so patients who may benefit from that full wrap-around support may be ideal.
- Specialty agnostic, they can see wound care, suture removals, device checks, etc.
- Please type “ESC follow up” into the EPIC secure chat prompt, select “groups” tab, and select the ESC Follow up Appointment group to request appointments for patients. These can be scheduled in person or via telemedicine, and the appointment can be scheduled prior to the patient’s departure from the department. If scheduling telemedicine, ensure the patient has a phone with video capabilities.

JHOC Internal Medicine Clinic Mon – Friday (2 block appointments available).

- More ideal for internal medicine follow up (who are already patients at JHOC/ need an appointment).

If a patient needs to be seen in a specialty service clinic - especially when the specialty service did not need to be consulted during the patient’s stay - if the patient doesn’t have an existing relationship with the clinic or does not have a means to get a referral, you may place a consult to social work/case management to assist the patient after placing an order “ambulatory referral to [specialty]” in the Dispo tab. Ensure there is an appropriate follow up phone number for the patient to call in the Dispo tab.

Making Radiology Disks for your Patients

Site: csc.rad.jhmi.edu

If transferring, you must do this to meet EMTALA requirements. Otherwise, it is a courtesy we should be doing for any patient from out of town or who gets their care from outside of JHH.

CRISP/Care Everywhere Access

CRISP and Care Everywhere are used to help you find patients’ prior health records at other facilities

- CRISP is a fantastic resource that allows you to navigate patient prior health records across hospitals. Additionally, they have also included Maryland prescription drug monitoring program (PDMP) to view recently prescribed controlled substances.
- Next to the patient’s picture, there is a small icon  that indicate the patient has OSH records that you can access via care everywhere.
-

SIGN IN/SIGN-OUT

In the Emergency Department, we do a team sign-out at 7am, 3pm and 11pm.

Resident-to-resident sign-out occurs at all other shift changes.

It is very important that you are on time and ready to work. You should arrive to sign-out at least 5 minutes early and expect to stay at least 30 minutes after your shift for sign out.

Be sure to SIGN IN to your role in EPIC and sign into your Jabber phone.

- Sign into Epic on the Trackboard
- Sign into your Role: Resident
- Sign into the provider role you have for that day (Example: JHH Adult ED Red Senior)
- Place your Jabber number into the contact # window
- Change your shift length

Orders Dispo Sign In Role Sign In

Role Sign In

Start: 1052 04/30/2022 End: 2252 04/30/2022 6H 8H 12H 16H

Contact #: 651-271-9630 Phone Pager

Comment:

Provider Teams (1)

Add teams

☐ JHH Adult ED South A/Flex 0 Patients Selected Select all

☒ JHH Adult ED EACU Provider 0 Patients Selected Select all

GIVING SIGN-OUT

We use the ED I-PASS handoff format for sign-out.

- ED Disposition: Is the patient under evaluation, bed requested, level of care, to-be admitted or needs to be seen still. What is the final disposition, and what is the diagnosis?
- Illness Severity: stable, “watcher”, unstable
- Patient Summary: A brief relevant PMH. Reason in the ED. Care thus far, **by problem**.
- Action List: What needs to be followed up? (Labs, final radiology read, consults, etc.)
- Situational Awareness / Contingency Plan: What will screw up your plan? If X happens, then Y should be done. Social issues. What will prevent the patient from meeting the planned disposition?
- Synthesis by Receiver: Oncoming resident, attending, APP repeats back a short synthesis of the above to the person giving the sign-out (closed loop communication).

As a general rule, if a patient you have been caring for throughout your shift is ready for discharge at the time of sign-out, it is your responsibility to discharge that patient (this includes psychiatry). If you’ve been sitting on a procedure for 1-2+ hours prior to sign-out, you should do the procedure after sign-out. In reality, if you’ve been working numerous 12 hour shifts in a row, or you had a very busy, high acuity shift, the EM resident receiving sign-out will understand you need to get home. Your well-being matters. If many procedures are left over after your sign-out, it’s good form to help out the oncoming team with 1 or 2 of them. Caveat: avoid signing-out a pelvic or rectal exam. You need to do it.

In the last 45 minutes of your shift, it is appropriate to “screen” patients (see them briefly, get orders started) with the expectation that the next provider will see them primarily and do their chart. All **Level 2** patients must be screened with work-up and management started up until sign-out occurs. At times, you may need to stay after your shift to wrap up patient care activities or charting.

RECEIVING SIGN-OUT

In EPIC, there is a handoff note you should fill out when you are receiving a sign-out. Use the smart phrase “.handoff” to find the template. This will document where the patient was at the time of handoff and will allow you to recall the important information you received.

Needle Stick and Splashes

Any exposure to bodily fluids should be reported immediately to 5-STIX. This includes needle sticks, as well as body fluid exposures to mucous membranes and non-intact skin. If exposed, wash the affected area with soap and water immediately. If splashed in the face, wash eyes with water or saline, or use the department eye wash station. You should then call 5-STIX because the effectiveness of post-exposure prophylaxis for HIV decreases exponentially with time. If you document an occupational injury, any subsequent care (even if prophylactic) is covered by the hospital.

General Approach and Miscellaneous

Multitasking

At times, you will receive an influx of several new patients in your assigned rooms. Some suggestions for how to handle this:

1. Review vital signs and chief complaints for all your patients.
2. Walk from room to room to “eyeball” the patients.
3. Introduce yourself, thank them for their patience and let the patient know that you have 2 patients ahead of them (for example), get a sense for how the patient looks, and order anything that they need urgently (e.g., pain or nausea medication).
4. Based on this quick assessment, put in orders you know the patients will need (such as a chest x-ray, EKG, and labs for a chest pain patient) for all patients.
5. Then begin a full assessment on the sickest patient
6. After reviewing all results, clear your result flags to help keep track of new results (ask a senior resident how to do that).
7. If you are overwhelmed or concerned about the safety of your patients, ask the EM PGY-4 (if you’re on the Red Team) or the EM PGY-3 or your attending (if you’re on the Blue Team) to help “screen” your patients, discharge a patient, check on a patient, help with a procedure, etc.
8. It is appropriate to ask for help even if you are a senior resident, as the ED is likely different from your usual clinical setting. Remember we are one team and asking for help to ensure all patients are receiving optimal care is expected - you’ll see that even your attendings do this between themselves! We’re all happy to help you!

Procedures (consents)

Consent forms (for procedures, blood transfusions) can be found on EPIC in the patient’s electronic chart under “Consents”, or under Forms On Demand on the Hopkins Intranet. All supplies are in the Pyxis. Any EM resident or nurse is more than happy to help you find supplies. Please inform the EM senior resident and Attending prior to performing any procedures, except for peripheral IV placement.

Laceration Repair

Laceration repair has a lot of nuance to it, including which size / type of suture to use, if primary or secondary repair is warranted, if deep stitches are needed, *etc.* If you have any questions, it’s best to ask your EM senior resident or EM attending. A fantastic website to utilize that will answer many of your questions is <https://lacerationrepair.com>.

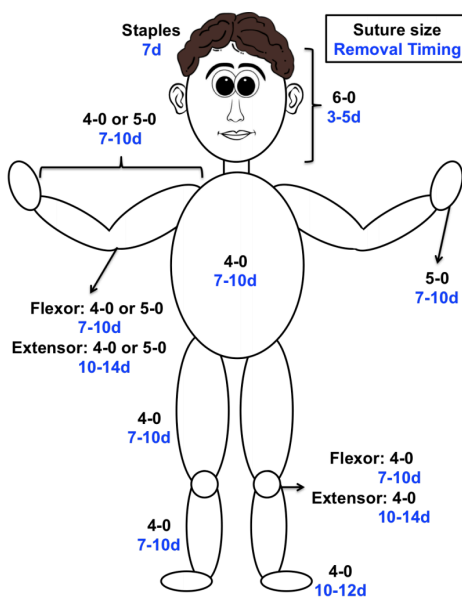
Absorption	Filament	Brand Name	Strength Retention	Full Absorption	Applications
Absorbable	Multi	Vicryl	50% at 21d	56-70d	Subcutaneous closure, oral surgery
		Vicryl Plus	50% at 21d	56-70d	Subcutaneous closure, oral surgery
		Vicryl Rapide	50% at 5d	42d	Tongue lacerations, oral injuries, skin closure on trunk and extremities
	Mono	Plain Gut	7-10d	70d	Suturing fatty tissues, oral repairs, nailbed repairs
		Fast Absorb. Gut	~7d	21-42d	Skin closure on the face
		Chromic Gut	21-28d	90d	Tongue lacerations, nail bed repair, subcutaneous closure
Non-absorbable	Multi	Ethibond	Indefinite	N/A	Tendon repair

		Perma-hand Silk	Gradual loss	N/A	Securing drains, lines, and tubes
	Mono	Ethilon	Gradual loss	N/A	Most common material for skin closure
		Prolene	Indefinite	N/A	Alternative choice for skin closure

Anatomic Region	High Tension	Low Tension	Without Removal	Deep Layer
Face	5-0 nylon (Ethilon)	6-0 nylon (Ethilon)	6-0 fast absorbing gut	5-0 polygalactin 910 (Vicryl)
Extremities/Trunk	4-0 nylon (Ethilon)	5-0 nylon (Ethilon)	4-0 and 5-0 gamma irradiated polygalactin 910 (Vicryl Rapide)	4-0 polygalactin 910 (Vicryl)
Tongue Lacerations	3-0 chromic gut	4-0 chromic gut	N/A	N/A
Nailbed Lacerations	4-0 and 5-0 chromic gut	6-0 chromic gut	N/A	N/A
Hair-Bearing Areas	4-0 and 5-0 colored polypropylene (Prolene)	5-0 and 6-0 colored polypropylene (Prolene)	See above	See above

Laceration Repair and Sutures

Lee H, Abubshait L



Special Consideration		
Location	Concern	Treatment
Eyelid margin	Requires careful approximation	Ophthalmology consult for repair
Medial canthus of eye	Lacrimal duct location	Ophthalmology consult for repair
Vermillion border of lip	Requires careful approximation	Consider consulting Oral Maxillofacial Surgery or Plastics
Mammalian bites	Risk for infection, especially of the hands: Human > Cat > Dog	Antibiotics: Amoxicillin-clavulanate (Cochrane: Antibiotics not warranted for uncomplicated dog bites to non-hand areas of the body [1].) - Do not close wounds, especially if puncture-like.

From *Academic Life in Emergency Medicine (ALiEM)*

DEATH CERTIFICATE

The following are basic instructions in order to minimize your work. Ask for help when filling out the death certificate the first couple times. For additional guidance, please review the EB Guidelines for “Death Administrative Process”. Notably, the certificate must be completed by a physician who was present at the time of death.

Immediate next-steps after a death occurs in the ED:

When a patient presenting as a Medical Critical Care or Trauma Critical Care dies in the ED, there’s a few key pieces of information you need to immediately obtain from EMS; namely, the EMS unit number, as well where the patient was found. Try to get as specific of a location as possible. Additionally, if a detective has been assigned, you need the contact information of the detective. If possible, contact the family and let them know you will be referring the case to the Medical Examiner to determine cause of death. See below for more information.

There’s a lot of different criteria for reporting a case to the Chief Medical Examiner. Pragmatically, *any death in which there is doubt as to whether or not it is a medical examiner’s case should be reported*. This means that all medical critical care and trauma critical care deaths should be discussed with the medical examiner.

Next, you will need to contact the Baltimore City Chief Medical Examiner Office at (410) 333-3250 or (410) 333-3271. Tell them you are a physician or physician assistant in the Emergency Department at Johns Hopkins Hospital (or Bayview Medical Center) and would like to discuss possibly referring a case to them. They will review the case immediately, or call you back. They will then give a Medical Examiner (ME) Number; you will need to write this number in your ED note.

Requesting an Autopsy

Requesting an autopsy can be difficult, and it requires effective and appropriate communication skills with the family. It is important to provide the following information to the family:

- It’s our standard of care to refer cases to the M.E., specifically deaths related to Trauma.
- The person taking responsibility for the body may give permission for the examination
- The family is not charged for the autopsy
- The autopsy may confirm the clinical diagnosis or reveal additional causes contributing to the patient’s death
- The autopsy will not delay the funeral or interfere with the viewing of the body
- The autopsy contributes to physician education and improved patient care
- Any findings are entrusted to the care team and the patient’s family.

For cases that the M.E. declines, the family may still request an autopsy. In these cases, verbal consent is not sufficient for autopsy. If a family member is not available, a telegram consent is required (contact the Admitting Office). For additional questions regarding autopsy or specific questions in reference to a case, contact the Department of Pathology at The Johns Hopkins Hospital at (410) 955-3765 or (410) 955-3500. There is a pathologist or resident pathologist on call 24hrs/day.

Autopsy and Organ Donation

The American Medical Association and the College of American Pathologists continue to stress the importance of an autopsy. **It is Maryland law to offer the family of the deceased an autopsy and organ donation.** At JHH, we offer a FREE autopsy for all patients who die on premise. The “death packet” contains the death certificate and the consent forms for autopsy and organ donation. Social Work and/or our ESC Registration supervisors are involved in every death occurring in the ED. They will be available to obtain consent, but the residents should be aware of the consent forms and be prepared to obtain that consent in the event the social worker is not available. If the deceased’s family gives consent for organ donation, or you are unable to obtain consent, call the

Transplant Resource Center at (410) 242-1173 (24hr/d).

CREATING A DEATH CERTIFICATE

This step-by-step guide was put adapted from the guide put together by Dr. Kiemanh Pham, MD, MPH

1. To get started with the Death Certificate system, you will need to open your web browser, which needs to allow pop-ups and have Adobe, and enter in the following URL address:
<https://mdedrs.dhmh.maryland.gov>
2. Enter the username and password which has been assigned to you by the MD-EDRS system administrator. Then click “Login.”
3. Once logged in, click on the Certificate tab and then “Create Certificate”:
4. Confirm that the death is not a Medical Examiner case or that you have contacted the Office of the Chief Medical Examiner and have been instructed to create the certificate in MD-EDRS. Enter the decedent’s information and click “Continue.”
5. The Certificate Page will appear. Next, click on the Medical Information tab on the bottom of the page.
6. You will then need to complete the items on this page as you currently do on the triplicate paper copy of the Death Certificate.

****PLEASE NOTE****

- A number of fields on the page will auto-populate.
 - If Place of Death is inpatient, ER/Outpatient, DOA, Hospice, or Nursing home/long term care facility, items 4a and 4b will be automatically populated. Items 4a and 4b are only completed if the place of death is “Decedent’s Home” or “Other.”
 - If the Manner of Death is “Natural,” items 28a-28g should be skipped.
 - Clicking on the next to each item will provide explanatory information on completing the item.
 - “Approximate interval between onset and death” and “Contributing Causes” are both required fields. If you have no information to report, or the information is unknown, enter a hyphen (-).
7. After all of the information on the Medical Information tab has been entered, click on the Validation tab near the top of the screen and then on “Validate MI” to check for any errors. It may take a moment for the information to be validated.
 8. If any errors are identified, they will be listed on the screen and should be corrected in order to proceed.
 9. If necessary, click on the Validation tab and then “Validate MI” button again to be sure there are no additional errors.
 10. When the information has been validated, a message indicating “Successfully Validated Medical Information” will appear. Click the Save[F8] tab to save the record.
 11. The certificate should be reviewed thoroughly for errors before it is attested. To review the certificate’s content, click on the Certificate View tab located at the bottom of the screen. This step can be completed at any time.
 12. If the Medical Certifier (physician, certified nurse practitioner, physician assistant) has personally entered the Medical Information, he or she may immediately certify the information by clicking on the Certificate Options tab and then on “Attest Certifier.”
 13. On the next page, the Medical Certifier should check “Yes” and then “Continue.”
 14. A message will appear indicating that the certificate was successfully attested.

PLACING A PATIENT IN ED OBSERVATION

The following are basic instructions about placing a patient in ED observation. Please ensure the ED attending is aware and agrees with the plan for ED observation, as this generates a separate bill with the patient's insurance so should not be placed until discussed with the supervising PGY4 (Red) or attending (Blue).

The CMS definition for observation services is as follows: A well-defined set of specific, clinically appropriate services, which include ongoing short term treatment, assessment, and reassessment, that are furnished while a decision is being made regarding whether patients will require further treatment as hospital inpatient or if they are able to be discharged from the hospital.

Consider placing patient in ED Observation when:

Patient is hemodynamically stable, doesn't meet acute criteria for admission, and satisfies the following criteria (+/- procedure element):

- 80% likelihood of stabilization and discharge are expected within 24 hours from arrival to ED
- Patients symptoms are minimally improved after at least 4 hours of active emergency department treatment OR clinical picture or diagnosis is unclear after at least 4 hours of active emergency department evaluation
 - Common diagnoses are abdominal pain, asthma, cellulitis.
- You anticipate the patient will require at least an additional 4-8 hours of care that is not pending consultation or imaging.
 - Asthma with serial lung exams, nebulization treatment and clinical monitoring is appropriate
 - A patient simply waiting on an MRI or a consultant to staff is not appropriate
- You anticipate the patient will be on an ED based pathway such as chest pain evaluation with stress testing planned in the AM, syncope with telemetry monitoring and echocardiography, or heart failure with diuresis.
- A procedure has been performed requiring more than six hours of observation

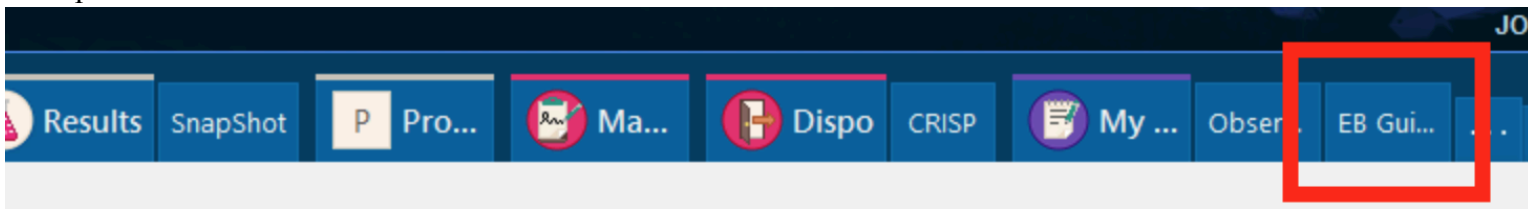
ED observation is not for delays in care or for awaiting consultation.

Click the ED observation tab. In the first section, place the ED observation order and click "sign". Once you put the order in for ED observation, ask a resident or attending to show you how to do the ED Obs note. There are templates (.eacupro1 and .eacupro3) that you will use the most.

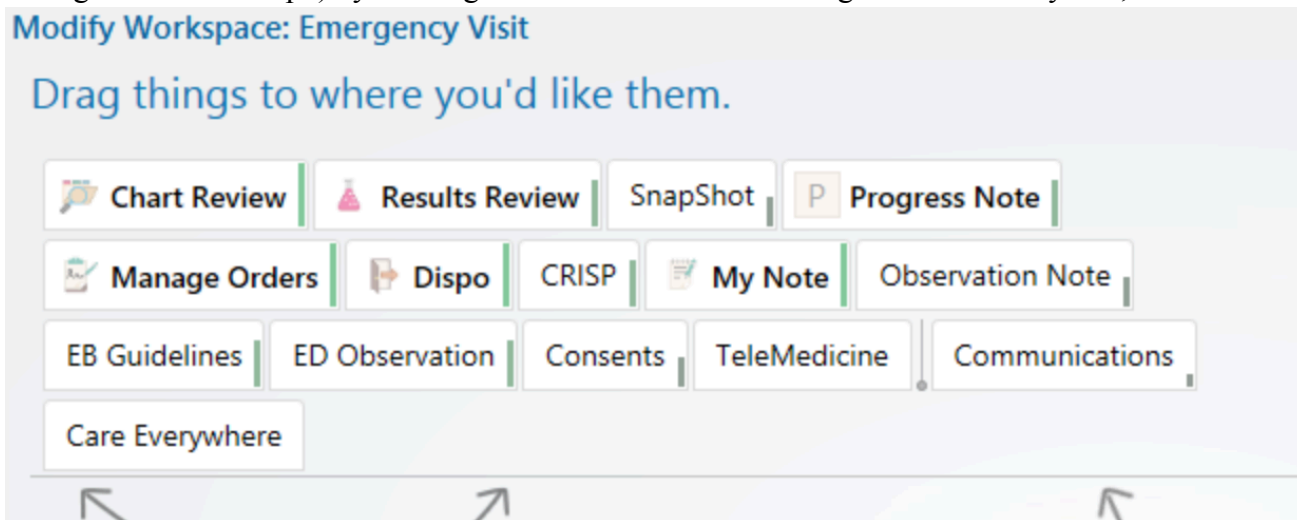
EB Guidelines

Evidence Based Guidelines (EB guidelines) is a Johns Hopkins Emergency Medicine developed clinical decision support tool located on the activities tabs that is horizontal from left to right in EPIC in each patient's chart. When you click on the activity button EB Guidelines, it will take you to a search screen where you can search available content. It will give you suggested guidelines based on the patient's chief complaint. When opened you will see a Hopkins reviewed and vetted care algorithm. These algorithms are designed to be interactive – within the EB guideline, you can directly order labs, medications, imaging, or consults. Clicking on the desired orders once will load them in a Queued Actions section located near top right, and upon clicking Accept button, will be sent to the manage orders activity in Epic, where each order can be modified if necessary for that patient (i.e. dose/ fluid rates adjustments, LMP, pregnancy status, known contrast allergies, etc). These guidelines also include clinical calculators such as PERC, Wells, HEART score, etc. and will create text based on the results that can be copied into your documentation. Additional resources available in EB guidelines include operational guidance such as for the death process, or when ordering methotrexate (technically chemotherapeutic so very specific requirements for ordering according to hospital policy), hospital admission guidelines, marking cases for M&M, informing the ED operations team of broken equipment, discharge instructions, and patient handouts for dental clinics and other resources.

Example:



You can prioritize and move the EB Guideline tab to be more prominent (such as where Dr. Niforatos keeps Manage Orders or Dispo) by clicking on the wrench icon at the right of the activity row, as described below.



Other Useful Information

Important phone numbers at JHED

These are useful contacts to save as your favorite on your Jabber/Rover

- Hopkins Access Line
- Adult ED Nursing Supervisor
- Adult ED Shift Coordinator
- JHH Psych ED resident
- CT ED JHH Radiology
- Adult ED Xray JHH Radiology
- Adult Respiratory Charge, RT JHH - connects you to the respiratory therapist
- Lab Core Lab Customer Service JHH

Pharmacy

Our ED pharmacists are extremely helpful members of the team.

- We will typically have a Clinical Pharmacist physically present in the ED 24 hours a day on Monday to Friday
- All clinical questions for the ED Clinical Pharmacists should be directed to the “JHH Adult ED Pharmacist” secure chat group in EPIC
- The ED Clinical Pharmacy team will be verifying medication orders when they are present. All other times, another pharmacist in the hospital will be in charge of verifying your medication orders.

ACUTE MANAGEMENT OF SELECT CONDITIONS

Dr. Niforatos wrote the following quick frameworks for common critical conditions when you're at the bedside and may not be by a computer to look up management. **Most information below comes from our Evidence-Based (EB) Guidelines in EPIC.** If you have a sick patient requiring resuscitation, *please notify the EM senior resident and EM attending* immediately. It is *your responsibility* to know contraindications and side effects of medications. For ACLS, download the MGH ACLS App (QR code below), which is approved by the AHA.

Advanced Cardiovascular Life Support

Cardiac Arrest – Asystole or PEA

Nonshockable Rhythm – START CPR

1. Rhythm / Pulse check q2 min
2. **Epinephrine** 1mg (1:10,000) IV q3-5 min
3. Treat reversible causes (H's and T's)

Cardiac Arrest – VF or Pulseless VT

Shockable Rhythm – START CPR while charging

1. Defibrillate 200J (interrupt CPR to do this)
2. CPR 2min → rhythm / pulse check
Epinephrine 1mg (1:10,000) IV q3-5 min
3. Defibrillate 200J
4. CPR 2min → rhythm / pulse check
Amiodarone 300mg IVP, 150mg IVP
Alternate with **Epinephrine** 1mg IV q3-5 min
Lidocaine 1-1.5 mg/kg, 0.5-0.75 mg/kg q5m (3g)
5. Treat reversible causes (H's and T's)

Electrical Storm

VT/VF refractory to Epi / 3 shocks

- +/- Dual Sequence Defib (max energy)
- +/- **Esmolol** 500 mcg/kg bolus (50+ mcg/kg/hr drip)
or, **Propranolol** 0.15mg/kg/hr

Return of Spontaneous Circulation (ROSC)

(Please refer to EB Guidelines for Post-ROSC Care)

1. Obtain full set of vitals, Temp 32-36 (24hrs)
2. Optimize O₂ (SaO₂ > 94%), Vent (ETCO₂)
10 breaths/min, ETCO₂ 35-40mmHg, ↓ FiO₂
3. Tx HoTN: 1-2L NS or LR, CVC, Art Line
4. Vasopressors gtt, MAP > 65, doses in **MCG/KG/MIN**
+/- **Norepinephrine**: 0.05mcg IV/IO, max 1-2mcg
+/- **Epinephrine**: 0.01mcg IV/IO, max 1-2mcg
+/- **Dopamine** 0.2mcg, max 20mcg
+/- reversible causes & #POCUS
5. ECG – N/STEMI, Electrical Instability → PCI



MGH ACLS APP (iOS/Android). Approved by the AHA.

ACLS Adjuncts

1. IV fluids: pressure bag 2L NS
2. **Naloxone** 0.4mg IV/IO bolus (overdose)
3. **Calcium gluconate** 3g IV/IO over 5-10min
Calcium chloride 1g IV/IO
4. **NaHCO₃** 50-150 mEq IV/IO bolus
5. **MgSO₄** 2g IV over 2min
6. **Vasopressor** gtt, titrate MAP > 65, doses in **MCG/KG/MIN**
+/- **Norepinephrine**: 0.05mcg IV/IO, max 1-2mcg
+/- **Epinephrine**: 0.01mcg IV/IO, max 1-2mcg
+/- **Dobutamine**: 2mcg IV/IO, max 20mcg
+/- **Phenylephrine**: 0.5mcg IV/IO
bolus 100-200mcg (not per kg, this is push dose)
7. **tPa** 50mg IV over 2min, re-bolus in 15-30min w/o ROSC
8. **Intralipid** 20% 1.5mL/kg then 0.25mL/kg/min

Bradycardia – Symptomatic

HoTN, AMS, ADHF, Shock, ACS

1. **Atropine** 1mg IV q3-5min (max 3mg)
2. Transcutaneous / Transvenous Pacing
3. Vasopressor gtt, titrate MAP > 65, doses in **MCG/KG/MIN**
+/- **Norepinephrine**: 0.05mcg IV/IO, max 1-2mcg
+/- **Epinephrine**: 0.01mcg IV/IO, max 1-2mcg
+/- **Dopamine** 0.2mcg, max 20mcg

Tachycardia – Stable vs Unstable

Unstable (Synchronized Cardioversion)

1. Narrow regular: 100J (Aflutter 50J)
2. Narrow irregular: 200J (Afib 360J)
3. Wide regular: 100J
4. Wide irregular: DEFIB 200J
5. Narrow complex: Adenosine 6à12mg IVRP

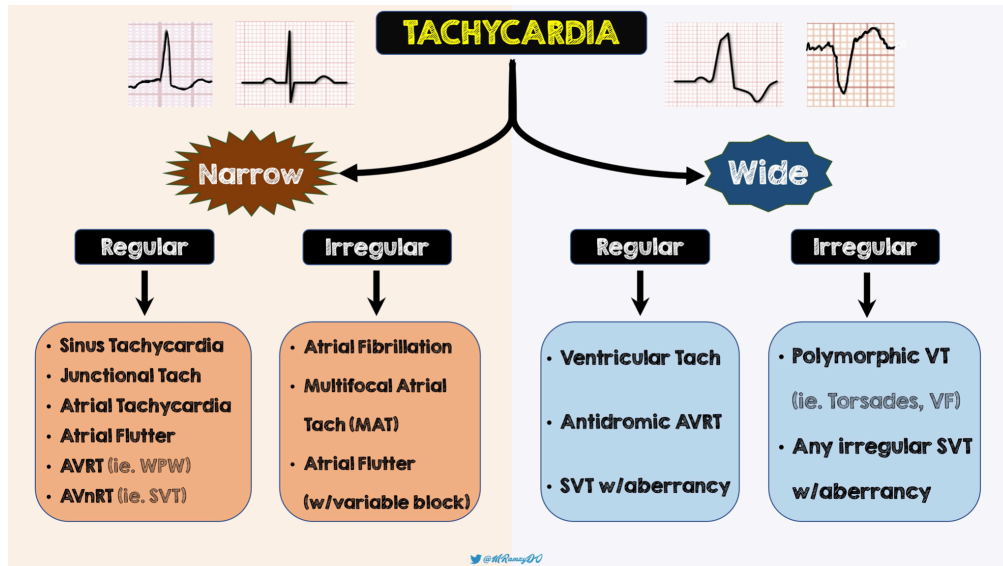
Stable with WIDE QRS

1. Regular / Monomorphic: **Adenosine** (Above)
2. Consider antidysrhythmic infusions:
- **Procainamide** 10-50mg/min IV, (1-4mg/min)
X LQT, CHF... stop if QRS > 50%,
HoTN, normal rhythm, maxed 17mg/kg or 1g
- **Amiodarone** 150mg IV (2.2g) --> (1mg/min 1st 6 hr)
- **Sotalol** 100mg IV (1.5mg/kg)-5min | **X LQT**

Stable with NARROW QRS

REVERT, Adenosine, Diltiazem (0.25 → 0.35mg/kg),
or 2.5mg/min infusion (50mg max)

Tachycardia and Bradycardia



Clinical pearls. Dosing on the previous page. Information below from Stephen Smith's Blog.

Narrow and Regular:

- Should have P waves, bedside assessment of rate and variability
- Tx: vagal maneuvers and adenosine

Narrow and Irregular:

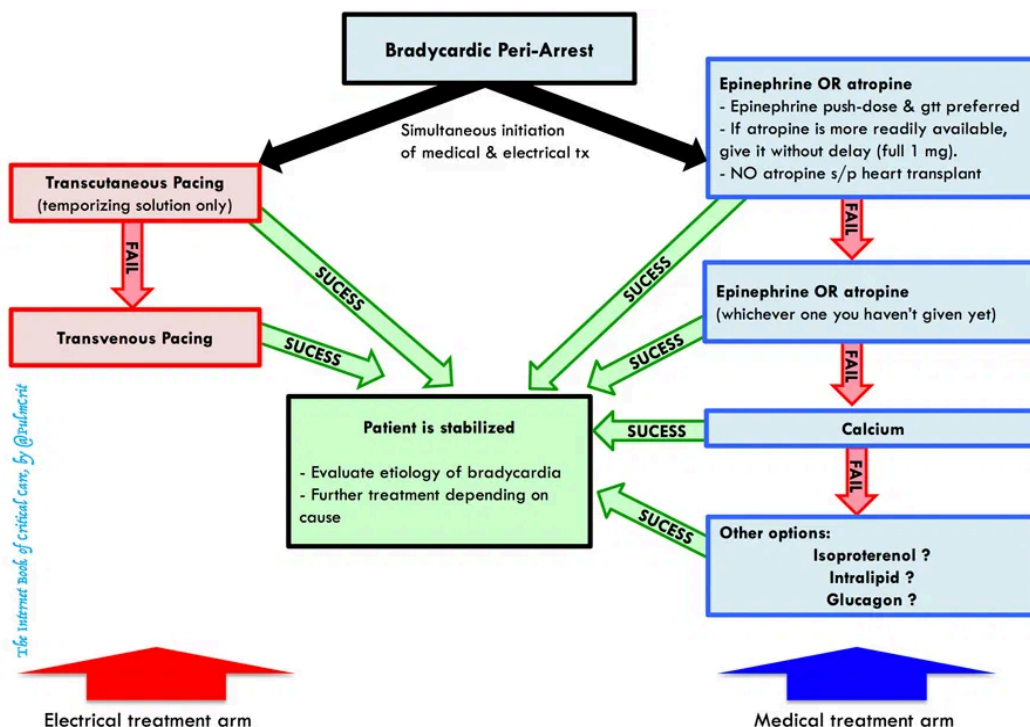
- Atrial Fibrillation > Atrial Flutter + Variable Block >> MAT
- Determine whether AF cause vs effect, follow treatment algorithm on approach on next page

Wide and Regular:

- Hyperkalemia vs Ventricular Tachycardia > SVT w/ aberrancy >> antidromic AVRT
- Don't rely on criteria for diagnosis at the bedside, can be quite cognitively cumbersome
- Electricity vs Medications
- **Rx:** amiodarone, procainamide, adenosine, calcium pushes / infusions

Wide and Irregular:

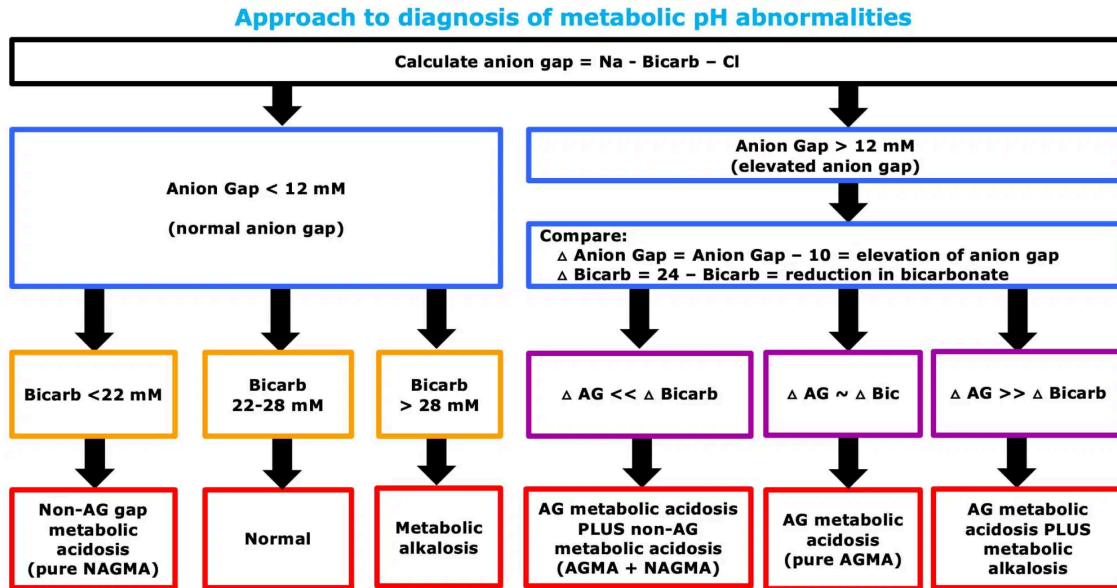
- Hyperkalemia vs Atrial Fibrillation w/ WPW vs Polymorphic VT vs Atrial Fibrillation w/ aberrancy
- **No nodal blockers** unless identical morphology to prior known BBB
- For these patients, it's simply safer to use **electricity** instead of procainamide



Acid-Base Interpretation

A simple, yet fantastic approach to acid-base disorders outlined below from the *Internet Book of Critical Care*.

- Metabolic Disorders: look at the change in either HCO_3 or AG
- Respiratory Disorders: look at the change in pCO
- $\text{HCO}_3 < 22 = \text{NAGMA}$; $\text{HCO}_3 > 22 = \text{metabolic alkalosis}$
- “CAT MUDPILES” Cyanide, carbon monoxide Alcoholic ketoacidosis, acetaminophen (5-oxoproline) Toluene Methanol, metformin Uremia Diabetic ketoacidosis Phenformin, paraldehyde, propylene glycol Iron, isoniazid Lactic acidosis Ethanol, ethylene glycol Salicylates



-The Internet Book of Critical Care, by @PulmCrit

pH compensation cheat sheet

RESPIRATORY COMPENSATION		METABOLIC COMPENSATION		
Primary Problem: Abnormal Bicarbonate	Compensatory pCO_2	Primary problem: Abnormal pCO_2	Acute compensation: Bicarbonate	Chronic compensation: Bicarbonate
>40	Not >50-55	100	30	Not > 45
40	49	97	30	44
39	48	94	29	43
38	48	91	29	42
37	47	88	29	41
36	46	85	29	40
35	46	82	28	39
34	45	79	28	38
33	44	76	28	37
32	43	73	27	36
31	43	70	27	35
30	42	67	27	34
29	41	64	26	32
28	41	61	26	31
27	40	58	26	30
Normal Range		55	26	29
22	42	52	25	28
21	41	49	25	27
20	39	46	25	26
19	38	Normal Range		
18	36	36	23	22
17	35	35	23	22
16	33	34	23	21
15	31	33	23	21
14	30	32	22	20
13	28	31	22	20
12	27	30	22	19
11	25	29	22	19
10	24	28	22	18
9	22	27	21	18
8	21	26	21	17
7	19	25	21	17
6	18			
5	16			
	Not < 10-15			

This table incorporates all compensatory equations into a single, easy-to-use format. No need to memorize formulas - just look at this and you're all set. Unfortunately, these formulas *aren't* well validated and their overall significance is *dubious* – so use them with caution and exercise judgement.

-The Internet Book of Critical Care, by @PulmCrit

Anaphylaxis / Anaphylactic Shock

From the [Resuscitation Crisis Manual](#) by Scott Weingart, MD.

Please note: the only medication shown to improve patient outcomes and decrease morbidity and mortality is **time to epinephrine administration**. Steroids, H1 / H2 blockers are adjuncts and not necessary in the initial management of patients. ***If the patient is not getting better with epinephrine, the answer is to give more epinephrine and escalate to IV infusion, titrating to effect.***

Cautionary tale: call a DART early if necessary

1. Remove any triggers and call for assistance
2. Consider early intubation for airway compromise or impending obstruction as edema can progress rapidly
3. Give high-flow oxygen via non-rebreather mask
4. Place two large bore IVs and infuse at least 20mL/kg LR (if in shock)
5. Give IM epinephrine (dosing below)
6. If symptoms persist, start IV epinephrine infusion and consider arterial line placement
7. If still no response, consider alternative agents listed below
8. Start adjunctive therapy once patient is hemodynamically stable

Epinephrine Route and Dosing

1. Intramuscular: 0.3-0.5 mg (use 1mg/mL concentration)
2. IV bolus: 5-20 mcg (use 10 mcg/mL concentration)
3. IV Infusion: 1-20 mcg/min
4. Nebulized: 5 mg standard epinephrine (5mL of 1 mg/mL) if patient has stridor

Alternatives if poor response to conventional therapy

1. **Epinephrine** 100 mcg IV bolus
2. **Norepinephrine** infusion 0.1 mcg/kg/min
3. **Vasopressin** 0.01-0.04 U/min or 2 U bolus (0.03 U/kg)
4. **Glucagon** 1 mg IV over 5 min (for beta-blocker reversal)
 - A. Start infusion at 5-15 mcg/min if needed
 - B. Watch out for nausea and vomiting
5. **Methylene Blue** 1.5-2 mg/kg IV bolus
 - A. Add continuous infusion of 0.5 mg/kg/hr in refractory cases

Adjunctive therapy when hemodynamically stable

1. **Prednisone** PO 1 mg/kg (max 50 mg), *or*
 - A. **Hydrocortisone** IV 2-4 mg/kg (max 200 mg), *or*
 - B. **Dexamethasone** IV 0.2-0.4 mg/kg (max 10 mg), *or*
 - C. **Methylprednisolone** IV 125 mg
2. H1 Blocker: **Diphenhydramine** IV or PO 1-2 mg/kg (max 50 mg)
3. H2 Blocker: **Cimetidine** PO 300 mg or **Famotidine** IV or PO 20 mg

Anticoagulation Reversal Management

Information from the *Johns Hopkins Antithrombosis and Hemostasis Guidelines*

Warfarin Reversal (Order: INR) PCC (KCentra) if < 50kg 1,000U IV x1 if >50kg 1,500U IV x1 30 minutes after admin, STAT INR if INR > 2 1,000U IV x1 if INR 1.4-2 500U IV x1 Vitamin K 10mg IV x 1 Alternatively, can give 4U FFP if not KCentra CNS Bleed KCentra Dosing INR 2-4, 25U/kg INR 4-6, 35U/kg INR > 6, 50U/kg Platelet Reversal DDAVP 0.3U/kg over 20-30min TXA 1g bolus, then 1g over 8hr	Dabigatran Reversal (Order: PTT) Idarucizumab (Praxbind) 5g IV x1 Consider Hematology consult Heparin/Lovenox Reversal (Order: PTT, Anti-Xa) Protamine 50 mg IV x1 -- if BAD bleed Factor Xa inhibitor (-ban) Reversal (Order: PTT, anti-Xa level) PCC and/or Andexxa (EBG) 4-PCC ICH = 25 U/kg (2.5kU); all else 50 U/kg (5kU) 4-PCC non-ICH = 2000U Low Andexxa: 400 mg IV load plus 500mgIV 2hr High Andexxa: 800 mg IV load plus 1k mg IV 2hr Follow EB Guideline for Andexxa approval process; consider Hematology consult Alteplase/Tenecteplase (tPa/TNKase) Reversal (Order: INR, PTT, platelet count, Fibrinogen) Aggressive fibrinogen replacement (10U Cryo)-call Blood Bank and request "stat cryo" Order 6-8 units of platelet (optional) If fibrinogen < 150 mg/dL, give/redose cryoprecipitate Consider Hematology consult
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Burn Management

PEARL: All burn patients are trauma and toxicology patients until proven otherwise.

For any patient with a concerning burn, please page the BURN pager if you're at Bayview, or HAL line the Bayview Burn Fellow / Attending if you're not at Bayview.

The below information is taken from the 2018 Advanced Burn Support Guidelines, 2018 EB Medicine "Emergency Department Management of Patients With Thermal Burns," and EM:RAP's Corependium chapters on chemical and thermal burns. We will review some pearls, the ABCs, and wound management.

Some important caveats about quick bedside burn evaluation:

1. Acute burns **do not** bleed. If there is bleeding, there's an associated injury.
2. Wounds should not be cooled, and attempts should not be made to decrease the core temp, as this will result in vasoconstriction and worsen the depth of the injury. Exceptions:
 - A. Tar and asphalt burns need to be cooled extensively w/ cold water
 - B. Chemical burns need to be brush dried off, then cooled with copious fluids
 - C. Water can worsen some chemical burns (Calcium oxide, Phenol, Sulphuric acid, Hydrochloric acids)
3. Acid attacks – Sulphuric acid, nitric acid common
4. Burn wounds can be classified into 6 separate groups based on the mechanism of injury: scalds, contact burns, fire, chemical, electrical, and radiation.
5. In the early hospital settings, prior to calculating the Total Body Surface Area (TBSA) burned, the initial fluid rates for patients with **visibly large burns** are based on patient age:
 - A. 5 years old and younger: 125 ml Lactated Ringers (LR) per hour
 - B. 6-13 years old: 250 ml LR per hour
 - C. 14 years and older: 500 ml LR per hour

History - do things quick, must ask questions related to:

1. *context* of the burn
2. *mechanism* of the burn
3. *timing* of the burn (important for fluid resuscitation)
4. and whether it was in an enclosed space or other context to determine if they patient is at risk for *smoke inhalation* injury
5. also ask about tetanus vaccination status

Physical Exam -- establish resuscitation priorities (in reality, you'll do all of these simultaneously and quickly with ATLS)

1. Vital signs
2. Oropharynx: carbanaceous sputum, intra-oral burns
3. Skin: estimate TSBA and depth of burn (more below)
4. Assess circumferential burns and burns overlying joints

Airway

Prompt intubation indicated when there are signs / symptoms of airway compromise or respiratory distress on initial assessment or with serial exams, such as:

1. Worsening throat pain
2. Change in phonation
3. Stridor
4. Visible swelling of neck
5. Deep burns to lower face or neck
6. Wheezing
7. Mucosal burns

There are distinct types of inhalation injury:

- Injury caused by exposure to toxic gases including carbon monoxide and/or cyanide
- Supraglottic (above the vocal cords) injury, due to direct heat or chemicals, causing severe mucosal edema.
- Subglottic or tracheobronchial (below the vocal cords) airway inflammation and edema, which may cause atelectasis and pneumonia as late effects.

Notably, *flash burns* experienced by COPD patients who smoke while on oxygen are **NOT** considered inhalation injuries by the Bayview Burn attendings, as well as the literature.

Optimize first pass success using video laryngoscope with a 7.5 ETT with a **small** back-up that is 6.0 in case there is significant cord edema. Have your DL back-up ready with gum elastic bougie at hand. In these cases, consider having the DART cart outside the door and assess neck anatomy prior to intubation. If there is any concern, **CALL A DART** as you prepare to intubate.

Succinylcholine can be used in the first 24 hours of burn care only.

PEARL: In the intubated burn patient, re-check the tube position frequently as fluid resuscitation and edema can result in tube displacement

Breathing

1. Watch for compartment syndrome of the chest
2. Assess for full-thickness/circumferential burns to the torso in addition to difficulty with ventilation or bagging the patient
3. Burn patients on the ventilator are at increased risk of pulmonary edema due to overly-aggressive fluid resuscitation, comorbidities, and for those with inhalation injury

Circulation

1. All patients with significant burns require cardiac monitoring and rapid IV access via 2 large bore IVs
2. Start fluid bolus of 500cc LR immediately (using above age guidelines), then consult fluid calculator after initial assessment
3. Estimate the burn area plus depth and initiate crystalloid resuscitation -- burns > 20% TBSA have capillary leak and at risk for significant fluid loss
 - A. At Johns Hopkins, Bayview, Howard County you will use the Modified Brooke Formula, as well as **Lactated Ringers**
 - B. **Modified Brooke Formula:** % TBSA * 2 * weight (in Kg) = total volume of fluid in 24 hours since ONSET of injury
 - I. Administer half of the volume in the first 8 hours after injury
 - II. Administer the other half of the volume in the next 16 hours after injury
 - III. Can start Albumin 5% at 2mL/kg/hr up to 250mL/hr at hour 8 (if still boarding in the ED and not meeting UOP goals)
 - IV. Titrate IVF for UOP* -- don't just bolus more fluids
4. Circumferential burns -- assess circulation distal to extremity burns, use doppler if necessary for pulses
 - A. page BURN or surgery (if not at Bayview) if escharotomy is warranted (can help with bedside procedure), look for signs of compromised perfusion, diminished/lack of distal pulses, or evidence of elevated compartment pressures

Urine Output	Titrate by
< 15 mL / hr	Increase IVF by 20% or 100 cc/hr
15-29 mL / hr	Increase IVF by 10%
30-50 mL / hr	No change
51-150 mL / hr	Decrease IVF by 10%
> 150 mL / hr	Decrease IVF by 20% or 100cc/hr

Disability

1. Aggressively manage pain in order to facilitate complete assessment and exposure
2. Consider toxic exposure: **carbon monoxide and cyanide** in enclosed structure fires, altered or unconscious patients, unexplained cardiovascular collapse, and those with profound acidosis or acidosis that is not improving with resuscitation.
 - A. **Carbon monoxide** turns hemoglobin bright red; late effects of carbon monoxide poisoning include increased cerebral edema that may result in cerebral herniation and death
 - I. TREATMENT: 100% **NRB** or 100% FiO2 on **HFNC** -- shortens half life of CO to approximately 45 minutes
 - II. Indications for hyperbaric oxygen (might transfer to UMMS or GBMC): CO Level > 25%, or > 15% if patient is pregnant
 - B. **Cyanide toxicity** should be suspected in **any patient** with smoke inhalation, elevated CO on labs, an anion gap metabolic acidosis, or a lactate > 8
 - I. Altered mental status + soot in the mouth/nose (60% likelihood of CN poisoning)
 - II. Altered mental status plus soot in the mouth/nose + hypotension/cardiac arrest (80% likelihood of CN poisoning)
 - III. TREATMENT: **Cyanokit** 5g given over 15min. Repeat the dose if the patient's GCS, hypotension, or dysrhythmia is not improving in 15 minutes. May consider **sodium thiosulfate** in addition to the hydroxocobalamin (cyanokit).
 - C. Blood gas and co-oximetry may be helpful but treatment of cyanide poisoning is empiric before confirmatory testing results will be available

Exposure

1. Fully expose the patient and assess for other injuries
2. Dress wounds with moist saline-soaked bandages and sterile drapes/towels.
3. Avoid ointments/antiseptic dressings prior to evaluation by a burn specialist.
4. Avoid hypothermia due to the loss of thermoregulation from large burns, exposure, application of moist dressings, and aggressive fluid resuscitation
5. Remove patients from backboards as early as possible to avoid development of pressure wounds.
6. Follow spine precautions in patients at risk for spinal injury

APPROACH TO BURN/WOUND CARE IN THE ED

Superficial (first-degree) burns should simply be kept clean and dry. They require no special dressing because the dermis is intact. Partial-thickness wounds or worse require a dressing to promote healing, reduce the risk of infection, and decrease pain.

General approach to blisters with minor burns if treated < 48 hours after the burn:

1. Leave all intact blisters alone
2. If blisters have ruptured, treat them as dead skin and debris them completely

*General approach to blisters with minor burns **ON FOLLOW-UP** or if treated > 48-72 hours after the burn:*

1. Debris all large intact blisters > 6cm and all blisters that have ruptured
2. Large blisters on palms and soles can technically be left a bit longer
3. Do NOT aspirate blisters
4. Do not debris small or spotty blisters until they break or until 5-7 days after the burn

General approach to blisters with minor burns if treated 5-7 days after the burn:

1. Debris all blisters

General approach the BURN Team at Bayview approaches treating burns by location of the body:

1. Ear -- sulfamylon
2. Eye -- ophthalmic bacitracin
3. Face -- bacitracin
4. Rest of the body
 - A. **Bacitracin + xeroform** = **safest bet** when in doubt!
 - B. **Collagenase** is another option -- can use if the burn is **dirty**
 - C. **Silvadene** -- can be used for **super contaminated** and gross burns
 - I. Will often see the BURN team recommend this for deep partial thickness or third degree burns
 - II. In general, do not use silvadene if it's an indeterminate burn

Silvadene has broad gram-positive and gram-negative antimicrobial spectrum includes β -hemolytic streptococci, Staphylococcus aureus and Staphylococcus epidermidis, Pseudomonas spp., Proteus spp., Klebsiella spp., Enterobacteriaceae, Escherichia coli, Candida albicans, and possibly herpesvirus hominis.

Aloe vera cream is commercially available in a 50% or higher concentration with a preservative. It exhibits antibacterial activity against at least four common burn wound pathogens: Pseudomonas aeruginosa, Enterobacter aerogenes, S. aureus, and Klebsiella pneumoniae.

Cardiovascular Emergencies

ACS (STEMI/NSTEMI) – EB Guidelines

- Show Attending ECG, Attending will call H.A.T
- **ASA** 324mg or 600mg PR + **Ticagrelor** 180mg
- **Heparin** bolus: 5,000 U/mL IV
- Analgesia: **Morphine** 2-4mg IV (avoid if RVF), or **NTG** 0.4mg ODT q5min x 3 (avoid in RVF), or **Fentanyl** mcg (likely safest)

HYPERTENSIVE EMERGENCIES

Acute Aortic Dissection (HR < 60, SBP < 120)

HR > 60, IV **esmolol** 500mcg/kg IVP bolus, then 50mcg/kg/min infusion q5-10min + re-bolus
Max rate: 300mcg/kg/min

Also can consider:

Labetalol 10-40mg IV bolus → 40-80mg q10min
Max rate: 300mg max
Pain control: **Fentanyl** 50mcg IV

If SBP > 120 after HR control,* consider:

1. **Nicardipine** 5mg/hr IV gtt, 2.5mg/hr q5min
Drop to 3mg/hr when desired BP obtained
Max rate: 15mg/hr
2. **Nitroprusside** 0.1 mcg/kg/min titrate
Max rate: 10mcg/kg/min

*Arterial line BP monitoring

HoTN/Shock: IVF bolus MAP > 70mmHg
+ emergent uncrossed transfusion or MTP
+ **Norepinephrine** gtt

Hypertensive Encephalopathy

Lower MAP 10-20% in 1st hour, 25% over 24 hr

1. **Esmolol** or **Nicardipine** or **Labetalol**
2. **NTG** 5-400 mcg/min gtt (consider C/Is)

*Other options available, too. Consult pharmacy

SCAPE / Flash Pulmonary Edema

1. BiPAP (10/5/100%) PRN. If delayed, can use BVM w/ PEEP valve + NC 15L O₂
 2. **NTG** (Vaso > Veno) 1mg IV bolus (aggressive!), or 100mcg/min → increase to Max 500 mcg/min gtt
- REMEMBER: 1 **NTG** ODT (0.4mg) = 400mcg!
 - If HoTN develops, reduce/stop NTG, consider 250mL IVF
 - Consider **enalaprilat** 1.25mg IVP vs benzos

Cocaine/Amphetamine End Organ Damage

Midazolam 5mg IV/IM, re-dose PRN. Avoid BB.
- **Phentolamine** 5mg q5-10min, or
- **Nitroprusside** (above). If BB needed, wait until a-blockade established, then consider **Esmolol**

Atrial Fibrillation w/ Rapid Ventricular Rate

Unstable: HR>120 -150 w/ signs of instability, consider A.C.

1. TREAT UNDERLYING CAUSE 1st IF STABLE!
2. SHOCK if unstable, or
 - **Amiodarone**: Load 150mg IV in 10min → 1mg/min (6h) → 0.5mg/min (18h)
3. HR > 150-160 (if meds works, transition to PO)
 - BP OK: **Metoprolol** 2.5-5mg IV q10-20min x3
 - BP low: **Esmolol** Load 500mcg, then 50mcg/kg/min IV, titrate HR (to 300mcg/kg/min max)
- **X** BB: **Dilt** 20 → 25mg IV, followed by 5-15mg/min, to HR
- **X** BB/CBB (asthma/COPD, ADHF) – **Amiodarone as above**

Consider IV Magnesium 3-4g over 1 hour for all patients.
After this, consider starting infusion at 1g/hr.

LVAD Resuscitation: Basics + ABCDEFPx2

Basics

- MAP goal 65-90 mmHg, must < 90mmHg
- BP measurement: manual cuff + doppler
- Assess: Flow, Power, Speed, Pulse Index, Device Type
- Pre/afterload dependent, very RVEF dependent
- INR must be 2-3, even 1.9 can be bad
- 2017 AHA ACLS when to start compressions:
MAP < 50, ETCO₂ < 20, **X** restart LVAD

ABCDEFPx2

1. Auscultate: Is there a hum? Yes = good; No = bad
2. Battery -- make sure it's plugged in
3. Controller -- check for alarms
4. Driveline -- check device type, evidence of infx/damage
5. Echocardiogram
 - A. BIG RV + BIG LV = PUMP AND VALVES (pump failure, pump clot, valve d/o)
 - a. Tx: Heparin, antiplatelets, thrombolytics
 - B. BIG RV + small lv = RIGHT SIDED PROBLEM (RHF, STEMI, pHTN)]
 - a. If LV to outflow cannula size ratio 1:1 = risk for suction event
 - b. Tx: IV fluids, ECG, consider inotropes
 - C. small rv + small lv = LOW CIRCULATING VOLUME (hypovolemia, GIB, sepsis)
 - a. Tx: IVF, ?blood transfusion, abx
6. Function of LVAD (parameters) -- SEE BELOW
7. Power, Pulsatility, ET CO₂ > 50 mmHg, if not, consider starting compressions

	HeartWare	HeartMate 2	HeartMate 3
Flow (L/min)	4-7	4-8	3-6
Speed (RPM)	2,500-3,000	8,600-9,800	5,000-6,000
Power (W)	3-7	6-7	3-7
Pulsatility*	2-4	4-6	1-4

*L/min flow/time waveform pulsatility from trough to peak

ENDOCRINE EMERGENCIES

Thyroid Storm

- extreme agitation: **Precedex**, or **Benzodiazepines**
- hyperthermia: **APAP**, active cooling
- 1. **X** effects: propranolol 1mg IV q10-15min until HR < 100; → 60-120mg PO q4-6hr, OR **Esmolol** 500mcg/kg → 50-300mcg/kg/min
- 2. **X** synthesis: **Methimazole** 20-25mg PO q4hr, or **PTU** 500mg-1g PO → 250mg PO q4hr
- 3. **X** conversion: **dexamethasone** 2-4mg IV q6hr
- 4. **X** release w/ Iodine > 1hr after STEP 2
- 5. **X** enterohepatic: cholestyramine 4g q12hr

DDAVP Clamp for Overcorrection of Serum Na

- 2mcg IV, then q6-8hr, < 1L fluids, no hypotonic fluids
- To increase Serum Na: 3% NS or (D5W + DDAVP)
- To decrease Serum Na: D5W or PO water (calculate)
- Maintain Na: give neither 3% or D5W
- Note: people retrain every drop of free water (D5W)*

Myxedema Coma

- **T4 (levothyroxine)** 200-400 mcg gtt, 100 mcg/d
- consider **T3 (liothyronine)** 10-25 mcg IV q12h must wait till TSH/T3/T4 labs comeback
- **Hydrocortisone** 100mg q8h

DKA +HHS

- *follow the EB Guidelines in EPIC closely for management*
- DKA: BG > 250, Ketonuria/emia, pH < 7.3, HCO₃ < 15
- HHS: BG > 600, no/small ketones, pH > 7.3, HCO₃ > 15
- don't forget euglycemic DKA if patient on SLGT2i
- Give fluids and wait for potassium before starting insulin gtt*

Hypoglycemia

- if mild symptoms, PO carbohydrates
- if moderate-to-severe symptoms, D50W IV +/- D5/10W gtt

Pulmonary Emergencies and O₂ Delivery Devices

Massive Pulmonary Embolism

1. 100mg IV **tPa** in 2h, if unstable 10-20mg IV followed by 80-90mg gtt over 2h.
2. **Heparin** 5,000U IV
- *Arterial line, FiO₂ to SpO₂ > 90%
- *MAP > 65mmHg, titrate **Norepi** cautiously, avoid big bolus
- *Bedside #POCUS for RVF / clot-in-transit
3. Cardiac Arrest, follow ACLS Adjuncts #7.

Severe (or Status) Asthma / COPD

1. Continuous albuterol nebulizer (0.083%)
2. HFNC, or NRB w/ **albuterol** (COPD 88-92%) BiPAP 10/5 (titrate IPAP PRN)
3. **Ipratropium bromide** 0.5mg in 20min x3
4. **Epinephrine** 0.3mg 1:1,000 SC q0.5-4h x3, or **Terbutaline** 0.25mg SC q20min x2 (TnI), or **Epi** 0.25 mL IV 1:10,000 & flush (25mcg)
5. **Methylprednisolone** 125mg IV q6h, or **Dexamethasone** 0.6mg/kg (Max 18mg)
6. **MgSO₄** 2g IV in 20min
7. IV fluids 30cc/kg bolus (peri-intubation)
8. **Ketamine** 0.1-0.5mg/kg IV (7-35mg), then IV infusion of 0.5mg/kg/hr for 3hrs
9. **Heliox** (Helium:O₂: 80:20, 70:20, 60:40)
10. Intubate w/ **Ketamine** or **Etomidate**, prepare for peri-intubation arrest (2nd pocket card)
11. Mechanical Ventilation (see chapter), Pplat < 30mmHg, consider manual chest decompression, disconnect ETT (exhalation)
12. Inhalational anesthetics (anesthesiology) and/or ECMO (consult CT surg)
 - *if cardiac arrest, proceed to ACLS
 - *consider PTX, b/l finger thoracostomies

O₂ Delivery Devices for Hypoxemic Failure

1. Nasal Cannula
 - a. Flow 1-7 LPM, FiO₂ 20-45%
 - b. Each 1L of O₂ ~ 4% FiO₂ above room air
2. Simple face mask
 - a. Flow 6-12 LPM, FiO₂ 35-60%
3. Venturi mask
 - a. Flow 2-12 LPM, FiO₂ 24-60%
4. Non-rebreather
 - a. Flow 10-15 LPM, FiO₂ 80-100%
 - b. Flush rate > 40 LPM
5. Humidified High Flow Nasal Cannula
 - a. Flow: up to 60 LPM, FiO₂ 30-100%
 - b. You get a few mmHg of PEEP with higher settings

Delivery Devices for Mixed Hypoxic/Hypercarbic Failure

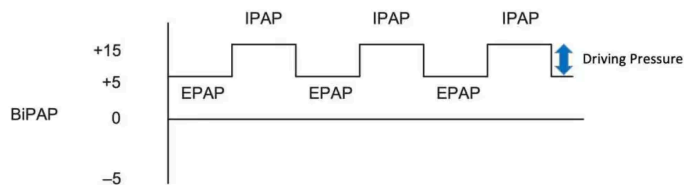
General approach to BiPaP titration for CHF in the ED:

- Start: iPAP 10cm / ePAP 5cm
 Increase: iPAP 15cm / ePAP 10cm
 Increase: iPAP 18cm / ePAP 14cm
- Mean airway pressure (MAP) improves oxygenation
 - ramp of the ePAP aggressively to achieve high MAP
 - could also just use CPAP (ePAP): 5-15cm

General approach to BiPaP titration for all else in the ED:

- Start: iPAP 10cm / ePAP 5cm
 Increase: iPAP 15cm / ePAP 5m
 Increase: iPAP 18cm / ePAP 5cm
- Driving pressure (iPAP-ePAP) supports work of breathing
 - ramp up iPAP to increase the driving pressure

Optimal BiPAP settings ??

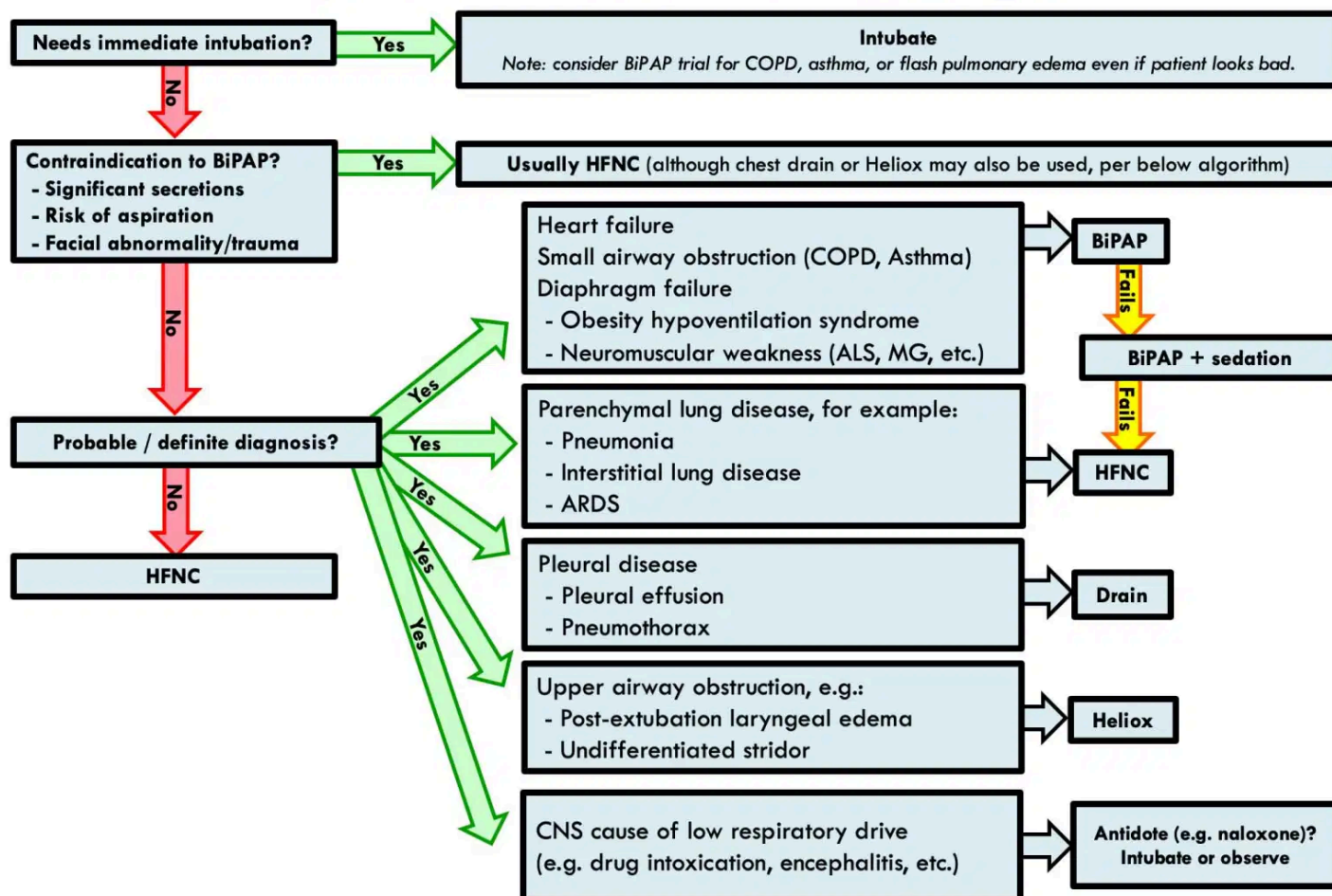


	Expiratory pressure (EPAP)	Driving pressure = (IPAP - EPAP)
Benefit	- Improves oxygenation (recruitment) - Treats heart failure (reduction of preload & afterload) - Can balance out intrinsic PEEP in patients with COPD or asthma.	- Provides mechanical support for breathing. - Improves ventilation (i.e. increases tidal volume and minute ventilation).
Situation where this is <i>most</i> beneficial	- Heart failure - Hypoxemic respiratory failure - Atelectasis	- Obesity hypoventilation syndrome - Neuromuscular weakness - Diaphragmatic fatigue
Risk	- Could impair exhalation (decreases exhalatory pressure gradient). - Excess EPAP will limit the amount of driving pressure which can be used (since the maximal IPAP is limited to ~20 cm).	- Could increase the tidal volume too much, leading to barotrauma. - Excess driving pressure will limit the amount of EPAP which can be used (since the maximal IPAP is limited to ~20 cm)

-Internet Book of Critical Care, by @PulmCrit

Respiratory Support Decision-Making

Cognitive schema for selecting a mode of respiratory support



The Internet Book of Critical Care, by @PulmCrit

Rapid Sequence Intubation and Post-Intubation Management

Information provided below is the general approach / medications used at JHH and Bayview

Rapid Sequence Intubation at JHH

Prepare:

- LEMON (predicts difficult intubation)
- SOAP ME (what's needed to intubate)
- framework for failed intubation (back-ups, cric, etc.)

Sedation (Name, Wt Based, Dose, Half Life)

- Etomidate** 0.3mg/kg (20mg), 7-15min
↓ ICP, adrenal suppression, ½ dose HoTN
- Propofol** 1-2mg/kg IVP (100-140mg), 10-15min
↓ ICP, can lead to HoTN
- Ketamine** 1-2mg/kg IV (100mg), 10-15min
↑ HR, ↑ SBP, ↑ ICP, ↑ IOP, laryngospasm
Caution w/ patients w/ known CVD
- in shock/trauma, ½ dose prevent sympatholysis

Paralytics (Name, Wt Based, Dose, Half Life)

- Succinylcholine** 1-2mg/kg IVP (120mg), 10min
Contraindication: pts at risk for hyperkalemia or NMD
↑ ICP, ↑ IOP, ↑ IGP, ↑ K+ (0.5-1 mEq/L)
- Rocuronium** 1-1.2mg/kg (70mg, 150mg), 30min
Less cardiovascular effects
Reversal: **Sugammadex** 2-8mg/kg

Post Intubation Management at JHH

Name of Medication / gtt rate / push dose

- Propofol** 5-100mg/kg/min IV (0.5-2mg/kg IV)
– can start w/ 20-50mg bolus based on hemodynamics
– preferred, and it's OK to start low dose Norepi!
- Midazolam** 0.5-20mg/hr IV (1-5mg IV)
– can start w/ 2-3mg bolus
- Fentanyl** 12.5-400mcg/hr IV (0.04/0.2 mg/kg)
– can start w/ 50mcg bolus (1mcg/kg)
- Ketamine**: 0.1-0.5 mg/min (or do 2-6 mg/kg/hr)
- Vecuronium** 0.1mg/kg.
– Reversal: **Sugammadex** 2-8mg/kg
- Cisatracurium (Nimbex)**: 0.15 - 0.2 mg/kg IV
– liver / renal failure w/ ARDS

Vent Management (Volume Assist/Control)

- major settings: TV/RR, and PEEP/FiO2
- good general purpose, lung protective settings
- set volume w/ each breath, pt triggered breaths
- must monitor Ppeak / Pplat (Pplat high, ↓ TV)
- must M.V.: auto-triggering leads to alkalemia
- match RR, TV 8cc/kg PBW, or 6cc/kg ARDS
- low PEEP, high FiO2, wean for SpO2 > 90%
- cons of this is can lead to barotrauma

Initial Ventilator Settings

	Protective (ARDSNet)	Obstructive	Acidosis
TV	6-8mL/kg (400-500mL)	6-8mL/kg (400-600mL)	10-12mL/kg (700-800mL)
RR	18/min	6-10/min → I:E 1:1-4:5	> 30 (or, pre-intubation)
FiO2	40%: titrate 88-95% O2	40%: titrate 88-95% O2	40%: titrate 88-95% O2
PEEP	5 mmHg, titrate	0 mmHg	0 mmHg
IFR	60-80mL/min	80-120mL/min	80-100mL/min

Mode	Description	Pros	Cons	Major settings / example	Monitor
VC Volume Control (a.k.a. assist control volume)	Every breath delivered (mandatory and patient triggered) is the same set volume (TV) T – time/pressure/flow, C – volume, L – volume	Good general-purpose mode; Ensures a minimum MV is achieved. Good mode for lung protective ventilation (LPV)	Requires you to monitor pressures to avoid barotrauma. (See my OnePager on ARDS for details.)	RR, TV, PEEP, FIO2 12 bpm, 450cc, +8, 60% (RR – respiratory rate, TV – tidal volume)	Pressures (Ppeak, Pplat)
PC Pressure Control (a.k.a. assist control pressure)	Every breath delivered (mandatory & patient triggered) is a set pressure (IP) for a set time (Ti) T – time/pressure/flow, C – time, L – pressure	Good for limiting pressure; may be more comfortable for select patients. Also can be used for LPV (no difference in mortality)	Requires you to monitor volumes to avoid volutrauma or hypoventilation	RR, IP, Ti, Risetime, PEEP, FIO2 12 bpm, 25 cmH2O, 0.9 sec, 0.15 sec, +8, 60% (IP – inspiratory pressure, Ti – inspiratory time)	Volumes (TV, MV)
PRVC Pressure Regulated Volume Control (a.k.a. VC+, APV, AutoFlow)	Hybrid PC mode that dynamically changes inspiratory pressure to deliver a desired volume T – time/pressure/flow, C – volume, L – volume	Guarantees TV but delivers pressure-controlled breaths; (e.g. low risk of causing VILI), which potentially may be more comfortable for patients	In patients who are struggling (e.g. high WOB) this mode will provide less support	RR, TV, Ti, Risetime, Pmax, PEEP, FIO2 12 bpm, 450cc, 0.9 sec, 0.15 sec, 30 cmH2O, +8, 60% (Pmax – maximum pressure)	Pressures & volumes
SIMV Synchronous Intermittent Mandatory Ventilation	Delivers mandatory breaths with a fixed volume but patient can't trigger (patient breaths are not the same as mandatory breaths); can use PS T – time, C – volume, L – volume	May be useful for patients with hiccups to avoid alkalemia	Seldom used; not effective for weaning; often found to be uncomfortable	RR, TV, PEEP, FIO2 12 bpm, 450 cc, +8, 60%	Pressure (Ppeak Pplat)
PS Pressure Support	All breaths are patient initiated; ventilation determined solely by patient (no backup rate). T – pressure/flow, C – flow, L – pressure	Ideal weaning mode (used in SBTs and for prolonged periods); most comfortable because it allows patient to control ventilation	Does not guarantee a rate; need to monitor to ensure adequate ventilation	PS, PEEP, FIO2 +10, +5, 40%	Volumes (TV, MV) Note that PS is above PEEP so "Ten over Five" PIP = 15cmH2O



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Airway Pearls

ASSESSING AIRWAY DIFFICULTY

Anticipating difficulty in establishing an airway in emergency patients is the first step in avoiding major complications. It helps us to think about the alternative methods. LEMON is a mnemonic to remember.

L

LOOK EXTERNALLY



Look for external markers of difficult intubation; these may include the following body habitus, head and neck anatomy (short neck), mouth (small opening, loose teeth or prominent teeth), jaw abnormalities (significant malocclusion), and beards.

E

EVALUATE 3-3-2



Can the patient fit 3 fingers between the incisors?

Is the mandible length 3 fingers from the mentum to the hyoid bone?

The distance from the hyoid to the thyroid. 2 fingers are what we are looking for.

M

MALLAMPATI



Class I and class II predict adequate oral access, class III predicts moderate difficulty, and class IV predicts a high degree of difficulty.



Mallampati - Courtesy of Jmarchin



OBSTRUCTION OR OBESITY



Conditions such as epiglottitis, head and neck cancer, Ludwig's angina, neck hematoma, foreign body or thermal injury can compromise laryngoscopy, the passage of the endotracheal tube (ETT), BMV, or all three.

N

NECK MOBILITY



Neck extension is the most important maneuver, and simple extension may be as effective as the "sniffing" position in achieving an optimal laryngeal view. Neck mobility can be significantly reduced in patients with trauma (cervical collar) or the elderly and those with arthritis.



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Successful Airway Preparation (SOAP ME)

Mnemonic – “SOAP ME”	
Suction	• Yankauer suction placed under the mattress on the right side, head of bed (x2 if GI bleed, vomiting, or lots of secretions)
Oxygen	• Bag valve mask (with PEEP valve) ready • Non-rebreather mask on patient (O₂ wide open) • Nasal cannula on the patient (with 15L O₂) during RSI
Airways	• Oral, nasal airways • 2 ETT (expected size & one size below) w/ balloons checked, & stylet straight to cuff • 1 ETT ready for video laryngoscopy (curved stylet needed) • Rescue devices (Laryngeal mask airway, scalpel, etc.)
Positioning	• Ear-to-sternal notch position • Ramped if obese
Monitors & Meds	• Continuous monitoring devices • RSI Meds: Drawn up in carefully considered doses, labeled syringes ◦ Sedative (Ketamine, etomidate, etc.) ◦ Paralytic (rocuronium, succinylcholine) • Post intubation sedation meds (Propofol, fentanyl, etc)
EtCO₂ & other Equipment	• Continuous EtCO₂ or at least color-change device to confirm successful intubation • Bougie placed under the mattress next to yankauer suction • 2 laryngoscopes (MAC 3 & 4) with lights checked. • Video laryngoscope plugged in & turned on

ETT SIZING / DEPTH

- Women: 7.0 ~ 21cm at the lip for an average sized female (can scale up or down with patient size)
- Men: 7.5 mm ETT / ~ 23cm at the lip for an average size male (can scale up or down with patient size)
 - For 8.0 and larger tubes: available in the pyxis
- Pediatric: (16 + Age in Yrs) / 4
- Bronchoscopy and Ventilation no longer depend on ETT size, and can be exchanged before procedure

Physiological Difficult Airway / Post-Intubation Complications

Things that could kill your patient during intubation if you do not optimize beforehand:

1. Hypotension / RV Failure: consider giving fluids or pressors
2. Hypoxia: have a pre-oxygenation plan
3. Acidemia: make sure to provide adequate ventilation before and after intubation
4. ICP issues: consider pre-medication or BP control

Post-intubation hemodynamic collapse (from <https://onepagericu.com>)

HEMODYNAMIC COLLAPSE POST INTUBATION

POSITION – esophageal, R mainstem? → **1. verify placement**
PEEP – Auto-PEEP from breath-stacking? → **2. break circuit, use BVM**
PRELOAD – loss of preload? hypovolemic? → **3. fluid bolus**
TONE – loss of sympathetic tone → **5. start/increase pressors**
TENSION – development of tension PTX? → **4. chest US, consider needle**

Troubleshooting the Ventilator in the ED

Trouble Shooting the Vent in the ED

High PIP (Ppeak) → Try in-line suctioning

Perform inspiratory hold maneuver

High Ppeak, Normal Pplat = Resistance Issue

Tube issue/biting, mucus plug, bronchospasm

High Ppeak, High Pplat = Compliance Issue

Parenchymal (ARDS, Edema)

Abdominal (compartment syndrome)

Chest Wall (TLSO, Burns, Fentanyl Chest)

Neuromuscular dysfunction

Mainstem Intubation, PTX vs tPTX

Elevated Baseline = Auto-PEEP

D.O.P.E.S. like D.O.T.T.S. (Hypoxia/Crashing)

Differential: displaced tube, cuff leak/rupture, barotrauma, auto-PEEP, PTX, mainstem tube, ball/valve or ETT obstruction, etc.

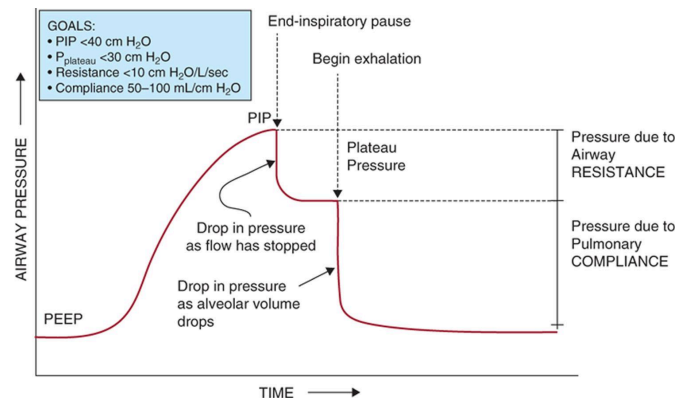
Step 1: Is the decompensation secondary to D.O.P.E.S.?

- Displaced ET tube / ET tube cuff not inflated or has a leak
- Obstruction of ET tube
- Pneumothorax
- Equipment malfunction (disconnection of the ventilator, incorrect vent settings, etc.)
- Stacking (breath stacking / Auto- PEEP)

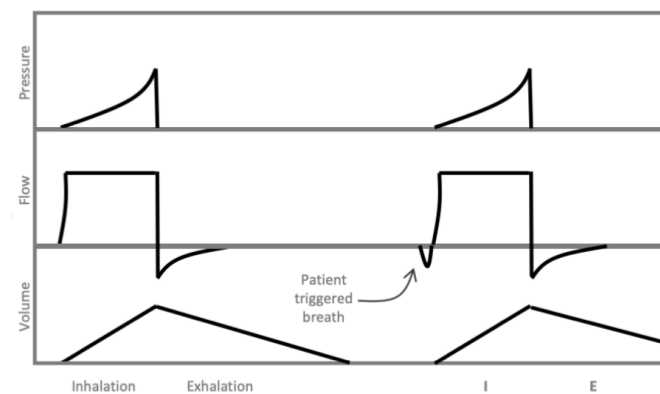
Step 2: Fix the problem with D.O.T.T.S.

- Disconnect – Disconnect patient from the ventilator (should be the last step and only if nothing is working!)
- Oxygen – Oxygenate patient with a BVM and feel for resistance as you bag
- Tube position / function – Did the ET tube migrate? Is it kinked or is there a mucus plug?
- Tweak the vent – Are the settings correct for this patient?
- Sonogram (ultrasound) – Sonogram to look for pneumothorax, mainstem intubation, etc.

Source: UMEM Educational Pearls



PEEP = Positive end-expiratory pressure (as set on ventilator)
PIP = Peak inspiratory pressure



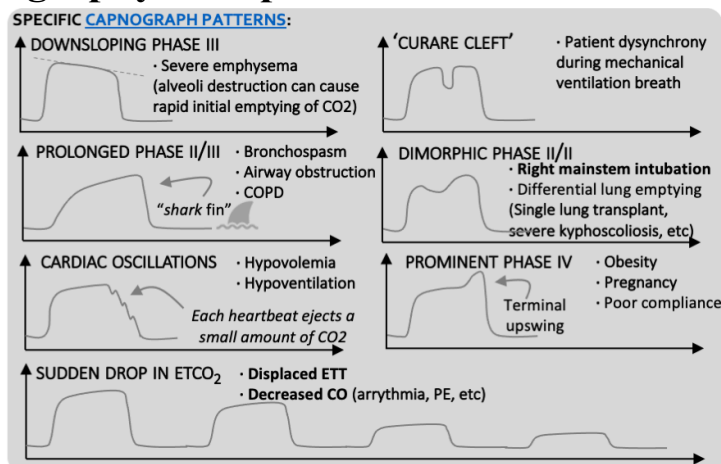
ABG: pH / PCO₂ / PaO₂ / HCO₃

VENTILATION

OXYGENATION

SETTINGS: RR Tv PEEP FiO₂

Capnography Interpretation (from <https://onepagericu.com>)



Tracheostomy Disasters

Algorithm taken from the *Resuscitation Crisis Manual* and www.tracheostomy.org/uk.

Respiratory Distress	Significant Bleeding (TIF)
1. Apply 100% oxygen to the face and tracheostomy. 2. Remove inner cannula and any attached devices. 3. Attempt to pass a suction catheter; suction airway. 4. If the suction catheter does not easily pass or EtCO2 waveform is absent, <i>deflate the cuff and remove the tracheostomy tube.</i> 5. If upper airway patent, use BMV, SGA or intubate to maintain oxygenation. 6. If not, ventilate via the stoma using a pediatric facemask or #2 LMA. 7. Replace the tracheostomy tube* or intubate the stoma. 8. Assess patency of large airways w/ fiberoptic scope. 9. If there is no obstruction, search for other causes.	1. Call for help and delegate tasks accordingly. 2. With a <i>cuffed</i> tracheostomy tube, <i>overinflate the cuff.</i> 3. If the tube is <i>uncuffed</i>, or overinflation unsuccessful, intubate orally and only then remove the tracheostomy tube. 4. Ensure cuff is distal to bleeding to limit aspiration of blood. 5. Insert finger through stoma into pretracheal space to compress artery against posterior aspect of sternum. Your finger will need to be slightly rotated to the patient's R shoulder. 6. Order blood products to the bedside. 7. Notify the surgical team and prepare for urgent OR transfer.

*In general, do not replace a tracheostomy that is less than 7 days old. If the patient is acutely dying before the ENT / Surgery team arrives, it's time to break the rules to save a life. For this, place the **bougie** through the tracheostomy tube that is still in the stoma. Next, remove the tracheostomy tube. Now the bougie is through the stoma and likely in the trachea. Advance a small endotracheal tube over the bougie, bag the patient, then connect to the ventilator.

Neurological and Psychiatric Emergencies

Seizures

IV: Ativan 0.1mg/kg IV (4mg)
Consider Midazolam drip at 0.1-0.4mg/kg/hr if intubated
No IV: Midazolam 0.2mg/kg IM (5-10mg)
AED IV: Keppra 20mg/kg or Valproate 20mg/kg or Phenobarbital 20mg/kg in 5-10min

Status Epilepticus (treatment based on ddx)

- Keppra 60mg/kg IV (max 4.5g) in 10min
or load the remainder 40mg/kg if you gave 20mg/kg
- Eclampsia/EtOH: Mg 6g IV 15min, 2g/hr gtt
If no IV access, Mg 10g IM (5g per buttock)
- TCA/Salicylate: NaHCO₃ 1mEq/kg IV bolus x1
- HypoNa: 3% NaCl 150mL over 20min x2 doses
Increase by 3-5mM (goal 4-6mM)
Crash Cart: 50cc 'Bicarb Amp' (8.4%)
→ osmolarity of 6% NaCl = 3% x2 = 3mM Na
- HypoCa: Calcium gluconate 3g IV bolus q5min
- INH: Pyridoxine 5g IV over 5min
- Cocaine/MDMA: benzodiazepines, as above
- EtOH: as above, plus benzodiazepines, as above

Consider Intubation if no control:

Propofol 3-5mg/kg bolus, 1-1.5mg/kg/h, or Pentobarbital, Versed gtt, etc.

Increased ICP + Herniation

1. Don't be a hero, call neurosurgery
2. Optimize oxygenation, ventilation, BP
3. Neuroprotective protocol for intubation
Avoid HoTN, hypoxemia, hypo/hypercapnia
Etomidate or Ketamine (1-2mg/kg)
4. HoB to 30 degrees, head midline
5. Maintain PaCO₂ at 35-40mmHg, use ETCO₂
6. Short-acting Rx for pain, agitation, seizures
7. If signs of herniation, do the following:
 - A. Hyperventilate to PaCO₂ of 30mmHg
 - B. Osmolar therapy via CVC
NS 30mL 23.4% "bullet", 500mL 3%,* or NaHCO₃ 2-3 50 cc 'amps' IV*
Mannitol 1-1.5mg/kg
 - C. Arrange immediate operative intervention

*does not need central access to administer

Stroke Blood Pressure Parameters

Ischemic Stroke: on REPEATED measurements

If not giving tPa: SBP < 220/120

If giving tPa:

- A. pre-tPa SBP < 185/110
- B. post-tPa SBP < 180/105 for 24h

Hemorrhagic Stroke

- SBP < 140 (160mmHg if SBP > 220) & no suspicion of ICP
- if elevated ICP, keep CPP > 60mmHg (50-70)
CPP = MAP - ICP; assume ICP = 20, so keep MAP > 90 !!

Treatment:

- Nicardipine IV (2.5 to 15mg/hr, start at 2.5mg/hr), or Labetalol IV 10mg q5min PRN x3
- Levetiracetam 20mg/kg IV (~ 1g prophylaxis)
- Non-traumatic: Nimodipine 60mg PO/NGT q4h

Agitation / Psychosis

Primary Known Psychiatric History

- Zyprexa 5mg ODT, 10mg IM
- Droperidol 5-10mg IM, 2.5-5mg IV 2min
- Versed/Haldol 5mg/5mg IM
- consider B52 IM, may not need Benadryl

Intoxicated vs Undifferentiated:

- Midazolam 2.5/5mg IM, or
- Lorazepam 2mg IM
- Ketamine 2-5mg/kg IM (Max 500mg)
- consider Haldol / Droperidol for rescue

Delirium

- Haldol 2.5/5mg IM, Zyprexa 5mg IM

PO Treatments

- Zyprexa 5mg ODT, Risperdal 2mg M-tab
- Haldol 1/5mg, Ativan 0.5-2mg

Pharmacy Notes

- Max dose Haldol: 20mg/24hr
- Max dose Zyprexa: 30mg/24hr
- Avoid IM Zyprexa + Benzo → HoTN (admin 60min apart)
- ½ dose for geriatric patients

Postpartum Hemorrhage

Remember the 4 T's: *Tone* (70%), *Trauma* (20%), *Tissue* (10%), *Thrombus* (1%)

Tone (atonic uterus), *Trauma* (lac, hemorrhage, inversion, rupture)

Tissue (retained products, invasive placenta), *Thrombus* (coagulopathy)

Step 1. Control the Bleed	Step 2. Increase Uterine Tone
1. Deliver Placenta, very slowly and carefully 2. r/o vaginal trauma and use clamps for bleeds 3. Bimanual Uterine Massage + Foley Catheter (empty bladder) 4. if uterine inversion, use Johnson / Harris maneuvers *if increased uterine tone and massage is not resulting in relaxing, can consider Terbutaline 0.25mg IV or MgSO4 2g IV	(Stepwise approach, can start with any of these) <i>Most of these can cause headache, nausea, vomiting</i> 1. Pitocin 10U IM, then 20-40U IV in 500cc-1L lactated ringers -- IVP can cause hypotension -- prolonged use can cause hyponatremia 2. Misoprostol (Cytotec) 0.6-1 mg PR, SL, PO -- transient fever 3. Methergine 0.2mg IM, 0.2mg PO q2-4h -- Avoid: hypertension, preeclampsia, cardiovascular disease -- severe hypertension if given IV 4. Hemabate (PGF2a) IM 0.25 mg q15-90min, max 8 doses -- or, Intramyometrial 0.25 mg -- avoid in asthma -- caution w/ hypertension, liver disease, pulmonary or cardiac disease
Step 3. Active Resuscitation	
1. Take blood for MTP, consider activating MTP 2. Consider TXA 1000mg IV 3. If all else fails and unable to go the OR immediately, consider -- Bakri balloon -- REBOA catheter	

Ophthalmology: Acute Angle Closure Glaucoma

Tonometry is diagnostic if IOP is >21 mm Hg and symptomatic; however, IOP is often in the range of 40-100 mm Hg. The goal of treatment is to restore vision by rapidly lowering the IOP. Make sure to treat the affected eye only.

- Elevate the head of the bed to 30° to decrease IOP
- Keep patient in a well-lit room to prevent pupillary dilation
- Topical agents to reduce aqueous production: *give both Timolol and Brimonidine*
 - Timolol 0.5% 1 drop q30min × 2 (beta-blocker)**
 - exercise caution in patients with chronic obstructive pulmonary disease or asthma;
 - alternative topical beta blockers can be used if timolol is not available
 - Brimonidine 0.1%-0.2% 1 drop q30min × 2 (alpha-2 agonist)**
 - alternative topical alpha agonists can be used if brimonidine is not available
- Carbonic anhydrase inhibitor to reduce aqueous production if no contraindication (such as sickle cell disease)
 - Acetazolamide 500 mg PO/IM/IV, followed by 250 mg q6h (CAi)**,
 - can substitute w/ methazolamide 100mg if the patient has renal failure.
- Constrict the pupil to relieve the narrow angle and prevent recurrence in ED.
 - Pilocarpine 1% or 2% q15 min x 2-4 doses (acts on muscarinic receptors)**, then q4-6h
- Topical steroids can be administered to reduce inflammation but will not acutely reduce IOP.
 - Prednisolone acetate 1% 1 drop q15min × 4**
- Hyperosmotic fluids quickly lower IOP and considered if there is no response to other meds if IOP is markedly elevated
 - Mannitol 1-2 g/kg IV over 30-60 min**, watch out for diuresis!
- If medical therapy is unsuccessful, the consulting ophthalmologist will need to perform emergency surgery or laser iridotomy.

Management of Overdose (Opioid, Beta-Blocker, Calcium Channel Blocker)

Opioid Overdose Naloxone (mg): 0.04, 0.4, 2, 4, 10 IV/IM/IN - Start at 0.08mg IV x2 / 2mg IM, adjust to RR - 10-15mg max, consider alternative diagnosis - Dosing: 0.1mg/kg/dose; gtt to RR NOT mental status - on the differential is also clonidine overdose Beta-Blocker Overdose <i>Same as CCB toxicity (see right column), plus:</i> Glucagon 3-10mg IV bolus q5min → 3-5mg/h Isoproterenol 20-60 mg IV bolus → 1-20mg/min	Calcium Channel Blocker Overdose <u>Calcium (10%)</u> - Gluconate : 3g IV q10-20min, 0.06-0.12g/kg/h - Chloride : 1g IV q10-20min, 0.02-0.04g/kg/h <u>Shock</u> - Vasoplegic: Norepi 0.05-0.1 mg/kg/min IV - Cardiogenic: Epi 0.05-2.0 mg/kg/h IV <u>Insulin (high dose)</u> : 1-20 U/kg IV → 1-2 U/kg/hr <u>Dextrose</u> (10% or 25% gtt → euglycemia) - D10W 3-5mL/kg at 1.5-2x maintenance rate <u>Atropine</u> 0.5-1mg q3-5min (max 3 doses) <u>Intralipid fat emulsion (20%)</u> - 1.5mL/kg over 2-3min (100mL, 70kg pt) → 0.25mL/kg/min <u>Methylene Blue</u> 1.5-2mg/kg IVP → 0.5mg/kg/hr
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TRAUMA BASICS!

If you're new to Emergency Medicine, an Off-Service Rotator, or medical student rotating in the ED, it can be intimidating to approach the Trauma Patient. Thankfully, Advanced Trauma Life Support is pretty straightforward. Your role will likely be the Primary and Secondary Survey. When I was a medical student and Emergency Medicine Intern (me: Joshua Niforatos), I felt like I never knew what to "shout out" and say.

Thankfully, [Dr. Taylor Nichols, MD](#) (UCSF EM 2017 Alumni) put together a great **Trauma Resuscitation Script**, which you can find below. Review it before your shifts!

A: Airway

To patient = "Hi Sir/Ma'am I'm Dr. Nichols, there's going to be a lot going on so try to just pay attention to me right now. Can you tell me your name"

To nurse = "Patient is phonating"

To patient = "Open your mouth" - inspect for blood / fluid, foreign bodies

(also, if they follow this command, you are already starting to thing GCS in your head as you already know they are following commands)

To nurse = "No blood or foreign bodies"

- Look at and feel the trachea to assess position

To nurse = "Trachea midline"

B: Breathing

To patient = "I'm gonna push on everything and you tell me if it hurts" - begin with pushing down their chest, push upper and lower chest wall anteriorly and then push on chest wall laterally. **To nurse** = "No chest wall tenderness or crepitus"

To patient = "Take a deep breath" - feel the chest rise with hands still on chest

To nurse = "Bilateral chest sounds; Symmetric chest rise"

- If you have a significant suspicion for pneumothorax, such as by EMS report, any penetrating trauma to torso or abdomen, broken ribs, asymmetry of chest rise, then listen, but otherwise I skip it - it's tough to hear anyways if the noise level starts to creep up

* If the mechanism is severe, to expedite your single pass, consider continuing down from the chest wall to press on the abdomen and then lateral compression of the pelvis at this point to begin into "C." If not, defer this to secondary as below.

C: Circulation

- Remember, your nurses are working on IV access, usually on the right arm

- Feel the L radial pulse. You can ask the nurse if there was a strong R radial and report that as well.

To nurse = "Left radial 2+ / Right radial 2+, L femoral 2+ / Right Femoral 2+"

- Direct someone to feel for DP pulses and ask for a report when task completed. Call out findings. - Look at the monitor. Call out vitals when up.

To nurse = "Blood pressure is X/Y. Heart rate is Z."

Questions:

- 1) What do you have for access? Do you need more access - (think about mechanism and vitals, if unstable get more large bore IVs or consider a Cordis introducer. Remember two or more 16G IVs or higher is at least as fast as a Cordis).
 - 2) Do you need a FAST? - (Remember, a FAST is indicated for abnormal vitals, despite mechanism, seat belt sign, etc. Also remember that a FAST is a static data point, so continue to repeat the FAST if vitals remain unstable).
 - 3) Do you need to start volume resuscitation → volume resuscitation should often be with blood in trauma. (911s will not have blood in the room, so call for it early. 900s will have blood in the room already, and you can call for more or consider activating massive transfusion protocol to have additional blood products, including PRBC, FFP, and platelets immediately. Remember to continue blood resuscitation in a 1:1:1 ratio)
- Assign tasks to appropriate people as needed

D: Disability

- Evaluate the pupils.

To nurse = "Pupils 3 to 2 bilaterally."

To patient = "Give me a thumbs up in both hands." "Wiggle your toes on both feet" To nurse = "Moving all 4s"

To patient = "Tell me the date today." "Tell me where we are right now." (If they don't know, then I go to "What kind of building are we in?" and they should at least be able to come up with "hospital." Be specific and give commands)

To nurse = "GCS 14, -1 for confusion" or consider calling out the breakdown "GCS 14 - E4, V4, M6"

E: Exposure/Environment

Exposure = look where you can't see. Remove or cut off clothes as needed. Look everywhere. Environment = consider the surroundings, temp, people in the room, etc. Now that they're naked and shivering, get someone to grab some blankets from the warmer.

Once you have exposure of the patient, roll them and assess the back:

To patient = "We are going to roll you onto your side. Cross your arms across your chest. Don't try to roll, we will do all of the work. You may feel like you are going to fall. Don't worry, we won't let that happen. All I want you to do is say 'yes' or 'no' if you have pain where I push. Do NOT shake your head."

- Assign people to roll / hold C spine / hold injured extremities. Roll onto the unaffected side if there are injuries. Roll on the count of the person holding C-spine.

- Inspect posterior scalp, back, posterior aspect of lower extremities.

- Palpate over C / T / L / S spine - (though you already assessed C spine tenderness)

To nurse = "Posterior scalp and back atraumatic. No tenderness, step-offs, or deformities to C/T/L/S spine"

** If the trauma is severe enough, the clothes will be cut off, so make one pass before going straight to CT or OR. Roll the patient and get a quick assessment of the back of their head

Question:

- 1) Does this patient need a rectal? If penetrating trauma, assessing for gross blood. If concern for neurologic findings, assessing for rectal tone.

- Veteran move = double glove and have lube packet at wrist between two gloves If yes:

To patient = "We need to do a quick rectal exam because of X. You are going to feel some pressure in your bottom. Take a deep breath." Perform rectal. "Ok, squeeze down." This is where you're assessing tone.

To nurse = "Normal tone. No gross blood."

F: Fingerstick

- always get a glucose, doesn't matter how you do it or how you remember to include it in your algorithm, a glucose is a part of your primary survey. EMS often checks a glucose and will tell you that number in their report.

To nurse = "Fingerstick is X from EMS" if you remember. Or ask to have the nurse recheck. We will often get a VBG in trauma patients, which will also have a glucose level.

* (Can consider as part of "D" as well, though keeping separate help to ensure that you won't miss this step.)

Secondary:

Then do your secondary survey and just go head to toe:

To patient = "Ok, I'm gonna go head to toe and check everything. If I push on anything that hurts, tell me" - Check anterior scalp and forehead

To nurse = "Scalp atraumatic"

- If facial trauma, look in nares for septal hematoma, assess for bony tenderness, mobility of maxilla, mandible, dental trauma.

To patient = "Open and close your mouth, do your teeth feel like they are lining up normally?" To nurse = "Face atraumatic, no dental malalignment"

- Check TMs or assign someone to check, particularly to check side opposite you so you don't have to walk around the patient, and continue while task is being completed

To nurse = "TMs clear bilaterally"

To patient = "Ok, I'm going to take this collar off, but you have to hold your head still."

- Have someone hold C-spine or if by yourself, hold the forehead stable, open the front of the collar. - Inspect the anterior neck

To nurse = "No anterior neck trauma."

To patient = "Tell me if you have any pain right where I push."

To nurse = "No C-spine tenderness, step off, or deformity."

- Put the C-collar back on
- Listen to the lungs
- Press the anterior and lateral chests
- Continue to work down and press over abdomen

To nurse = "Abdomen soft, non-tender"

- Assess the pelvis. DO NOT GIVE DOWNWARD PRESSURE
- you don't want to open an open book fracture. Apply lateral pressure over the greater trochanters. You're not looking for the iliac wings here. If it is not stable, stay there and ask for a pelvic binder.

To nurse = "Pelvis stable"

To patient = "Tell me if anything hurts on your arms or legs"

- Take left arm and palpate over arm, elbow, forearm, and wrist. Range all joints.
- Take right arm and palpate over arm, elbow, forearm, and wrist. Range all joints.
- Take left leg and palpate femur, thigh, leg, ankle. Range all joints.
- Take right leg and palpate femur, thigh, leg, ankle. Range all joints.

To nurse = "No bony tenderness, full range of motion in all 4s"

*Also, consider asking the patient to bring arms behind head and their legs up with knees bent and feet to bed, which covers range of motion throughout.

If you have time to finish the secondary with the **AMPLE** mnemonic, ask those questions before you leave the room.

A = Allergies

M = Medications

P = Past Medical History (also add Pregnancy status in women of childbearing age) **L** = Last PO intake

E = Events leading up to injury

This may seem like a lot, especially when you're trying to run through this all quickly. Once you practice a few times and get your tasks into a logical order for you, you'll start to fly through the whole list. You should practice this enough that you end up being able to do this in your sleep.

Vasopressor Properties

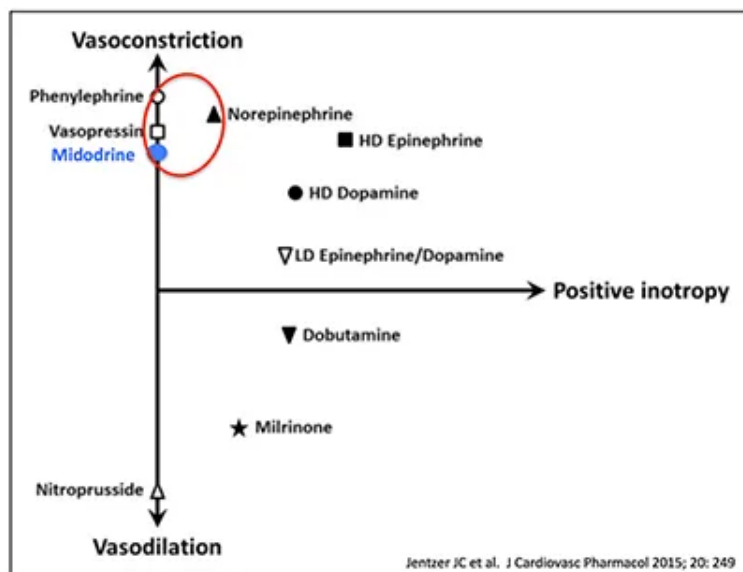
From the Internet Book of Critical Care

Rough properties of various vasopressors

Drug Typical dose range	Target	Effect on - Heart rate - Inotropy - Ectopy	Effect on systemic vascular resistance	Effect on cardiac output	Effect on blood pressure	Effect on pulmonary vascular resistance	Main uses	Safe for peripheral use?
Inodilators								
Dobutamine 2-20 mcg/kg/min	$\alpha\beta\beta\beta$	$\uparrow\uparrow\uparrow$	$\downarrow$	$\uparrow\uparrow\uparrow$	Variable	$\downarrow$	Cardiogenic shock	
Milrinone 0.375-0.75 mcg/kg/min	cAMP	$\uparrow\uparrow\uparrow$	$\downarrow\downarrow$	$\uparrow\uparrow\uparrow$	Variable	$\downarrow\downarrow$	Cardiogenic shock	
Isoproterenol 2-10 mcg/min	$\beta\beta\beta$	$\uparrow\uparrow\uparrow\uparrow\uparrow$	$\downarrow$	$\uparrow\uparrow\uparrow$	Variable		Bradycardia	Yes
Pure Vasopressors								
Vasopressin 0.01-0.06 U/min	V1 & V2	$\downarrow$	$\uparrow\uparrow\uparrow$	$\rightleftharpoons/\downarrow$	$\uparrow\uparrow\uparrow$	$\downarrow$	Distributive shock, Pulmonary HTN	No.
Phenylephrine 40-180 mcg/min	$\alpha\alpha\alpha\alpha$	$\downarrow$	$\uparrow\uparrow\uparrow$	Variable	$\uparrow\uparrow\uparrow$	$\uparrow\uparrow$	Distributive shock	Yes
InoPressors								
Norepinephrine 0-40 mcg/min*	$\alpha\alpha\alpha\beta$	$\uparrow$	$\uparrow\uparrow\uparrow$	$\rightleftharpoons/\uparrow$	$\uparrow\uparrow$	$\rightleftharpoons$	Shock (most types)	Yes, for short period with monitoring
Epinephrine 0-20 mcg/min*	$\alpha\beta\beta\beta$	$\uparrow\uparrow\uparrow$	$\uparrow$	$\uparrow\uparrow\uparrow$	$\uparrow\uparrow$		Bradycardia, cardiogenic shock, sepsis, anaphylaxis	Yes
Dopamine, low 1-4 mcg/kg/min	Dopa-R	$\rightleftharpoons$	$\downarrow$	$\uparrow$	$\downarrow$		Zombie apocalypse (absence of better agents).	Probably not
Dopamine, medium 4-10 mcg/kg/min	$\alpha\beta\beta\beta D$	$\uparrow$	Variable	$\uparrow\uparrow$	Variable			
Dopamine, high 10-20 mcg/kg/min	$\alpha\alpha\alpha\beta D$	$\uparrow\uparrow$	$\uparrow\uparrow$	$\uparrow$	$\uparrow\uparrow\uparrow$	$\uparrow$		

*Listed ranges are typically used doses in the United States, but there is no true "maximal" dose. Some countries may tend to use higher doses than others. At very high doses, pressors may lose some receptor specificity. The best dose is the dose required to keep the patient alive – in some cases very high norepinephrine or epinephrine doses may be needed.

-The Internet Book of Critical Care, by @PulmCrit



Vasopressor Demystified

From the OnePagerICU

VASOPRESSORS DEMYSTIFIED by Nick Mark MD

ONE

onepagericu.com
@nickmark

Link to the most current version →



Does this person need vasopressors?

- Consider all etiologies of shock (cardiogenic, obstructive, hypovolemic, and distributive); are other treatments (fluids, blood transfusions, inotropes, etc.) indicated?
- Is there evidence of hypoperfusion? Is BP accurate?

What is my blood pressure goal?

Use mean arterial pressure (MAP) as your goal; target MAP >65 mmHg. MAP > 60 mmHg may be equivalent to MAP > 65 mmHg in patients over 65 years old. Although higher MAP goals are generally not beneficial, some patients (neurological issues, stenosed coronaries, etc) may benefit from higher individualized MAP goals.

Which vasopressor to start?

Treat the underlying physiology (is a mixed vasoconstriction and inotropy desirable?). High PA pressures → VASO, Anaphylaxis → EPI

Push-dose versus continuous infusion

Push-dose good for transient hypotension (e.g. post intubation) or when pressor infusion is not immediately available. Two options:

- PHENYLEPHRINE** syringe (pre-mixed); administer 50-100 mcg
- EPINEPHRINE**: combine 1 cc of a 10 cc Epi syringe (1:10,000 ACLS dose) with 9 cc of saline (makes 100 mcg epi in 10 cc); administer 10-20 mcg at a time (repeat q1 minute)

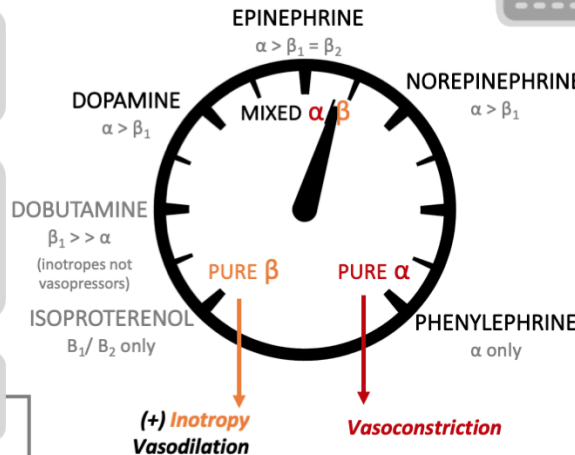
If a patient requires push dose, expect a need for an ongoing infusion.

Add additional pressors if needed

Again consider the physiology. Does this person need inotropy? Do they need blood products/fluid? Steroids? Are they acidemic? For sepsis, no benefit to starting in a particular sequence, though NE → VASO → EPI → PHENYL → DA is common.

Weaning vasopressors

Wean one pressor at a time; may be advantage to weaning VASO before NE. Some patients may benefit from adding MIDODRINE 10 mg 8 hr PO to facilitate weaning from pressors/liberating from ICU. Consider contraindications and renal dosing.



Central versus peripheral administration?

Do not wait for central access to begin pressors if needed! It is safe and effective to give vasopressors peripherally if:

- The IV is newly placed, in a larger vein (4mm or larger) and not in the hand, wrist, or antecubital fossa
 - You have a protocol to monitor for extravasation
 - You know what to do if there is extravasation (protocol)
- PHENYLEPHRINE, NOREPINEPHRINE, EPINEPHRINE can be given peripherally. (Avoid VASOPRESSIN peripherally) In the case of high dose pressors, multiple pressors, or prolonged infusion central venous access is recommended.

NOREPINEPHRINE 0.5 – 30 mcg/min (a.k.a. Levophed, 'levo', noradrenaline)
Good general purpose pressor with combined vasoconstriction and inotropy. Often used first line for septic shock.

EPINEPHRINE 1 – 10 mcg/min (a.k.a. adrenaline)
Ideal for anaphylactic shock (also has bronchodilator activity). Increases lactic acid production.

VASOPRESSIN 0.01 – 0.06 units/min
Long half-life; hard to titrate, often used at a fixed dose. Non-catecholamine pressor; Good adjunct for septic shock. Unlike other pressors it does not ↑ PA pressures but higher risk for gut ischemia.

PHENYLEPHRINE 50 – 360 mcg/min (a.k.a. Neosynephrine 'neo')
Pure α effects; good for pure vasodilatory states or in patients who cannot tolerate inotropy (tachycardia or Afib w/ RVR).

DOPAMINE 1 – 20 mcg/kg/min
Mixed effects; May be vasodilatory at low doses (hard to 'wean' off). In patients with cardiogenic shock, DA is more arrhythmogenic than NE.

Vasopressor refractory shock

Am I treating the cause of shock?

- Consider differential d/dx of shock (e.g. don't treat blood loss w/ pressors!)
- Acidosis decreases efficacy of pressors! Increase dose of pressors: EPI, NE, DA, PHENYL do not have a true max dose.

Consider stress dose steroids and alternative agents (such as methylene blue, angiotensin II) or interventions (VA ECMO)

STEROIDS

Stress Dose Steroids

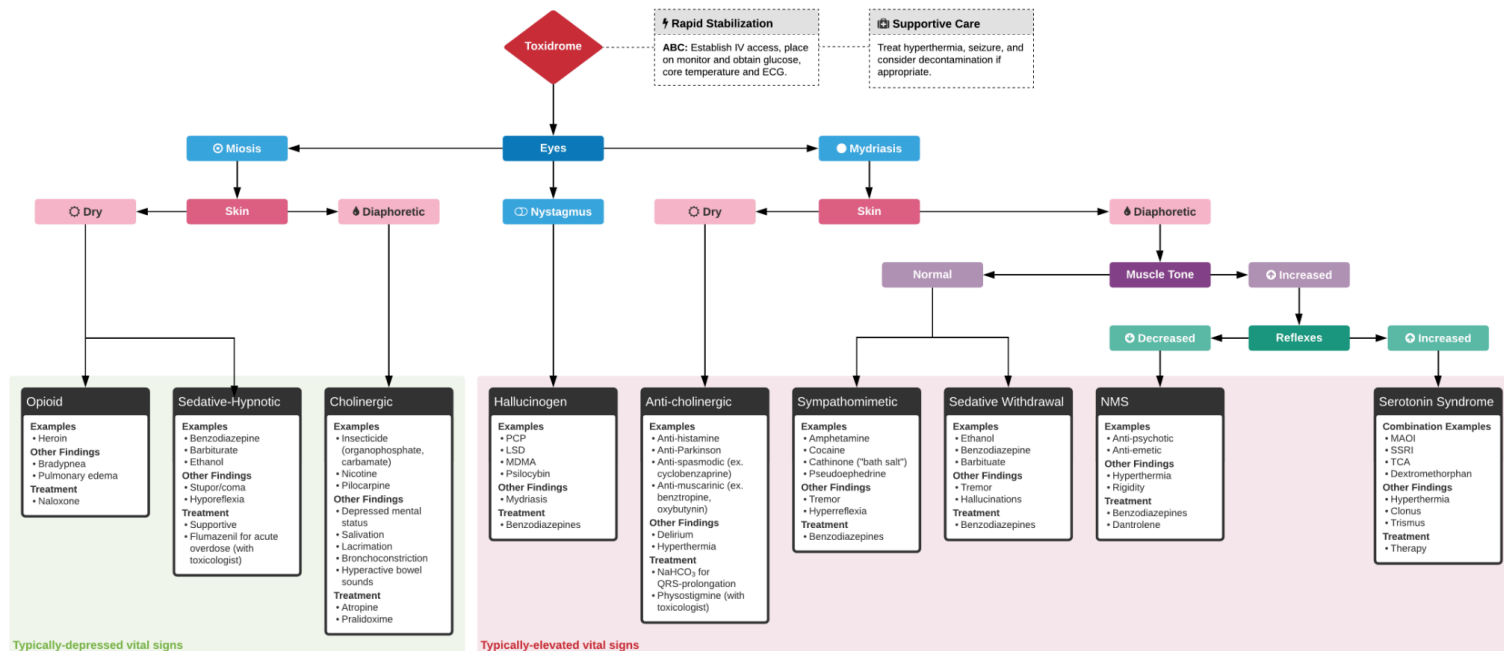
- Hydrocortisone 50 mg q6 hrs IV
- Wean over days as pressor requirement decreases
- Reduces pressor requirement/duration

METHYLENE BLUE

Nitric oxide scavenger that can be used if pressor refractory

- 1 – 2 mg/kg SLOW IV push
- Good for refractory hypotension or hypotension due to vasoplegia (e.g. after cardiopulmonary bypass)

Toxidromes / Rapid Review Toxicology (DDxof.com)



GI Decontamination

Activated charcoal (1g/kg) within 1-hour post-ingestion and if the patient is awake and cooperative (or via enteric tube if intubated)
Not recommended for: Heavy metals, Ions (ex. lithium), Corrosives, Hydrocarbons, Alcohols

Whole-bowel irrigation

Indicated for sustained-release formulations, expulsion of body packing materials, or ingestion of agent not absorbed by activated charcoal

Serum alkalization

For certain ingestions (salicylate, phenobarbital, methotrexate), serum alkalization through infusion of sodium bicarbonate targeting serum pH 7.5 (and urine pH 8.0) may promote elimination

Intralipid emulsion

May be useful for local anesthetic toxicity, b-blocker, and calcium channel blocker overdose

Gap-producing Toxidromes

- Osmolar Gap: Osmolar gap >10-20 is suggestive of toxic alcohol**
 - Toxic alcohol: Ethanol, Methanol, Ethylene glycol, Isopropyl alcohol
 - Drug stabilizing agents: Mannitol, Propylene glycol, Glycerol
- Anion Gap: Salicylate, Iron, Isoniazid, Methanol, Ethylene glycol, Cyanide**

Electrocardiographic Toxidromes

- QT Prolongation:** Antiemetic, Antipsychotic, Antimicrobials, Antidepressants (TCA, SSRI), Anti-arrhythmic
- QRS Prolongation:** Diphenhydramine, Cocaine, CCB (Diltiazem, Verapamil), BB (Propranolol), Amantadine, Carbamazepine

Indications for fomepizole or ethanol in toxic alcohol poisoning

Known ingestion of methanol, ethylene glycol or diethylene glycol without access to rapid serum osmolality

AG metabolic acidosis or elevated osmolar gap plus strong suspicion of ingestion

Serum methanol >8 mmol/L; Serum ethylene glycol >3.2 mmol/L

Suspicion of toxic alcohol ingestion with evidence of end organ damage (ocular, renal)

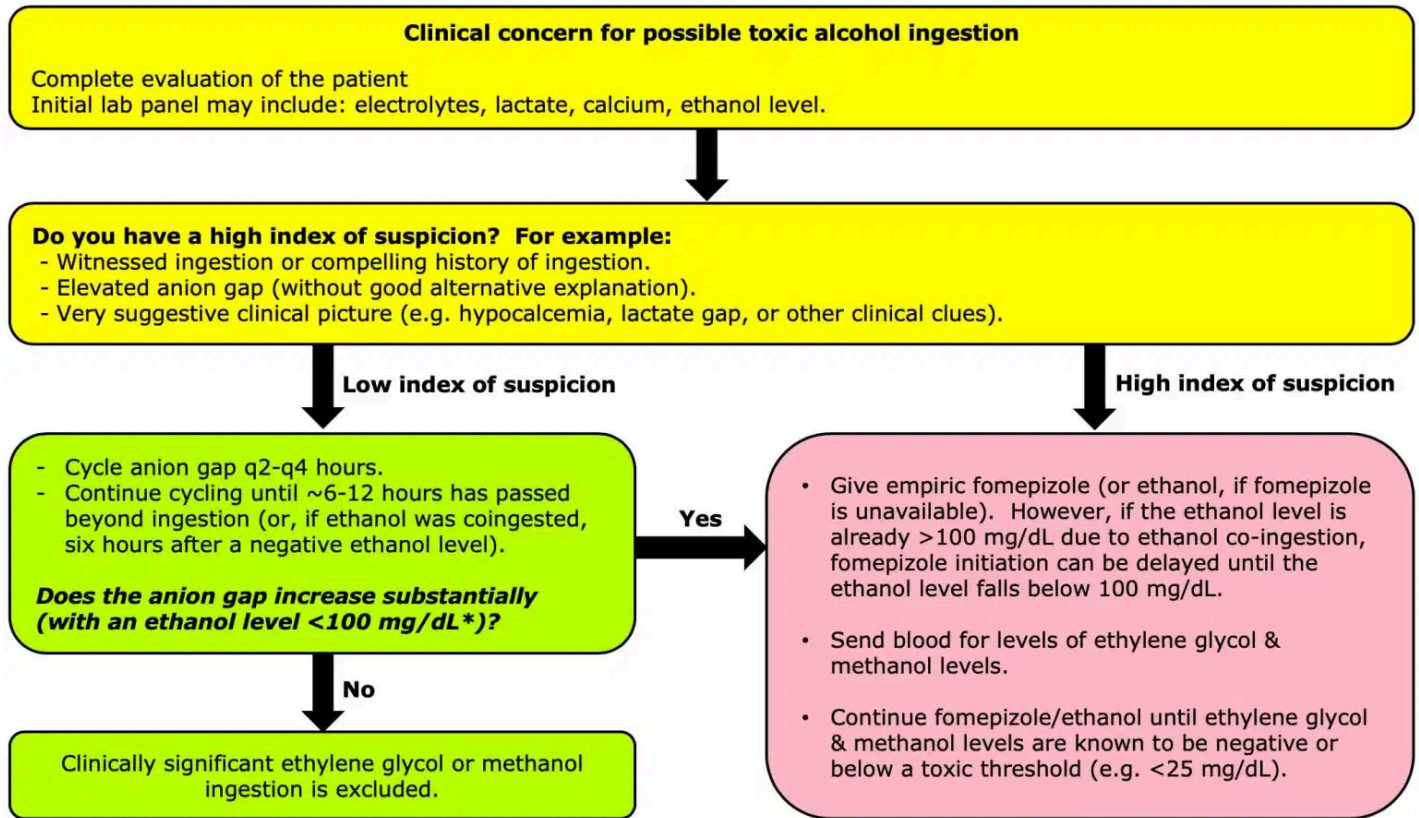
Indications for dialysis in toxic alcohol poisoning

Metabolic acidosis with evidence of end organ damage (ocular, renal, CNS)

Methanol >15 mmol/L; Ethylene glycol >6 mmol/L

Elevated osmolar gap if toxic alcohol levels not available

Approach to possible toxic alcohol ingestion (if levels aren't immediately available)



General schema for approaching the evaluation and treatment of patients with possible ingestion of ethylene glycol or methanol. Clinical judgement is required, and consultation with a local toxicologist is always advisable.

*If the anion gap elevates in the presence of an ethanol level >100 mg/dL, this suggests a cause *other* than toxic alcohols.

-The Internet Book of Critical Care, by @PulmCrit

DIALYZABLE DRUGS

- Hemodialysis successfully removes toxins that are smaller (up to 5,000 daltons) and not bound to proteins.
- Common dialyzable poisonings include toxic alcohols, lithium, salicylate, metformin, acetaminophen, valproic acid, phenytoin, barbiturates, carbamazepine, INH, tenormin (atenolol), dabigatran, depakote, and theophylline
- Less common poisonings include starfruit, paraquat, and hair dye

ONE PILL KILL DRUGS

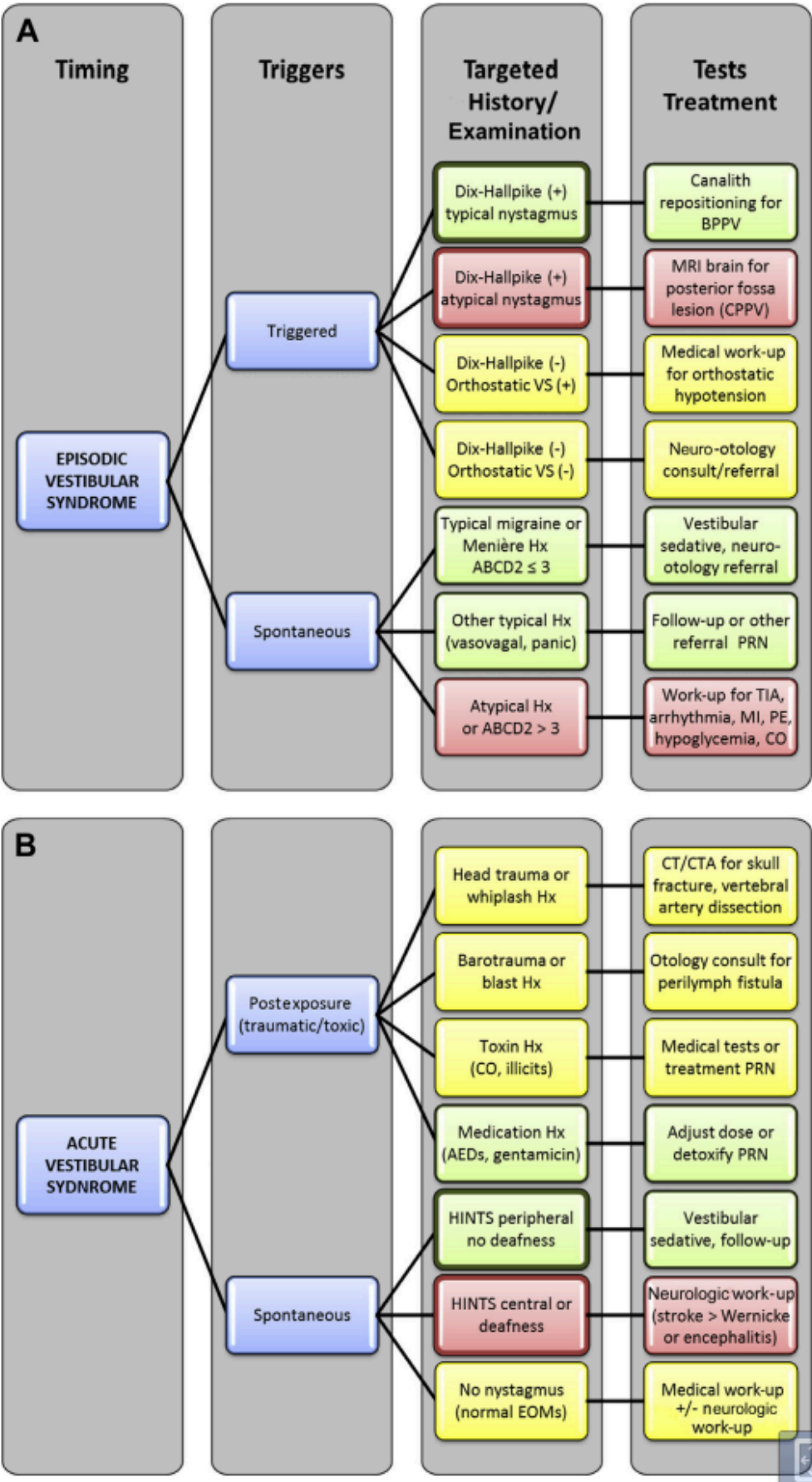
Prescription Medications: CCB, BB, Buprenorphine, Clonidine, Benzodiazepines, TCAs, Parkinsons' drugs (Selegiline, MAOI), Antimalarials (chloroquine, quinine, HCQ), Opioids, Sulfonylureas, Class 1 Antiarrhythmics, Imidazolines (oxymetazoline, tetrahydrozoline), amphetamines

OTC and Household Products: Camphor, Oil of Wintergreen (Methyl Salicylate), Liquid Nicotine, Selenium Dioxide, Laundry Detergents / PODS, Carbamates/organophosphates, toxic alcohols, amphetamines, Paraquat/diquat, Hydrocarbons (solvents, eucalyptus oil, kerosene), Corrosives (sodium hydroxide, strong acids), Naphthalene (mothballs), Strychnine

Other sources: [Don't Forget the Bubbles -- One Pill Kills](#), [Pediatric FOAM One Pill Kill](#), [ACEP One Pill Kill](#)

VERTIGO DIFFERENTIAL (TiRATE)

PMID: 26231273



Stroke Triage: Approach to BATs at Hopkins

Assessment of the patient activated as a BAT (Brain Attack) seems complicated at first, though as you will discover is in fact very algorithmic. There are two important factors that will guide imaging and management, namely, **Last Known Well** and **NIHSS / Physical Exam** (please note, the NIHSS can miss posterior circulation strokes as it favors strokes in the ACA and MCA distribution). This brief post will assume you have ruled out stroke mimics and thus focus primarily on how Strokes are triaged throughout the Johns Hopkins EDs.

Pearl: Don't miss / sit on a hemorrhagic stroke! A good story for brain bleed w/ on going neuro symptoms even if > 24 hours should go to the CT scanner right away.

To activate a BAT, click the BAT icon next to the patient's picture within Epic chart.

Time of Onset and Cincinnati Prehospital Stroke Scale (CPSS)

1. Ask the patient/EMS/family when symptoms began or timing of **Last Known Well (LKW)**

2. Perform the CPSS -- if any 1 of these 3 is abnormal below, the probability of Large Vessel Occlusion (LVO) is ~ 72%

- Facial Droop
 - Ask the patient to smile
 - Normal: Both sides of face move equally
 - Abnormal: One side of face does not move at all
- Arm Drift
 - Ask the patient to raise both arms in front of them with palms facing up
 - Normal: Both arms move equally or not at all
 - Abnormal: One arm drifts compared to the other
- Speech
 - I typically say, "Say after me, no ifs, ands, or buts"
 - Normal: Patient uses correct words with no slurring
 - Abnormal: Slurred or inappropriate words or mute

Imaging selection

MRI/MRA is the first imaging study for all BATs between 7am and 3pm, Monday through Friday!

Around noon (from Monday through Friday) MRI techs are at lunch so patients should go through the CT pathway at these times.

The exceptions to MRI first are:

1. patients that are medically unstable
2. clinically suspected of having a hemorrhagic stroke (see below)
3. unable to determine or fail the MRI screening

These patients should go through the usual CT pathway.

For the ED BAT MRI protocol, patients should go to the ED MRI scanner, if the scanner is down, the process reverts to CT based imaging. Aside from the ED BAT MRI process, MRI for BAT patients is available as needed on the 4th floor scanner for selected inpatient and ED BATs.

The requirements for 4th floor scanner are:

1. The Neurology attending has determined MRI is necessary (i.e. wake up stroke)
2. There is a BAT activated for the patient

This avenue should not be used to bypass the ED protocol when the MRI techs are at lunch.

Last Known Well $\leq$ 4.5 hours or Within $\leq$ 4.5 hours of Waking Up with Symptoms and Symptoms Still Ongoing

These patients are your classic **systemic Tenecteplase (TNKase)** candidates

- If CPSS **positive**, tell Charge Nurse to Overhead Page "Level 1 BAT"
 - A. Activate the NEURO BAT TEAM via EPIC
- If CPSS **negative with concern for stroke**, activate a Level 1 BAT as described above.
- Proceed with imaging (as above)

Perform NIH Stroke Scale

- NIH Stroke Scale < 6 -- CTH w/o contrast if MRI unavailable
- NIH Stroke Scale ≥ 6 **OR** concern for PCA stroke -- CTH w/o contrast, CTA Head/Neck, if MRI unavailable

An NIH Stroke Scale ≥ 6 is highly concerning for LVO.

Last Known Well 4.5 to 24 Hours and Symptoms Ongoing

- If CPSS **positive**, this will be paged overhead as a "Level 2 BAT to North Bed or (Team Color) Hallway".
 - The BAT team is not yet activated.
- If CPSS **negative**, this will not be paged overhead but you will be notified by the Shift Coordinator of the patient.
 - The BAT team is not yet activated.

Perform NIH Stroke Scale

- NIH Stroke Scale < 6 **WITHOUT** Concern for Posterior Stroke -- CTH w/o contrast as appropriate if MRI unavailable
 - The ED team (aka YOU) can activate a BAT if you feel indicated, or you can consult neurology if this is NOT a Level 1 BAT
 - Some of these patients may still be **mechanical thrombectomy** candidates even if they are not systemic TNKase candidates
- NIH Stroke Scale ≥ 6 **OR** concern for PCA stroke -- CTH w/o contrast, CTA Head/Neck, CT Perfusion if MRI unavailable
 - It is YOUR responsibility to 1) change this to a Level 1 BAT and 2) activate the NEURO BAT Team
 - These patients may be either **mechanical thrombectomy candidates** (and might still get **systemic TNKase**)

> 24 hours or Fully Resolved Stroke Symptoms

- These will be Level 2 or Level 3 patients, but will not be paged overhead
- These patients are often your consult/admit to neurology for TIA work-up
- Recurrence of symptoms while in the ED (stuttering symptoms) should trigger you to consult neurology ASAP
 - Some providers will make these patients a Level 1 BAT and activate the NEURO BAT Team via HAL if the story is unclear
 - It's better to err on the side of caution and activate a BAT, though technically these do not qualify for **TNKase**