

Resuscitation Rotation: A Novel Emergency Medicine Rotation to Augment Resuscitative Training

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ABSTRACT:

Audience: This resuscitation curriculum is designed for second year emergency medicine residents who have completed their intensive care unit rotations during their first year of residency.

Introduction: Resuscitation of critically ill patients is an integral part of emergency medicine (EM). While EM residents provide resuscitation during clinical training, dedicated educational time associated with resuscitations can vary. At our institution, we developed a new emergency department (ED) curriculum focused on improving and supplementing resident resuscitation training.

Educational Goals: Our goal is to augment resuscitative education in the ED in order to improve resident skill, confidence, and knowledge of resuscitative treatments.

Educational Methods: The educational strategies used in this curriculum include: case-based didactic sessions, resuscitation literature review, and focused clinical shifts with the ability to follow patients longer during the course of critical illness.

Research Methods: This curriculum was implemented at the Beaumont Hospital Emergency Medicine Residency Program, associated with Oakland University William Beaumont School of Medicine. Survey questionnaire responses and encounter logs were collected from 10 residents during a one-year pilot period in 2015. Likert scales from 1 (least) to 5 (most) were utilized to evaluate a variety of experiences including how confident a resident feels in certain clinical scenarios, how much anxiety a resident feels during resuscitations, and other various experiences. Knowledge-based questions were included on the pre- and post-surveys as well, and residents were instructed to log encounters and procedures during the month.

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Results: Statistical significance was demonstrated in several parameters comparing pre- and post-scores. Mean Likert scores of perceptions of self-efficacy increased by 0.70 (pre = 3.40, post = 4.10; $p = 0.001$). Mean score for confidence in leading a resuscitation increased by 0.60 (pre = 2.50, post = 3.10; $p = 0.005$). Mean score for involvement in resuscitation of septic patients increased by 0.80 (pre = 4.20, post = 5.00; $p = 0.003$). Both mean scores for anxiety level when performing a thoracentesis and recognizing different cardiac arrhythmias decreased, by values of 0.90 (pre = 2.50, post = 1.60; $p = 0.004$) and 0.40 (pre = 2.00, post = 1.60; $p = 0.037$) respectively. There was no statistical difference between the pre- and post-percentage of knowledge-based questions on the survey (pre = 54.67%, post = 66.67%, $p = 0.074$), or any of the other survey questions.

Discussion: Based on survey results and resident feedback from the pilot period, we concluded that this resuscitation curriculum was of benefit to our residents and incorporated it as a permanent rotation.

Length of curriculum: The curriculum is a one-month rotation.

Topics: Resuscitation training and management: Trauma and medical codes, post-cardiac arrest care, targeted temperature management, sepsis, pulmonary embolism, unstable arrhythmias, cerebral vascular accident.



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Learner Audience:

Junior residents, senior residents, faculty

Length of Curriculum:

The curriculum is a one-month rotation. The residents are expected to spend a minimum of 40 hours a week in the emergency department (ED) during high volume hours. A weekly two-hour critical care conference with faculty occurs to discuss cases and relevant literature, as well as one instructional session on resuscitation procedures.

Topics:

Resuscitation training and management: Trauma and medical codes, post-cardiac arrest care, targeted temperature management, sepsis, pulmonary embolism, unstable arrhythmias, cerebral vascular accident.

Objectives:

During the rotation, learners should take part in active participation with procedures, medical decisions, and teaching in cases the learner is involved with. Goals should be discussed with the learners prior to the beginning of the rotation, which include how to monitor progress during the rotation and how the goals will be met. By the end of this rotation, learners should have developed more competency in the following:

1. Performing as team leader in a medical code
2. Performing as team leader in a trauma code
3. Describing post-cardiac arrest management, including implementation of targeted temperature management (TTM)
4. Determining indications and contraindications to TTM

5. Defining massive and sub-massive pulmonary embolism (PE)
6. Describing risk stratification of PE and active participation with discussion of adjunct therapies including thrombolytics
7. Describing and recognizing different cardiac arrhythmias (including, but not limited to, ventricular tachycardia, ventricular fibrillation, pulseless electrical activity, atrial fibrillation with rapid ventricular response, supraventricular tachycardia, nodal blocks, etc)
8. Recognizing septic patients and understanding the defining criteria
9. Understanding the indications to initial vasopressors on septic patients
10. Understanding how to perform various advanced airway techniques (including, but not limited to, endotracheal intubation via delayed and rapid sequence intubation, cricothyrotomy, etc)
11. Understanding how to perform and teach proper central line placement
12. Understanding how to perform and teach a thoracentesis
13. Understanding how to perform and teach intraosseous line placement
14. Understanding how to perform and teach proper thoracostomy tube placement
15. Understanding how to perform an emergent thoracotomy
16. On-shift teaching of junior residents and medical students with critical care procedures and helping ensure timely transitions of care

Brief introduction:

Resuscitation of critically ill patients is an essential aspect of emergency medicine (EM) education. In general, EM residency programs include clinical rotations which create multi-faceted educational experiences.¹ While EM residents are exposed to resuscitating patients during clinical training, and continuing care of critically ill patients in the intensive care unit (ICU),^{2,3} actual educational opportunities can vary.⁴ For many residents, this can result in inconsistent training in the management of critically ill patients. In addition, the American Heart Association (AHA) recently published a scientific statement illustrating that the current standardized resuscitation courses can lead to skill decay over time, and offered concepts to help learners avoid this.⁵ However, this statement was targeted towards long-term learners and was not specific to residents in training. In regards to medical student and resident education, a gap between core educational goals and “entrustable professional duties” has been recognized,⁶ and suggests that



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these are areas that can be improved upon. In order to improve emergency physician resuscitation training as a whole, we believe a more focused approach to resuscitation education in the ED is necessary.

Problem identification, general and targeted needs assessment:

At our institution, we have a traditional ICU curriculum to supplement critical care training for first- and second-year residents. During clinical EM months, a section of our department is dedicated to high acuity patients, and residents receive a limited number of shifts in this area. Even with the ICU and high acuity EM shift exposure, we have noticed experiences between residents vary greatly, and augmenting their EM specific resuscitation education may be of benefit. This curriculum addresses the variation residents experience by dedicating time to resuscitative care in the ED, and to our knowledge, has not been described in previous literature.

Residents on this rotation will spend time specifically in our high acuity section of the ED, where they do not take over as the primary resident, but help facilitate the overall care and transition of these patients. Residents will also have the responsibility to provide dedicated longitudinal care of critically ill patients while in the ED. In addition, the critical care conferences allot time to review cases and relevant literature, allowing for further supplementation on uncommon clinical scenarios. This conference time is also an opportunity for debriefing and feedback in one to two-hour intervals, allowing for a more appropriately spaced learning environment. Overall, we believe that the curriculum is a contextual learning experience that motivates the residents and directly enhances patient care with the augmentation of their resuscitation experience.

Goals of the curriculum:

Our goal for this curriculum is to provide an educational model that focuses specifically on the care of the acutely ill in the ED and their transition of care.

Objectives of the curriculum:

Objectives: Resuscitation training and management

During the rotation, learners should take part in active participation with procedures, medical decisions, and teaching in cases the learner is involved with. Goals should be discussed with the learners prior to the beginning of the rotation, which include how to monitor progress during the rotation and how the goals will be met. By the end of this rotation, learners should have developed more competency in the following:

1. Performing as team leader in a medical code
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3. Describing post-cardiac arrest management, including implementation of targeted temperature management (TTM)
4. Determining indications and contraindications to TTM
5. Defining massive and sub-massive pulmonary embolism (PE)
6. Describing risk stratification of PE and active participation with discussion of adjunct therapies including thrombolytics
7. Describing and recognizing different cardiac arrhythmias (including, but not limited to, ventricular tachycardia, ventricular fibrillation, pulseless electrical activity, atrial fibrillation with rapid ventricular response, supraventricular tachycardia, nodal blocks, etc)
8. Recognizing septic patients and understanding the defining criteria
9. Understanding the indications to initial vasopressors on septic patients
10. Understanding how to perform various advanced airway techniques (including, but not limited to, endotracheal intubation via delayed and rapid sequence intubation, cricothyrotomy, etc)
11. Understanding how to perform and teach proper central line placement
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14. Understanding how to perform and teach proper thoracostomy tube placement
15. Understanding how to perform an emergent thoracotomy
16. On-shift teaching of junior residents and medical students with critical care procedures and helping ensure timely transitions of care

Educational strategies:

(See curriculum chart) Please refer to the curriculum chart of linked objectives and educational strategies.

Educational strategies, implementation of the rotation, and evaluation of the rotation were planned with a curriculum development approach⁷. This curriculum provides an adjunct to fulfilling the American College of Graduate Medical Education (ACGME) requirements for resident competencies regarding many patient care management and procedural skills⁸. Some of the main competencies are illustrated in section IV.A.5.a).(2), which include:

- IV.A.5.a).(2).(a).(i) performing diagnostic and therapeutic procedures and emergency stabilization;



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- IV.A.5.a).(2).(a).(ii) managing critically-ill and injured patients who present to the emergency department, prioritizing critical initial stabilization action, mobilizing hospital support services in the resuscitation of critically-ill or injured patients, and reassessing after a stabilizing intervention;
- IV.A.5.a).(2).(a).(iii) properly sequencing critical actions for patient care and generating a differential diagnosis for an undifferentiated patient;
- IV.A.5.a).(2).(a).(iv) mobilizing and managing necessary personnel and other hospital resources to meet critical needs of multiple patients;
- IV.A.5.a).(2).(a).(v) performing invasive procedures, monitoring unstable patients, and directing major resuscitations of all types on all age groups;
- IV.A.5.a).(2).(c).(i) adult medical resuscitation;
- IV.A.5.a).(2).(c).(ii) adult trauma resuscitation;
- IV.A.5.a).(2).(c).(iv) cardiac pacing;
- IV.A.5.a).(2).(c).(v) chest tubes;
- IV.A.5.a).(2).(c).(vi) cricothyrotomy;
- IV.A.5.a).(2).(c).(viii) emergency department bedside ultrasound;
- IV.A.5.a).(2).(c).(ix) intubations;
- IV.A.5.a).(2).(c).(xi) pediatric medical resuscitation;
- IV.A.5.a).(2).(c).(xii) pediatric trauma resuscitation;
- IV.A.5.a).(2).(c).(xiii) pericardiocentesis;
- IV.A.5.a).(2).(c).(xiv) procedural sedation.

Since the majority of these skills are beyond the level of a first-year resident, this rotation has been implemented in our residents' second-year core curriculum. Third- or fourth-year residents could also benefit from the rotation because the curriculum gives the opportunity to focus on supplementing any potential educational gaps. The best approach is to discuss goals with the resident prior to the rotation, identifying any areas of interest or skill deficiencies the resident may have. That way, if the resident isn't able to acquire enough experience in a given resuscitation skill or procedure, education can be supplemented during the critical care conferences and the resuscitation procedure session. For example, if a resident doesn't feel comfortable managing an unstable PE patient, and happens to not encounter one on a resuscitation shift, discussion at the conference can be centered around unstable PE management and literature review. In fact, during previous conferences, old cases from other residents' experiences were reviewed when relevant, which allowed for a natural dialogue about clinical experiences. In addition, the resuscitation procedure session serves a similar purpose: to practice rare resuscitative procedures in the simulation lab or with equipment designated for practice purposes in the ED.

While on shift, the resident will work in the critical care area, under the supervision of the faculty members in that specific area, or a resuscitation faculty member in the department. Aside from the critical care area, residents on this rotation will also survey the other areas of the ED for patients that have the potential to become unstable or require resuscitation. This patient population includes patients who are admitted to the hospital and boarded in the ED due to capacity. Patients being boarded in the ED have been a growing issue among hospitals across the nation⁹. Moreover, critically ill patients being boarded in the ED are a population that tends to have high mortality rates.^{10, 11} One intent of this curriculum is for residents, while in training and after they graduate, to recognize when these patients will require early intervention.

The resuscitation resident also has a role to teach junior residents and medical students. This can occur in a variety of manners, including while on shift and during the weekly critical care conferences. Given that the resuscitation resident is usually unencumbered by other clinical care duties (seeing fewer acuity patients, primary ED note, etc), he or she has a little bit more time to teach effectively while on shift. During the conferences, the resident is expected to choose a relevant article to discuss. The resident will present this article to faculty members, junior residents, and medical students, with the purpose of teaching everyone the key points of the article, as well as determining whether the article would change their management of patients in the future.

The global concept of this rotation is to allow the resident as much ED resuscitation exposure as possible. The learners have a certain level of autonomy while on resuscitation shifts, with the ability to choose which articles they wish to present during the critical care conferences. At the beginning of the month, residents will receive the curriculum overview, description, required articles to read, instructions on patient logging, and a pre-rotation survey (all illustrated in appendices).

Associated content:

Curriculum content and overview will initially be presented to the resident in the form of an email before the rotation starts (Appendices A and B). The overview and description of the rotation in this email refers to department specific terminology. Examples of this include specific areas of the department and resources at our institution, such as a PE response team. The email includes the associated content illustrated below:

- Curriculum Overview (Appendix A)
- Curriculum Description (Appendix B)
- Resuscitation Patient Logging (Appendix C)
- Resuscitation Core Reading Bullet Points (Appendix D)
- Resuscitation Pre-and Post-Survey (Appendix E and F)



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While the appendices are program specific, including how residents log their encounters and procedures, the examples provided can be tailored as other programs see fit. There are a series of additional readings that are a part of this rotation, which can be found in the additional readings and resources section.

Results and tips for successful implementation:

This curriculum was implemented at the Beaumont Hospital Emergency Medicine Residency Program, associated with Oakland University William Beaumont School of Medicine. Survey questionnaire responses and encounter logs were collected from 10 residents during a one-year pilot period in 2015. Illustrated in the pre- and post-survey attachments (Appendices E and F), Likert scales from 1 (least) to 5 (most) were utilized to evaluate a variety of experiences including how confident a resident feels in certain clinical scenarios, how much anxiety a resident feels during resuscitations, and other various experiences. Knowledge-based questions were included on the pre- and post-surveys as well, and residents were instructed to log encounters (Appendix C) and procedures during the month on a protected, web-based data bank (New Innovations by New Innovations Inc.; Uniontown, OH).

Out of the survey questions, statistical significance was demonstrated in several parameters comparing pre- and post-scores. Mean Likert scores of perceptions of self-efficacy increased by 0.70 (pre = 3.40, post = 4.10; $p = 0.001$). Mean score for confidence in leading a resuscitation increased by 0.60 (pre = 2.50, post = 3.10; $p = 0.005$). Mean score for involvement in resuscitation of septic patients increased by 0.80 (pre = 4.20, post = 5.00; $p = 0.003$). Both mean scores for anxiety level when performing a thoracentesis and recognizing different cardiac arrhythmias decreased, by values of 0.90 (pre = 2.50, post = 1.60; $p = 0.004$) and 0.40 (pre = 2.00, post = 1.60; $p = 0.037$) respectively. There was no statistical difference between the pre- and post-test percentage of knowledge-based questions on the survey (pre = 54.67%, post = 66.67%, $p = 0.074$), or any of the other survey questions. Regarding encounters, a total of 363 logged resuscitation encounters were observed during the pilot period. While 10 residents were involved in the pilot period, only 7 residents were able to log their encounters. From these encounters, 148 resuscitation procedures were recorded (7 residents; >21 procedures per resident). These procedures included intubations, chest tubes, central lines, arterial lines, transvenous pacemaker placement, and various other procedures. All recorded data was voluntarily entered by each resident.

All data and feedback collected has had a positive influence on the rotation. An important aspect for successful implementation of this curriculum is to allow real time feedback

while on the shift and anonymously through the post-rotation survey. This allows for in-the-moment adjustments during the month, as well as calculated changes to the curriculum over time. Encouraging residents at the beginning of the month to provide as much feedback as possible during the rotation can help streamline this process. Another tip for implementation is having faculty reinforce to the resuscitation resident that they are the adjunct provider, prior to the beginning of the rotation. This suggestion is to help prevent the resuscitation resident and other residents on shift from fighting over procedures and patient management. It is paramount that open communication occurs in any scenario where there are competing interests for a procedure. Moreover, during peri-arrest or cardiac arrest scenarios, it is important to task the resuscitation residents with pre-defining roles with the primary resident before taking ownership over any resuscitative procedure. Typically, this pre-defining discussion is about who initially manages the airway, who will be the team leader, and who will perform any secondary procedures such as central lines, arterial lines, etc. So far at our institution, this has not been an issue; however, if not addressed, we see the potential for conflict between the resuscitation resident and the residents on shift. One last suggestion for successful implementation is to assess how many faculty members would be willing to host the critical care conferences and on-shift experience because at least 2 would be the recommended minimum for adequate engagement. We had several faculty members demonstrate interest, and from the pilot period feedback, we concluded that this resuscitation curriculum was of benefit to our residents, and we incorporated it as a permanent rotation.

Evaluation and feedback:

As stated in the results and tips section, residents are given an opportunity to give feedback after their one-month rotation on an anonymous, password-protected electronic questionnaire. Within this questionnaire, feedback has resulted in improvements to the curriculum. One change that happened during the development of this rotation was to schedule the resuscitation resident at peak volume times during the day to get the most exposure to critically ill patients. Since there was no statistical difference in knowledge-based questions, core content material was added to the rotation readings and was made more of a focus during the critical care conferences. In addition, the conference time was increased to two hours in order to accommodate core content review, case review, and article presentation (illustrated in the core reading bullet-point attachment and further readings section). From feedback, it was also determined that the resuscitation resident should have a designated intradepartmental phone to utilize. This way, the resuscitation resident can be reached anywhere in the department and be notified of a critical ill patient. Feedback



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and resident evaluation have led to a greater defined role for the resuscitation resident, and we will continue to rely on these methods to enhance the curriculum.

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 32. Long B, Koyfman A. Best clinical practice: emergency medicine management of stable monomorphic ventricular tachycardia. *J Emerg Med*. 2017;52(4):484-492. doi: 10.1016/j.jemermed.2016.09.010.



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Topic	Recommended Educational Strategy	Educational Content	Objectives	Learners	Timing, Resources Needed (Space, Instructors, Equipment, Citations of JETem pubs or other literature)	Recommended Assessment, Milestones Addressed
Trauma and medical codes	<p>1. Brief discussion on proper trauma and medical code management</p> <p>2. Real-time hands-on experience in the department</p> <p>Readings: 1. <i>Assessing shock resuscitation strategies by oxygen debt repayment.</i> Barbee RW, et al. 6. <i>Trial of Continuous or Interrupted Chest Compressions during CPR.</i> Nichol G, et al. 12. <i>Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage.</i> Shakur H, et al. 13. <i>Emergency physician-initiated extracorporeal cardiopulmonary resuscitation.</i> Bellezzo LM, et al. 15. <i>End-tidal carbon dioxide monitoring during cardiopulmonary resuscitation.</i> Garnett AR, et al.</p>	<p>-An overview of trauma and medical code management</p> <p>-Indications for blood products in trauma codes</p> <p>-Indications for various resuscitative medications given the scenario</p> <p>-Monitoring modalities during a code</p> <p>-Resuscitation strategies in associated readings and bullet points from Appendix D</p>	<p>The learner will demonstrate the ability to:</p> <p>-Run a medical code as team leader</p> <p>-Run a trauma code as team leader</p> <p>-Perform closed loop communication</p> <p>-Know the ratio of 1:1:1 for blood products</p> <p>-Know how to monitor CPR with end tidal CO₂</p> <p>-Know what vasoactive medications can be utilized in a medical code</p> <p>-List and consider Hs and Ts during a PEA (pulseless electrical activity) arrest</p>	PGY-2	<p>2-hour dedicated resuscitation discussion/lecture with faculty members Instructors: 1 – 3</p> <p>Equipment: electronic medical record (and projector/screen)</p>	<p>Milestone: PC1, PC6, ICS2</p> <p>Assessment: Real time feedback by the instructor for each resident while on shift, and retrospective assessment during the weekly critical care conference.</p> <p>Appendices E and F for pre- and post-survey assessment</p>



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Topic	Recommended Educational Strategy	Educational Content	Objectives	Learners	Timing, Resources Needed (Space, Instructors, Equipment, Citations of JETem pubs or other literature)	Recommended Assessment, Milestones Addressed
Trauma and medical codes con't	<p>16. <i>Can mainstream end-tidal carbon dioxide measurement accurately predict the arterial carbon dioxide level of patients with acute dyspnea in ED.</i> Cinar O, et al.</p> <p>17. <i>Randomized Trial of Apneic Oxygenation during Endotracheal Intubation of the Critically Ill.</i> Semler MW.</p> <p>19. <i>Mechanical chest compressions and simultaneous defibrillation vs conventional cardiopulmonary resuscitation in out-of-hospital cardiac arrest: the LINC randomized trial.</i> Rubertsson S, et al.</p> <p>20. <i>Derivation and validation of two decision instruments for selective chest CT in blunt trauma: a multicenter prospective observational study.</i> Rodriguez RM, et al.</p> <p>21. <i>Near infrared spectroscopy for evaluation of the trauma patient: a technology review.</i> Ward KR, et al.</p>					



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Topic	Recommended Educational Strategy	Educational Content	Objectives	Learners	Timing, Resources Needed (Space, Instructors, Equipment, Citations of JETem pubs or other literature)	Recommended Assessment, Milestones Addressed
Trauma and medical codes con't	25. <i>The Shock Index revisited - a fast guide to transfusion requirement? A retrospective analysis on 21,853 patients derived from the TraumaRegister DGU.</i> Mutschler M, et al.					



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Topic	Recommended Educational Strategy	Educational Content	Objectives	Learners	Timing, Resources Needed (Space, Instructors, Equipment, Citations of JETem pubs or other literature)	Recommended Assessment, Milestones Addressed
Post-cardiac arrest	<ol style="list-style-type: none"> Brief discussion on proper post-cardiac arrest management Real-time hands-on experience in the department <p>Readings: 2. <i>Awakening after cardiac arrest and post resuscitation hypothermia: are we pulling the plug too early?</i> Gold B, et al. 4. <i>Refractory cardiac arrest treated with mechanical CPR, hypothermia, ECMO and early reperfusion.</i> Stub D, et al.</p>	<p>-Overview on post-cardiac arrest management</p> <p>-Management of patients with refractory cardiac arrest</p> <p>-Medications indicated post-cardiac arrest</p>	<p>The learner will demonstrate the ability to:</p> <ul style="list-style-type: none"> -Appropriately manage post-cardiac arrest patients -Know what vasoactive medications can be utilized post-cardiac arrest -Know when ECMO (extracorporeal membrane oxygenation) is indicated 	PGY-2	<p>2-hour dedicated resuscitation discussion/lecture with faculty members Instructors: 1 – 3</p> <p>Equipment: electronic medical record (and projector/screen)</p>	<p>Milestone: PC1</p> <p>Assessment: Real time feedback by the instructor for each resident while on shift, and retrospective assessment during the weekly critical care conference</p> <p>Appendices E and F for pre- and post-survey assessment</p>



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Post-cardiac arrest con't	<p>23. <i>Post-cardiac arrest syndrome: epidemiology, pathophysiology, treatment, and prognostication: a scientific statement from the International Liaison Committee on Resuscitation; the American Heart Association Emergency Cardiovascular Care Committee; the Council on Cardiovascular Surgery and Anesthesia; the Council on Cardiopulmonary, Perioperative, and Critical Care; the Council on Clinical Cardiology; the Council on Stroke.</i> Nolan JP, et al.</p> <p>24. <i>Postresuscitation disease after cardiac arrest: a sepsis-like syndrome?</i> Adrie C, et al.</p> <p>28. <i>Vasopressin, steroids, and epinephrine and neurologically favorable survival after in-hospital cardiac arrest: a randomized clinical trial.</i> Mentzelopoulos, et al.</p> <p>29. <i>Targeted temperature management at 33°C versus 36°C after cardiac arrest.</i> Nielsen N, et al.</p>					
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Topic	Recommended Educational Strategy	Educational Content	Objectives	Learners	Timing, Resources Needed (Space, Instructors, Equipment, Citations of JETem pubs or other literature)	Recommended Assessment, Milestones Addressed
Targeted temperature management (TTM)	<p>1. Brief discussion on appropriate technique and indication for targeted temperature management (TTM)</p> <p>2. Real-time hands-on experience in the department</p> <p>Readings: 10. <i>Relationship between time to target temperature and outcome in patients treated with therapeutic hypothermia after cardiac arrest.</i> Haugk M, et al. 11. <i>Effects of timing and duration of hypothermia on survival in an experimental gerbil model of global ischaemia.</i> Noguchi, et al. 27. <i>Therapeutic hypothermia is associated with improved neurologic outcome and survival in cardiac arrest survivors of non-shockable rhythms.</i> Lundbye JB, et al.</p>	<p>-Overview on TTM techniques -The indications and contraindications for TTM -Appendix D bullet points for Targeted Temperature Management at 33 °C versus 36 °C after Cardiac Arrest</p>	<p>The learner will demonstrate the ability to: -Appropriately initiate TTM -Know the indications and contraindications for TTM</p>	PGY-2	<p>2-hour dedicated resuscitation discussion/lecture with faculty members Instructors: 1 – 3</p> <p>Equipment: electronic medical record (and projector/screen)</p>	<p>Milestone: PC1</p> <p>Assessment: Real time feedback by the instructor for each resident while on shift, and retrospective assessment during the weekly critical care conference</p> <p>Appendices E and F for pre- and post-survey assessment</p>



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Topic	Recommended Educational Strategy	Educational Content	Objectives	Learners	Timing, Resources Needed (Space, Instructors, Equipment, Citations of JETem pubs or other literature)	Recommended Assessment, Milestones Addressed
Pulmonary embolism (PE)	<p>1. Brief discussion on appropriate approach to the management of different types of pulmonary emboli</p> <p>2. Real-time hands-on experience in the department</p> <p>Readings: 9. <i>Fibrinolysis for Acute Care of Pulmonary Embolism in the Intermediate Risk Patient.</i> Meyer G, et al. 22. <i>Efficacy and safety of low dose recombinant tissue-type plasminogen activator for the treatment of acute pulmonary thromboembolism: a randomized, multicenter, controlled trial.</i> Wang C, et al. 26. <i>Moderate pulmonary embolism treated with thrombolysis.</i> Sharifi M, et al.</p>	<p>-A review of PE risk stratification and rapid recognition of cases meeting criteria for massive and submassive PE</p> <p>-Indications for thrombolysis</p> <p>-Appendix D bullet points for Moderate Pulmonary Embolism Treated with Thrombolysis</p>	<p>The learner will demonstrate the ability to:</p> <ul style="list-style-type: none"> -Define massive and sub-massive PE -Risk stratify the different types of PE -Properly manage massive and sub-massive pulmonary emboli, as well as know when to utilize heparin, thrombolytic therapy, or when thrombectomy is indicated 	PGY-2	<p>2-hour dedicated resuscitation discussion/lecture with faculty members Instructors: 1 – 3</p> <p>Equipment: electronic medical record (and projector/screen)</p>	<p>Milestone: PC1</p> <p>Assessment: Real time feedback by the instructor for each resident while on shift, and retrospective assessment during the weekly critical care conference</p> <p>Appendices E and F for pre- and post-survey assessment</p>



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Topic	Recommended Educational Strategy	Educational Content	Objectives	Learners	Timing, Resources Needed (Space, Instructors, Equipment, Citations of JETem pubs or other literature)	Recommended Assessment, Milestones Addressed
Unstable arrhythmias	<ol style="list-style-type: none"> Brief discussion on appropriate approach to the management of different types of unstable arrhythmias Real-time hands-on experience in the department <p>Readings 32. <i>Best Clinical Practice: Emergency Medicine Management of Stable Monomorphic Ventricular Tachycardia</i>. Long B, et al.</p>	<p>-An overview of the different types of arrhythmias -A review of different antiarrhythmic medications -Indications for cardioversion</p>	<p>The learner will demonstrate the ability to:</p> <ul style="list-style-type: none"> - Recognize different cardiac arrhythmias (including, but not limited to, ventricular tachycardia, ventricular fibrillation, pulseless electrical activity, atrial fibrillation with rapid ventricular response, supraventricular tachycardia, nodal blocks, etc) -Properly manage different unstable arrhythmias, as well as which medications can be used and when to cardiovert 	PGY-2	<p>2-hour dedicated resuscitation discussion/lecture with faculty members Instructors: 1 – 3</p> <p>Equipment: electronic medical record (and projector/screen)</p>	<p>Milestone: PC1, PC5</p> <p>Assessment: Real time feedback by the instructor for each resident while on shift, and retrospective assessment during the weekly critical care conference</p> <p>Appendices E and F for pre- and post-survey assessment</p>



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Topic	Recommended Educational Strategy	Educational Content	Objectives	Learners	Timing, Resources Needed (Space, Instructors, Equipment, Citations of JETem pubs or other literature)	Recommended Assessment, Milestones Addressed
Sepsis	<p>1. Brief discussion on appropriate approach to the management of sepsis and septic shock</p> <p>2. Real-time hands-on experience in the department</p> <p>Readings</p> <p>3. <i>A randomized trial of protocol-based care for early septic shock.</i> Yealy DM, et al.</p> <p>5. <i>Early goal-directed therapy.</i> Rivers EP, et al.</p> <p>14. <i>Effect of heart rate control with esmolol on hemodynamic and clinical outcomes in patients with septic shock: a randomized clinical trial.</i> Morelli A, et al.</p> <p>30. <i>Hydrocortisone, Vitamin C, and Thiamine for the Treatment of Severe Sepsis and Septic Shock: A Retrospective Before-After Study.</i> Marik PE, et al.</p>	<p>-A review of the early signs of sepsis development</p> <p>-The sepsis core measure and when they are indicated</p> <p>-Appendix D bullet points for Early Goal-directed Therapy, ProCESS, and the PROPPR trial</p>	<p>The learner will demonstrate the ability to:</p> <p>-Define the criteria for sepsis and septic shock</p> <p>-Manage patients with sepsis and septic shock</p> <p>-Know the appropriate antibiotic choice</p> <p>-Know when to start vasoactive agents and what types are indicated</p>	PGY-2	<p>2-hour dedicated resuscitation discussion/lecture with faculty members Instructors: 1 – 3</p> <p>Equipment: electronic medical record (and projector/screen)</p>	<p>Milestone: PC1, PC5, PC6</p> <p>Assessment: Real time feedback by the instructor for each resident while on shift, and retrospective assessment during the weekly critical care conference</p> <p>Appendices E and F for pre- and post-survey assessment</p>



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Topic	Recommended Educational Strategy	Educational Content	Objectives	Learners	Timing, Resources Needed (Space, Instructors, Equipment, Citations of JETem pubs or other literature)	Recommended Assessment, Milestones Addressed
Cerebral vascular accident	<ol style="list-style-type: none"> Brief discussion on appropriate approach to the management of cerebral vascular accidents Real-time hands-on experience in the department <p>Readings: 18. <i>Tissue plasminogen activator for acute ischemic stroke</i>. NINDS-PSS.</p>	<p>-A review of appropriate application of the NIH stroke scale.</p> <p>-The indications and contraindications for thrombolytic therapy and neuro-interventions</p> <p>-Appendix D bullet points for Intensive Blood Pressure Lowering with Acute Cerebral Hemorrhage</p>	<p>The learner will demonstrate the ability to:</p> <ul style="list-style-type: none"> -Properly perform an NIH stroke scale -Appropriately identify the indications and contraindications for thrombolytic therapy and neuro-interventions 	PGY-2	<p>2-hour dedicated resuscitation discussion/lecture with faculty members Instructors: 1 – 3</p> <p>Equipment: electronic medical record (and projector/screen)</p>	<p>Milestone: PC1</p> <p>Assessment: Real time feedback by the instructor for each resident while on shift, and retrospective assessment during the weekly critical care conference</p> <p>Appendices E and F for pre- and post-survey assessment</p>
Research basics	<ol style="list-style-type: none"> Brief discussion on appropriate approach to research in the emergency department Article review during the one-month rotation <p>Readings: 31. <i>Tutorials in clinical research, part VI: descriptive statistics</i>. Neely JG.</p>	<p>-A review of the basic approaches to research in the emergency department.</p>	<p>The learner will demonstrate the ability to:</p> <ul style="list-style-type: none"> -Present different studies at the weekly critical care conference and review the strengths and weaknesses -Define and establish a scholarly activity during this rotation, if it hasn't already been done 	PGY-2	<p>2-hour dedicated resuscitation discussion/lecture with faculty members Instructors: 1 – 3</p> <p>Equipment: electronic medical record (and projector/screen)</p>	<p>Milestone: PC1. PBLI</p> <p>Assessment: Real time feedback by the instructor for each resident while on shift, and retrospective assessment during the weekly critical care conference</p>



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Topic	Recommended Educational Strategy	Educational Content	Objectives	Learners	Timing, Resources Needed (Space, Instructors, Equipment, Citations of JETem pubs or other literature)	Recommended Assessment, Milestones Addressed
Resuscitation procedure session	1. Overview of basic resuscitation procedures and practice in the simulation lab or with equipment in the ED	-The basic approach and description on how to perform various resuscitative procedures -A focus on any procedures that the resident feels uncomfortable with -Appendix D bullet points for delayed sequence intubation	The learner will demonstrate the understanding of how to perform: -Advanced airway techniques (endotracheal intubation, cricothyrotomy, etc) -Central line placement -Thoracentesis -Intraosseous line placement	PGY-2	1 – 2-hour procedure session Instructors: 1 Equipment: simulation lab or equipment in the ED designated for practice use	Milestone: PC9 Assessment: Real time feedback by the instructor in the simulation lab or after session



Appendix A: Resuscitation Rotation Overview

Please read the entire email, but the time sensitive pieces of information include:

- You will receive a Pre-Resus Rotation survey monkey; this is being done for research purposes described in that email.
- Make sure you get the resus phone so you have it for your first day, or you may use your own phone.
- The resus-specific logging (described in separate attachment) may not be automatically available so please discuss with the clerkship coordinator prior to commencing your rotation.
- Talk to our departmental research director to arrange time to meet (before or very early) during rotation, to discuss ongoing clinical research initiatives in our dept. so you can be another set of eyes to identify these patients. At this time, you can also discuss your involvement in already, or areas for future involvement in scholarly activity.

Introduction

As you likely know, the goal of this rotation is to get great high acuity experience.

Sometimes it is super busy in the high acuity area; other times you have to self-search for sick people in the other areas, and **do not forget PEDS too!**

- Whenever you are at work, notify all emergency medicine attendings and residents that you are around and carry a phone (ideally the resus phone).
- Your goal with this experience should be to get comfortable with the critical care decision tree and the utilization of aggressive adjuncts (ie, push dose pressors, awake intubations, rapid/safe placement of invasive lines, airway adjunct maneuvers, aggressive pulmonary embolism (PE) treatment, etc).
- A weekly resus meeting will occur to discuss cases that you were involved with and relevant literature.
- Resus Meeting duration is variable, usually ~ 1.5 hours at least. For each meeting we will discuss an article/resident.
- Resus-specific case logging is in New Innovations. This will not be part of your general procedure logging, but rather an additional log to track procedures during the rotation. Only log cases where you played a role in the care of the patient.



Appendix B: Resuscitation Rotation Description

Expectations

Scheduling

- You may make your own hours (but please post in high acuity area doctor room).
- You should ideally work M/T/W/Th/Fri (minimum 8 hours per day, 40/week) or equivalent hours spread over 4-5 days.
- You can work with other resuscitation residents or separately (if applicable).
- Please keep resus faculty member apprised of resuscitation cases when he or she is in the department.

Resuscitation meetings

- Weekly resus meetings will occur, with a total of 3-4 per month.
- You should have a list of the patients in whose resuscitations you participated during that week (keep stickers/Medical record numbers/etc).
- You should bring attention to cases which were either interesting or which you had any concerns regarding management.
- We will discuss articles (1 article per week/resident); please send article to the clerkship director ~ 48 hours or more prior to meeting.
- Make sure to keep updated on your normal procedure logs (log resuscitation cases in New Innovations).

Teaching

- When able, on shift teaching expectations with the PGY1 residents and medical students include:
 - Overseeing active bedside management
 - Supervising PGY1 critical care procedures
 - Improving patient flow for the department's high acuity patients.
- Assist in resident simulation sessions or procedure labs that are resuscitation pertinent during your month.



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Research

- This rotation offers a great opportunity to start or enhance your scholarly activity.
- It is strongly encouraged to spend any downtime on this rotation participating in research activities, which will be discussed throughout the month.
- At rotations end it will be expected that you can describe your research participation during the month.

Reading material

- All resuscitation required reading is available on New Innovations.
- The following articles are pre-requisites to the rotation:
 - Early Goal-directed Therapy in the Treatment of Severe Sepsis and Septic Shock (Rivers, et al).
 - A Randomized Trial of Protocol-Based Care for Early Septic Shock (ProCESS Investigators).
 - Targeted Temperature Management at 33 C versus 36 C after Cardiac Arrest (Nielsen, et al).
 - Intensive Blood-Pressure Lowering in Patients with Acute Cerebral Hemorrhage (Qureshi, et al).
 - The PROPPR Randomized Clinical Trial (Holcomb, et al).
 - Moderate Pulmonary Embolism Treated with Thrombolysis (Sharifi, et al).
 - Delayed Sequence Intubation: A Prospective Observational Study (Weingart, et al).

Identification of patients to follow for "Resuscitation Rotation" purposes:

Pulmonary embolism

- There is a PERT (PE Response Team) which for every PE, clerks activate a "PERT Consult" and a rapid response advanced practice provider (APP) responds. If the PE is sub-massive (ie, Intermediate Low Risk or Intermediate High Risk by European Society of Cardiology 2014 Guidelines) or massive category, then a multidisciplinary conference call occurs which is led by this same APP. When possible, jump on this conference call too since great learning! **(The APP can provide you the call in #).**
- When able, perform a bedside ultrasound (US) to assess for right ventricular (RV) heart strain, etc. [if US team is around, they will perform it preferentially, evaluate/document cardiac/lungs and inferior vena cava (IVC) in qpath]. Obtaining this ED bedside US before a multidisciplinary



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conference call can be helpful (especially if the CT is negative for RV strain but ED bedside US appears to have RV strain).

- If patient is being considered for catheter-based adjunct PE treatment, ensure that patient can tolerate laying flat (the procedure can take an hour or more). **IF PATIENT CAN'T LIE FLAT NOTIFY THE APP OR PERT PHYSICIANS ON THE CALL.**
- Screen for clinically significant large volume clot burden (saddle/etc).
- Screen for sub-massive PE (trop/BNP/lactic acid, 2D echo).
- Screen for massive PE [identify any systolic blood pressure (SBP) < 90] or pseudo-massive PE (PE + syncope).
- All high risk sub-massive PE and massive PE go to Cardiac Critical Care Unit (even if they do not receive an adjunct).

Unstable arrhythmia and cardiac arrest

- Follow the process of arrhythmia treatment and resolution.
- Follow every unsuccessful and successful cardiac arrest.
- Run the code if no senior resident present.
- If not running code help facilitate IV access including intraosseous (IO) lines +/- intubation, help the team leader!
- Perform bedside US (if US team is around, they will perform it preferentially, evaluate/document cardiac/lungs and IVC in qpath).
- If return of spontaneous circulation (ROSC) is achieved, be involved in decision regarding targeted temperature management (TTM).
- If TTM is desired and approved by the ED attending on case, help get cold saline instilling/etc initially. The decision regarding TTM is at the discretion of the ED attending. **IF PATIENT IS BEING COOLED, NOTIFY SINCE MAY BE STUDY ELIGIBLE.**
- Ensure that EMS records are obtained.



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Sepsis

- Follow septic patients [more than 2/4 systemic inflammatory response syndrome (SIRS) criteria]; community-acquired pneumonia (CAP), healthcare-associated pneumonia (HCAP), urological, and surgical sepsis).
- Be aware of Surviving Sepsis recommendations; ensure compliance with the 3- & 6-hour bundles.
- In coordination with the EC attending/resident, facilitate line(s) placement if desired.
- Manage the initial fluid resuscitation and assess if patient is fluid responsive or not, reassess lactate level when possible in ED to gauge lactic acidemia clearance, ensure IV antibiotics are started as promptly as possible.
- Help determine if patient requires transition onto vasoactive agents and help make that decision in timely manner.
- Perform bedside US (if US team is around, they will perform it preferentially, evaluate/document cardiac/lungs and IVC in qpath). Serial bedside US IVC assessments are very helpful in this population to see how fluid responsive they are.

Neuro-deficit vs devastation

- Facilitate getting patient immediately to CT (travel with patient, look at CT live time to see if any obvious findings).
- Perform stroke scale and tabulate results (**compare to value the "stroke team" tabulates, address any major discrepancies**).
- If ischemic cerebrovascular accident, help facilitate decisions with patient, stroke team, etc, regarding tissue plasminogen activator (tPA).
- If intracranial hemorrhage, help rapidly identify use of blood thinners and coordinate prompt use of reversal agents, as well as quickly determine from neurosurgery consultants what their BP goal is and if an arterial line is necessary.
- For all patients with major bleeding on a new oral anticoagulant (NOAC), consider FEIBA.

Miscellaneous skills to be attained/refined this month

- When/how do I use push dose pressor?
- How do I perform a hemodynamically stable intubation?
- How do I perform an awake intubation?



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- Determining if a patient needs the ICU or not.
- Determining if a patient requires massive transfusion protocol.



Appendix C: Resuscitation Patient Logging

When logging your patients for Resuscitation follow the instructions below.

1. Select the option indicated by the arrow



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2. Choose the indicated box

Resuscitation Patient Evaluation

[Subject Name]
[Subject Status]
[Evaluation Dates]
[Subject Rotation]

Evaluator
[Evaluator Name]
[Evaluator Status]

Date:

Date Patient Seen in ED:
[Text Box]
Remaining Characters: 5,000

MRN

Medical Record Number:
[Text Box]
Remaining Characters: 5,000

Working Diagnosis:

- Acute CVA
- STEMI
- PE
- Dysthythemia
- Adult Sepsis
- Pediatric Sepsis
- Undifferentiated Shock
- Cardiac Arrest w/ ROSC
- Cardiac Arrest w/o ROSC
- Post-Arrest
- Other

Did you perform or assist in a procedure?

3. Fill out evaluation

Upon completion of the evaluation, you will then be able to start over from step 1 for your remaining patients.

If you do not complete and evaluate, or stop midway through without signing, it will create a “evaluation pending” (under the evaluations portion in Notifications). By selecting the pending evaluation, you will be able to resume that specific evaluation.

You will have access only during the rotation. Please make sure they are done prior to the rotation ending.



Appendix D:

Resuscitation core Reading Bullet Points

- Early Goal-directed Therapy in the Treatment of Severe Sepsis and Septic Shock (Rivers, et al)
 - Early goal-directed therapy (EGDT) provided at the earliest states of severe sepsis and septic shock has been demonstrated to show benefit.
 - Early identification of patients at high risk of severe sepsis and septic shock can help prevent cardiovascular collapse.
- A Randomized Trial of Protocol-Based Care for Early Septic Shock (ProCESS Investigators)
 - Usual care and early recognition of severe sepsis and septic shock have similar outcomes to protocol-based care (EGDT protocol).
 - Serial serum lactate levels are demonstrated to be not inferior to central venous oxygen saturation (Scvo2) monitoring.
 - If sepsis patients are identified early in the emergency department with intervention, there was no benefit observed to protocol-based care.
- Targeted Temperature Management at 33 C versus 36 C after Cardiac Arrest (Nielsen, et al)
 - Targeted temperature management (TTM) improves neurologic outcomes in patients who have been resuscitated after out-of-hospital cardiac arrest.
 - No difference in neurologic outcomes was observed when initiating TTM at temperature 33°C compared to 36°C.
- Intensive Blood-Pressure Lowering in Patients with Acute Cerebral Hemorrhage (Qureshi, et al)
 - Intensive reduction in the systolic blood pressure does not provide a significant clinical benefit in the presence of acute cerebral hemorrhage.
 - Acute reduction in target systolic blood pressure of 110 to 139 mm Hg in patients with intracerebral hemorrhage is more effective in outcomes compared to a reduction of 140 to 179 mm Hg.
- The PROPPR Randomized Clinical Trial (Holcomb, et al)
 - No significant difference in overall mortality in patients who receive massive transfusion with a 1:1:1 ratio compared to 1:1:2 ratio.



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- Patients who received a 1:1:1 ratio achieved hemostasis and had fewer deaths due to exsanguination by 24 hours.
- Moderate Pulmonary Embolism Treated with Thrombolysis (Sharifi, et al)
 - “Safe dose” or half dose tPA is a safe and effective treatment for moderate pulmonary embolism in a stable patient.
 - “Safe dose” tPA leads to a significant early reduction in pulmonary artery systolic pressure.
- Delayed Sequence Intubation: A Prospective Observational Study (Weingart, et al)
 - Delayed sequence intubation is initiated by titrating ketamine (usually 1 mg/kg) to allow for continued spontaneous breathing prior to intubation.
 - Preoxygenation is initiated at this time, and after 3 minutes the patient can then receive a paralytic agent.
 - Delayed sequence intubation can be utilized in patients requiring emergency airway management who cannot tolerate standard preoxygenation.



Appendix E: Resuscitation Rotation Pre-Rotation Survey

(Questions with correct answers highlighted in red)

Emergency Medicine PGY-2 Resuscitation Rotation Pre-Survey

1. Please create your study ID by using the first two letters of your last name combined with the last four numbers on your Beaumont ID badge (example: John Smith, Beaumont ID: 12345678 would be SM5678).

2. What is your age?

3. What is your gender

- Female
- Male
- Decline to respond

4. When was your most recent ACLS training successfully completed?

- 18 - 24 months ago
- 12 - 18 months ago
- 6 - 12 months ago
- 1 - 6 months ago
- less than 1 month ago

5. In which of the following fields have you received prior ACLS training/experience? Please select all that apply.

- EMT-P
- Military
- ACLS training outside of the United States
- Previous residency training
- None of the above
- Other (please specify)



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6. On a scale of 1 to 5, where 1 = unskilled and 5 = skilled, how would you rate your current level of skill in life-saving techniques?

1 2 3 4 5

7. Please rate your confidence level in the following areas during patient resuscitation:

	Not Confident	Somewhat Confident	Confident	Very Confident
7.1 Leading a resuscitation				
7.2 Working with a team to handle a resuscitation				
7.3 Recognizing when to get additional help during a resuscitation				
7.4 Ability to supervise team members during a resuscitation				
7.5 Knowing how to get additional help during a resuscitation				

8. Please rate your anxiety level when performing the following skills during patient resuscitation:

	Not Anxious	Somewhat Anxious	Anxious	Very Anxious
8.1 Endotracheal intubation				
8.2 Thoracentesis				
8.3 Recognizing different cardiac arrhythmias				
8.3 Choosing synchronized cardioversion or defibrillation				
8.4 Adequate chest compressions				
8.5 Selecting medications for endotracheal intubation				
8.6 Intraosseous line placement				

9. In how many resuscitation events (critically ill patient with or without arrest) have you participated?

- ≤ 5
- 6 - 10
- 11 -15
- 16 - 20
- > 20



DIDACTICS AND HANDS-ON CURRICULUM

10. Please rate how frequently you have been involved in the following types of resuscitation cases:

	Never (0%)	Rarely / Seen a few ($<10\%$)	Sometimes / But have heard reports of many more (10-50%)	Often / Seen many cases first hand (50-75%)	Very Often / About once a week ($>75\%$)
10.1 Pulmonary embolism					
10.2 Unstable arrhythmias after cardiac arrest					
10.3 Any septic patient (2/4 or $>$ SIRS criteria; CAP/HCAP/urological and surgical sepsis)					
10.4 Any patient with significant neurologic deficit vs. devastation					

11. Which of the following is the correct dose and route of administration of epinephrine for a patient with anaphylaxis?

- A. 0.3 - 0.5 mg of 1:1,000 IM
- B. 0.3 - 0.5 mg of 1:10,000 IM
- C. 0.3 - 0.5 mg of 1:10,000 subcu
- D. 1 - 20 mcg/min of 1:1,000 IV

12. What is the most appropriate cardiac arrest dose of epinephrine for an average-sized 1 year old?

- A. 1 mg of 1:10,000 solution
- B. 0.5 mg of 1:10,000 solution
- C. 1 mL of 1:10,000 solution
- D. 0.5 mL of 1:10,000 solution

13. Which vasoactive agent may cause an increase in lactate production from skeletal muscle, thus limiting the use of serum lactate as an endpoint of resuscitation?

- A. Dobutamine
- B. Vasopressin
- C. Norepinephrine
- D. Epinephrine



DIDACTICS AND HANDS-ON CURRICULUM

14. Which of the following vasopressors may be best considered in conjunction with norepinephrine and what is the mechanism?

- A. Dopamine, because it augments both stroke volume and endogenous norepinephrine
- B. Vasopressin, because its effect is less sensitive to metabolic acidosis
- C. Vasopressin, because it reduces mortality
- D. Phenylephrine, because it decreases heart rate and thus cardiac demand

15. What is the best combination of vasopressors for use in cardiogenic shock?

- A. Dopamine + Phenylephrine
- B. Dopamine + Epinephrine
- C. Dobutamine + Dopamine
- D. Norepinephrine + Dobutamine

16. What is the best emergent transfusion approach for a patient with massive bleeding, taking into consideration the need to conserve resources?

- A. Type specific for all patients
- B. O- RBCs for all women, O+ for all men
- C. O- RBCs for children and women of childbearing age, O+ for all others
- D. Component replacement in an approximate 1:1:1 ratio
- E. Both A and D
- F. Both B and D
- G. Both C and D

17. Which of the following patients would most likely benefit from a 100 mL bolus of 3% hypertonic saline, with the least risk for osmotic demyelination syndrome?

- A. 80-year-old female on chronic Lasix therapy, sodium level 125, normal neurologic exam
- B. 25-year-old male seizing after barely finishing the Boston Marathon
- C. 50-year-old male alcoholic, sodium level 129, lethargic on exam
- D. 45-year-old female intubated with septic shock



DIDACTICS AND HANDS-ON CURRICULUM

18. The textbook differentiation of beta blocker overdose versus calcium channel blocker overdose includes:

- A. Beta blockers cause hypoglycemia; calcium channel blockers cause hyperglycemia
- B. Beta blockers cause hyperglycemia; calcium channel blockers cause hypoglycemia
- C. Both cause hypoglycemia
- D. Both cause hyperglycemia

19. What is the typical initial dose of DigiFab for a patient with acute ingestion of >10 mg of digoxin?

- A. 1 mg per 1 mg of ingestion
- B. 10 mg per 1 mg of ingestion
- C. 1 vial per 1 mg of ingestion
- D. 10 vials empirically

20. The three principle priorities, in correct order, for treatment of thyroid storm include:

- A. Treat fever; treat high output heart failure; inhibit endogenous hormone production
- B. Block effects of thyroid hormone; treat fever; inhibit endogenous hormone production
- C. Block hormone release from thyroid; block effects of thyroid hormone; stop production of endogenous hormone
- D. Intubate; treat fever; stop production of endogenous hormone
- E. Block effects of thyroid hormone; stop production of endogenous hormone; block hormone release from thyroid

21. In patients >50 years old or if immunocompromised, the accepted antibiotic regimen to cover for meningitis includes:

- A. Vancomycin + 3rd generation cephalosporin
- B. Vancomycin + 3rd generation cephalosporin + ampicillin
- C. 3rd generation cephalosporin + ciprofloxacin
- D. 3rd generation cephalosporin + acyclovir



DIDACTICS AND HANDS-ON CURRICULUM

22. When choosing rate control for atrial fibrillation with rapid ventricular rate, which of the following is true?

- A. Calcium channel blockers are first line for patients with congestive heart failure, acute coronary syndrome, or recent surgery
- B. Diltiazem has a faster onset of action than beta blockers and is therefore the first choice
- C. Cardioversion is contraindicated during pregnancy
- D. Verapamil is useful in patients with COPD but has more negative inotropic effects than diltiazem and may cause hypertension
- E. Magnesium decreases atrioventricular node (AVN) conduction and may promote conversion to sinus rhythm in up to 50% of patients**

23. Syncope is associated with acute aortic dissection typically because of which of the following?

- A. Tamponade
- B. Acute mitral regurgitation
- C. Acute aortic insufficiency
- D. Both A and B
- E. Either A or C**
- F. None of the above

24. The most useful laboratory test to check when a patient presents with bleeding associated with dabigatran is:

- A. INR (international normalized ratio - if it is normal the patient is not adherent to their medication)
- B. PTT (partial thromboplastin time)- typically it is significantly elevated on dabigatran and we can follow this serially to reliably assess drug clearance
- C. Creatine clearance - since dabigatran is highly renally cleared, acute kidney injury will prolong drug effects and clearance**
- D. Clotting time - this is readily available and useful for assessing an individual patient's ability to form clot



DIDACTICS AND HANDS-ON CURRICULUM

25. Which of the following indication / tPA (tissue plasminogen activator) dosing is/are correct?

- A. Acute ischemic stroke - 0.9 mg/kg IV (max dose 90) with 10% given as bolus over 1 minute and the rest over 60 minutes
- B. Acute ischemic stroke - 100 mg over 2 hours
- C. Acute pulmonary embolism - if weight is ≤ 67 kg: 15 mg IVP bolus over 1-2 minutes, THEN 0.75 mg/kg IV infusion over 30 minutes (not to exceed 50 mg), THEN 0.5 mg/kg IV over the next 60 minutes (not to exceed 35 mg over 1 hour). If weight is >67 kg: 15 mg IVP bolus over 1-2 minutes, THEN 50 mg IV infusion over next 30 minutes, THEN remaining 35 mg over next 60 minutes
- D. Acute myocardial infarction - 0.9 mg/kg IV (max dose 90) with 10% given as bolus over 1 minute and the rest over 60 minutes
- E. Both A and C
- F. Both B and D

26. When do you think feedback following a resuscitation event would be most helpful?

- Immediately
- The same day
- Within a week
- Sometime during the rotation month
- After the rotation is over

27. How often is feedback following a resuscitation event necessary?

- | | | | | |
|-------------------------------------|---------------------------------------|------------------------------------|---|----------------------------|
| Rarely / Typically not
necessary | Rarely / Only for
unique scenarios | Sometimes /
Depends on the case | Often / Can learn
something from most
cases | Very Often / Every
Case |
|-------------------------------------|---------------------------------------|------------------------------------|---|----------------------------|

28. From whom would feedback be most helpful following a resuscitation event? Please select all that apply.

- Other emergency medicine (EM) residents
- EM residents in resuscitation rotation
- EM attending physicians
- Consulting physicians
- None of the above
- Other (please specify)



DIDACTICS AND HANDS-ON CURRICULUM

29. The resuscitation rotation will improve my performance during a resuscitation event.

Strongly Disagree Disagree Neither Agree nor Disagree Agree Strongly Agree

30. The resuscitation rotation will not be valuable to my emergency medicine residency training.

Strongly Disagree Disagree Neither Agree nor Disagree Agree Strongly Agree

31. Please describe how the number of personnel can affect an emergency medicine resident's experience during a resuscitation event.

32. Please describe the value of having the flexibility to accompany patients during and after their transfer from the emergency department.



Appendix F: Resuscitation Rotation Post-Rotation Survey

(Questions with correct answers highlighted in red)

Emergency Medicine PGY-2 Resuscitation Rotation Post Survey

1. Please enter your study ID by using the first two letters of your last name combined with the last four numbers on your Beaumont ID badge (example: John Smith, Beaumont ID: 12345678 would be SM5678).

2. On a scale of 1 to 5, where 1 = unskilled and 5 = skilled, how would you rate your current level of skill in life-saving techniques?

1 2 3 4 5

3. On a scale of 1 to 5, where 1 = unskilled and 5 = skilled, how would you rate your level of skill in life-saving techniques before the beginning of the resuscitation rotation?

1 2 3 4 5

4. Please rate your confidence level in the following areas during patient resuscitation:

	Not Confident	Somewhat Confident	Confident	Very Confident
4.1 Leading a resuscitation				
4.2 Working with a team to handle a resuscitation				
4.3 Recognizing when to get additional help during a resuscitation				
4.4 Ability to supervise team members during a resuscitation				
4.5 Knowing how to get additional help during a resuscitation				



DIDACTICS AND HANDS-ON CURRICULUM

5. Please rate your anxiety level when performing the following skills during patient resuscitation:

	Not Anxious	Somewhat Anxious	Anxious	Very Anxious
5.1 Endotracheal intubation				
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DIDACTICS AND HANDS-ON CURRICULUM

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24. How often is feedback following a resuscitation event necessary?

- | | | | | |
|---|---|--|---|--|
| <input type="radio"/> Very Rarely /
Typically not
necessary | <input type="radio"/> Rarely / Only for
unique scenarios | <input type="radio"/> Sometimes /
Depends on the case | <input type="radio"/> Often / Can learn
something from most
cases | <input type="radio"/> Very Often / Every
Case |
|---|---|--|---|--|



DIDACTICS AND HANDS-ON CURRICULUM

25. From whom would feedback be most helpful following a resuscitation event? Please select all that apply.

- Other emergency medicine (EM) residents
- EM residents in resuscitation rotation
- EM attending physicians
- Consulting physicians
- None of the above
- Other (please specify)

26. Presenting clinical cases to attending physicians and colleagues bettered my understanding of critical care during a resuscitation event.

Strongly Disagree Disagree Neither Agree nor Disagree Agree Strongly Agree

27. The resuscitation rotation improved my performance during a resuscitation event.

Strongly Disagree Disagree Neither Agree nor Disagree Agree Strongly Agree

28. The resuscitation rotation served as a valuable part of my emergency medicine residency training.

Strongly Disagree Disagree Neither Agree nor Disagree Agree Strongly Agree

29. Please describe how the number of personnel can affect an emergency medicine resident's experience during a resuscitation event.

30. Please describe the value of having the flexibility to accompany patients during and after their transfer from the emergency department.