Eastern Association for the Surgery of Trauma

Advancing Science, Fostering Relationships, and Building Careers

Advanced Practitioners in Trauma Workshop

Addressing Professional and Clinical Development When Caring for the Acutely Injured Patient

January 16, 2020
Loews Sapphire Falls Resort
Orlando, Florida

CME and CNE Credit for this workshop is being provided by the Society of Trauma Nurses. To claim credit for this workshop go to http://www.traumanurses.org/east-cne-evaluation-forms. **Visit the STN Booth in the EAST Exhibit Hall for additional details, or contact Brian Doty, STN Meetings and Education Director, at 859-977-7446 or bdoty@traumanurses.org for more information.**

Advanced Practitioners in Trauma Workshop – Addressing Professional & Clinical Development When Caring for the Acutely Injured Patient

THURSDAY, JANUARY 16, 2020 • 1:30 PM-5:45 PM

Presented by EAST and the Society of Trauma Nurses (STN)

Target Audience: Advanced Practitioners

Needs Statement: Advanced Practitioners in Trauma comprise physician assistants and advanced practice nurses in a variety of settings. Each year, a task force representing APs from EAST and the Society of Trauma Nurses meets to identify areas involving emergency general surgery, critical care, and trauma care in which updated information can be disseminated. This year's workshop aims to provide a balance of clinical and professional content that will continue to strengthen the role of the AP.

Overview: The 2020 EAST workshop for Advanced Practitioners (APs) will provide insight into management of the injured patient and best practices for APs throughout trauma, critical care, and emergency general surgery. This workshop aims to provide a balance of clinical and professional content. Coagulopathy in trauma is an ongoing struggle for clinicians to manage. Information addressing heparin induced thrombocytopenia, trauma induced coagulopathy, and management of DOACs will be provided. Many advanced practitioners serve as educators, preceptors, and mentors. Evidenced based practices for providing feedback and how to best mentor new providers will be discussed. Real and practical tools that have proven success will be disseminated. As EAST continues to grow and update its practice management guidelines, insight into the process on both the institutional and national level will be shared. Learners will identify opportunities to build guidelines within their own institution as well as contribute to EAST's robust process. A panel of providers will share cases addressing great saves and near misses. The workshop will conclude with opportunities for attendees to share similar experiences.

Learner Objectives:

At the conclusion of this workshop, the participant should be better able to:

1. Identify coagulopathy in the injured patient, methods to treat, and agents for reversal of medication-induced-coagulopathy
2. 2. List tools for providing feedback to learners and determine evidenced based best practices.
3. Discuss methods for involvement in guideline development on the institutional and national levels.

Workshop Directors: A. Britton Christmas, MD, Jasmine Garces-King, DNP, ACNP-BC, CCRN, TCRN, & Jonathan Messing, MSN, ACNP-BC

Course Size: 50

Course Price: $325

SCHEDULE:

1:30 pm- 2:30 pm
Coagulopathy in Trauma –
Kelsey Rosen, AGACNP-BC

2:30 pm-3:30 pm
Feedback that Sticks –
Dee Dee Herrmann, DHSc, MPH, PA-C

3:30 pm-3:45 pm
Break

3:45 pm-4:45 pm
AP Involvement and Influence in the Development of Guidelines –
George Kasotakis, MD, MPH &
Colleen Trevino, PhD, NP

4:45 pm- 5:45 pm
Great Saves and Near Misses. A Case Series -
Caroline Banes, ACNP-BC,
Katrina Flowers, MCHS, PA-C, &
Marialice Gulledge, DNP, ANP-BC

Coagulopathies in Trauma

Kelsey Rosen, MSN, AGACNP-BC
Trauma Nurse Practitioner
Center for Trauma and Critical Care
The George Washington University Hospital

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Financial Disclosures

- None

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Objectives

- Understand physiology of coagulopathies in trauma
  - Trauma induced coagulopathy (TIC)
  - Disseminated intravascular coagulopathy (DIC)
  - Venous thromboembolism (VTE)
  - Heparin induced thrombocytopenia (HIT)
- Review current research and recommendations
- Examine case studies
- Understand TEG interpretation and its clinical application
- Review anticoagulation and reversal agents

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Trauma Induced Coagulopathy

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Trauma Induced Coagulopathy

- Trauma induced coagulopathy (TIC), coagulopathy in trauma, acute traumatic coagulopathy, early coagulopathy of trauma, acute coagulopathy of trauma shock
- 25-35%
- Increased mortality

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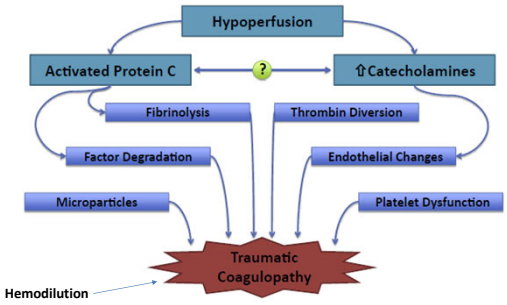

Cohen M.J., Christie S.A. Coagulopathy of Trauma, *Critical Care Clinics*. 2017; 33(1): 101-118. https://doi.org/10.1016/j.ccc.2016.08.003. Accessed 11/2019

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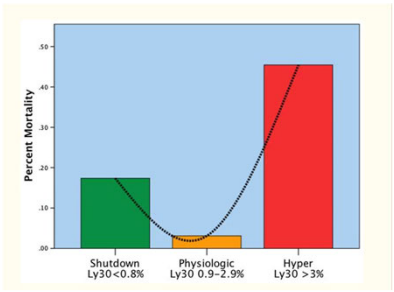

Hyperfibrinolysis:
- Early death from hemorrhage
- More resources

Fibrinolysis shutdown:
- Delayed death from multisystem organ failure.
- More common

J Trauma Acute Care Surg. 2014 Dec;77(6):811-7; discussion 817. doi: 10.1097/TA.0000000000000341.

Hyperfibrinolysis, physiologic fibrinolysis, and fibrinolysis shutdown: the spectrum of postinjury fibrinolysis and relevance to antifibrinolytic therapy.

Moore HB1, Moore EE, Gonzalez E, Chapman MP, Chin TL, Silliman CC, Banerjee A, Sauaia A.

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TIC in Isolated TBI

- Incidence 42%
- 4.7x odds mortality
- Poor clinical outcomes
- Systemic coagulopathy?

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Mechanism of TIC in iTBI

- Early hypercoagulopathy
- Later hypocoagulable state
- Disruption in blood-brain barrier
- Activation of platelets

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Diagnosis

Table 1
Standard admission trauma laboratory measures in the evaluation of TIC

Lab	Level	Usefulness in the Diagnosis of TIC
pH	Low	Significant hypoperfusion probable
Base deficit/excess	Negative	Significant hypoperfusion probable
Hemoglobin/hematocrit	Low	Likely significant blood loss
Platelet count	Low	Absolute/relative thrombocytopenia
Partial thromboplastin time	Prolonged	Diagnostic of TIC
Prothrombin time/International Normalized Ratio	Prolonged	Diagnostic of TIC

injured population (Injury Severity Score >15) in a multicenter retrospective study, but at least 1 prospective study has refuted this finding.[36]

However, concerns have been raised regarding the use of standard coagulation assays as the benchmark for TIC. PTT and INR were designed initially to test heritable coagulopathy, and standard reference ranges were generated using data from healthy volunteers. Additionally, concerns have been raised regarding the length of time required to run standard coagulation tests when rapid and ongoing diagnosis and

Cohen M.J., Christie S.A. Coagulopathy of Trauma, *Critical Care Clinics*. 2017; 33(1): 101-118. https://doi.org/10.1016/j.ccc.2016.08.003. Accessed 11/2019

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Treatment

- Stop the bleed
- Prevent hemodilution, hypothermia and acidosis
- Balanced resuscitation initially, then targeted resuscitation

Product	Component
Fresh frozen plasma	Fibrinogen, clotting factors, proteins
Cryoprecipitate	Fibrinogen
Prothrombin Complex Concentrate	Factors II, VII, IX, X
Tranexamic acid	Anti fibrinolytic

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Summary of TIC

- More than just hemodilution
  - Activated protein C
  - Massive TPA release
  - Platelet dysfunction
- TBI mechanism likely from disruption in BBB
- Fibrinolysis dysregulation phenotypes
  - Hyperfibrinolysis= death from exsanguination
  - Fibrinolysis shutdown= death from MSOF

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Disseminated Intravascular Coagulation

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Disseminated Intravascular Coagulation

- Acquired systemic syndrome of intravascular activation of coagulation from microvascular damage
- Fibrinolytic vs thrombotic phenotype
- 21-47% of DIC cases are from trauma
- Mortality 40-80%

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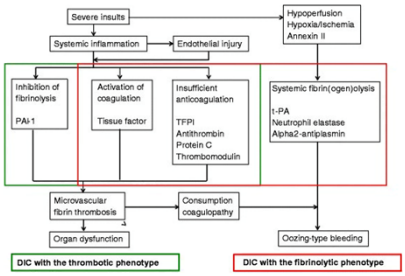
Mechanism



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Diagnosis

- Prolonged PT, PTT
- Thrombocytopenia
- Decreased fibrinogen level
- Elevated fibrin degradation products and D dimers
- Schistocytes

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Treatment

- Supportive care
- Treat the cause
- Resuscitation
  - Blood
  - Cryoprecipitate
  - Fresh Frozen Plasma
  - Platelets

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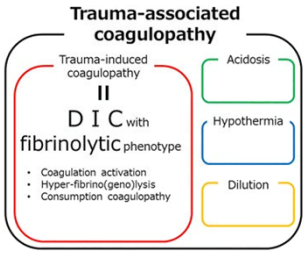
TIC vs DIC



Hayakawa M. Pathophysiology of trauma-induced coagulopathy: disseminated intravascular coagulation with the fibrinolytic phenotype. *J Intensive Care*. 2017;5:14. Published 2017 Jan 31. doi:10.1186/s40560-016-0200-1

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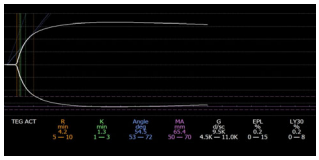
Thromboelastography (TEG)



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Thromboelastography

- Global assessment of viscoelastic clot formation in whole blood
- PT/INR, PTT only reflect soluble clotting factors in serum
- Platelet function

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Goal Directed Massive Transfusion

- Survival benefit
- Shorter hospital and ICU stay
- More ventilator free days
- Fewer blood product utilization
- Cost reduction

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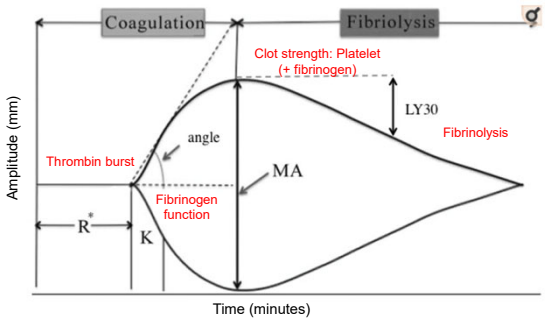

*Adapted from Gonzalez E, Moore EE, Moore HB. Management of Trauma-Induced Coagulopathy with Thrombelastography. *Crit Care Clin.* 2017;33(1):119–134. doi:10.1016/j.ccc.2016.09.002

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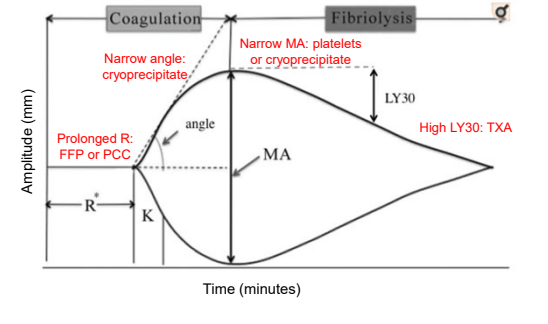

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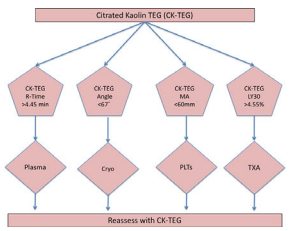

Plasma for **r-value** >9 minutes

Plasma and/or cryoprecipitate (fibrinogen concentrate) for **k-time** >4 minutes

Cryoprecipitate (or fibrinogen concentrate) and/or plasma for **α-angle** <60°

Platelets for **mA** <55 mm

Anti-fibrinolytics for **LY30** >7.5 percent

Stettler GR, Sumislawski JJ, Moore EE, et al. Citrated kaolin thrombelastography (TEG) thresholds for goal-directed therapy in injured patients receiving massive transfusion. *J Trauma Acute Care Surg.* 2018;85(4):734–740. doi:10.1097/TA.0000000000002037

ACS TQIP Massive Transfusion in Trauma Guidelines, 2014

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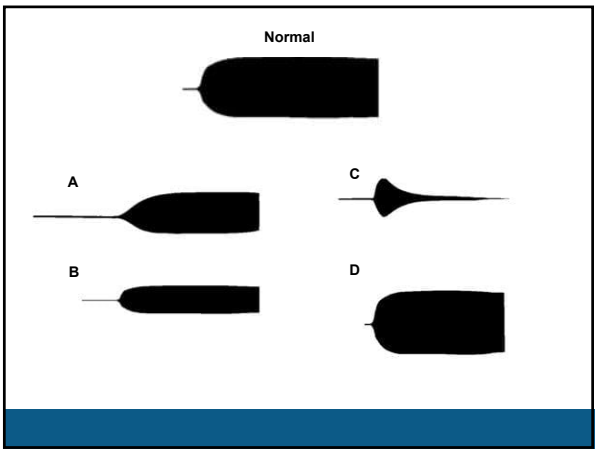

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Indications for TXA

- Bleeding patients
- Hyperfibrinolysis patients (LY30 >3%)
- Within 3 hours

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Platelet Function

- Measures arachidonic acid (AA) and adenosine diphosphate (ADP) receptor pathway
- No difference between:
  - Minor and major trauma
  - TBI and non-TBI
- No relationship to ISS, LOS, or mortality

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Case Study

- 40 yo male pedestrian vs car
- Significant chest trauma and pulseless
  - 30.1° C
- Thoracotomy
  - Massive transfusion
- Labs:
  - Prolonged PT and PTT, slightly elevated INR
  - Elevated D dimer
  - Fibrinogen initially 154
  - Lactate 8.4

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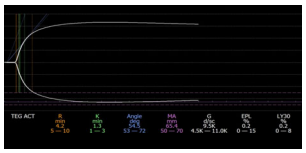
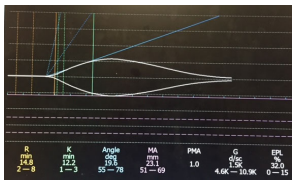


Normal TEG



Patient

TEG Value (normal range)	Result
R (5-10 min)	14.8 prolonged
K (1-3 min)	12.2 prolonged
Angle (53-72)	19.6 narrow
MA (50-70°)	23.1 Narrow/low
Ly30 % (<7.5%)	32 Elevated

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Venous Thromboembolism

Kristensen AMD, Rosberg V, Juel J, Pareek M. Conservatively managed saddle pulmonary embolism. *Clin Case Rep*. 2019;7(6):1259–1260. Published 2019 Apr 24. doi:10.1002/ccr3.2174

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Venous Thromboembolism

- Deep Vein Thrombosis (DVT) and Pulmonary Embolism (PE)
- Post thrombotic syndrome, stroke risk
- Venous stasis, endothelial damage, hypercoagulability
- Inflammation, platelet adherence and fibrin

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Risk Factors

TABLE 1. Risk Factors Associated With VTE (Univariate Analysis)

Risk Factor (number with risk)	Odds ratio (95% CI)
Age ≥ 40 yrs. (n = 178,851)	2.29 (2.07–2.55)
Pelvic fracture (n = 2,707)	2.93 (2.01–4.27)
Lower extremity fracture (n = 63,508)	3.16 (2.85–3.51)
Spinal cord injury with paralysis (n = 2,852)	3.39 (2.41–4.77)
Head injury (AIS ≥ 3) (n = 52,197)	2.59 (2.31–2.90)
Ventilator days >3 (n = 13,037)	10.62 (9.32–12.11)
Venous Injury (n = 1,450)	7.93 (5.83–10.78)
Shock on admission (BP <90 mmHg) (n = 18,510)	1.95 (1.62–2.34)
Major surgical procedure (n = 73,974)	4.32 (3.91–4.77)

*Knudson MM, Ikossi DG, Khaw L, Morabito D, Speetzen LS. Thromboembolism after trauma: an analysis of 1602 episodes from the American College of Surgeons National Trauma Data Bank. *Ann Surg*. 2004;240(3):490–498. doi:10.1097/01.sla.0000137138.40116.6c

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Signs and Symptoms

Deep vein thrombosis

- Pain
- Swelling
- Tenderness
- Redness

Pulmonary embolism

- Dyspnea
- Tachypnea
- Pleuritic chest pain
- Tachycardia
- Dyspnea
- Hypoxia/hypoxemia
- Cardiogenic shock

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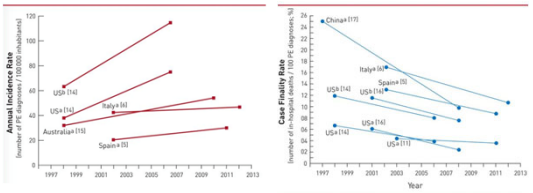
Incidence and Mortality



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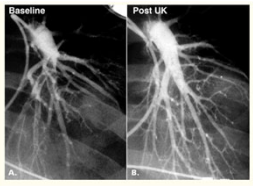
Diagnosis

Deep vein thrombosis

- Ultrasound
- CT scan



Pulmonary embolism

- CT pulmonary angiography
- Interventional angiography
- Echocardiography
  - Right ventricle size and function
  - Abnormal septal wall motion
  - Tricuspid regurgitation
- V/Q Scan?

*Subramanian R, White CJ. Mechanical interventions and thrombolytic therapy in venous thrombosis and pulmonary embolism. *Ochsner J*. 2002;4(1):30–36.

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Chemoprophylaxis

- Low molecular weight heparin> unfractionated heparin
- Standard dosing inadequate
- Anti-Xa monitoring
- Inferior Vena Cava filters?
  - Anticoagulation is contraindicated and high risk

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Treatment

Deep vein thrombosis

- Proximal vs distal
- Provoked vs unprovoked
- Anticoagulation
  1. Dabigatran, Rivaroxaban, or Apixaban
  2. Vitamin K Antagonist
  3. LMWH
- Upper extremity DVT

Pulmonary embolism

- Depends on hemodynamic stability and bleeding risk
  - Subsegmental?
- Anticoagulation
  1. Dabigatran, Rivaroxaban, or Apixaban
  2. Vitamin K Antagonist
  3. LMWH
- Systemic thrombolysis?
- Catheter directed intervention
- Surgical Embolectomy
- Mechanical circulatory support

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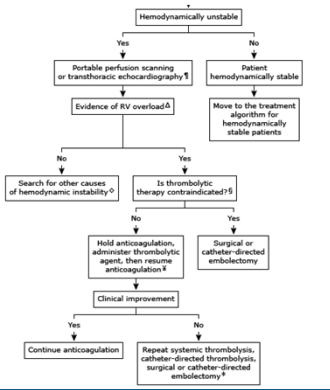

- Catheter directed intervention
  - Hypotension
  - High bleeding risk
  - Death is imminent
  - Contraindication to AC
- Surgical Embolectomy
  - Contraindication to thrombolytic therapy
- Systemic thrombolysis
  - Cardiac arrest
  - Better than UFH
- Mechanical circulatory support
  - VA ECMO
  - Ventricular assist balloon pump

*Algorithm from Uptodate 2019

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Case Study

- 37 yo male PMH smoker, morbid obesity and HTN s/p fall onto metro tracks
  - T10 3 column fracture, hyperextension injury
- Postop T5-L3 posterior spinal fusion and T8-T11 laminectomy
- Awaiting acute rehab

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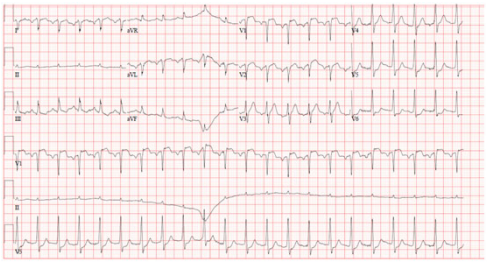
- SOB, chest pain, diaphoretic, hypoxic



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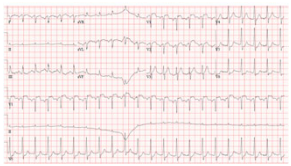
- Echo: RV dilation and right heart strain
- IR for venogram, thrombolysis and thrombectomy
  - Pulmonary hemorrhage
- VV ECMO -> VA ECMO



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Heparin Induced Thrombocytopenia

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Heparin Induced Thrombocytopenia

- Immune mediated response to the presence of heparin which causes prothrombotic state
- Incidence <0.1-7%
- Mortality rate 10%
- ⅓ to ½ cases complicated by thrombosis

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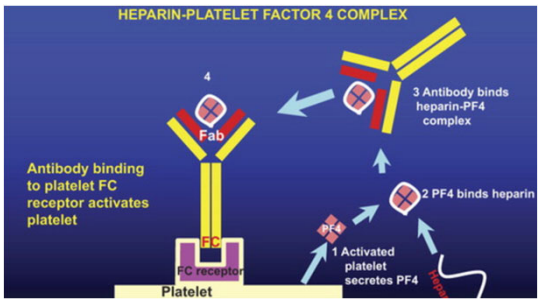
Immune Mediated Response



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Clinical Suspicion

- Decrease in platelets ≥50%
- Onset 5-10 days after heparin exposure
  - Unless prior exposure
- Hypercoagulability

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4T Scoring System for Pretest Probability of HIT

Category	2 Points	1 Point	0 Point
Thrombocytopenia	Platelet decrease ≥50%	Platelet decrease 30-50%	Platelet decrease <30%
Onset	Days 5-10	>10 days	<Day 4 with no recent exposure
Thrombosis	New thrombosis	Suspected thrombosis	None
Other Causes of Thrombocytopenia	None	Possible	Definite

Low 0-3: negative predictive value 99.8%
Intermediate 4-5: positive predictive value 14%
High 6-8: positive predictive value 64%

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Diagnosis

- Serotonin Release Assay (SRA)
  - Sensitivity 88-100%
  - Specificity 89-100%
- Heparin Induced Platelet Antibody
  - Sensitivity >95%
  - Specificity 50-89%
- The combined sensitivity of 99%

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Treatment

- Discontinue heparin product immediately
- Initiate non-heparin therapeutic anticoagulant
- Do not transfuse platelets
  - Increased arterial thrombosis
  - Increased mortality

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Anticoagulant	Mechanism	IV/PO	Monitoring	Considerations
Argatroban	Direct thrombin inhibitor	IV infusion	PTT, goal 1.5-3 x baseline	Hepatically eliminated Can be used in renal Impairment. No reversal. Major hemorrhage rate 1%
Bivalirudin	Direct thrombin inhibitor	IV infusion	PTT, goal 1.5-2.5 x baseline	Renally eliminated Can be used in hepatic impairment No reversal
Fondaparinux	Indirect factor Xa inhibitor	Subcut injection	None	Renally cleared Can be used in hepatic impairment Reversal agent
Apixaban, Rivaroxaban	Direct factor Xa inhibitor	Oral, Subcut injection	None	Reversal agent Renally cleared
Dabigatran	Direct thrombin inhibitor	Oral	None	Reversal agent Renally cleared

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Case Study

- 34 yo male fall 30 feet from bridge while intoxicated with bilateral lower extremity deformities.
- Significant pelvic fracture, bilateral femur fracture, bilateral tibia fractures

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Hospital Course

Total of 12 operative visits and 2 interventional radiology visits:

- Ex-lap and pelvic packing and subsequent closure
- Pelvic ex-fix, Pubic symphysis ORIF, then ex fix removal
- L3-S1 posterior spinal fusion and sacral ORIF
- Right femur ex-fix then later ORIF
- Left femur ex-fix and I&D x2. Then later ORIF
- Right tibia knee expanding ex-fix
- Left tibia knee expanding ex-fix and wound VAC, eventual removal
- Right radius ORIF
- Multiple I&D

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Hospital Course

- Hospital day #6: Found to have acute bilateral PE with right heart strain
- Hospital day #7: Intubated d/t respiratory distress. Went to IR for thrombectomy and thrombolysis
- Hospital day #8: Oxygenation improved and was extubated

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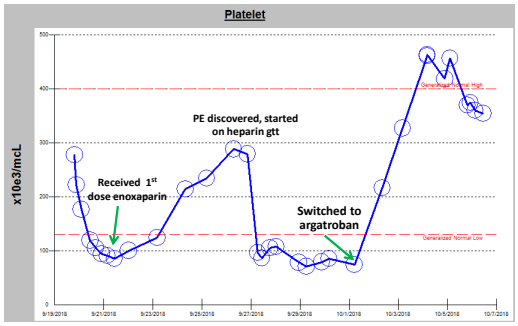

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Summary

- Hypercoagulable state despite thrombocytopenia
- Most often with heparin and in surgical patients
- Onset 5-10 days, platelet drop >50%
  - Intermediate/high probability= treat as HIT+
- Treatment is anticoagulation

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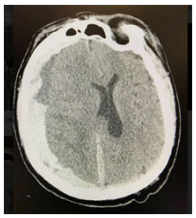
Anticoagulant and Reversal Agents



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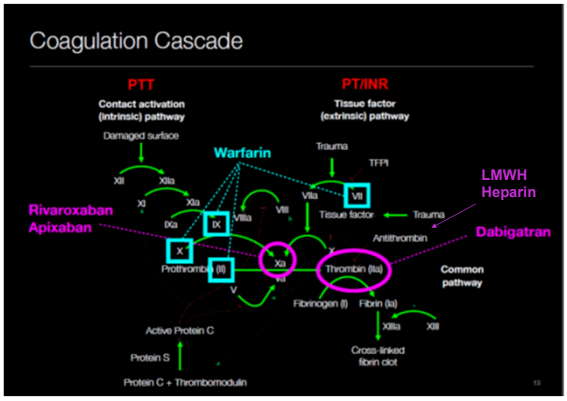

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Direct Oral Anticoagulation

- Non-inferior
- Improved safety
- Prevention and treatment of VTE
- No lab monitoring

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Anticoagulation Reversal

Drug	Mechanism	Lab Monitoring	Reversal
Dabigatran	Direct Thrombin Inhibitor	Thrombin Time (not PT or PTT)	Idarucizumab
Fondaparinux/ Apixaban/ Rivaroxaban	Factor Xa inhibitor	Anti Xa levels	Andexanet alfa
Unfractionated Heparin	Activates antithrombin	PTT	Protamine sulfate
Low Molecular Weight Heparin	Activates antithrombin	Anti Xa levels	Protamine sulfate?
Warfarin	Vitamin K Antagonist	PT/INR	Vitamin K and PCC or FFP

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THE GEORGE WASHINGTON UNIVERSITY HOSPITAL

Questions?

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Feedback that Sticks

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1

The State of Feedback Today I

- Essential for the acquisition of new knowledge and skills……and to enhance teaching
- Part of trainee and faculty evaluations
- Frequent faculty development/RATs topics
- General descriptive (vs. specific prescriptive) literature

Bing-You et al., 2017

2

2

The State of Feedback Today II

FRUSTRATING

Students: non-existent, insufficient

Faculty: time-consuming, unappreciated

Bing-You et al., 2017

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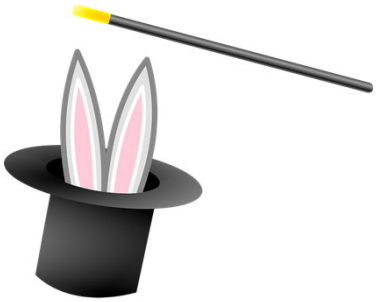
Vanishing Feedback



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Consequences of Vanishing Feedback

- *Nothing of real value gets transmitted or received*
- *Mistakes go uncorrected*
- *Students generate own feedback from cues that may be misread*

Ende, 1983

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Learning Objectives

By the end of this session, you should be able to:

1. Recognize the issues inherent in giving and receiving feedback
2. Discuss different perspectives on feedback and how they could impact individual development
3. Practice suggested techniques
4. Identify aspects of your feedback approach that you want to refine

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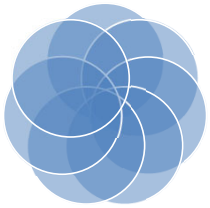
Forms of Feedback to Trainees

Checklists

Narrative assessments

Written tests



Skills tests

Scales & rubrics

Patient response

Verbal comments

7

What's the Evidence in Med Ed? I

Guidelines: *See Appendix A & B*

observation-based……..well-timed

focused……..descriptive….. non-judgmental

Models

FAST…INSIGHT…Grid…PEARLS…SOAP…Sandwich

Limited in effectiveness

Bing-You et al., 2017; Downing & Yudkowsky, 2009; Kind & Agrawal, 2015

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What's the Evidence in Med Ed? II

Models

repeated & immediate feedback best

Modes

Verbal: +honest & engaging*; often not recognized*

Written: + if used over time*; can be generic*

Rubrics

focus on behavior vs. KSAs…reliability & validity issues

Bing-You et al., 2017; Downing & Yudkowsky, 2009; Kind & Agrawal, 2015

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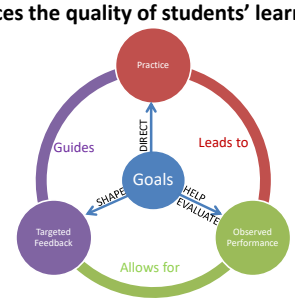
What Can the Learning Sciences Add?

Goal-directed practice coupled with targeted feedback enhances the quality of students' learning



Ambrose et al., 2010

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Deliberate Practice with Targeted Feedback Makes Teaching & Learning Efficient

Deliberate Practice

- ✓ ***specific goal*** or set of goals related to what is difficult
- ✓ appropriate level of ***challenge*** that is not too hard or too easy & provides scaffolded support
- ✓ ***sufficient practice*** amount for benefits to accumulate

Targeted Feedback

- ✓ guides ***relative goal attainment***: where they are; what to do to improve
- ✓ ***explicit*** to target criteria
- ✓ ***frequent*** but timely
- ✓ linked to ***additional practice*** opportunities

Ambrose et al., 2010

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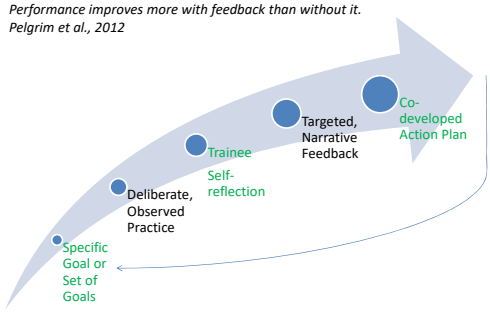
Clinical Performance Development Process

Performance improves more with feedback than without it.
Pelgrim et al., 2012



Adapted from Ambrose et al., 2010; Pelgrim et al., 2012

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Characteristics of Effective Feedback

1. Is approached as a ***continuous learning*** opportunity.

2. Is based on ***observation of a focused, agreed-upon goal*** or set of goals.

3. Occurs as ***immediately*** as possible after observation.

4. Follows a ***+/- structured approach***, repeated over time.

5. Covers ***K, S, A & Bs relevant to criteria*** for meeting the goal.

6. ***Engages the trainee*** in dialogue (even if a rubric).

7. Ends with specific, agreed-upon ***action steps*** guiding more practice.

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A Suggested Feedback Format

So far this (semester/rotation), TRAINEE's NAME has been focusing on improving_____ .

So far this semester/rotation), TRAINEE's NAME has demonstrated strengths in _____.

During the remainder of the (semester/rotation), TRAINEE's NAME should be encouraged to improve their ability to _____.

In order for TRAINEE's NAME to improve, I suggest that they _____.

YOUR NAME DATE

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Practice Situations

1. Trainee delivers a disorganized presentation that lacks relevant information about a post-operative patient.
2. Trainee delivers an accurate, laborious verbal report on morning rounds, proceeding through each piece of information in detail.
3. Trainee comes to the OR unprepared for the case (can not answer questions about- relevant anatomy, steps of the procedure, does not know the patient's history).
4. Trainee has no situational awareness, gets in the way, asks "simple" questions readily instead of trying to work out solutions to problem or asks questions during inappropriate times of the case.
5. Trainee does not show up on time (i.e. to rounds, conference, educational sessions, etc.).
6. Trainee shows up to conference or rounds unprepared.
7. Trainee leaves early and provides excuses for not finishing tasks completely at the end of the day.

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Barriers to Even the Best Feedback Being Used

- Receiving feedback properly requires maturity, honesty and a commitment to improvement
- Feedback does not register when it sets off a:
  - ***truth trigger***: off-base assessment/advice
  - ***relationship trigger***: issues with the giver
  - ***identity trigger***: questions your self

Stone & Heen, 2014

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Becoming Better Feedback Receivers

1. **Know your response** tendencies.
2. **Separate** the message from the messenger.
3. **Find the coaching** in the criticism.
4. **Explore** where the feedback is coming from.
5. **Ask** for feedback regularly.
6. **Test advice** in small experiments.

How can we help our trainees become better receivers of feedback?

Stone & Heen, 2014

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If Not You, Who?

Feedback provides trainees with:

- *Valuable information on their performance*
- Sets the *stage* for improvement
- *Gets at aspects of the clinical process not easily examined in cognitive skills tests*
- Conveys an attitude of concern for the development of the whole person

THANK YOU!

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Appendix A: Exemplar Feedback Language

- Descriptive, non-evaluative
  - *Your differential is inadequate.*
  - *The differential did not include the possibility of X.*
- Action-based without assumptions
  - *Your choice of antibiotic indicates a lack of appreciation for the possibility for xyz infection.*
  - *The antibiotic regime chosen did not provide coverage for xyz.*
- Subjective comments labelled as such
  - *You looked uncomfortable talking with the patient about x.*
  - *Watching you, I felt you were uncomfortable talking with the patient about x.*
- Qualified praise
  - *You're terrific! You were great when you presented that case.*
  - *That case presentation gave me a very detailed and useful picture of the patient's problem.*

Ende, 1983

Appendix B: Exemplar Feedback Session

1. Establish time and location for feedback session
2. Explain/discuss how the session will run
3. Restate performance goals
4. Ask the trainee how they think things went
   - What was done well?
   - What could be improved?
5. Provide your feedback (if not integrated in previous step)
6. Discuss action steps for improvement
7. Agree on progress check-in

Adapted from Hewson & Little, 1998

Eastern Association for the Surgery of Trauma
east
Advancing Science, Fostering Relationships, and Building Careers

Practice Management Guideline Development

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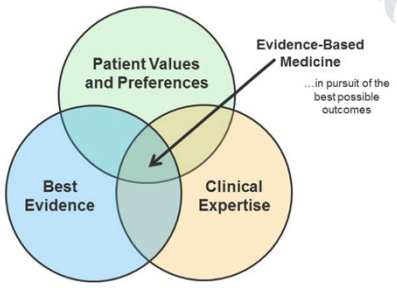
1

Objectives

- What is evidence-based medicine?
- Where to look for research evidence?
- What is a Practice Management Guideline?
- How to incorporate guidelines into practice.
- Example of practice guidelines (SBO, diverticulitis)
- Discuss developing a guideline.

2

Components of Evidence-Based Medicine



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Model of Care-Triple Aim's

- Improved quality
- Improved patient satisfaction
- Reduced costs

4

The Five Ways Evidence-Based Medicine Adds Value to Health Systems

#1: Helps clinicians stay current on standardized, evidence-based protocols.

#2: Uses near real-time data to make care decisions.

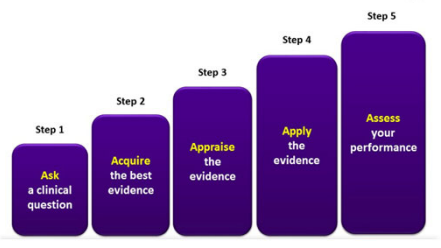
#3: Improves transparency, accountability, and value.

#4: Improves quality of care.

#5: Improves outcomes.

5

The 5 Steps of Evidence-Based Medicine



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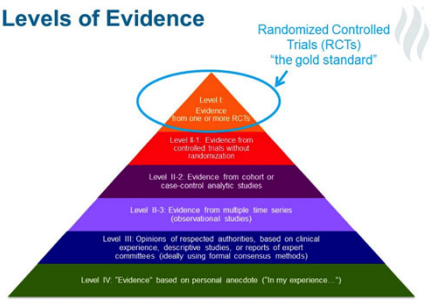

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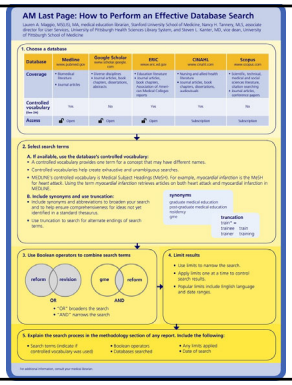
Where to find research evidence?



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Assessing the Quality of Studies

- **Conceptual framework**:
  - Are the aims clearly stated and research questions clearly identified?
  - Does the author link the work to an existing body of knowledge?
- **Study design**:
  - Are the methods appropriate and clearly described?
  - Is the context of the study well set out? Did the research design account for possible bias?
  - Are the limitations of research explicitly identified?
- **Research analysis**:
  - Are the results clearly described, valid and reliable?
  - Is the analysis clearly described?
- **Conclusions**:
  - Are all possible influences on the observed outcomes considered?
  - Are conclusions linked to aims of study?
  - Are conclusions linked to analysis and interpretation of data?

9

10

Existing Practice Management Guidelines

Guidelines have two parts (IOM, 2012):

1. The foundation is a systematic review of the research evidence bearing on a clinical question, focused on the strength of the evidence on which clinical decision-making for that condition is based.
2. A set of recommendations, involving both the evidence and value judgments regarding benefits and harms of alternative care options, addressing how patients with that condition should be managed.

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Existing Practice Management Guidelines

Government Sponsored Programs
-Report of the U.S. Preventive Services Task Force
-CDC Guidelines
-Cochrane Database (National Institute for Health Research)
Specialty Organizations
-American College of Surgery
-Eastern Association for the Surgery of Trauma
-American Association for the Surgery of Trauma
World Health Organization

12

Standardization in Practice

- 17 years for medical research findings into standard clinical practice
- 2006-2011 the rate of guideline utilization increased only slightly, ***35% to just 50%***, across the entire industry. *The Advisory Board Company*
- Standardization
  - reduces variation in clinical treatment and patient outcomes
  - care is safer by reduction of errors
  - reduces waste
  - makes treatment predictable and controllable
  - defines clear responsibilities for all team members

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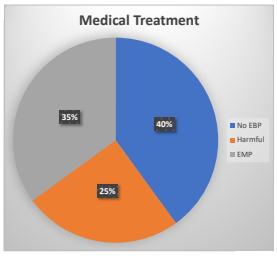
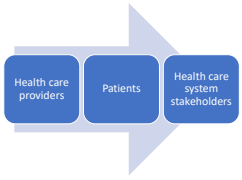
How to Incorporate Practice Guidelines into Practice- things to consider…



Behavior Change



Undo practices versus introduce new practices

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Barriers to Standardizations

- Lack of consistent clinical performance data for benchmarking
- Inefficient or disjointed clinical processes
- Inadequate means of enforcement
- Concern for threat to individual judgment and creativity, loss of treatment freedom, reduces innovation in management
- All treatment recommendations are not created equal
  - Some are based on very rigorous science, others are not

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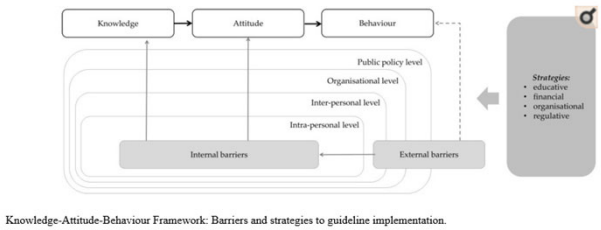

Knowledge-Attitude-Behaviour Framework: Barriers and strategies to guideline implementation.

16

Steps in Implementation

1. Needs assessment- to identify the target group and stakeholders
2. Define program objectives-the expected changes in behavior and environment need to be explicit
3. Select theory-based methods and practical strategies
4. Create of a program plan with a structure and themes of implementation and testing of program materials
5. Adoption and implementation of the guideline
6. Evaluate outcomes, implementation

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Implementing Practice Standards

1. People affected by protocols are involved in the creation of standards
2. Algorithms: guarantee a basic standard of care for all patients
3. *Makes providers accountable for their practice*

18

Small Bowel Obstruction Guidelines

GUIDELINES

Evaluation and management of small-bowel obstruction: An Eastern Association for the Surgery of Trauma practice management guideline

Adrian A. Maung, MD, Dirk C. Johnson, MD, Greta L. Piper, MD, Ronald R. Barbosa, MD, Susan E. Rowell, MD, Faran Bokhari, MD, Jay N. Collins, MD, Joseph R. Gordon, MD, Jin H. Ra, MD, and Andrew J. Kerwin, MD

J Trauma Acute Care Surg
S362 Volume 73, Number 5, Supplement 4

Di Saverio et al. World Journal of Emergency Surgery 2013, 8:42
http://www.wjes.org/content/8/1/42

REVIEW

Bologna guidelines for diagnosis and management of adhesive small bowel obstruction (ASBO): 2013 update of the evidence-based guidelines from the world society of emergency surgery ASBO working group

Salomone Di Saverio[1*], Federico Coccolini[2], Marica Galati[3], Nazareno Smerieri[3], Walter L Biffl[4], Luca Ansaloni[5], Gregorio Tugnoli[1], George C Velmahos[6], Massimo Sartelli[7], Cino Bendinelli[1,3], Gustavo Pereira Fraga[1,8], Michael D Kelly[9], Frederick A Moore[10], Vincenzo Mandalà[3], Stefano Mandalà[3], Michele Masetti[1], Elio Jovine[1], Antonio D Pinna[1], Andrew B Peitzman[11], Ari Leppaniemi[12], Paul H Sugarbaker[13], Harry Van Goor[14], Ernest E Moore[4], Johannes Jeekel[15] and Fausto Catena[2,16*†]

EAST Practice Management Guidelines | The Journal of TRAUMA® Injury, Infection, and Critical Care

Guidelines for Management of Small Bowel Obstruction

Jose J. Diaz, Jr., MD, Faran Bokhari, MD, Nathan T. Mowery, MD, Jose A. Acosta, MD, Ernest F. J. Block, MD, William J. Bromberg, MD, Bryan R. Collier, DO, Daniel C. Cullinane, MD, Kevin M. Dwyer, MD, Margaret M. Griffin, MD, John C. Mayberry, MD, and Rebecca Jerome, MLIS, MPH

J Trauma. 2008;64:1621–1666.

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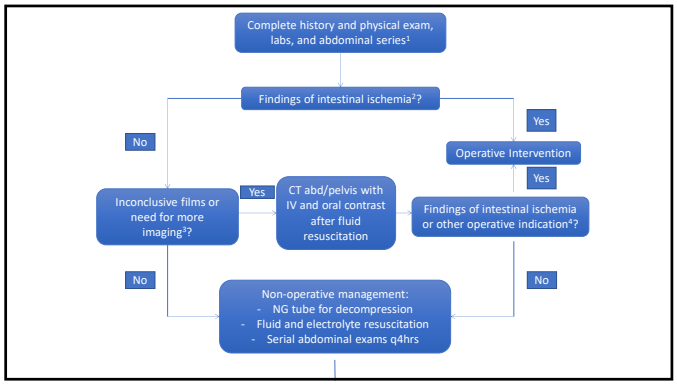

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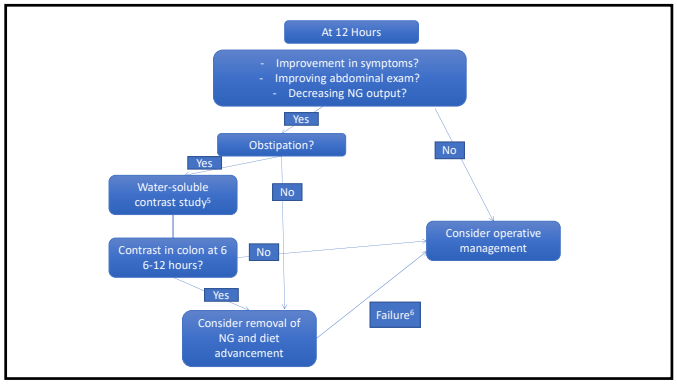

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[1]Labs to include CBC with differential, basic chemistry panel, and serum lactate. Abdominal series should include an upright film, supine film, and a view of the diaphragms

[2]Findings suggestive of intestinal ischemia and absolute indications for operative management include peritonitis on exam, free intraperitoneal air on plain films, and/or irreducible hernia. Relative indications that are concerning though less specific include elevated lactate, fever, tachycardia, severe pain, focal tenderness, and leukocytosis > 15,000.

[3]Indications for CT scan include patient who meet some relative indications above but are not felt to necessitate urgent operative intervention, those with no history of abdominal surgery NOR any hernias noted on exam, and those whom abdominal series does not clearly make the diagnosis of small bowel obstruction

[4]CT findings predictive of intestinal ischemia and/or predictive of ultimately requiring operative intervention in SBO include free intraperitoneal fluid, mesenteric edema, poor or absent bowel wall enhancement, pneumatosis intestinalis, mesenteric/portal venous air, mesenteric vascular "whirl sign," bowel wall thickening, high-grade obstruction, and lack of fecalization of the small bowel

[5]Order 50 ml of Omnipaque to be given through NGT. Do not dilute. Order a KUB timed for 6 hours after the administration of the contrast. (Be sure to remove in the order the instructions to call radiology). If no contrast in the colon at 6 hours may repeat KUB in another 6 hours.

[6]Indications include persistent abdominal pain and/or distension, NG drainage volume >500cc/24hrs on hospital day #3, fever at 48-72 hours, WBC > 10,000, or any findings described in notes 2 and 4 above

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Implementation of an adhesive small bowel obstruction protocol using low-osmolar water soluble contrast and the impact on patient outcomes☆

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Adhesive small bowel obstruction
Non-operative management

ABSTRACT

Background: Small bowel obstruction (SBO) is a common condition leading to numerous hospital admissions and operations. Standardized care of adhesive SBO patients has not been widely implemented in hospital systems.

Methods: A prospective cohort of SBO patients was compared to a historical cohort of SBO patients after implementation of a SBO protocol using evidence-based guidelines and Omnipaque, a low-osmolar water soluble contrast. Patients without a history of abdominal surgery were excluded and data was collected through chart review.

Results: Univariate analyses demonstrated a decrease in both LOS by 1.35 days and in the proportion of patients receiving surgery (37% vs 25%; $p < 0.05$). There was a decrease in time to surgery, rate of SBR, and rate of complications, yet an increase in readmission, although these findings were not statistically significant.

Conclusions: Utilizing an evidence-based SBO protocol can lead to shorter LOS and may result in fewer operations for adhesive SBO patients.

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Practice Management Guideline Development

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1

Practice Management Guidelines (PMG)

- Evidence-Based Recommendations aimed at standardizing care & improving outcomes
- Move away from 'expert opinion', base on actual data
- Patient preference increasingly taken into account
- Based on specific clinical questions
- Many ways to generate a PMG, but all on same foundation

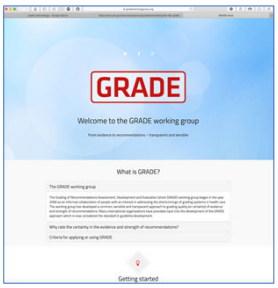
2

Standardization of Guideline Development?

3

GRADE Methodology

- The Grading of Recommendations Assessment, Development and Evaluation (GRADE) Approach
- Standardized, transparent, reproducible methodology for creating evidence-based PMGs
- Universally accepted framework, developed 2004-2008



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GRADE Methodology

GRADE

- >100 Organizations currently use GRADE:
  - WHO
  - CDC
  - Cochrane
  - SCCM
  - UK National Institute for Health & Care Excellence
  - **EAST (2012)**
  - ASH

5

GRADE Methodology

- In-depth training seminars (2.5-day) & workshops available by original members
- Not typically necessary (unless leading a PMG group)
- 4h-courses commonly available by several societies (inc. EAST)

GRADE

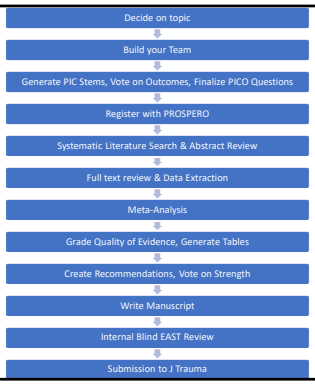
6

Who can participate?

anyone

- Senior Attendings?
- Junior Attendings?
- Fellows?
- NPs/PAs?
- RNs?
- Residents?
- Medical Students?
- Motivated High school students?
- Public?

7



12 Steps to a GRADE PMG

8

1. DECIDE ON PMG TOPIC

- Aim to work on a project you are enthusiastic about
- Ensure no other societies already have similar Guidelines already in place
- Ensure literature is available to address the proposed topic
- Duration: 2-3 weeks

9

2. BUILD YOUR (or join a) TEAM

- Use your EAST Network to connect peers interested on the topic
- Consult with Guideline Committee Leadership to access volunteers
- All participants need to be EAST members* (approx. 6-10)
- Ensure balanced opinions on topic
- Duration: 2-3 weeks

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3. FORMULATE PICO QUESTIONS

- Select & carefully word your 2-4 PIC components
- Select various possible outcomes of interest
  - Can vary by PICO
- Vote on Outcomes (1-9 Scale), include critical ones
- Finalize PICO Questions
  - Keep <3-4 PICOs, <3-4 Outcomes in each
- Duration: 4-6 weeks

P – Population
I – Intervention
C – Comparison
O - Outcome

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Example: PIC Stem

- In **patients with retained traumatic hemothorax deemed to require drainage** should **early VATS (less than or equal to 7 days)** vs **Late VATS (greater than 7 days)** be performed?

P – Population
I – Intervention
C – Comparison

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Example: Outcomes & Scoring

• Empyema	• 8
• Hospital LOS	• 8
• Need for additional drainage procedures	• 6
• Conversion to open thoracotomy	• 9
• Loss of Income	• 3
• Functional ability	• 5
• Long-term Incentive Spirometry	• 4
• Mortality	• 8

P – Population
I – Intervention
C – Comparison
O - Outcomes

13

Example: Outcomes & Scoring

• Empyema	• 8
• Hospital LOS	• 8
~~• Need for additional drainage procedures~~	~~• 6~~
• Conversion to open thoracotomy	• 9
~~• Loss of Income~~	~~• 3~~
~~• Functional ability~~	~~• 5~~
~~• Long-term Incentive Spirometry~~	~~• 4~~
• Mortality	• 8

P – Population
I – Intervention
C – Comparison
O - Outcomes

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Example: Final PICO Question

- In **patients with retained traumatic hemothorax deemed to require drainage** should **early VATS (less than or equal to 7 days)** vs **Late VATS (greater than 7 days)** be performed **to decrease Hospital LOS, rates of empyema, open thoracotomy, and mortality?**

P – Population
I – Intervention
C – Comparison
O - Outcomes

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4. REGISTER WITH PROSPERO

- Register Project with PROSPERO (http://www.crd.york.ac.uk/PROSPERO) before the literature search
- Ensures you will not change the question(s) after the analysis
- Visit at end of project to summarize/disseminate results
- Duration: 20 min

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5. SYSTEMATIC LITERATURE SEARCH & ABSTRACT REVIEW

- Use a librarian and perform an exhaustive literature search (>2-3 search engines – PubMed, Cochrane, Embase, Web of Science, etc), compile list of *abstracts*
- Two reviewers look at each, determine whether it should be kept in analysis
  - Must include similar P
  - Both I & C
  - Provide information on O
- Use Excel, or Covidence, to keep track of work.
- Duration: 3-4 weeks

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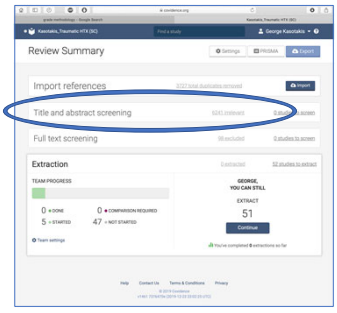
Example: Covidence



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Example: Abstract Screening

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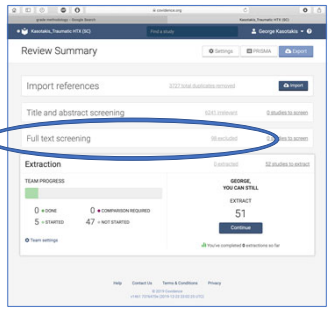
6. FULL TEXT REVIEW & DATA EXTRACTION

- Repeat the same process on *full manuscripts.*
- Two reviewers look at each, determine whether it should be kept in analysis for same reasons, extract data regarding:
  - Primary Author – Publication year
  - Study Design
  - Reason for Exclusion, if any
  - Means, SDs for Intervention, Comparator continuous outcomes
  - 2x2 tables for Intervention, Comparator binary outcomes
- Use Excel, or Covidence to keep track of work.
- Duration: 3-5 weeks

20

Example: Covidence



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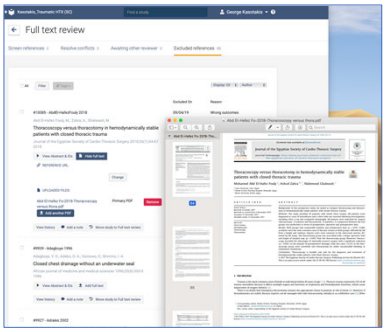
Example:
Full Text Review



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Example:
Data Extraction

Table 1

study	design	earlydead	earlyalive	latedead	latealive
Husman, 1993	Retrospective	2	18	5	18
Joseph, 2018	Retrospective review	5	15	43	24
Rostas, 2016	Retrospective	20	5	30	2
Costa, 1985	Retrospective review	12	2	30	5

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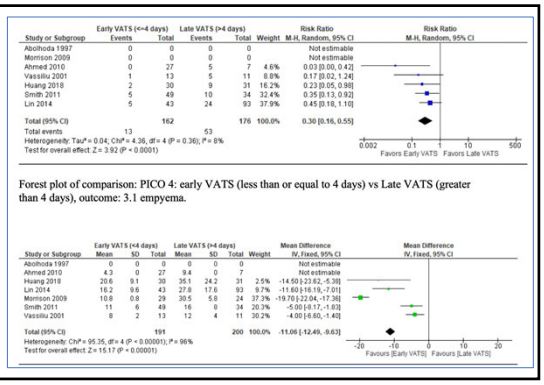
7. META-ANALYSIS

- Best performed by biostatistician.
  - (EAST can help if none available at your institution)
- Provides an evidence-based answer to your PICO question
- Common software packages:
  - RevMan
  - Stata
- Duration: 2 weeks

24

Example: Meta-Analysis



Forest plot of comparison: PICO 4: early VATS (less than or equal to 4 days) vs Late VATS (greater than 4 days), outcome: 3.1 empyema.

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8. GRADE QUALITY OF EVIDENCE, CREATE GRADE PRO TABLES

- GradePRO to accomplish
- Details discussed in upcoming presentation
- Provides evidence-based answer on strength of recommendation
- Duration: 2-3 weeks

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Example: GradePRO

Population / Setting: Adults and children who were healthy, now suspected to have or had impaired renal function in a non-specialized clinical setting
New Test / Cut-off value: Serum or plasma Cystatin C (Cys C) / 0.82 to 1.64 mg/L [1]
Comparison Test / Cut-off value: Serum Creatinine concentration (S Creat) / 70.7 to 130.74 µmol/L [1]
Reference Test: Glomerular Filtration Rate measured by exogenous inulin, Cr-EDTA, Tc-DTPA, iohexol or I-lothalamate

Test Important Outcome	Results per 1000 patients tested (95% CI)						Number of participants (Studies)	Quality of Evidence	Comment
	Pre-test probability 10%		Pre-test probability 50%		Pre-test probability 80%				
	Cys C	S Creat	Cys C	S Creat	Cys C	S Creat			
True Positive (TP)	81 (76-85)	69 (61-76)	405 (380-425)	345 (305-380)	648 (608-680)	552 (488-608)	2007 (27)	⊕⊕◯◯ Low [3]	Detection of TPs will likely improve mortality and slow progression to ESRD. TPs will have further testing which will increase anxiety, complications and resources use.
TP absolute difference[2]	12 more (9-15 more)		60 more (44-75 more)		96 more (72-120 more)				
False Positive (FP)	108 (81-144)	315 (288-342)	60 (45-80)	175 (160-190)	24 (18-32)	70 (64-76)	2007 (27)	⊕⊕◯◯ Low [3]	FPs will likely have further testing which will increase anxiety, complications and resources use.
FP absolute difference[2]	207 fewer (198-217 fewer)		115 fewer (80-120 fewer)		46 fewer (44-48 fewer)				
True Negative (TN)	792 (756-819)	585 (558-612)	440 (420-455)	325 (310-340)	176 (168-182)	130 (124-136)	2007 (27)	⊕⊕◯◯ Low [3]	This will likely be reassured, but will still be retested every year to detect new cases that develop.
TN absolute difference[2]	207 more (198-217 more)		115 more (110-120 more)		46 more (44-48 more)				
False Negative (FN)	19 (15-24)	31 (24-39)	95 (75-120)	155 (120-195)	152 (120-192)	248 (192-312)	2007 (27)	⊕⊕◯◯ Low [3]	FN will likely have progression to ESRD and increased mortality due to delayed diagnosis.
FN absolute difference[2]	12 fewer (9-15 fewer)		60 fewer (45-75 fewer)		96 fewer (70-120 fewer)				

Footnotes:
**Ploos et al. Diagnostic accuracy of cystatin C compared to serum creatinine for the estimation of renal dysfunction in adult and children-A meta analysis. Clinical Biochemistry 40 (2007) 383-391
(1) In these studies, cystatin C was measured using particle-enhanced immunoturbidimetry (PETIA) and particle-enhanced immunonephelometry (PENIA) and creatinine using the standard and modified Jaffe assay, and the enzymatic assay. Studies included in the meta-analysis directly compared Cys C versus S Creat.
(2) Differences calculated as an absolute difference with when cystatin C is done compared to serum creatinine
(3) Low quality evidence is due to very serious indirectness of outcomes in a wide spectrum of patients and indirect comparison of tests and serious imprecision.
(4) Low quality evidence is due to some limitation in the design and very few events noted that affected imprecision.

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9. CREATE RECOMMENDATIONS, VOTE ON STRENGTH

- Discuss findings of Meta-Analysis, Quality of Evidence. Formulate a Recommendation based on these.
- Vote on Strength of Recommendation:
  - **STRONG**: Intervention should be the new standard of care
  - **CONDITIONAL**: Intervention should be considered in the majority of cases
- Need >70% of votes for a strong recommendation!

- Duration: 2-3 weeks

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10. DRAFT MANUSCRIPT

- **Introduction**: Magnitude of the problem, current practices, data available, unknown factors, purpose of the project.
- **Methods**: Describe the PICO Formulation process, the literature search, data review and extraction, analysis.
- For each PICO, include:
  - **Qualitative Synthesis**: Discuss differences across analyzed manuscripts, how these may affect your recommendation. Comment on notable observations, specific subpopulations that may benefit more or less from the proposed intervention.
  - **Quantitative Synthesis**: Review / Discuss the Meta-Analysis results, present the GRADE Pro table findings.
- **Conclusion**: Summarize recommendation, reiterate potential exceptions.
- Duration: 3-4 weeks

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11. SUBMIT FOR INTERNAL BLIND REVIEW

- Submit to Guidelines Committee leadership for blind review

- Duration: 1-2 weeks

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12. SUBMIT TO J. TRAUMA

- Submit to JoT (or other journal)
- Sign up to help with other PMGs!
- Duration: 1 afternoon

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Questions?

Want to Volunteer?

Email: George.Kasotakis@duke.edu
Twitter: @gkasot

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GREAT SAVES AND NEAR MISSES

Caroline Banes RN, MSN, ACNP-BC
Lead Trauma ICU Nurse Practitioner
Vanderbilt University Medical Center

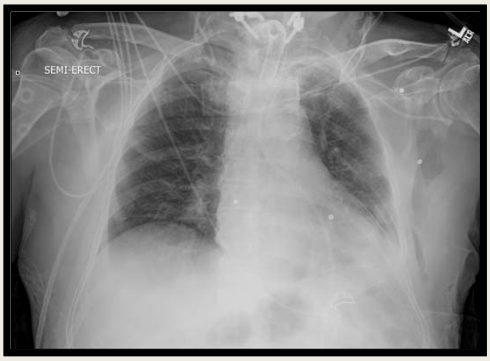
CASE OF THE MISPLACED DHT

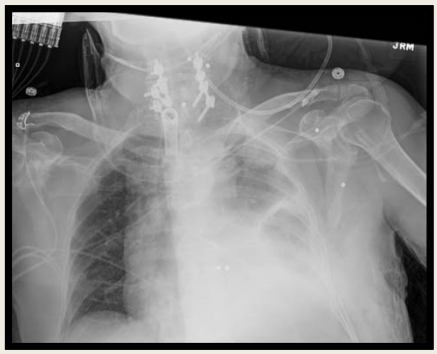
Case Introduction

- 72 year old male s/p fall out of car, striking head
- Hx: HTN, DVT, stroke, ETOH
- Trauma Dx:
  - C5/6 jumped facet
  - R vertebral artery occlusion
  - Sternal fracture
  - L pneumothorax
  - Tetraplegia

Early Hospital Course

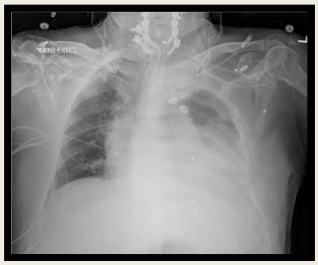
- Day 1:
  - Intubated, arterial line, L SC CVC, PSF (C5-T1)
- Day 2:
  - L chest tube 2/2 PTX, bronchoscopy for mucus plug, gastric DHT placed
- Day 3:
  - Tracheostomy, bronchoscopy/BAL
- Day 4:
  - L CT removed, DHT re-placed
- Day 5:
  - Morning CXR revealed opacification of L side





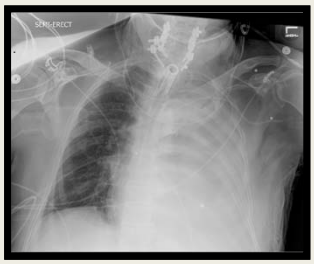
Hospital Course

- Day 5: Bronchoscopy performed
  - DHT found descending L mainstem bronchus
  - No tube feeds present in trachea or bronchi



Intervention

- Day 6:
  - Chest CT obtained
  - L CT placed
  - Tube feed appearing drainage
  - L VATS planned however was aborted d/t inability to single lung ventilate



Hospital Course

- Follow up CT demonstrated adequate drainage – no empyema
- Complicated remaining course
- 3 month hospitalization
- Prolonged ventilator course
- Multi-organism pneumonia
- Neurogenic shock, autonomic dysfunction
- Multiple swallow study fails
- Discharged to LTAC

Process Improvement

- Review with nursing staff
  - Individual one on one training
  - Restricted DHT placement until trained and checked off
  - "Old school" teaching along with Cortrack placement training
- Review with clinicians
  - Adjusted morning sign out routine to give time for morning x-ray review
  - Reviewed with each ICU NP
- Reviewed with radiology
  - Process Improvement committee follow up with radiologist attending and residents

Why PI matters

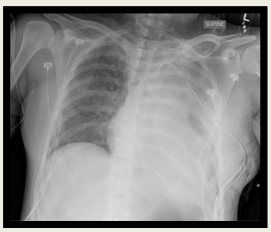
- An intensivist led, high performing, multidisciplinary team that is dedicated to the ICU is an integral part of care delivery.
- Backbone of achieving high quality ICU outcomes
- Standardized guidelines, bundles, and order sets facilitate measurable processes and outcomes.
- Combo of effective process of care and appropriate structure increases the likelihood that every patient will receive
  - *Correct interventions*
  - *At the appropriate time*
  - *Interventions will be performed properly*
  - *Interventions will be cost effective*

Weled et al. (2015). The importance of process of care and ICU structure to improved outcomes: an update from the American College of Critical Care Medicine Task Force on Models of Critical Care. Critical Care Medicine. 43(7): 1520-1526.

CASE OF THE MISTAKEN TAMPONADE ETIOLOGY

Case Introduction

- 35 year old female with history of being kicked in chest 1 week prior to presentation
- Presented at local hospital and was discharged when event occurred
- Returned one week later with shortness of breath - massive hemothorax demonstrated on XR
- Chest tube placed with 2L output
- Hypotensive, combative, intubated prior to arrival



Day 1

- Extremis upon arrival
  - Responded to 4 PRBCs via R humeral IO
  - R femoral art line placed
- Oxygenation without improvement
  - R chest tube placed
  - 2nd left CT placed
  - PEEP 10-15 with minimal improvement
- CT Traumagram
  - Complete consolidation L lung with air bronchograms
  - Alveolar edema vs alveolar hemorrhage
  - BL pulmonary contusion
  - Consolidative changes RUL/RLL
  - Small BL PTX – CTs appropriate
  - R 9th and 10th rib fx

ECMO

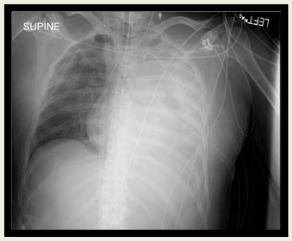
- Continued profound hypoxia
- Emergently cannulated upon arrival to Trauma ICU
  - R femoral drainage cannula
  - R IJ return cannula
  - SpO2 70% to 99%
    - Sweep gas flow 3
    - Flow 3.5:/min
    - FdO2 100%
- ETT cuff leak
  - Exchanged over COOK catheter
  - Brief desaturation but recovered

Additional care:

- Additional access obtained
- Heparin infusion given no CHI
- Initiated on chemical paralytic

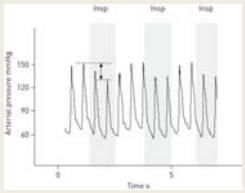
Day 2

- Early morning progressive hypotension
- Increase in vasopressor requirement
- Morning CXR unchanged
  - *R side notably clear, basilar ptx*
- Formal echo with small pericardial effusion



Day 2

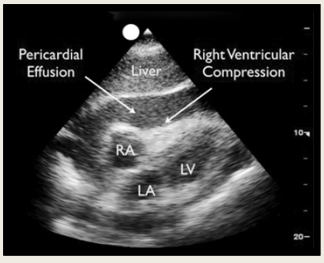
- Pulsus paradoxus



- Intrathoracic pressure transmitted to pericardial space
- Marked decrease in arterial pressure on inspiration
- Decreased LV stroke volume d/t increased R end diastolic volume as septum shifts leftward
- Inspiratory decrease in pulmonary venous return
- Decrease in BP on inspiration
- Ventricular interdependence

Cardiac Tamponade

- Clinical Findings
  - Tachycardia
  - Hypotension
  - Elevated JVP
  - Pulsus paradoxus
  - Muffled heart sounds



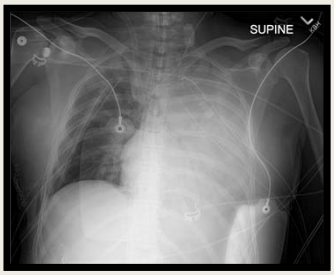
APP Action

- Contacted Trauma attending
- ECMO physician at bedside
- CT surgery contacted
- CVICU fellow at beside
  - *Formal echo showed small pericardial effusion*
- R chest tube noted to have >1000cc sanguineous output
- PRBCs/FFP given
- Leveled to OR

CT Surgery

- R thoracotomy
  - Large clot evacuated
  - Intercostal vessels ligated
  - Anterior/Posterior CT placed
- Pericardial window
  - Serous pericardial effusion evacuated
- Bronchoscopy
  - Serous pericardial effusion evacuated

Post-op CXR



Tension Hemothorax

- Things we did well
  - *Timely activation of all team members*
  - *Recognition of tamponade physiology*
  - *Utilization of POCUS*
  - *Recognition of bleeding*
  - *Appropriate early resuscitation*
  - *Quick transition to OR*
- Things we learned
  - *Reviewed finger thoracostomy in emergent scenarios*
  - *Full evaluation of patient important*

Follow-up

- Discharged on hospital day 18
- Home with family
- SW involved for safe discharge planning

Case presentation: Blunt trauma with severe penetrating neck injury

PRESENTED BY KATRINA FLOWERS PA-C
TACOMA TRAUMA TRUST
EAST AP WORKSHOP 2020

1

Disclosure: conflicts of interest

Neither I, nor any immediate family member has any financial relationship with, or interest in, any commercial interest connected with this presentation.

The material in this presentation will not include discussion of unapproved or investigational uses of product or devices.

2

Case Info

- 17 year old male. step one trauma 0857am. MVC. 15 min ETA
- MOI: "driver of car traveling high rate of speed that hit the back of a dump truck"
- EMS reports large right neck laceration with "carotid vessels visible" with active bleeding. Unconscious. Intubated. Bystander put combat gauze in neck wound prior to EMS arrival. Unknown if restrained or not.
- Field vitals and interventions: hypotension en route "90's". Cervical collar. Back Board. Intubation. IV placement.

3

Trauma Bay Workup

- Initial VS in trauma bay: 112/57, pulse 114-150, on vent, sats 100%.
- Exam:
  - Airway: ETT. Tube advanced 2cm on arrival.
  - Breathing: on vent. No over breathing. (paralytic on board). Equal chest rise and fall.
  - Circulation: hypotensive x 2 episodes. HR 150's. Cordis and peripheral lines. MTP 1:1:1. large neck and face wounds. Bleeding controlled.
  - Disability: limited exam due to Rocuronium en route. Pupils 4mm and fixed. Clear fluid from bilateral nares.
  - Initially an equivocal fast exam then repeated it and negative fast exam

4

5

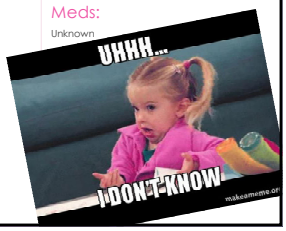
6

History

PMHx:
Unknown

PSHx:
Unknown

Meds:
Unknown



7

Labs…

0905 am
Hematocrit 28
Hemoglobin 9
INR 1.6

0932
Lactate 4.9

1145 intraop
Hematocrit 20
Hemoglobin 7

8

Imaging

- Xr Chest 1 View: No acute disease identified in the chest. Endotracheal tube appears well-placed.
- Ct Head, max face, and C spine without Iv Contrast:
  - ***Extensive right scalp hematoma and laceration.***
  - ***Minimally displaced fractures of posterior lateral wall of the right maxillary sinus. Blood in the right maxillary sinus and nasopharynx. Hematoma in the superolateral right orbit with right proptosis without right orbital tenting.***
  - ***Comminuted displaced fractures of the right transverse process of C7 and the right C7 cervical rib.*** This fracture extends into the right ***inferior C7 facet.*** Nonspecific right the ***right transverse process of C5. Slight widening of the right C5-C6 facet joint.*** No other evidence of cervical spine fracture.
- Ct Angiogram Neck With And Or Without Iv Contrast:
  - ***intraluminal thrombus in the exposed right jugular system.***
  - Asymmetrically prominent enhancement within right-sided cerebral venous structures suggests ***increased venous pressures related to partial venous occlusion.*** No convincing carotid/cavernous sinus fistula is noted.
  - ***Arterial injury to the right common carotid artery with intimal dissection flap.***
  - ***High-grade stenosis and near complete occlusion of the proximal right vertebral artery, likely related to vascular injury and traumatic dissection associated with right-sided cervical spine fractures.*** 4.
  - Right-sided scalp swelling, subcutaneous emphysema and scalp hematoma.
  - Right greater than left airspace opacities, with likely ***tiny right apical pneumothorax.***

9

Imaging continued…

- Ct Chest/abdomen/pelvis and recons of the T and L spines With Iv Contrast:
  - ***Complete atelectatic collapse of the right upper lobe, due to mucous/debris within the right upper lobe bronchi.***
  - Scattered moderate severity pulmonary contusions in the left upper lobe, as well as right lower lobe.
  - ***Trace right pneumothorax.***
  - ***Tiny liver laceration.***
  - Tiny ***nondisplaced fracture of the superior aspect of the left scapula.***
  - ***Minimally displaced right pelvic acetabular fracture. Nondisplaced right inferior pubic ramus fracture.***
  - ***Mild anterior superior endplate fracture at T5, with a small paraspinal hematoma.***
- Pelvis xray:/Left femur xray/left tibia xray:
  - ***Comminuted fractures of the left femur and left tibia.***

10

To the OR we go:

Brief op note from trauma surgeon:

- EBL 3 L
- Fluids given - 10 U PRBC, 10 U FFP, 3 U Platelets, 3 U cryo (started on way up to ICU)
- 650 cc cellsaver, 7.8 L crystalloid
- Urine output - 500 cc
- Complication - cardiac arrest due to hemorrhagic shock 10:44 am to approx 11:10 am

11

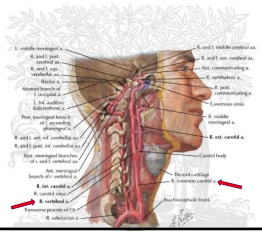
Vascular surgeon to the rescue…

- Upon arrival right neck laceration was exposed with pressure held.
- cervical spine fractures present with arterial and venous bleeding. With pressure held, I evaluated the location of bleeding.
- Focal venous branches and appeared avulsed spinal and muscle branches from vertebral bodies bleeding and despite placement of 6-0 prolene and 5-0 prolene recurrent bleeding present.
- During course of operation, he lost vital signs and chest compression and ACLS initiated with continuation of massive transfusion protocol. With pressure held on neck injury.
- We evaluated other signs of bleeding or blood loss.
  - Left thigh soft.
  - Distal neck exposure with continue bleeding
  - concerned for hemothorax or subclavian injury. A right 32F chest placed with blunt dissection at inframammary crease in mid anterior axillary line intercostal space. No hemothorax present.

12

Arterial Injuries….

- Proximal right common carotid artery with pulse.
- Evident blunt injury present of mid CCA without bleeding dilation.
- Distal common carotid without palpable pulse. (did not feel open arterial repair of CCA would be beneficial and this juncture due to critical nature of patient).
- Right vertebral artery intact with pulse.



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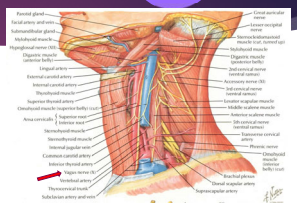
Viva Las Vagus…..

- Vagus nerve lacerated from initial injury and both ends identified and reapproximated with use of 6-0 prolene suture.
  - longest cranial nerve. It runs all the way from the brain stem to part of the colon.
  - Sensory functions of the vagus nerve include:
    - providing somatic sensation information for the skin behind the ear, the external part of the ear canal, and certain parts of the throat
    - supplying visceral sensation information for the larynx, esophagus, lungs, trachea, heart, and most of the digestive tract
    - playing a small role in the sensation of taste near the root of the tongue
  - Motor functions of the vagus nerve include:
    - stimulating muscles in the pharynx, larynx, and the soft palate, which is the fleshy area near the back of the roof of the mouth
    - stimulating muscles in the heart, where it helps to lower resting heart rate
    - stimulating involuntary contractions in the digestive tract, including the esophagus, stomach, and most of the intestines, which allow food to move through the tract



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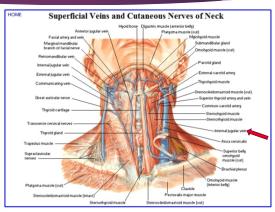
Venous injuries

- The internal jugular with medial laceration, repaired with 5-0 prolene.
- Lacerated ends of external jugular ligated with 3-0 silk.
- Deep posterior neck soft tissue and trapezius and scalene muscles re-approximated with 3-0 vicryl.
- SCM approximated with 3-0 vicryl.
- placed 7F JP drain and reapproximated remaining tissue defect.



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List of other injuries:

- Maxillary sinus fracture (HCC) - right lateral/post wall - min displaced
- Traumatic orbital hematoma
- Proptosis
- Open fracture of transverse process of cervical vertebra (HCC) - right C7,C5
- Right jugular vein thrombosis
- Pneumothorax - small Right on CT
- Liver laceration - minor
- Left scapula fracture - tiny nondisplaced
- Acetabular fracture (HCC)
- Closed fracture of multiple pubic rami, right, initial encounter (HCC)
- Fracture, thoracic vertebra (HCC)
- Paraspinal hematoma at T5
- Femur fracture, left (HCC)
- Fracture of left tibia
- Cardiac arrest due to trauma (HCC) - in OR
- Open fracture of right zygomatic arch (HCC)
- Open fracture of one rib of right side - cervical rib
- Closed nondisplaced dome fracture of left acetabulum (HCC)
- Closed displaced transverse fracture of shaft of femur with routine healing
- Closed fracture of left scapula
- Acute blood loss anemia
- Closed displaced transverse fracture of shaft of left tibia
- Brachial plexus injury, right, initial encounter

16

Hospital Course:

1/19/2018 RIGHT NECK EXPLORATION, RIJ REPAIR, R VAGUS REPAIR, R CHEST TUBE PLACEMENT

1/23/2018 L FEMUR CLOSED REDUCTION/EX FIX, L TIB CLOSED REDUCTION/EX FIX

2/6/18 EGD

2/14/18 OPEN TRACHEOSTOMY

2/14/18 L FEMUR REMOVAL EX FIX AND IM NAILING, L TIBIA REMOVAL EX FIX IM ROD

2/16/18 IR PLACEMENT OF 14 FRENCH 2.5 CM MIC-KEY GASTROSTOMY TUBE

3/6/18 DISCHARGED TO INPATIENT REHAB

17

Inpatient Rehab 3/6 to 4/27

Long term effects: cognitive communication impairment, dysphonia, and dysphagia (mild to mod)

OT long term effects: impaired activities of daily living and instrumental activities of daily living due to decreased lower extremity strength, range of motion, coordination, impaired left upper extremity

PT goals met: ambulate 500 feet, perform all car transfers, perform floor recovery without use of assistive devices, ascend and descends a full flight of stairs with single rail support, ascend and descend a 40' ramp without assistive device

Now on baby ASA daily and pregabalin

Passed test for GED certificate

Working toward getting a job doing car detailing

18

Take home points:

- Stop the Bleed Campaign
- Mass Transfusion Protocol
- Hypovolemic Shock in young healthy people
- Neck anatomy
- Poly system trauma

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Questions?

20

Case of the
" No evidence of traumatic injury"

PRESENTED BY KATRINA FLOWERS PA-C
TACOMA TRAUMA TRUST
EAST AP WORKSHOP 2020

21

Disclosure: conflicts of interest

Neither I, nor any immediate family member has any financial relationship with, or interest in, any commercial interest connected with this presentation.

The material in this presentation will not include discussion of unapproved or investigational uses of product or devices.

22

Case Info

- 40 y/o M BIB EMS as Step 3 trauma at 0258
- MOI: Unrestrained driver in MVC who's car struck a parked vehicle in head on collision. Heavy front end damage noted by EMS. + air bag deployment. Pt found initially unresponsive and lying across center console. Upon extrication became aggressive and uncooperative.
- Field vitals: BP 160/90 HR 99 RR 20 94% RA. EMS Exam only positive for full thickness laceration of R side of knee.

23

Trauma Bay Workup

- Initial VS in trauma bay: BP 140/90 HR 101 Temp 95.9 RR 23 SPO2 100% GCS 346
- Exam
  - Gen: "slurring words, uncooperative, providing scant information".
  - CV- normal rate
  - Pulm- effort normal, breath sounds normal
  - Abd- soft, non-distended, no tenderness, no rebound or guarding
  - MSK- 8 cm laceration lateral R knee- "unclear if joint capsule is involved". R ankle noted to have abrasion and tenderness.
- He underwent pan-scan and had irrigation and skin repair of laceration of R knee with staples.

24

History

PMHx:
HTN
DM
Fatty Liver
ETOH abuse

PSHx:
None

Social Hx:
+ETOH
+tobacco
Unk. Recreational drug use
Lives with wife

Meds:
Glimperide
Indocin
Jardiance
Losartan
Felodipine
Zyrtec
Albuterol
Felodopine
Zocor
Metoprolol

25

Imaging

- CXR: 1. Shallow lung volumes with interstitial opacities likely reflecting vascular congestion. No focal pneumonia. 2. Severe cardiomegaly.
- Xray R ankle: cortical irregularity along anterior aspect of tibial plafond may reflect fracture.
- CT head and max/face- normal
- C/T/L spine- negative
- Pelvic xray- normal
- Xray R knee- no fracture or dislocation. Soft tissue laceration involving the lateral aspect of the R knee w/ associated subcu gas. No foreign body.

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Imaging continued

- CT Chest, Abdomen, Pelvis: Nonacute. No evidence of traumatic injury.
  Additional incidental observations described in the body of the report.
  - 3mm lung nodule right middle lobe
  - Diffuse fatty infiltration liver with a small 10 mm hypervascular lesion in the right lobe the liver most likely hypervascular hemangioma. However, liver, spleen, pancreas, adrenal glands and kidneys show no evidence of solid organ injury. No pericapsular or subcapsular fluid or hematoma. Simple cyst in the right mid kidney.

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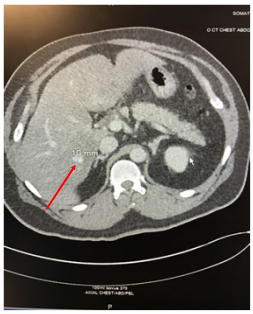

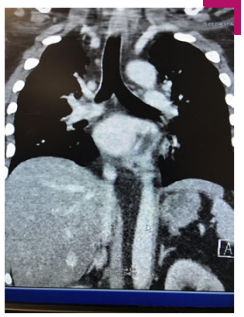

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Admit labs

CBC

WBC 8.17
HGB 15.6
HCT 47.3
PLT 285

Chemistry

NA 137
K 3.2
CL 99
CO2 24
BUN 9
CREAT 0.99
Gluc 212

INR 0.94

Tox Screen

+ Ethanol level 220

29

Assessment/Plan

1. R lateral knee laceration with question of traumatic arthrotomy. Underwent irrigation and skin closure of laceration in ED by Trauma PA. Plan to consult ortho for further evaluation in am.
2. Tibial plafond fracture- placed in short leg posterior splint. Consult ortho.
3. Admit to med/surg

30

Consultant

- Orthopedic surgeon was consulted for suspected traumatic arthrotomy of R knee and R tibial plafond fracture.
- Seen by Ortho PA at 0800 and booked for OR to undergo I&D and exam of knee joint under anesthesia with saline load to evaluate for traumatic arthrotomy.

31

Tertiary Exam

- Pt evaluated at 1000 am (7 hours after pt arrival) to perform tertiary exam.
- Noted ortho had already seen and booked pt so decision to perform saline load trial was deferred.
- Tertiary exam revealed **RUQ tenderness and guarding on abdominal exam as well as tenderness over the sternum.**
- Vitals BP 122/61 HR 115 RR 24
- Serial CBC's ordered
- Imaging re-reviewed. Hypervascular hepatic hemangioma noted on rad read.
- Case discussed with attending MD.

32

HD1 (3/27)

- Pt taken to OR by Dr. Corman at 1330 on 3/27 for I&D R knee with exploration and found to have a traumatic arthrotomy through the lateral capsule.
- Extensive irrigation and debridement done with repair of the arthrotomy and repair of lateral knee laceration.
- Periop antibiotics given- ancef (3 doses)

33

Serial CBC's 3/27

3/27/2019 03:00	3/27/2019 11:00	3/27/2019 17:33
WBC: 8.17	**WBC: 13.17 (H)**	**WBC: 15.87 (H)**
RBC: 5.51	RBC: 4.73	RBC: 4.31 (L)
Hgb: 15.6	**Hgb: 13.5 (L)**	**Hgb: 12.4 (L)**
Hct: 47.3	**Hct: 39.0 (L)**	**Hct: 35.7 (L)**
MCV: 85.8	MCV: 82.5	MCV: 82.8
MCH: 28.3	MCH: 28.5	MCH: 28.8
MCHC: 33.0	MCHC: 34.6	MCHC: 34.7
RDW: 14.6	RDW: 14.4	RDW: 14.5
PlI: 285	PlI: 264	PlI: 244

34

Repeat CT ABD/PELV w/ IV and oral contrast

- IMPRESSION:

1. Development of a **large intrahepatic hematoma most likely on the basis of intrahepatic pseudoaneurysm initially thought to represent a hypervascular hemangioma or vascular anomaly on the initial CT scan performed one day previous**. In appropriate clinical situation consider IR consult for potential embolization.

2. Associated **small amount of intraperitoneal hemorrhage** adjacent to the liver extending to the pelvis.

3. No evidence of bowel injury

Findings discussed with PA Crabb of the trauma service at 3:26 AM

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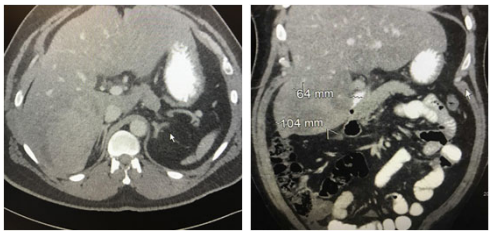

VS 3/28 0400 BP 174/99 HR 105 RR 18 Temp 99.3

36

Subsequent course

- IR contacted immediately and mobilized IR team
- Upgraded to ICU
- Additional IV access obtained
- Type and Cross for 4 units
- Underwent angioembolizaton of right posterior hepatic artery branch by IR

37

Hospital course continued

- HD 2 (3/29) he was noted to have fever and tachycardia. Leukocytosis present during hospitalization. (8->13->15->20->25->22->20->18->17)
- 3/29 CXR- diffuse lung airspace opacities which could reflect pneumonia. Started on empiric rocephin/flagyl.
- 4/2 antibiotics discontinued- leukocytosis thought to be likely liver injury/embolization
- 4/3 (HD6) He was tolerating diet, leukocytosis trending down, ambulatory, pt was evaluated and felt to be stable and discharged home with wife with instructions to follow up with Trauma Clinic 4/10 and f/u with ortho on 4/11.

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Take home points:

- Review own imaging and correlate clinically
- Importance of a good tertiary exam (once patient is clinically sober)
- BP and pulse can have subtle changes that indicate bigger problems
- Patient doesn't need to be hypotensive, tachycardic, and have blood loss anemia to be bleeding.
- Follow your gut
- Discuss and review with attendings as needed

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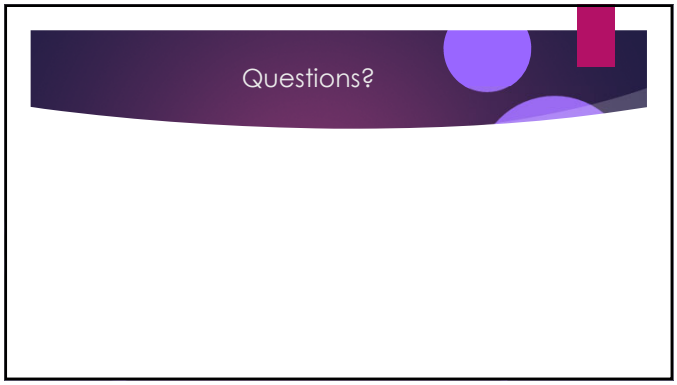
Questions?

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Great Saves and Near Misses

Marialice Gulledge, DNP, AG ACNP, ANP

1

"Near Misses"

Patient AC

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2

Analysis of contributing factors:

- Initial CT H results: Thought process: Incidental versus an indication of a possible or true thrombus.
  - Radiology noted → subtle finding, non specific (dense right MCA).
  - Can be seen with acute intra-luminal thrombus as well as more chronic severe calcific atherosclerosis.
- Role of CTA: In setting of L sided neck trauma and ecchymosis.
  - While the CVA was ultimately on the RIGHT side, the acute thrombus may have been identified earlier if the diagnostic work up for BCVI had occurred.

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Systems Related:

- Hospital was at 110% capacity.
- Daily inpatient census report.
- Incidental finding and hand off info.
- STAT CT within 40 minutes of order; delay of read
- Timing of follow up on results.

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Provider/Team member related:

- Timing of “Code stroke” activation during continuum of care:
  - Included in the “differential list.”
  - Multiple multidisciplinary team members encountered during course of care.
- Multiple hand-off between days and nights, residents, APP, and Attending Physicians.

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The role of cognitive bias:

- Cognitive error or bias:
  - Heuristics “estimate the probability of an occurrence by using the ease or accessibility with which it comes to mind.[1]”
  - New onset of left upper extremity weakness in a patient with a newly diagnosed left glenoid fracture and in the setting of trauma → no activation of code stroke, despite it being in the differential list.

1. Llanfeld, S.O., & Lynn., S. J. (2014). Errors/Biases in clinical decision making. Retrieved on Oct 13, 2019 from https://onlinelibrary.wiley.com/doi/full/10.1002/9781118625392.wbecp067

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Communication:

- Communication failures and breakdowns are one of the main causes of adverse events - in particular, during hand off.[1]
- According to the Joint Commission, a typical teaching hospital may experience 4000 hand offs a day.[2]

1. Muller, M., Jurgens, J., Redaelli, M., Klingberg, L., Hautz, & Stock, S. (2018). Impact of the communication and patient hand off tool SBAR on patient safety: A systematic review. BMJ Open. Aug 23 8(8). doi: 10.1136/bmjopen-2018-022202

2. Joint Commission. (2017). Sentinel even alert 58: Inadequate hand off communication. "Take Five" Retrieved on Nov 23, 2019 from http://hwcdn.libsyn.com/p/e/4/2/e4271fed3ea8f675/Tackling_Inadequate_Hand_off_Communications10-25_1-2.mp3?c_id=17468615&cs_id=17468615&expiration=1563196024&hwt=3b0486c674568b50bd5faa79f7321f51

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Communication:

- Hand-offs are obviously complex:
  - vulnerable points of time, with the environment, the sender, and the receiver all functioning as critical components of the hand-off cycle.
  - there is no simple practices or "one size fits all."
  - each root cause needs a strategy or solution to overcome issues.
  - failures during sign out can lead to inefficient or suboptimal care and can lead to patient harm.[1]

1. Arora, V., Johnson, J., Lovinger, D., Humphrey, H.J., & Meltzer, D.O. (2005). Communication failures in patient sign-out and suggestions for improvement: a critical incident analysis. BMJ Quality & Safety, 14(401-407).

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"Great Saves"

Patient BD

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9

Conclusion:

- As humans we all use shortcuts to quickly assess and respond to situations.
  - When applied inappropriately, this shortcuts (heuristics) have the potential to redirect our thinking of the available information – can contribute to bias and errors.
  - Cognitive bias → "seek and ye shall find" - how we perceive and interpret clinical data →can account for upward of 75% of all diagnostic errors.[1]
- Process of shared decision making (APP/APP or APP/Attending, etc.) with clinical index of suspicion and differentials can help mitigate missed or delayed diagnoses.
- Role of communication and hand off.

1. Graber M.L. Franklin N., Gordon R. (2005). Diagnostic error in internal medicine. Arch Intern Med.165: (1493–1499).

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