



Blood Work in MHP's



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Objectives



1. Identify type and frequency of laboratory tests



2. Discuss the use of CPOE in a MHP for sample labeling



3. Discuss strategies to ensure rapid draws for group and screen and other MHP blood work

(No disclosures)



- 27 responding sites: protocols reviewed from both level 1 and community facilities



Themes

- Inconsistent sampling practices for repeat samples
- Inconsistent use of ABG vs VBG
- Not all protocols include initial Ca or have low frequency of repeat Ca sampling
- Type and Cross done, more than it is written into the policy

Initial Panel



- 100% of sites had an initial group of blood tests/panel
- 48% had panels
 - Initial group/panel included CBC, Chem, Creat, PT/INR, APTT, Fibrinogen, lactate
 - Most included Ca, Gases,
 - Others: thrombin time, trop, Mg, PO₄, Albumin, CK, total protein
- 51% stated cross and type in protocol

Repeat Blood Work

- Q1hr
- Q30min
- With arrival of product
- Q4hr
- No frequency or not mentioned in protocol
- Deactivation blood work





Venous vs Arterial Sampling

- 40% Either VBG or ABG
- 37% ABG only
- 12% VBG goal test
- 9% not specified or not include a gas in panel



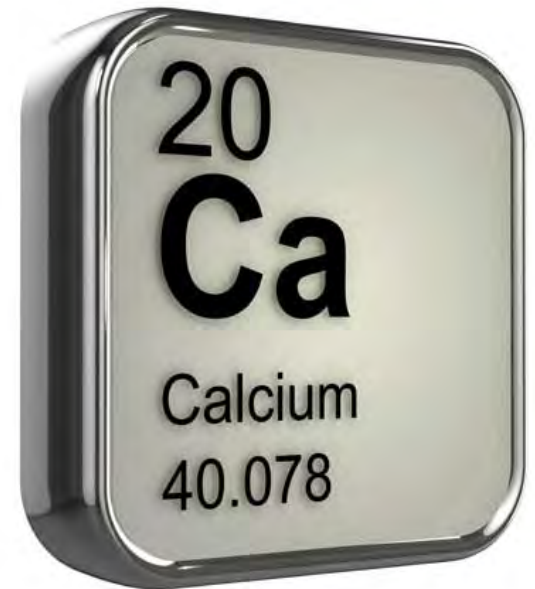
Advantages and Disadvantages

VBG	ABG
<p>Venous samples better reflective of tissue perfusion</p> <p>VBG better predictor of survival than ABG. (Schmelzer et al.)</p> <p>Easier to obtain</p> <p>Lower cost</p> <p>Less complications</p> <p>Less pain for patient</p>	<p>Better reflect adequacy of ventilation and oxygenation</p> <p>Technically more difficult to obtain</p>

- Zeserson, E., Goodgame, B., Hess, D., Schultz, K., Hoon, C., Lamb, K., Maheswari, V., Johnson, S., Papas, M., Reed, J. & Breyer, M. (2018). Correlation of Venous blood gas and pulse oximetry with arterial blood gas in the undifferentiated critically ill patient. *Journal of Intensive Care Medicine*, 33(3), 176-181
- Schmelzer, T., Perron, A., Thomason, N. & Sing, R. (2008). A comparison on central venous and arterial base deficit as a predictor of survival in acute trauma. *The American journal of emergency Medicine*. 28, 119-123
- Malinoski, D., Todd, s., Slone, S., Mullins, R., Martin, R. & Schreiber, M. (2005). Correlation of central venous and arterial blood gas measurements in mechanically ventilated trauma patients. *Archives of Suergery*. 140. 1122-1125
- Rudkin, S., Kahn, C., Oman, J., Dolich, M., Lotfipour, S., Lush, S., Gain, M., Firme, C., Anderson, C. & Langdorf, M. (2012). Prospective correlation of arterial vs venous blood gas measurements in trauma patients. *The American journal of emergency medicine*. 30, 1371-1377

Calcium

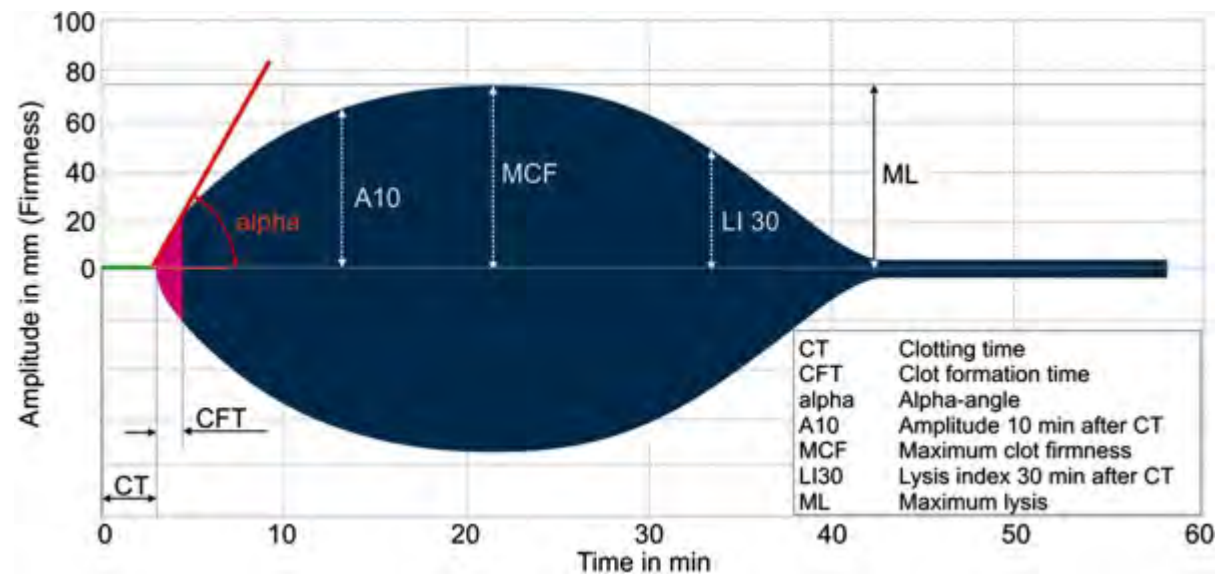
- Calcium Chelation with MTP
- Normally perfused liver can clear 3gm Citrate q5min,
- 3gm in 1 unit PRBC's
- Hypocalcemia is dose dependent and can develop rapidly
- Should be checked frequently



- Li, K. & Xu, Y. (2015). Citrate metabolism in blood transfusions and its relationship due to metabolic alkalosis and respiratory acidosis International Journal of Clinical and Experimental Medicine. 8(4), 6578–6584
- Giancarelli A, Birrer K, Alban R. (2016). Hypocalcemia in trauma patients receiving massive transfusion. J Surgical Research 202: 182-87

Point of Care Testing

- Calculated Hgb
- Lactate
- Gases
- ROTEM/TEG



Viscoelastic Assessment of Clot Formation (ROTEM/TEG)

Advantages	Disadvantages
More accurate in detecting TIC than Standard Lab Testing (SLT)	Requires additional personnel for training and calibration and testing
Used near patient	Expensive
Faster than SLT	Not yet standardized
Provides information about platelet function	Graphs not accessible in all areas

- Found in 2 sites, Used in 1
- Role in future

- Hayter, M., Pavenski, K. & Baker, J. (2012). Massive Transfusion in the trauma patient: Continuing professional development. *Canadian Journal of Anesthesia*. 59 1130-1145
- Winearls, J., Mitra, B. & Reade, M. (2017). Haemotherapy algorithm for the management of trauma induced coagulopathy: an Australian perspective. *Current Opinions of Anesthesiology*, 30(2), 265-276
- Hanke, A., Horstman, H. & Wilhelmi, M. (2017). Point of Care monitoring for the management of trauma induced bleeding. *Current Opinions of Anesthesiology*, 30(2), 250-265
- Kolen, K. & Longstaff, C. (2016). Bleeding related to disturbed fibrinolysis. *British journal of hematology*. 175, 12-23

Take away messages

- Standardize What should be drawn and when.
- Include reminder to send Cross and Type with initiation of MHP
- Advocate for VBG
- Advocate for regular Ca testing



CPOE

- 2:1
- Downtime procedures
- System dependent



Pros

- Once initiated, automatically prints labels
- Outlines correct tubes for draw
- Encourages use of panels
- Triggers lab before samples arrive
- Bundled with product ordering

Cons

- Too many screens to click through
- Delay in initiation
- Clerical enters orders
- not enough access to computers

- Hussain, E. & Kao, E. (2004). Medication Safety and transfusion errors in the ICU and beyond. *Critical care clinics*. 21 91-110
- Tran, M., Vossoughi, S., Harm, S., Dinbar, N. & Fung, M. (2016). Massive Transfusion Protocol: Communication Ordering Practice Survey (MTP COPS) *American Journal of Clinical Pathology*, 146, 319-323

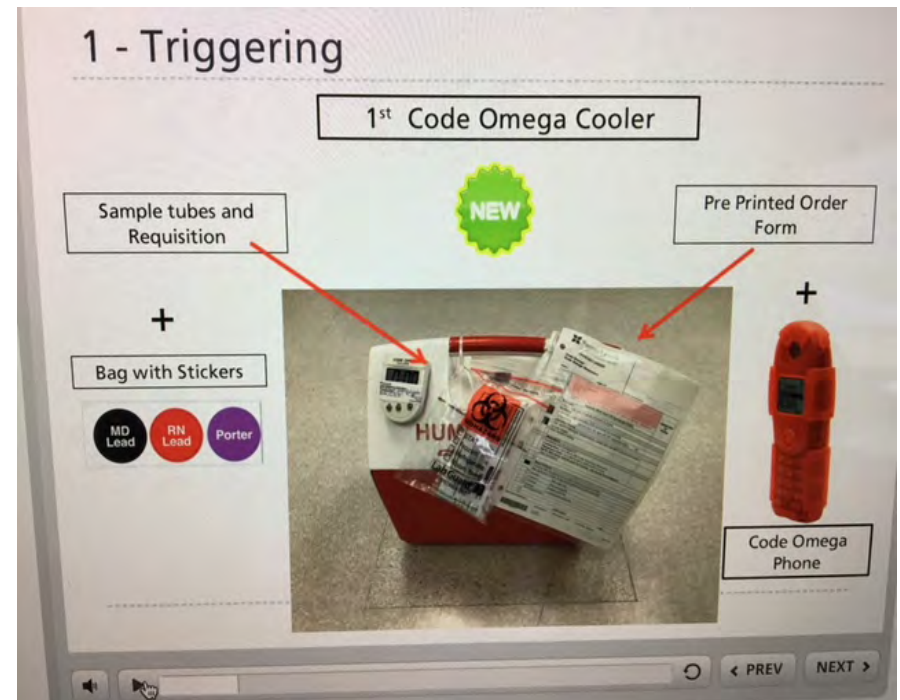
Barriers

- Remembering to draw repeat blood work, no specific times, prompts,
- Clericals entering orders
- Delays in porter processes.
- Lab tech doing the blood draws
- Linking order sets to product



Enablers

- Job action sheets
- Lab panels
- Premade bundles
- Pre-filled requisitions
- Posted pictures of panels and tubes to draw
- Checklists
- Blood goes to lab with “Code Emerg” priority
- Call the lab prior to sending
- Over head paging of MHP
- Annual simulations



Final take away messages

- Consistent evidence based recommendations around re-drawing samples is needed
- Enablers of process and flow go along way to ensuring adherence
- CPOE is a challenge, but with enablers in place are manageable in this environment

