Title: Venous Thrombosis in Central Lines of Pediatric Cardiac Patients

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1 Background

In critically ill patients, like those found in the PICU, central venous catheters can be used to administer fluids, medications and draw essential labs and information to better manage the patient. Life-threatening complications such as infection or venous thrombosis can be associated with placement and care of lines (Goutail-Flaud et al., 1991). Clots can be created when there is endothelial injury to vessels, causing an inflammatory response and the clotting cascade which can then disrupt blood flow in the system. If the clots become dislodged, they become emboli which can lodge into smaller vessels, such as the alveoli or brain, causing ischemia and damage.

There are various factors involved when choosing a central line for placement, which the research team sought to look at regarding line placement: line size, type of line, height and weight of patient, the site placement and end of line placement to see if any were associated with higher rates of clots (Harris & Maguire, 1999). These are all factors that could have a role in a line that is inappropriate for the patient. For example, a line too large for the vessel can cause injury which could lead to a clot.

Our first priority was to gather raw data on the prevalence of central line clots, as well as the common factors that these lined shared and possible factors regarding the placement of central lines and how they could lead to clots. In addition, we hoped to identify certain key factors that could help the nurses to identify clots early and to initiate prompt treatment.

2 Objectives

1.Identify how many venous thrombosis were formed in patients with central lines among Cardiac Patients.
2.Identify common factors that are associated with central line thrombosis in Cardiac PICU patients.
3.Survey other Pediatric Intensive Care units to compare their incidences and policies surrounding Cardiac central line thrombosis.

3 Methods

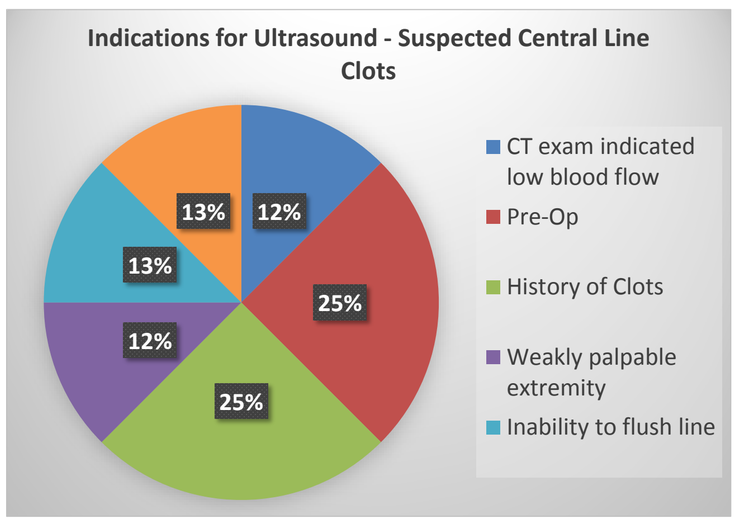
At the Johns Hopkins University PICU, we looked at 70 Cardiac Surgery and Cardiology patients with central lines over the months of January-May 2015. Using Hopkins Electronic Medical Record system POE, we tracked factors involved with central line placement including: line size, type of line, height and weight of patient, the site and end of line placement , date of insertion, and date of removal. Thrombi were positively identified using Radiology documentation such as use of Duplex Doppler ultrasonography. These ultrasounds were used to evaluate central line catheters upon suspicion of a thrombus, to detect the presence of thrombus formation and venous occlusion. Other information regarding the line was obtained through flow sheets and other nursing and provider documentation. We noted two categories: (1) incidences that were suspected central line clots and (2) instances of confirmed central line clots.

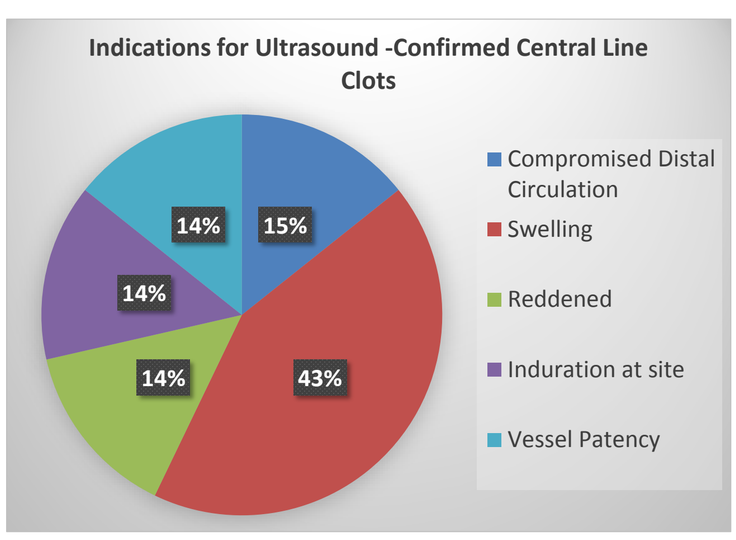
To ensure our central line care focused on 'best' practices, we sent surveys to over 50 other top pediatric ICU's to benchmark our practices. Benchmarking, a cooperative process comparing data and outcomes against those of high performance organizations to identify best practices, is evidence useful for EBP decision making (Thurston & King, 2005). The survey covered factors that both influence the placement of central venous catheters and the individual unit's protocol in treating thrombi.

4 Results

We identified all Cardiac patients from January-May with central lines and looked at these factors. In addition, we surveyed over 50 other Pediatric ICU's in the world to compare their protocols and processes when placing and assessing central lines. Currently, the team is still gathering and analyzing data to identify other hospitals' best practices.

Of the 70 patients identified, five of them developed thrombi that were confirmed by Duplex Doppler ultrasonography. The thrombosis rate is the number of thrombi divided by the total number of central line-days in the Cardiac population. The thrombosis rate for January-May was 0.7%, with the highest months being January with 2%, and April with 3.6%. We also found that of the confirmed central line clots, swelling was a common indicator, while history of clots and a pre-op Duplex ultrasound were common reasons to rule out central line clots. Other factors did not show a clinical significance in leading to a future thrombus.





5 Conclusions

Because of the lack of published evidence regarding Pediatric central line thrombosis, a survey can be a great way to start to gather data regarding common practices, which can then help guide the research to become published evidence. Pediatric central line thrombosis is a non-reportable event, which means that few hospitals know each other's rates or practices (Joint Commission, 2015).

The five confirmed clot instances among the 70 patients did not indicate statistical significance; however, it was able to give an initial insight to the practices of identifying and treating central line thrombosis which can affect clinical practices.

6 Future Directions

This early research combined with benchmarking practices from other top PICUs can guide a more in-depth research project that can follow all types of PICU patients and look at more factors including the treatment and prevention of thrombosis in central lines.

Further research and more EBP on central line clots can inspire the Joint Commission to make it a valued topic and a future reportable event. Heparin and Lovenox treatment of clots can put patients, especially pediatrics, at unnecessary risk and injury (Albisetti, 2015). By researching ways to avoid thrombi, such as a protocol checklist, developing future best practices can help reduce financial and emotional burdens.

7 References

Albisetti, M., & Chan, A. (2015, October 8). *Diagnosis and treatment of venous thrombosis and thromboembolism in infants and children.* Retrieved from: http://www.uptodate.com/contents/diagnosis-and-treatment-of-venous-thrombosis-and-thromboembolism-in-infants-and-children?source=search_result&search=Diagnosis+and+treatment+of+venous+thrombosis+and+thromboembolism+in+infants+and+children&selectedTitle=1~150

Goutail-Flaud, M. F., Sfez, M., Berg, A., Laguenie, G., Couturier, C., Barbotin-Larrieu, F., & Saint-Maurice, C. (1991). Central venous catheter-related complications in newborns and infants: a 587-case survey. *Journal of pediatric surgery*, *26*(6), 645-650.

Harris, J. L., & Maguire, D. (1999). Developing a protocol to prevent and treat pediatric central venous catheter occlusions. *Journal of Infusion Nursing*, *22*(4), 194.

Thurston, N., & King, K. (2005). Implementing evidence-based practice: walking the talk. *Journal Of Vascular Nursing*, *23*(2), 54-60.

Joint Commission on Accreditation of Healthcare Organizations [Joint Commission]. 2015. *Venous Thromboembolism.* Retrieved from:http://www.jointcommission.org/venous_thromboembolism/

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