

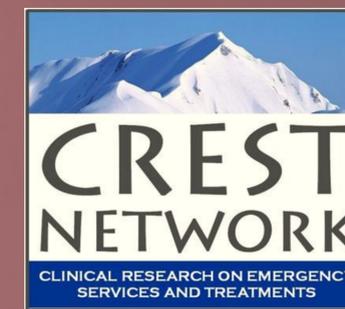
# BLEEDING COMPLICATIONS OF CVC IN SEPTIC PATIENTS WITH ABNORMAL HEMOSTASIS

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## Background

- Emergency physicians are prone to avoid central venous catheterization (CVC) in septic patients with known bleeding risks who are otherwise eligible for full early goal-directed therapy (EGDT) (Vinson DR, et al. *West J Emerg Med*; in press).
- This procedural disinclination is based on a perception of a significant risk of major bleeding, a risk thought sufficiently high to forego the benefits of thoracic central venous access and monitoring.
- An estimate of the incidence of hemorrhagic complications will help inform physicians' risk/benefit calculus when considering central line placement in patients with hemostatic lab abnormalities.

## Objectives

To measure the 24-hour incidence of major and minor bleeding complications in septic emergency department (ED) patients undergoing CVC for EGDT.

## Setting and Inclusion Criteria

- This retrospective cohort study was undertaken from March 2010 to June 2012 in 21 community EDs
- All septic patients undergoing ED CVC were included if they had one of the following:
  - ❖ Platelet count <100,000/ $\mu$ l;
  - ❖ International normalized ratio (INR)  $\geq$ 1.3; or
  - ❖ Partial thromboplastin time  $\geq$ 35 sec.
- Electronic health records (EHRs) were reviewed by 4 investigators.

## Outcome Measures Definitions

### Major hemorrhage:

- A new post-procedural fluid collection or enlargement in the pleural cavity, mediastinum, or neck, as confirmed by the staff radiologist's final interpretation of plain films or computerized tomography imaging;
- Line-related bleeding causing hemodynamic compromise that required blood or fluid replacement, inotropes, or surgery.

### Minor hemorrhage:

- Oozing from a percutaneous CVC puncture site;
- A superficial hematoma (visible or palpable).

## Statistical Analysis

- Bivariate associations with bleeding complications
- Multiple logistic regression included variables based on the bivariate analyses results and clinical relevance
- Results are presented as odds ratios and inter-rater reliability reported as % agreement after independent review of a random selection of 5% of cases.

## Results

Of the 2,612 patients undergoing ED CVC, 936 (35.8%) cases met inclusion criteria (Table 1). Mean age was 68.1 ( $\pm$ 14.9) years; 535 (57.2%) were male. Two or more qualifying labs were present in 204 cases (21.8% of 936).

- Physician Characteristics:** ED attendings (766; 81.8%), residents (146; 15.6%), and non-ED staff (24; 2.6%).

| INR level            | n=936<br>No. |
|----------------------|--------------|
| $\geq$ 1.3           | 768          |
| $\geq$ 1.3 and <2.0* | 532          |
| $\geq$ 2.0 and <3.0† | 139          |
| $\geq$ 3.0†          | 97           |
| PTT $\geq$ 35 sec    | 72           |

| Platelet count<br>(1,000/ $\mu$ l) | n=936<br>No. |
|------------------------------------|--------------|
| <100                               | 317          |
| $\geq$ 50 and <100*                | 246          |
| $\geq$ 20 and <50†                 | 55           |
| <20†                               | 16           |

**Table 1: Distribution of hemostatic lab abnormalities**

\* mild hemostatic abnormality; † mod-to-severe abnormality

- Site and Success of Initial CVC Attempt:** internal jugular (IJ) (800; 85.5%), subclavian (123; 13.1%), and femoral (13; 1.4%) veins. Access was successful at the initial site in 872 cases (93.2%).
- Pre-procedural Blood Products:** Overall 20 patients (2.1%): fresh frozen plasma (n=17) and platelets (n=3).
- Complications:** 1 case (95% CI, 0--0.6%) of major bleeding: a hemothorax from a misplaced subclavian line in a patient with refractory septic shock and an INR of 1.4. 37 cases (4.0%; 95% CI, 2.8-5.4) of minor bleeding were identified, only 7 of which required line removal or sutures. There were 4 cases (0.4%; 95% CI, 0.1-1.1) of pneumothorax among 921 thoracic CVCs.
- Failed Access at Initial Site:** In bivariate analyses, only this variable was statistically significantly different between the hemorrhage and non-hemorrhage groups: 17.2% vs. 3.1% (p<.0001) (see Table 2).

|  | Unadjusted OR<br>(95% CI) | Adjusted OR‡<br>(95% CI) |
|--|---------------------------|--------------------------|
| Res. vs. attending                     | 1.7 (0.8-3.7)*            | 1.7 (0.8-3.8)            |
| Subclavian vs. IJ                      | 0.6 (0.2-1.8)             | 0.4 (0.1-1.3)            |
| Mod-to-severe vs. mild abnormalities   | 1.1 (0.6-2.3)             | 1.2 (0.6-2.4)            |
| Failed access at the initial vein site | 6.5 (3.1-13.8)†           | 8.0 (3.7-17.6)           |

**Table 2: Odds ratios (ORs) of hemorrhagic complications**

\* p = 0.16; † p < .0001; ‡ adjusted for the 4 variables in the table

## Strengths and Weaknesses

- Systematic review of comprehensive integrated EHR
- Redundant chart review of all physician and nursing notes to 48 hours from ED arrival
- Sensitivity analysis of different definitions of mod-to-severe lab abnormalities yielded similar results
- Percent inter-rater agreement: 97.8% to 100%
- Ultrasound use was prevalent but poorly documented
- We suspect under-reporting of minor hemorrhage
- Unable to include cases of failed ED CVC, estimated to be approximately 13 cases during the study period

## Conclusions

- Major bleeding from CVC among septic ED patients with abnormal hemostasis is rare.
- Minor bleeding is uncommon and infrequently requires intervention.
- Failed CVC at the initial site is associated with hemorrhagic complications.