

Best Evidence Statement (BESt)

Date published/posted

03/03/09

Topic and/or question as originally asked

How much waste should be drawn from an intravenous saline-well catheter to obtain a subsequent undiluted blood sample?

Clinical Question

P (population/problem) In adult patients with intravenous saline well catheters who are undergoing testing,
I (intervention) does 1ml of “waste” blood obtained prior to the actual blood specimen,
C (comparison) compared to 5ml of “waste” blood obtained prior to the actual blood sample
O (outcome) provide samples that produce accurate serum sodium levels?

Target Population

Adult patients with intravenous saline well catheters who need lab specimens obtained.

Recommendation(s)

There is insufficient evidence and lack of consensus to make a recommendation on the minimum amount of blood wastage needed to permit effective samples in adult patients. (Davies, et al, 2000 4b; Herr et al, 1990 4a; Yucha & DeAngelo, 1996 4a; Zlotowski, et al, 2001 4a.)

It is recommended that a research study be conducted to determine the minimum amount of blood wastage needed to permit effective undiluted blood specimen (renal panel) to add to the body of knowledge on this topic.

There is no current Saline Well Policy at Cincinnati Children’s Hospital Medical Center (CCHMC).

Discussion/summary of evidence

Yucha and DeAngelo (1996, 4a) studied nine healthy adults and compared hematocrit readings of blood obtained from an IV catheter following waste draws of 1 mL, 1.5 mL, and 2.5 mL to the average hematocrit readings of blood obtained from blood drawn from an IV catheter following more than 2.5 mL of waste. They concluded, with 95% confidence, that there was no difference in hematocrit readings between blood obtained following 1.5 mL of waste (three times the dead space of the catheter used) and the subjects’ true hematocrit reading, which they defined as the average of the hematocrit readings drawn after at least 2.5 mL of waste was drawn.

Davies, Mehr, and Morley (2000, 4b) studied sodium levels of blood obtained through an IV catheter following waste draws of 0.6 mL, 0.9 mL, 1.3 mL, and 1.6 mL. These values were compared to a control sodium level that was obtained through the IV catheter following a 10 mL waste. They concluded that drawing 1.6 mL of waste prior to obtaining a blood sample was adequate to obtain accurate sodium levels. A confidence percentage was not included in this study.

Zlotowski, Kupas, & Wood (2001, 4a) studied 33 healthy volunteers and compared venipuncture to IV catheter with no waste drawn to IV catheter with a 12 mL waste drawn. They report a 95% confidence

Herr, R. et al. (1990). Intravenous Catheter Aspiration for Obtaining Basic Analytes during Intravenous Infusion. *Annals of Emergency Medicine*, 19:7, 789-792. (Level of Evidence 4a, Longitudinal) _____

Yucha, C., & DeAngelo, E. (1996). the Minimum Discard Volume: Accurate Analysis of Peripheral Hematocrit. *The Journal of Intravenous Nursing*, 19, 141-146. (Level of Evidence 4a, Longitudinal) _____

Zlotowski, S., Kupas, D., & Wood, G. (2001). Comparison of Laboratory Values Obtained by Means of Routine Venipuncture versus Peripheral Intravenous Catheter after a Normal Saline Solution Bolus. *Annals of Emergency Medicine*, 38:5, 497-504. (Level of Evidence 4a, Longitudinal) _____

Note: Full tables of evidence grading system available in separate document:

- Table of Evidence Levels of Individual Studies by Domain, Study Design, & Quality (abbreviated table below)
- Grading a Body of Evidence to Answer a Clinical Question
- Judging the Strength of a Recommendation (abbreviated table below)

Table of Evidence Levels (see note above)

<i>Quality level</i>	<i>Definition</i>
1a† or 1b†	Systematic review, meta-analysis, or meta-synthesis of multiple studies
2a or 2b	Best study design for domain
3a or 3b	Fair study design for domain
4a or 4b	Weak study design for domain
5	Other: General review, expert opinion, case report, consensus report, or guideline

†a = good quality study; b = lesser quality study

Table of Recommendation Strength (see note above)

<i>Strength</i>	<i>Definition</i>
“Strongly recommended”	There is consensus that benefits clearly outweigh risks and burdens (or visa-versa for negative recommendations).
“Recommended”	There is consensus that benefits are closely balanced with risks and burdens.
No recommendation made	There is lack of consensus to direct development of a recommendation.

Dimensions: In determining the strength of a recommendation, the development group makes a considered judgment in a consensus process that incorporates critically appraised evidence, clinical experience, and other dimensions as listed below.

1. Grade of the Body of Evidence (see note above)
2. Safety / Harm
3. Health benefit to patient (*direct benefit*)
4. Burden to patient of adherence to recommendation (*cost, hassle, discomfort, pain, motivation, ability to adhere, time*)
5. Cost-effectiveness to healthcare system (*balance of cost / savings of resources, staff time, and supplies based on published studies or onsite analysis*)
6. Directness (*the extent to which the body of evidence directly answers the clinical question [population/problem, intervention, comparison, outcome]*)
7. Impact on morbidity/mortality or quality of life

Supporting information

Introductory/background information

Patients undergoing testing in a hospital setting often will have a peripheral indwelling intravenous catheter inserted. The IV may be used to infuse medications or converted to a saline well to obtain frequent blood samples. After an IV catheter is inserted, the catheter is flushed with 2 mLs of 0.9% normal saline to flush the blood out of the catheter and ensure patency of the IV. Before the next blood sample is obtained, a “waste” sample is drawn to remove the saline or heparin that was in the catheter. The purpose of this evidence evaluation is to investigate how to minimize the volume of waste required to be drawn from an indwelling intravenous catheter to obtain a subsequent undiluted blood sample.

Group/team members

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Search strategy

OID Databases

Medline, CINAHL, and Cochrane Databases for Systematic Reviews

PubMed Databases Clinical Queries for Systematic Review

Scopus Databases Clinical Queries for Systematic Review

Filters:

Publication Date	1980 to present
Limits	Humans and English language

Search Terms:

“intravenous catheter”, “IV catheter”, “indwelling catheter”, “blood”, “blood sample”, “waste”, “volume”, “dilution”, “blood specimen”, “catheter”, “sample dilution”, “specimen dilution”, and “saline well”.

Known conflicts of interest

All team members have signed a conflict of interest declaration and none were found.

Applicability issues

Because insufficient evidence to guide practice was found, a research study is planned to be conducted in the CRC at CCHMC.

Copies of this Best Evidence Statement (BESt) are available online and may be distributed by any organization for the global purpose of improving child health outcomes. Website address: <http://www.cincinnatichildrens.org/svc/alpha/h/health-policy/ev-based/default.htm>
 Examples of approved uses of the BESt include the following:

- copies may be provided to anyone involved in the organization’s process for developing and implementing evidence based care;
- hyperlinks to the CCHMC website may be placed on the organization’s website;
- the BESt may be adopted or adapted for use within the organization, provided that CCHMC receives appropriate attribution on all written or

- electronic documents; and
- copies may be provided to patients and the clinicians who manage their care.

Notification of CCHMC at HPCEInfo@cchmc.org for any BESt adopted, adapted, implemented or hyperlinked by the organization is appreciated.

For more information about CCHMC Best Evidence Statements and the development process, contact the Center for Professional Excellence/Research and Evidence-based Practice office at CPE-EBP-Group@chmcc.org.

Note

This Best Evidence Statement addresses only key points of care for the target population; it is not intended to be a comprehensive practice guideline. These recommendations result from review of literature and practices current at the time of their formulation. This Best Evidence Statement does not preclude using care modalities proven efficacious in studies published subsequent to the current revision of this document. This document is not intended to impose standards of care preventing selective variances from the recommendations to meet the specific and unique requirements of individual patients. Adherence to this Statement is voluntary. The clinician in light of the individual circumstances presented by the patient must make the ultimate judgment regarding the priority of any specific procedure.

Reviewed by Center for Professional Excellence