

<i>Subject/Title:</i> <b>Blood Collection Adverse Reactions and Patient Blood Volumes</b>		<i>Approved By and Title:</i> Bill Pettross, M. D. Director of FRHG Laboratories	
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**Purpose** Adverse reactions from blood collection can occur and personnel collecting blood specimens must know what can occur and how best to manage the reactions. This policy addresses some adverse reactions and what should be done to address these reactions. This policy also addresses the issue of patient blood volumes and how to manage blood collections and not compromise a patient's health.

- Adverse Reactions**
- a. Hematoma: Blood can leak out of a vein and under the skin during venipuncture. This can cause discomfort and pain and can complicate further collections from that site. As soon as a hematoma is noted, remove the needle and tourniquet and apply pressure at the site for a minimum of 3 minutes. Check the site and if the hematoma has stopped forming, put on a bandage or gauze with tape and inform the patient of the hematoma. The bandage should remain in place for a minimum of a half hour.
  - b. Arterial puncture: If the blood pulses into the collection system or fills collection tubes rapidly and is bright red, an artery has been punctured. If no hematoma is forming and the patient is not under any noted duress, continue the collection without the tourniquet and then apply pressure for a minimum of 5 minutes. Check the site before applying a bandage to ensure the artery has sealed and notify the patient that the site needs to have a bandage on it for an hour and not to use the arm for lifting any thing over 5 pounds for the day. Let the patient know there may be more discomfort at the site than if the draw was a venipuncture draw.
  - c. Pain: Since nerves are very close to veins and arteries, there is some risk a nerve maybe pierced by a needle during blood collection. The patient will complain that he/she feels an electric shock going up his/her arm. Immediately remove the needle from the patient's arm and put pressure on the site. Ask the patient if the sensation has stopped. If so, try to redraw at another site if the patient is willing. Explain to the patient that a nerve was touched by the needle and that was what he/she felt. Ask them to let us know if they have any more numbness, weakness, or shocking sensations at the first site. See Nerve Damage.

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**Adverse  
Reactions,  
continued**

- d. Nerve Damage: If a nerve has been pierced or cut, the patient will feel pain or numbness or a shocking sensation as discussed in c. If the patient continues have these symptoms, ask for one of our on-site pathologists to meet with the patient or get the patient to ED (Emergency Department) or FOPD (Fremont Outpatient Department) and ask the staff there to examine the patient for nerve damage. The patient may need to be seen by his or her doctor to follow-up. Comfort the patient and let them know we cannot feel for nerves and this is a rare out-come of venipuncture.
  - e. Re-Bleed: Patients with some liver disease, vascular diseases, clotting disorders, or medications may complicate normal clotting post a blood collection. Hot temperatures outside may cause a site to re-bleed because the veins dilate to cool the body. Always check the site after holding it and keeping the patient sitting and their arm slightly bent. If the bleeding has not stopped, continue to apply pressure. If bleeding still continues, ask a CLS (Clinical Laboratory Scientist) or pathologist to look at the site and ask the patient if they have any bleeding issues. The patient may need to be taken to ED or FOPD to evaluate the bleeding. He/she may need to see his/her own doctor to evaluate the bleeding. Commonly, if the site is held at least 5 minutes, the bandage is kept in place for one hour and the patient does not lift objects over 5 pounds for that same period, the site should seal and not re-bleed. The patient may have more bruising than usually because of the causes mentioned and this should be explained to the patient.
  - f. Allergy: Some patients may have itching or burning at the collection site. Rashes or hives may form near the site. FRHG is latex free to ensure our equipment does not have any latex, which has been a common allergy among some patients. If these symptoms or signs are severe or the patient is having difficulty breathing, stop the collection immediately and get the patient to ED or FOPD. If the patient passes out or stops breathing call a STaRRT Alert and get emergency care to the patient. CPR should be started immediately in anaphylactic shock. If the reaction is mild, have the patient see his or her physician immediately or take him or her to ED or contact the nursing house supervisor for an exam.
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### Adverse Reactions, continued

- g. Phlebitis is inflammation of a vein. Thrombophlebitis is due to one or more blood clots in a vein that cause inflammation. Thrombophlebitis usually occurs in leg veins, but it may occur in an arm. The thrombus in the vein causes pain and irritation and may block blood flow in the veins. Phlebitis can occur in both the surface (superficial) or deep veins.
1. Superficial phlebitis affects veins on the skin surface. The condition is rarely serious and, with proper care, usually resolves rapidly. There is usually a slow onset of a tender red area along the superficial veins on the skin. A long, thin red area may be seen as the inflammation follows a superficial vein.
    - This area may feel hard, warm, and tender. The skin around the vein may be itchy and swollen.
    - The area may begin to throb or burn.
    - A low-grade fever may occur.
    - Sometimes phlebitis may occur where a peripheral intravenous line was started. The surrounding area may be sore and tender along the vein.
    - If an infection is present, symptoms may include redness, fever, pain, swelling, or breakdown of the skin.
    - Sometimes people with superficial phlebitis also get deep vein thrombophlebitis, so a medical evaluation is necessary.
    - Avoid these areas for blood collection and have the patient seek medical care if the symptoms persist.
  2. Deep Vein Thrombosis affects the larger blood vessels deep in the legs. Large blood clots can form, which may break off and travel to the lungs. This is a serious condition called pulmonary embolism and must be treated immediately by a doctor.
- h. Vasovagal reaction: A reflex of the involuntary nervous system that causes the heart to slow down (bradycardia) and that, at the same time, affects the nerves to the blood vessels in the legs permitting those vessels to dilate (widen). As a result the heart puts out less blood, the blood pressure drops, and what blood is circulating tends to go into the legs rather than to the head. The brain is deprived of oxygen and the fainting episode occurs. The vasovagal reaction is also called a vasovagal attack. Stop collection immediately and help control the patient to prevent injury. If the patient is moving to the floor, verbally call out for help and gently help the patient to the floor. Call ED (Emergency Department), the Administrative House Supervisor or designee, or 911 if at an off-site location to help evaluate the patient. If the patient does not revive quickly or has any other adverse reactions, call a STaRRT Alert and get emergency care to the patient.

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### Adverse Reactions, continued

- i. Anxiety/fear: Patients, especially children under the age of 12 or mentally disabled persons, may show anxiety and/or fear when they present for blood collection. Take the time to explain to the patient exactly what will happen at the patient's level of understanding. Ask care givers to assist with calming the patient. Then seek out help to hold the arm still during collection and make sure you let the patient know each step you are doing and what he/she will be feeling. Use a focus point for the patient to look at while you draw like a caregiver, a stuffed animal, some stickers, or something else in the room away from the site of collection. Remain calm and comforting and put yourself in the patient's position to help guide you in the collection. If the patient refuses, notify medical staff immediately and wait for their direction before trying to draw the patient. Seek out caregiver/family member helps as possible.

### **In summary, appropriate actions include:**

1. Checking that the tourniquet is providing sufficient venous engorgement
  2. Removing collection system and starting again at a different site
  3. Obtaining support from a more experienced practitioner.
  4. Ask for help if you are unsure and keep the patient's safety foremost in your decision making.
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### Patient Blood Volumes

- a. Phlebotomy by its definition removes blood from a patient. If too much is removed at one time, day, week or month, a patient's health could be compromised further. Therefore blood collections should be at minimal levels and when large amounts are required for testing, medical staff must be made aware of how much the lab may remove from a patient.
  - b. Blood volume varies with the age of the patient. The following details how much blood in milliliters is present per kilogram of body weight per patient age:
    - Preterm infants 90-105 mL/kg
    - Term infants 78-86 mL/kg
    - 1-12 months 73-78 mL/kg
    - 1-3 years 74-82 mL/kg
    - 4-6 years 80-86 mL/kg
    - 7-18 years 83-90 mL/kg
    - >18 years 70-90 mL/kg
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**Patient  
Blood  
Volumes**

- c. As a rule of thumb, no more than 3-5% of a patient's total blood volume should be drawn in one day. So, a patient's weight in kilograms times the blood volume per kg times 0.03 will give the amount of blood that can be taken from a patient within one day. Seek out our clinical lab staff for help calculating. Since pediatric patients are at a higher risk for blood loss due to blood collection, the next section details how much can be removed from a patient and when.

### GUIDELINES FOR PEDIATRIC BLOOD DRAWS

Ideally it should be less than 3% of the total blood volume, and where possible, micro-sampling techniques to reduce the amount further are preferred. Blood draws in infants and children should not exceed 10% of the total blood volume in any one-month period, unless medically necessary. Review the following table.

**Maximum Amounts of Blood to be Drawn From  
Patients Younger than 14 Years**

Patient's Weight Pounds	Patient's Weight Kilograms (approx.)	Maximum Amount to be drawn at any one time (mL)	Maximum Amount of blood – cumulative to be drawn during a given hospital stay (1 month or less- mL)
6-8	2.7-3.6	2.5	23
8-10	3.6-4.5	3.5	30
10-15	4.5-6.8	5	40
16-20	7.3-9.1	10	60
21-25	9.5-11.4	10	70
26-30	11.8-13.6	10	80
31-35	14.1-15.9	10	100
36-40	16.4-18.2	10	130
41-45	18.6-20.5	20	140
46-50	20.9-22.7	20	160
51-55	23.2-25.0	20	180
56-60	25.5-27.3	20	200
61-65	27.7-29.5	25	220
66-70	30.0-31.8	30	240
71-75	32.3-34.1	30	250
76-80	34.5-36.4	30	270
81-85	36.8-38.6	30	290

## Blood Collection Adverse Reactions and Patient Blood Volumes

86-90	39.1-40.9	30	310
91-95	41.4-43.2	30	330
96-100	43.6-45.5	30	350

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### Patient Blood Volumes

Always work with medical staff if there is any question about how much blood should be taken. All laboratory tests have a minimum volume required and use these guides to know how much blood will be needed for the tests ordered. If there is a risk of too much blood being removed in one draw, let the medical staff know immediately before collection so any order adjustments can be done if possible.

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### Limitations of the Procedure

Always work with doctors and nursing staff who are directly caring for our patients if there are any adverse reactions or risk of over-phlebotomizing a patient. This guide does not encompass all possible reactions and use caution if there are any unusual outcomes or reactions during blood collection or after.

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### References

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4. "Blood." *World Book Encyclopedia*. Chicago: World Book, 1998: 407.
5. From The Harriet Lane Handbook, adapted from "Hematology of Infancy and Childhood" by D Nathan and FA Oski.
6. [www.emedicinehealth.com/phlebitis/article\\_em.htm](http://www.emedicinehealth.com/phlebitis/article_em.htm), March 2007.

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**Affected Departments: Laboratory, Laboratory Services**