

To: Doctors Lab Nursing Home Staff: Resident Physicians, DONs and Personal Nurses

From: Doctors Lab Technical Support Staff

Date: June 25, 2018

Re: Alert: Postural Pseudo-anemia Phenomenon in Long-Term Care Facilities

Issue: We have received a number of calls consistent with the following scenario: Patient is drawn in early AM. CBC performed and reports a “critical value” on Hemoglobin and/or Hematocrit. Patient admitted to hospital for possible transfusion. Hospital draws CBC for evaluation and finds the Hgb/Hct is now higher and not critical and the patient does not require a transfusion or receives an unnecessary transfusion.

Review: On each one of these calls, Doctors Lab has reviewed each case to insure that there were no instrument or system failures. We have reviewed: Correct patient drawn, Instrument maintenance and QC. We sent split samples to other labs and have re-drawn patients and sent split samples to other labs for comparison. We contacted the instrument manufacturer. None of these review processes have satisfactorily identified an “issue” that could or should be corrected. After each review we felt confident in the accuracy of the results that we provided. However, we still had no satisfactory explanation for the lower results that we reported. Note: we were anxious to resolve this issue as the “tendency” is to assume that the laboratory and its results are always the ones who are wrong.

Conclusion: After our case reviews, we continued to research possible explanations for the phenomenon that we and you were experiencing. As we have searched the literature, we believe that we have found a plausible explanation to accurately explain the differences in the results.

The literature search revealed several papers referencing several studies noting a phenomena termed “Postural Pseudo-anemia”. These studies (one by the Mayo clinic) drew patients early in the morning while lying down and later in the day while sitting up. The studies noted that on several CBC parameters that the earlier drawn samples (posture supine) were consistently lower than the later drawn samples (posture sitting up). One of the papers names was: ***Postural Pseudoanemia in Long-Term Care Facilities.***

Study Conclusions:

- **Our results confirm the theory that a change in posture causes changes in some of the blood indices;** posture changes the hydrostatic pressure that leads to a change in the movement of fluid between interstitial space and intravascular space and causes physiologic fluctuations in blood volume.
- It is recommended that healthcare providers consider the postural pseudo-anemia phenomena in the event of a Critical Hgb or Hct prior to admitting for possible transfusion.
- ***Changes in posture can lead to substantial changes in Hgb/Hct, which may be attributed mistakenly to blood loss or acute anemia and result in a cascade of unnecessary diagnostic costs. In reality, these changes represent postural pseudoanemia, a normal physiological response to a change in position from standing to lying (and vice versa).***

From our literature reviews and our own in-house study, we believe that the Postural Pseudo-anemia phenomena is most likely the reason for most of the differing CBC results between the early AM and later in the day draws.

Recommendations: We believe that this Postural Pseudo-anemia phenomena is probably happening on most of our patient results but does not become an “issue” until the results approach the Critical Values borders.

Our recommendation: Change the position of the patient and call us for a STAT redraw prior to admission.

Summary: When receiving a Critical Value on a Hgb/Hct on an early AM draw that could potentially indicate the need for a transfusion (especially in the absence of other clinical indications of bleeding or anemia), is to get the patient up (change of posture) and redraw the sample before admitting to the hospital. Call us for STAT redraw.

Postural Pseudoanemia in Long-Term Care Facilities: Low hemoglobin in the morning, physicians taking warning!

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(2011) *Abstracts and Case Studies From the College of American Pathologists 2011 Annual Meeting (CAP '11)*. *Archives of Pathology & Laboratory Medicine*: September 2011, Vol. 135, No. 9, pp. 1102-1230.

American Geriatric Society Annual Meeting 2013, Journal of the American Geriatrics Society 61: Suppl. 1 S70.

Context: Anemia is very common in the geriatric population. The definition of anemia relies heavily on the complete blood cell (CBC) count and specifically hemoglobin and hematocrit, which are affected by several factors: ethnic background, sex, altitude, and physiologic fluctuation of plasma volume. It has been shown that posture can cause change in the results for some blood indices.

Design: The CBC specimens were collected from residents in long-term care facilities early in the morning when the patients were still in bed. Another set of CBC specimens were collected from the same patients in the afternoon. The patients' position was noted, and CBC results were collected using Coulter LH 780 impedance/cell sizing counter (Beckman Coulter, Fullerton, California). Statistic calculations were performed using Statistica (StatSoft, Tulsa, Oklahoma). We considered any $P < .05$ to be statistically different.



Results: All the samples showed an increase in CBC values in the afternoon drawn samples (patient has been moving) compared to the early morning (patient in bed) drawn samples. The most statistically significant difference was with hemoglobin followed by hematocrit, red blood cells, platelets, and white blood cells.

Test	AM, No. (SD)	PM, No. (SD)	P
White blood cell count, No./ μ L	8.74 (4.1)	10.02 (5.3)	<.001 ^a
Red blood cell count, $\times 10^6/\mu$ L	3.46 (0.59)	3.64 (0.66)	<.001 ^a
Hemoglobin, g/dL	10.55 (1.65)	11.07 (1.82)	<.001 ^a
Hematocrit, %	31.8 (4.7)	33.63 (5.65)	<.001 ^a
Platelet count, $\times 10^3/\mu$ L	266.6 (136.1)	285.7 (143.8)	<.001 ^a

^a Statistically significant.

Conclusion: Our results confirm the theory that a change in posture causes changes in some of the blood indices; posture changes the hydrostatic pressure that leads to a change in the movement of fluid between interstitial space and intravascular space and causes physiologic fluctuations in blood volume. Physicians should give more attention to this fact, especially in severely anemic patients, where the difference in posture may alter the hemoglobin result or indicate a need for more aggressive treatment (blood transfusion)

Postural Pseudo-anemia: Posture-Dependent Change in Hematocrit

- **Mayo Clinic Proceedings:** [Volume 80, Issue 5](#), May 2005, Pages 611-614
- [Giris Jacob](#), MD, DSc, [Satish R. Raj](#), MD, MSCI, [Terry Ketch](#), MD, [Boris Pavlin](#), BSc, [Italo Biaggioni](#), MD, [Andrew C. Ertl](#), PhD, [David Robertson](#), MD  Correspondence information about the author MD David Robertson  Email the author MD David Robertson

OBJECTIVE

To determine the magnitude of posture-related changes in blood components.

SUBJECTS AND METHODS

Twenty-eight healthy subjects were studied between 1995 and 2004 at the Vanderbilt Autonomic Dysfunction Center, Nashville, Tenn. Lying and standing plasma volume (PV) and hematocrit (Hct) values were determined for each subject.

RESULTS

Individual PV decreases on standing ranged from 6% to 25%. The absolute mean \pm SD PV shift was 417 ± 137 mL (range, 149-717 mL). The mean \pm SD change in Hct was from $37.7\% \pm 2.8\%$ while supine to $41.8\% \pm 3.2\%$ within 30 minutes of standing. This absolute increase in Hct of $4.1\% \pm 1.3\%$ represents a relative increase of $11.0\% \pm 3.6\%$ from lying to standing.

CONCLUSIONS

Changes in posture can lead to substantial changes in Hct, which may be attributed mistakenly to blood loss or acute anemia and result in a cascade of unnecessary diagnostic costs. In reality, these changes represent *postural pseudoanemia*, a normal physiological response to a change in position from standing to lying (and vice versa). BV (blood volume), Hct (hematocrit), PV (plasma volume)

The importance of recognizing postural pseudoanemia

- Fred Goldner, Giris Jacob, Satish R. Raj, David Robertson [Email author](#)
- [Comprehensive Therapy](#): March 2006, Volume 32, [Issue 1](#), pp 51–55 | [Cite as](#)

Abstract

The determination of the packed red cell volume and the hemoglobin level has been paramount for monitoring anemia and blood loss for patients in the hospital setting. Recently, these variables have been studied during various control conditions including changes in posture. It has been found that the hematocrit changes markedly with alteration of body posture, in such a way that shifts of estimated blood volume of 1 pint can commonly be elicited by a simple change of posture from supine to upright or vice versa. Therefore, it is important to recognize that in addition to the numerous pathological conditions that may affect the value of the packed cell volume, certain physiological maneuvers may have an equal impact and may confound the accurate assessment of true pathological changes in these variables. Thus, changes in posture can lead to substantial changes in hematocrit, which may be attributed mistakenly to blood loss or acute anemia and may result in a cascade of unnecessary diagnostic costs. In reality, these changes represent postural pseudo-anemia, a normal physiological response to a change in position from standing to lying

Patient Posture (Nurse Learning site)

There is a little known fact that the patient's posture can affect lab values obtained from certain tests. There have been differences noted in lab values in patients who have been in a recumbent or supine position as opposed to those who have been standing or ambulatory for long periods of time. The difference in these lab values have been attributed to shifts in body fluids. Fluids tend to stay in the vascular compartment (bloodstream) when the patient is recumbent or supine. This tends to dilute the blood. There is a shift of fluids to the interstitial spaces upon standing or ambulation. The lab tests that are the most affected by this phenomenon are proteins (enzymes, albumin, globulins) and protein-bound substances such as triglycerides, cholesterol, calcium, and iron.

For example, ALT (alanine aminotransferase) has been known to increase up to 14% when the patient goes from supine to the erect position. Patients who are having any of these above tests performed, should be told to avoid prolonged standing prior to the venipuncture. It takes about 20 to 30 minutes to equalize fluid shifts due to changes in position.

<https://www.nurseslearning.com/courses/nrp/labtest/course/section2/index.htm>