

**TITLE:** HEMODYNAMIC MONITORING DURING AUTOLOGOUS BLOOD DONATION FOR HIGH RISK PATIENTS

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**Introduction:** The use of autologous blood transfusions for patients undergoing elective surgery has increased due to public and physician pressure regarding the AIDS crisis. Many of these patients are elderly or have developed significant cardiovascular, renal, pulmonary or hepatic disease. Several such patients have been reported to have suffered untoward consequences of blood donation when they donated in the blood bank. Because of the increased demand to phlebotomize high risk patients, a cooperative program has been undertaken between the Blood Banking Services and the Department of Anesthesiology to effectively monitor and increase safety for this patient group. The following study of hemodynamics was undertaken to assess the relative risk of blood donation in a high risk group and assess some measures to reduce that risk.

**Methods:** 25 patients were identified as high risk by blood banking personnel when they were scheduled for autologous blood donation. Criteria for inclusion in this group included a history of one or more of the following: significant cardiac disease (i.e. angina, MI, CHF, or arrhythmia), vascular disease (stroke, TIA, aneurysm) renal failure, hepatic failure or neurologic disease (seizures). Patients were scheduled on an outpatient basis and admitted to the recovery room where phlebotomy was performed by a Blood Bank technician while the patient was monitored by anesthesia personnel. Monitors included continuous ECG, automated oscillometric blood pressure, continuous pulse oximetry and continuous cardiac output (Bomed Impedance Cardiac Output). Baseline data was recorded before, every 5 minutes during and at the end of phlebotomy. 5 minutes after the completion of phlebotomy patients sat up from a semi-reclining position with their legs over the edge of the bed for 5 minutes. If stable, they were then allowed to stand for 5 minutes. Hemodynamic data were collected during these periods and patients were judged discharge-ready if they were hemodynamically stable and had no symptoms at the end of their 5 minutes of erect posture. A subset of patients were monitored and in addition had a 500cc lactated ringers infusion administered after the termination of the phlebotomy.

**Results:** Table 1 demonstrates the prevalence of risk factors and drug therapy present in the population studied.

TABLE 1: DEMOGRAPHICS OF HIGH RISK POPULATION

Disease	Prevalance(%)	Medication	Prevalance(%)
Angina	66.7	Anti-hypertensives	58.3
Hypertension	57.1	Nitrates	40.9
MI	52.4	Beta - blockers	29.2
CHF	23.8	Anti-arrythmics	29.2
Arrythmia	23.8	Ca channel blockers	25.0
CVA or TIA	19.0	Digoxin	16.7

Hemodynamic changes showed a decrease over time in systolic, diastolic and mean blood pressure with phlebotomy. Those changes were most pronounced when patients were asked to sit upright with their legs over the side of the bed. Heart rate remained constant throughout our observation period. Cardiac output decreased and again was lowest when patients were asked to sit upright. Oxygen saturation did not change. Three patients, despite IV fluid therapy, had their phlebotomy prematurely terminated due to hypotension. These patients were not allowed to sit or stand until adequate resuscitation was completed. Only one patient of our 25 became grossly symptomatic, however. Two patients were noted to have occasional PVC's and one patient did develop multiple PAC's during phlebotomy. One patient had a near syncopal episode similar to her TIA's with a significant hypotensive episode 90/54. This episode responded to O<sub>2</sub> and rapid fluid administration.

**Discussion:** Significant decreases in blood pressure during autologous blood collection have been demonstrated in this group of high risk patients. The cause for that hemodynamic change must almost certainly be due to a decreased cardiac output secondary to a fall in pre-load. Our patients did not increase their heart rate at all in compensation for the decrease in pre-load. That inability to compensate for pre-load changes would be expected in a group of patients with a high percentage of myocardial infarctions and angina who may be receiving either Ca channel blockers or beta-blockers. Healthy populations adequately compensate for a 10% phlebotomy; whereas we have shown only a partial ability to do so in medicated and high risk patients. The risk of hemodynamic compromise and aggravation of pre-existing disease states justifies the appropriate monitoring of high risk patients during autologous blood collection. The expanding clinical role of contemporary anesthesiologists and their hemodynamic expertise makes them most appropriate to provide the safest new cooperative service with blood banking for autologous blood collection.

TABLE 2: HEMODYNAMIC CHANGES OVER TIME WITH AUTOLOGOUS BLOOD COLLECTION

	Blood Pressure					
	Systolic	Diastolic	Mean	HR	CO	O <sub>2</sub> Sat
Baseline						
Phlebotomy	153	77	102	73	6.7	96.1
5 min	150	77	102	72	6.5	96.4
10 min	145	77	100	72	6.2	96.2
15 min	140	71	94	72	6.0	96.3
Post-Phlebotomy						
Sitting						
20 min	128	67	88	74	5.7	96.0
Standing	130	73	92	75	6.2	96.0