IMJ
Official Journal of the Irish Medical Organisation

Ir Med J; November-December 2024; Vol 117; No. 10; P1051

December 19th, 2024

The use and benefit of venous blood lactate in ambulatory patients attending the Emergency Department

J. Phelan[1], T. Quinn[1], M. Jee[2], J. Foley[2].

1. School of Medicine, College of Medicine, Nursing and Health Sciences, University of Galway, Newcastle, Co. Galway, Ireland.
2. Emergency Medicine, University Hospital Galway, Newcastle, Co. Galway, Ireland.

Abstract

Aim

A venous blood lactate (VBL) is a commonly utilised test in Emergency Departments. (EDs) The present study aimed to assess if a VBL is beneficial for clinical decision making, predicting outcomes and cost-effective for ambulatory patients attending the ED.

Methods

Consecutive ambulatory patients who attended the ED and had bloods taken were included. The frequency of VBL sampling, and variables including demographics, outcomes and cost were analysed.

Results

102 patients were included. 77.5% (n=79) patients had a VBL taken, with 25.3% of these patients (n=20) having an elevated VBL (over 1.9mmol/L). There was no correlation between lactate and further blood results, admission rate or disposition. Patients with a high lactate were more likely to receive IV fluids.

Discussion

VBLs obtained for ambulatory patients attending this ED had no association with further investigations or disposition decisions and had a significant cost and time incurred. The authors recommend judicious use of VBL for ambulatory patients attending EDs.

Official Journal of the Irish Medical Organisation

Ir Med J; November-December 2024; Vol 117; No. 10; P1051

December 19th, 2024

Introduction

A venous blood lactate (VBL) is a commonly utilised test in Emergency Departments (EDs) as it is a marker of tissue hypo-perfusion, and it is correlated with poor outcomes in critically ill patients[1-4]. However, there is a dearth of literature on the benefit of lactate in ambulatory patients, who are typically not critically unwell. In this ED, we observed that VBL was commonly performed for ambulatory patients, and aimed to assess if this practice was beneficial for clinical decision making, predicting clinical outcomes and cost-effectiveness.

Methods

Consecutive ambulatory patients who attended the ED between the hours of 0800-1500, for a three day period in November 2023 and had bloods taken by the ED phlebotomist were recruited retrospectively. Patients were included if they walked into ED, and were assessed in the ambulatory treatment area of the department. Data including demographics, investigations including venous blood gas and disposition were extrapolated from healthcare records. In this hospital, an abnormal lactate result is greater than 1.9mmol/L. Medians with interquartile ranges are reported for continuous variables, with chi-squared analysis performed for comparisons. A p value of <0.05 was considered significant. Statistics were performed using SPSS™ v.27. Ethical approval was approved by the Research and Ethics Committee in University Hospital Galway (Ref: CA 3160).

Results

There were 102 patients included in the study. 77.5% (n=79) patients had a VBG taken. The median age was 46.5 years (IQR 29:67, Range 19-93) and 54.1% (n=53) were female. The most common triage category as per Manchester Triage Scale was Category 3 (58.8%) followed by Category 2 (21.6%) and Category 4 (19.6%). Patients self-presented in 59.2% of cases, with 40.8% referred by their GP and 4.1% arriving by ambulance. There were no baseline differences identified between those who had a VBG and those who did not.

An abnormal lactate result was demonstrated in 25.3% (n=20) of patients. There was no correlation between an elevated urea, creatinine, white cell count or C-reactive protein and an elevated lactate. Regarding disposition, 21.6% (n=22) of patients were admitted, with 36.4% of this group (n=8) having an elevated lactate. There was no significant difference in the admission rate between those who had an abnormal lactate versus those who had normal lactate (44.4% v 24.1%, p=0.09).The diagnosis for patients who were admitted, with their arrival lactate and triage category are shown in Table 1.

There were 12 patients discharged who had an abnormal lactate on arrival (Median 4.1, IQR 2.1:3.5, Range 2.0-6.1) with diagnoses including cocaine intoxication (n=1), diverticulitis (n=1), gastritis (n=2), tonsillitis (n=1), urinary tract infection (n=1) and hydrocele (n=1) There were 5 patients who were discharged with no notes available. More patients who had an abnormal lactate received intravenous (IV) fluids, than those who had a normal lactate (40% (n=8) v 9.8% (n=8), p<0.05).

The cumulative cost for all the VBGs performed in this cohort was €351.92, and the cumulative time to perform each VBG (from drawing blood to obtaining a written result) was 276.5 minutes.

Table 1. Hospital Discharge Diagnosis, Initial Lactate, Triage Category

Discharge Diagnosis	Initial Lactate	Triage Category
Acute Liver Failure Secondary to Paracetamol Overdose	5.8	C2
Acute Gallstone Pancreatitis	4	C2
Anaemia due to GAVE	3.6	C2
Gross Prostatomegaly	3.3	C3
Inflammatory Bowel Disease and Polycystic Kidneys	2.9	C3
UTI secondary to Obstructive Uropathy	2.4	C3
Orthostatic Hypotension	2.3	C3
Microcytic Anaemia with unknown cause	2.1	C3

Complication of Implantable Contraceptive	**1.6**	**C3**
Drug induced Liver Injury and Pyelonephritis	**1.4**	**C3**
Vomiting secondary to known CNS tumour	**1.3**	**C3**
Diabetic Foot Infection	**1.3**	**C3**
Cardiogenic Syncope	**1.2**	**C3**
Cellulitis	**1.2**	**C3**
Terminal Ileitis	**1.2**	**C4**
Epididymitis	**1.1**	**C3**
Chest Pain	**1.1**	**C2**
Seizure	**1.1**	**C3**
Obstructed jaundice with Pancreaticobiliary cancer	**1**	**C4**
Cystic Ovarian Neoplasm	**0.9**	**C3**
Pyelonephritis + Lower Respiratory Tract Infection	**0.8**	**C3**
Acute-on-chronic kidney disease	**0.7**	**C3**

Discussion

Multiple studies have shown the benefit of lactate measurement in sepsis[1-5]. The cohort chosen for this study were ambulatory, most commonly category 3, and self-presenters or GP referrals indicating that the likelihood of being critically unwell is probably low. Just 22.7% (n=5) of the admitted patients had a diagnosis including infection and an elevated lactate was not a predictor of subsequent diagnostic abnormalities. There is a myriad of diagnoses in this admitted group, and in most cases, an experienced emergency clinician is unlikely to need a VBL to aid decision making, so the benefit of the test is questionable. Additionally, the majority of patients who had high lactates were discharged, indicating that the diagnosis is more relevant, and a high lactate can only be used in conjunction with other signs or symptoms to make decisions.

In this study, fluids were administered to nearly half the patients with a high lactate. This is not surprising as anectotally, a high lactate results usually triggers IV fluid administration,

regardless of diagnosis. The focus should remain on the clinical diagnosis, rather than administering fluids because of the test result.

There is a cost and time benefit to performing VBGs. If time is spent performing unnecessary investigations, this will impact care elsewhere. The frequent use of VBGs is perhaps a consequence of rising attendances and attempt to “do the most for the most” at the first point of contact. While this likely frontloads investigations, doing VBGs on 75% of patients does not appear beneficial, and it is probably unlikely to be unnecessary later in the patient’s journey if not done initially.

This is a small study which represents a limitation, but given the consecutive sampling method, we believe this is an accurate descriptor of blood gas utility in this ED, and is likely generalizable to other EDs in Ireland and internationally.

VBLs obtained for ambulatory patients attending this ED had no association with further investigations or disposition decisions and had a significant cost and time incurred. The authors recommend judicious use of VBL for appropriate patients whose management is likely to change if the lactate is abnormal.

Declarations of Conflicts of Interest:

None declared.

Corresponding Author:

James Foley,
Department of Emergency Medicine,
University Hospital Galway,
Newcastle.,
Co. Galway,
Ireland.
E-Mail: jamesm.foley@hse.ie

IMJ
Official Journal of the Irish Medical Organisation

Ir Med J; November-December 2024; Vol 117; No. 10; P1051

December 19th, 2024

References:

1. Bernhard M, Doll S, Kramer A, Weidhase L, Hartwig T, Petros S, et al. Elevated admission lactate levels in the emergency department are associated with increased 30-day mortality in non-trauma critically ill patients. Scand J Trauma Resusc Emerg Med. 2020;28(1):82.
2. Datta D, Walker C, Gray AJ, Graham C. Arterial lactate levels in an emergency department are associated with mortality: a prospective observational cohort study. Emerg Med J. 2015;32(9):673-7.
3. Park YJ, Kim DH, Kim SC, Kim TY, Kang C, Lee SH, et al. Serum lactate upon emergency department arrival as a predictor of 30-day in-hospital mortality in an unselected population. PLoS One. 2018;13(1):e0190519.
4. Wardi G, Brice J, Correia M, Liu D, Self M, Tainter C. Demystifying Lactate in the Emergency Department. Ann Emerg Med. 2020;75(2):287-98.
5. Edward U, Sawe HR, Mfinanga JA, Ottaru TA, Kiremeji M, Kitapondya DN, et al. The utility of point of care serum lactate in predicting serious adverse outcomes among critically ill adult patients at urban emergency departments of tertiary hospitals in Tanzania. Trop Med Health. 2019;47:61.