LACTATE, ARTERIAL AND VENOUS AGREEMENT IN SEPSIS

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Hospitals ordered to declare war on the 'silent killer' sepsis in crackdown that should save 12,500 lives a year

- Hospitals and GPs which fail to tackle sepsis will suffer cuts
- Health watchdogs believe the plans should be national
- Plans to tackle condition, known as blood poisoning, under way
- Sepsis kills 31,000 people annually in England

How to spot the danger signs of deadly sepsis

Shortness of breath, delirium, low blood pressure and an inability to urinate are the key symptoms of an illness that claims 37,000 lives a year

Thousands dying of sepsis because of poor NHS care: Delays in diagnosis means chances to save lives are being missed

- The delays are causing almost 13,000 deaths a year, say experts
- They also cost the health service money through longer stays
- Health ombudsman said 'it is time for the NHS to act'

Awareness could prevent sepsis deaths

The silent sepsis epidemic: The killer disease that strikes through tiny cuts
Common condition worldwide

Overall hospital mortality rate of >30%

28.3% mortality rate from severe sepsis in Scotland
Box 1: Systemic Inflammatory Response Syndrome (SIRS)
SIRS is present if any of the following are present:

- Temperature >38.3 °C or <36.0°C
- Pulse >90/min
- RR >20/min
- New confusion/drowsiness
- WBC >12 or <4.0 x 10^9/L
- Blood glucose >7.7 mmol/L (non-diabetic patients)

Box 5: The Sepsis Six

1. Administer high-flow oxygen
2. Take blood cultures and consider infective source
3. Administer intravenous antibiotics
4. Give intravenous fluid resuscitation
5. Check haemoglobin and serial lactates
6. Commence hourly urine output measurement
SEPSIS DIAGNOSIS

‘Gold Standard’ (e.g. ‘Sepsis Six’): Arterial Blood

Blood lactate concentration >2 mmol/L

Common alternative: Venous Blood

Less painful, and quicker

BUT.... Unclear how well it represents arterial lactate values

Very painful and stressful for patients

EVIDENCE NEEDED
The aim of the LAVAS study:

To determine the level of agreement between peripheral venous (PV-LACT) and arterial lactate in sepsis.
Prospective observational cohort study

304 consented patients presenting with sepsis

Single site (Royal Infirmary of Edinburgh) Oct 2013-May 2014
INCLUSION CRITERIA

Aged 16 or over
Within 4 hours of presentation to the ED
Presumed to have sepsis, as judged by attending clinician

EXCLUSION CRITERIA

Clear alternative cause of presentation
Seizures, trauma, strenuous exercise, chronic liver disease, current Metformin use…
..Challenges in the ED
Arterial and Peripheral Venous lactate samples taken from each patient

Samples taken sequentially, separated by no more than 20 minutes

Samples analysed immediately, on-site, using Gem 4000 blood gas analyser
RESULTS

Bland-Altman plots used to visualise level of agreement between PV-LACT and arterial lactate

Consider Patient A...

Venous lactate = 4.75
Arterial lactate = 3.25
AVERAGE = 4
Difference (venous minus arterial) = (4.75 - 3.25) = 1.5

Each point represents a patient

Difference between measures

Patients with generally LOW lactate

Patients with generally HIGH lactate
RESULTS

Patients with generally HIGH lactate

Patients with generally LOW lactate

Bland-Altman plots used to visualise level of agreement between PV-LACT and arterial lactate

Above 0: Venous higher than arterial

Below 0: Arterial higher than venous

If there is good agreement, the points will all be compressed horizontally
RESULTS

Bland-Altman plots used to visualise level of agreement between PV-LACT and arterial lactate.

PV-lact 0.4 mmol/L higher than arterial, on average.

At low lactate levels, correspondence is good.

Correspondence worsens as lactate level increases...

...so we can’t be sure how good PV-LACT is at high values...

...but partly because the sample size is small at high values – more data needed.
GOOD CLINICAL AGREEMENT BETWEEN ARTERIAL AND PERIPHERAL VENOUS LACTATE MEASURES WHEN LACTATE LEVELS ARE RELATIVELY LOW

Peripheral lactate measures are on average 0.4 mmol/L higher than arterial lactate measures.

Greater difference at higher lactate levels.
Sepsis is a common condition, causing significant mortality worldwide.

Rapid, efficient diagnosis saves lives.

Venous lactate has good clinical agreement.

Area of focus for the Scottish Patient Safety Programme.
EMERGE

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Website coming soon

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