



Insulin sensitivity and sepsis score: A correlation between model-based metric and sepsis scoring system in critically ill patients



Fatanah M. Suhaimi^{a,*}, J. Geoffrey Chase^b, Christopher G. Pretty^b, Geoffrey M. Shaw^c, Normy N. Razak^d, Ummu K. Jamaludin^e

^a Advanced Medical and Dental Institute, Universiti Sains Malaysia, Bertam, 13200 Kepala Batas Penang, Malaysia

^b Department of Mechanical Engineering, University of Canterbury, Christchurch 8054, New Zealand

^c Department of Intensive Care, Christchurch Hospital, Christchurch 8054, New Zealand

^d Universiti Tenaga Nasional, Jalan Ikram-Uniten, 43000 Kajang, Selangor, Malaysia

^e Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Kuantan, Pahang, Malaysia

ARTICLE INFO

Article history:

Received 19 January 2016

Received in revised form 12 July 2016

Accepted 10 August 2016

Available online 21 August 2016

Keywords:

Glucose-insulin model
ICU

Insulin sensitivity
Sepsis
Sepsis score

ABSTRACT

Sepsis is highly correlated with mortality and morbidity. Sepsis is a clinical condition demarcated as the existence of infection and systemic inflammatory response syndrome, SIRS. Confirmation of infection requires a blood culture test, which requires incubation, and thus results take at least 48 h for a syndrome that requires early direct treatment. Since sepsis has a strong inflammatory component, it is hypothesized that metabolic markers affected by inflammation, such as insulin sensitivity, might provide a metric for more rapid, real-time diagnosis. This study uses clinical data from 30 sepsis patients (7624 h in ICU) of whom 60% are male. Median age and median Apache II score are 63 years and 19, respectively. Model-identified insulin sensitivity (S_I) profiles were obtained for each patient, and insulin sensitivity and its hourly changes were correlated with modified hourly sepsis scores (SS_{H1}). S_I profiles and values were similar across the cohort. The sepsis score is highly variable and changes rapidly. The modified hourly sepsis score, SS_{H1} , shows a better relation with insulin sensitivity due to less fluctuation in the SIRS element. Median S_I and median ΔS_I of the cohort is $0.4193e-3$ and $0.004253e-3$ L/mU.min, respectively. Additionally, median S_I are 4.392×10^{-4} L/mU min ($SS_{H1} = 0$), 4.153×10^{-4} L/mU min ($SS_{H1} = 1$), 3.752×10^{-4} L/mU min ($SS_{H1} = 2$) and 2.353×10^{-4} L/mU min ($SS_{H1} = 3$). Significant relationship between insulin sensitivity across different SS_{H1} groups was observed ($p < 0.05$) even when corrected for multiple comparisons. CDF of S_I indicates that insulin sensitivity is more significant when comparing an hourly sepsis score at a very distinguished level.

© 2016 Elsevier Ltd. All rights reserved.

* Corresponding author.

E-mail addresses: fatanah.suhaimi@usm.my

(F.M. Suhaimi), geoff.chase@canterbury.ac.nz (J.G. Chase),

chris.pretty@canterbury.ac.nz (C.G. Pretty), Geoff.Shaw@cdhb.govt.nz (G.M. Shaw),

Normy@uniten.edu.my (N.N. Razak), ummu85@ump.edu.my (U.K. Jamaludin).