

Insulin IP Calc: A smartphone application for insulin infusion protocol in Intensive Care Units

Sir,

Insulin infusion for hyperglycaemia management in the Intensive Care Unit (ICU) is often based on paper-based, complex protocols that are variable rate insulin infusion protocols or sliding scale regimens. The older sliding scale regimens are considered obsolete in current practice, while more complex, validated variable rate algorithms such as the Yale insulin infusion protocol, Portland protocol and University of Washington protocol are increasingly being used in ICUs.

The conversion of paper-based protocols to computer-based software protocols may improve adherence and reduce errors in implementation.^[1] Goldberg *et al.* described the 'Yale Insulin infusion protocol' an intuitive, structured variable rate insulin infusion protocol for hyperglycaemia management in ICU.^[2] The protocol is not tailored for use in diabetic ketoacidosis or hyperglycaemic hyperosmolar states. Numerous subsequent studies have validated this protocol in cardiac surgical and medical ICUs.^[3]

Older guidelines for hyperglycaemia management emphasised, 'Tight Control' insulin infusion regimens that kept blood glucose in the target range of 80–110 mg/dL. Later studies showed an

increased risk of major hypoglycaemic events with these lower targets.^[4] In view of this, the revised consensus guidelines of the American Association of Clinical Endocrinology and American Diabetes Association recommended a blood glucose target of 140–180 mg/dL.^[4] Accordingly, the Yale insulin infusion protocol was modified and updated to a blood glucose target of 120–160 mg/dL by Shetty *et al.*, with a median target of 150 mg/dL.^[5]

We describe, 'Insulin IP Calc', a simple, point of care, Android operating system smartphone application created by us, based on the updated Yale insulin infusion protocol that can be used as a bedside clinical decision support app for insulin infusion management. It can be freely downloaded and installed from its project page <https://sourceforge.net/projects/insulinipcalc> in an Android-based smartphone or tablet for use at the bedside. The use of software-based variable rate insulin infusion protocols can potentially simplify the implementation of the Yale algorithm by critical care providers. It may also reduce human errors and the incidence of complications such as severe hypoglycaemia, thus decrease the risk of morbidity and mortality. The application, when launched, requires input of an initial blood glucose value in mg/dL, measured by point of care glucometer devices [Figure 1]. The user then calculates the initial insulin infusion rate, which as per algorithm recommends an initial bolus before the infusion. Subsequent values to input include the current (new) blood glucose value (measured at hourly intervals as per protocol, until the values stabilise), the previous blood glucose value and the previous insulin infusion rate. The application then calculates and recommends an action based on the Yale algorithm.

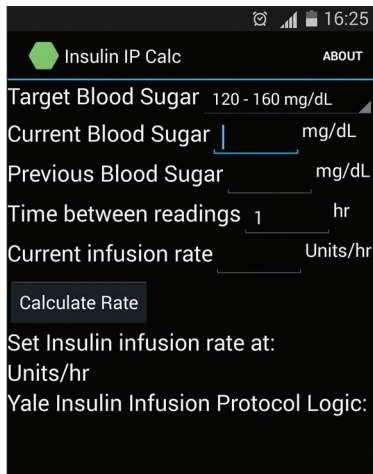


Figure 1: Insulin IP Calc software user interface in Android operating system

It also displays the protocol logic such as a warning to stop insulin infusion due to risk of hypoglycaemia. Future efforts could include the addition of graphical and tabular trends of blood sugar values for an individual patient, reminder alarms for hourly blood glucose measurement and incorporation of updated blood glucose targets.

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Conflicts of interest

There are no conflicts of interest.

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