Performance of STAR Virtual Trials for Diabetic and Non-Diabetic in HTAA Intensive Care Unit

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Abstract—**Critically ill patients are commonly linked to stress-induced hyperglycaemia which relates to insulin resistance and the risk of per-diagnosed with diabetes and other metabolic illnesses. Thus, it is essential to choose the best practice of blood glucose management in order to reduce morbidity and mortality rates in intensive care unit. This study is focusing on clinical data of 210 critically ill patients in Hospital Tengku Ampuan Afzan (HTAA), Kuantan who underwent Intensive Insulin Therapy which utilized a sliding scale method. Patients were identified in two main groups of diabetic (123) and non-diabetic (87) where stochastic model is generated to observe 90% confidence interval of insulin sensitivity. Blood glucose levels comparison between these two cohorts is conducted to observe the percentage of blood glucose levels within targeted band of 4.4 – 10.0 mmol/L. It is found that 82% of BG levels are within targated band for non-diabetes cohort under stochastic targeted (STAR) glycaemic control protocol. However, only 59.6% and 70.6% BG levels are within targeted band for diabetes cohort for insulin infusion therapy used in HTAA and STAR protocols. Thus, further investigation on blood glucose control protocol for diabetes patients is required to increase the reliability and efficacy of current practice despite of patient safety.**

Keywords—glycaemic protocol; virtual trial; blood glucose; insulin sensitivity; intensive care; diabetes

I. INTRODUCTION

People diagnosed with chronic diseases such as heart disease and diabetes has significantly increased in recent years [1]. These diseases are life-threatening and may cause mortality if it is untreated especially in intensive care unit (ICU) [2, 3]. Usually patients admitted in ICU will experience stress-induced hyperglycaemia (high blood glucose level) [4]. The stress response of a critically ill patient experiences is highly complex, variable and dynamic [5], making safe, effective control of blood glucose (BG) difficult. Thus, a number of studies may have failed to achieve consistent, safe and effective GC [6-9].

In fact an accurate computerized model-based glycaemic control (GC) protocol has been applied in ICU [10-13] since 2011.This model-based method can identify evolving patient-specific parameters and customize clinical treatment based on patient's metabolic state known as stochastic targeted (STAR) GC protocol. STAR which is tablet-computer-based uses a clinically validated physiological model of the insulin-glucose system [14] and a population-based model of insulin sensitivity (*SI*) variability [15]. This protocol will generate optimal patient-specific insulin and nutrition treatments that maximize control and nutrition, while maintaining a maximum 5% risk of hypoglycaemia (low blood sugar level) incidences [16]. Practically STAR has been the standard of care in Christchurch Hospital ICU, Christchurch, New Zealand, and in the Kalman Pandy Hospital ICU, Gyula, Hungary, since 2011. STAR is the based on modification and improvement of Specialized Relative Insulin and Nutrition Tables (SPRINT) [9].

Besides, the insulin infusion therapy (IIT) protocol is reportedly reduced BG levels besides morbidity and mortality in ICU. In some cases, IIT has a drawback in regulating normal BG level if high insulin dose is given to the patient which can lead to hypoglycaemia (low blood sugar level) [17]. The current IIT practice [3] is solely dependent on insulin infusion without participating the nutrition input in the same protocol despite the aim of protocol is to attain BG level between 4.4 to 10.0 mmol/L. Hence the performance of current GC practice in Malaysia ICU especially patient with diabetes is utterly vague