

The evaluation of current insulin infusion guidelines used to manage critically ill patients at Alfred Health.

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Background

At present, an understanding of the ideal blood glucose target in critically ill patients remains a developing area. Over recent years the target range of glycaemia have changed from 'intensive glucose control' (4.4-6.1mmol/L) to 'conventional glucose control' (<10mmol/L).^[1,2]

Observational evidence demonstrates that hyperglycaemia has been associated with poorer clinical outcomes in different critically ill patient populations. It is a consensus among clinicians that prevention of uncontrolled hyperglycaemia is desired, however the recommendations for target blood glucose ranges remains controversial.^[3]

Although the optimal target glucose range in critically ill adults remains unclear, the goal of glucose management should aim to avoid hypoglycaemia and to minimize hyperglycaemic episodes.^[4]

Aim

To determine the proportion of time critically ill patients are within the target blood glucose range, according to the Alfred Health Intensive Care Unit (ICU) Blood Glucose Management Guidelines.^[5]

Methods

This retrospective observational cohort study involved an audit of patients who were admitted to The Alfred ICU and commenced on an insulin infusion over a period of one month (March-April 2017).

Data collected included patient demographics and blood glucose levels (BGLs) up to the first 72 hours of commencing an insulin infusion

Each BGL was reviewed and classified into the following groups:

- ≤4.0mmol/L (hypoglycaemia)
- 4.1 to 5.0mmol/L (clinically acceptable)
- 5.1-10mmol/L (target range)
- 10.1 – 12.0mmol/L (clinically acceptable)
- >12mmol/L (hyperglycaemia)

The primary outcome was the proportion of time spent within the target BGL range of 5.1 – 10mmol/L. Secondary outcomes included the proportion of time spent outside of the target range and adherence with infusion guidelines.

Results

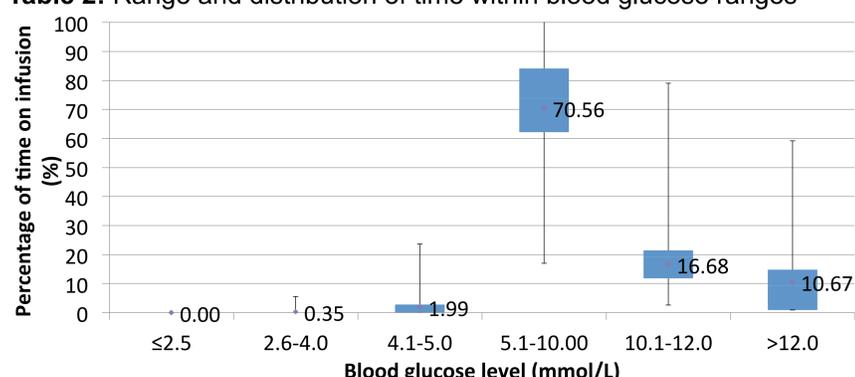
One hundred and thirty seven patients that were admitted to ICU during the study period, 25.5% were commenced on an insulin infusion (n=35), see Table 1.

Table 1: Patient demographics

Characteristics (n=35)	n (%)	Characteristics (n=35)	n (%)
Age		Admission diagnoses	
<40	4 (11.4)	Transplant	9 (25.7)
40-59	10 (28.6)	Sepsis	6 (17.1)
60-79	16 (45.7)	Coronary artery bypass graft	6 (17.1)
>79	5 (14.3)	Trauma	4 (11.4)
Gender		Intracranial haemorrhage	3 (8.6)
Male	21 (60)	Laparotomy	2 (5.7)
Type 1 diabetes	1 (2.8)	Aortic Dissection	2 (5.7)
Type 2 diabetes	14 (40)	Sternotomy	1 (2.8)
No diabetes	20 (57.2)	Liver Cirrhosis	1 (2.8)
		Diabetic Ketoacidosis	1 (2.8)

Overall, patients spent 70.6%(±19.8%) of the insulin infusion duration within the target range (Table 2,3).

Table 2: Range and distribution of time within blood glucose ranges

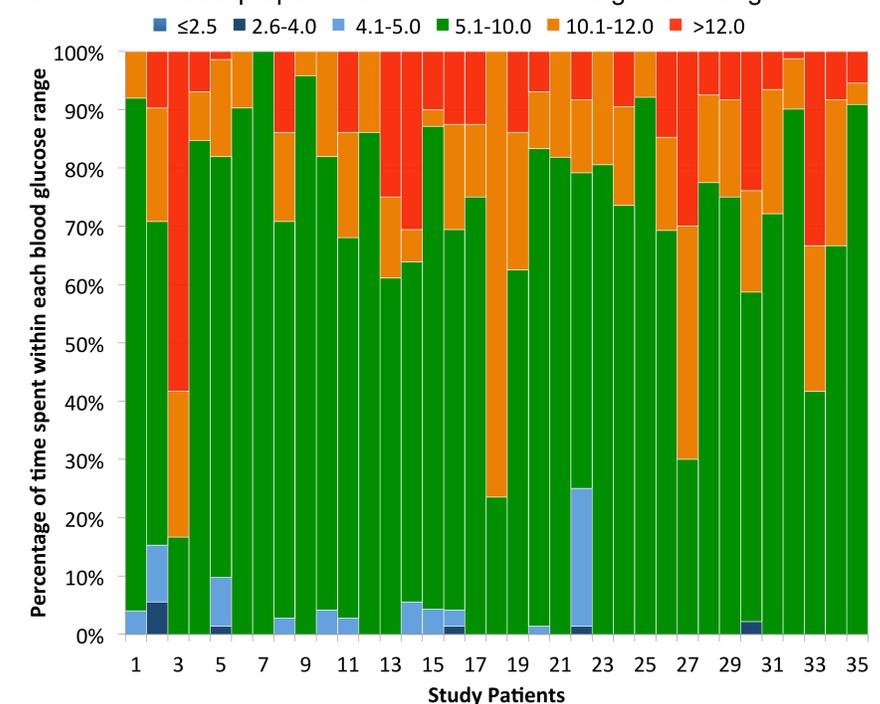


Results

There were 31 patients (88.6%) who had a median BGL within the target range. The median BGL, whilst on the insulin infusion, was 8.35mmol/L (7.8-9.0mmol/L).

In total 810 BGLs were recorded, in response to 63.8% of those BGLs, the insulin infusion rate was correctly adjusted, as per the guidelines. While 70.1% were monitored at the correct times, as recommended by the guidelines.

Table 3: Individual proportions of time within blood glucose ranges



Discussion

This study of critically ill patients, receiving an insulin infusion, has demonstrated that target levels of blood glucose were being met for the majority of the time.

- Periods of hyperglycaemia were more common than hypoglycaemia
- Episodes of hypoglycaemia were limited in occurrence and duration
- Episodes of severe hypoglycaemia (<2.5mmol/L) were absent

Non-adherence to monitoring was anticipated and consisted of delays in recording 2-4 hourly BGLs. Deviations from dosing guidelines included incorrect starting doses and incorrect infusion rate changes.

Barriers and shortfalls of this project relate to the time constraints for conducting the project and also reflect time constraints of care provision in ICU, where minor deviations from monitoring guidelines are unavoidable. Facilities to provide continuous blood glucose monitoring would improve this. BGLs were assumed to remain within the range of the previous level until the next level was taken, hence the study provides an estimate of blood glucose management rather than an exact representation. This study reflects the monitoring and management of insulin therapy and BGL monitoring; it was not within the scope of the study to assess clinical outcomes of therapy.

Conclusion

The vast majority of patients remained within an acceptable target blood glucose range for the majority of time. The results demonstrate that the current BGL management of critically ill patients on an insulin infusion is safe and effective, however there is room for improvement to reduce the frequency of hyperglycaemia.

References

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