

MEASURE OF SAFETY FOR Q2HOUR VS Q1HOUR GLUCOSE CHECKS FOR INTRAVENOUS INSULIN DOSING

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PURPOSE

The purpose of this retrospective study was to determine the safety and efficacy of two-hour (q2hour) blood glucose checks when using an electronic glucose management system (eGMS) for intravenous (IV) insulin dose recommendations.

BACKGROUND

Paper protocols and eGMS dosing algorithms for IV insulin make recommendations to change from hourly (q1hour) blood glucose (BG) checks to every two-hour (q2hour) checks based on various measures of the subject's BG stability and mean BG¹. The stability measure is different for published paper protocols and eGMS. This retrospective study was designed to evaluate the safety of the q2hour BG checks of an eGMS by analyzing the relationship between BG check timing on hypoglycemia events in a large database of patients. The hypothesis was that the incidence of hypoglycemia, defined here as BG less than 70 mg/dL, for the q2hour should be equal to or less than those for q1hour BG checks.

METHOD

Analysis was applied to a database of more than a million BG readings of de-identified data without exclusions from five unaffiliated hospital systems using the same eGMS. The data was accumulated from January 2015 to November 2017 and included approximately 45,000 patients. The analysis was stratified based on the timing of scheduled BG checks, either q1hour or q2hour. For this retrospective study, the observed incidence of hypoglycemia was calculated based on the timing of the BG relative to that scheduled time, q1hour or q2hour.

RESULTS

TABLE 1
Safety Outcomes: Q1Hour vs Q2Hour

Outcome Measure	Q1Hour	Q2Hour
Hypoglycemia, % of All BGs	0.29%*	0.24%*
Readings > 5 Minutes Late, % of Readings	44.3%	38.7%

* p < 0.0001

TABLE 1

- Overall incidence of hypoglycemia following q1hour and q2hour are reported in TABLE 1.
- The incidence of hypoglycemia was lower for q2hour compared to q1hour scheduled BG readings.

TABLE 2
Control Performance Outcomes: Q1Hour vs Q2Hour

Outcome Measure	Q1Hour	Q2Hour
Mean BG, mg/dl	149	126
Variance, % of Mean	25%	20%
Readings, n	620,905	257,027

TABLE 2

- The performance of this eGMS was significantly better after a q2hour-scheduled BG compared to a q1hour schedule.
- The performance of this eGMS when q2hour is recommended does not compromise the glycemic care.

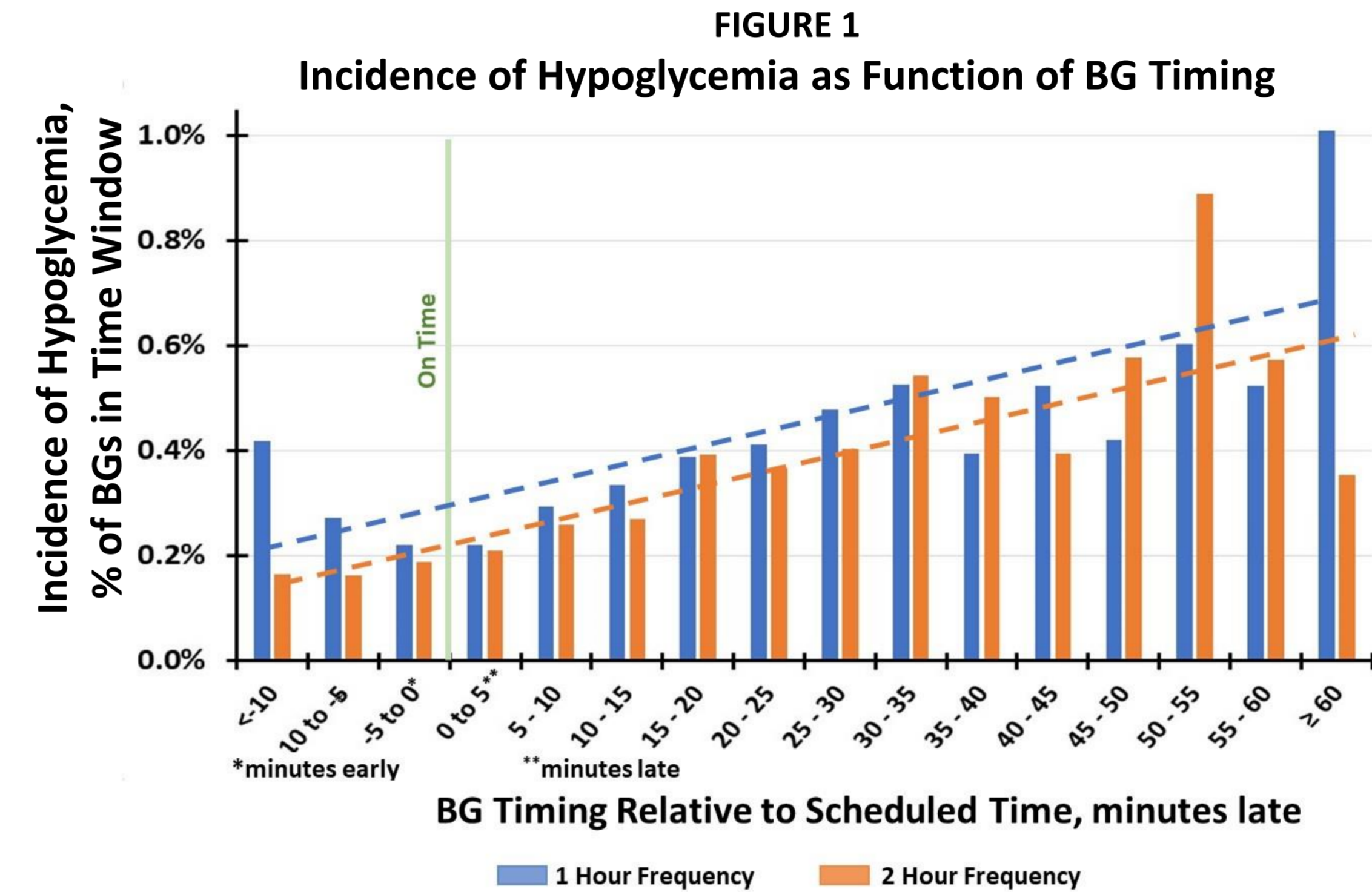


FIGURE 1

- In FIGURE 1, the incidence of hypoglycemia when the BG is late is illustrated graphically: q1hour (blue) & q2hour (orange).
- A linear regression illustrates that the incidence of hypoglycemia is lower with q2hour than q1hour.
- At one hour late, the risk for hypoglycemia is roughly three-fold higher for both q1hour and q2hour timing.

DISCUSSION

The measures of hypoglycemia and the measures of BG control were superior with q2hour checks compared to q1hour checks, confirming that the algorithm for recommendation of q2hour BG checks is appropriate. Given the size of the database and statistical significance, these observations appear to confirm that using this eGMS algorithm for q2hour recommendations is safe. In addition to the benefits for the patient, the appropriate transition to q2hour checks also has a significant positive impact for nursing workflow and reduced costs of care.

CONCLUSIONS

Measures of safety for q2hour BG checks are needed for the clinical evaluation of the algorithms that recommend q2hour BG checks for IV insulin dosing. These observations that the hypoglycemia incidence, mean BG, and BG variance are superior to those observed for q1hour should be used to confirm the efficacy and safety of other q2hour recommendation protocols. These results also illustrate the importance of timely BG checks for both q1hour and q2hour.

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REFERENCES

1 Editors. Standards of Medical Care in Diabetes-2019. Diabetes Care in the Hospital. *Diabetes Care*, 2019, **42**, Supplement 1: S175.