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Impact of Continuous Glucose Monitoring (CGM) in the Intensive Care Units (ICUs): Accuracy, Reliability, Feasibility and Nurse Acceptance

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Background: The COVID-19 pandemic led to crisis-level shortage of hospital beds and staff, predominantly in the ICUs. Minimization of patient contact moved the FDA to issue a statement that allowed CGMs in hospitals, which were quickly adopted by ICUs. We conducted a study to better understand the use of CGM in ICUs and test for accuracy, reliability feasibility, and acceptance by care providers.

Methods: Patients were eligible for CGM if they had diabetes mellitus and concomitant COVID-19 infection that required ICU level of care. CGM signals were received by smart phones that were placed in a transparent biohazard bag outside patients’ rooms. Nurses were educated on the interpretation of glucose trends, alerts, and calibration. CGM alerts were set for glucose readings below 100mg/dL and above or equal to 250mg/dL. Nursing staff could obtain point-of-care (POC) glucose as scheduled and for CGM alarms. Mean Absolute Relative Difference (MARD) values were calculated for accuracy. Nurses were invited to respond to a questionnaire with 5-point Likert scales to assess their perception of CGM use, and the potential decrease in the amount of personal protective equipment (PPE) needed in the care of patients on CGM. A question on the estimated time it takes to don and doff PPE was also included.

Results: 26 patients were included in the study; average age 60.8 ± 13.5 years, 7 were female and 12 belonged to underrepresented minorities (Hispanic, non-Hispanic Black, or Asian); mean HbA1c was 9.2 ± 2.6%. 7 patients were on intravenous insulin infusion, 6 were intubated and 5 received vasopressors. Average duration on CGM was 6 ± 3.75 days.168 paired serum glucose-CGM measurements and 259 paired POC-CGM measurements were used. MARD between serum glucose and CGM measurements was 11.2%; MARD between POC glucose and CGM measurement was 11.6%. Questionnaires from 33 nursing staff were analyzed; the most frequent answer (mode) for time to don and doff PPE was 10 minutes. The vast majority of answers were "agree" (21.2%) or "strongly agree" (78.8%) to the statements that CGM was easy to use and interpret and during the pandemic staff felt protected with use of CGM. Likewise, the answers were "agree" (18.8%) or "strongly agree" (81.8%) that CGMs could replace POC glucose in COVID-19 patients and that there was a lower need for PPE.

Conclusion: There is not an established acceptable MARD for patients with COVID-19 in an ICU setting. Wollersheim et al. suggested that CGM with a MARD of <14% is acceptable for ICU patients. The MARD we found in our study was well within this range. We concluded that use of CGM in the ICU setting has acceptable accuracy and is reliable, feasible and well accepted by the nursing staff.

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