

Online-only Supplemental Material Files

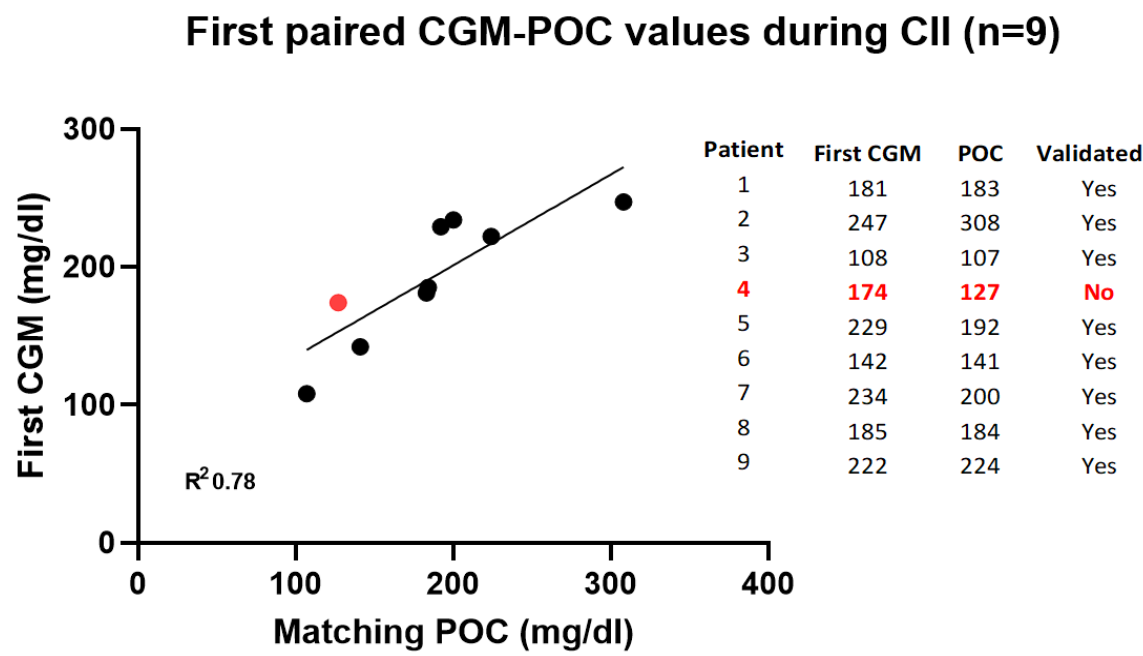
Supplemental Table 1. Patient characteristics

| | |
|----------------------------------|--------------|
| Age, years | 65.9± 15.2 |
| BMI, m/kg ² | 33.6± 6.2 |
| LVEF, % | 48.9± 12.4 |
| A1c, % | 7.8± 2.7 |
| eGFR, mL/min/1.73 m ² | 34.7± 27.0 |
| IL-6, pg/mL | 268.9± 165.3 |
| CRP, mg/dL | 186.1± 57.6 |
| Lactic acid, mmol/L | 5.3± 5.5 |
| pH | 7.22± 0.10 |
| Time on CII, hours | 138.3± 132.9 |
| Insulin rate, units/hour | 4.34± 2.81 |
| Male, n (%) | 6 (56%) |
| Black race, n (%) | 8 (89) |
| Type 2 Diabetes, n (%) | 9 (100) |
| Vasopressors, n (%) | 8 (89) |
| Mechanical ventilation, n (%) | 9 (100) |
| Steroids, n (%) | 9 (100) |
| CRRT, n (%) | 6 (67) |
| Heart failure, n (%) | 6 (67) |

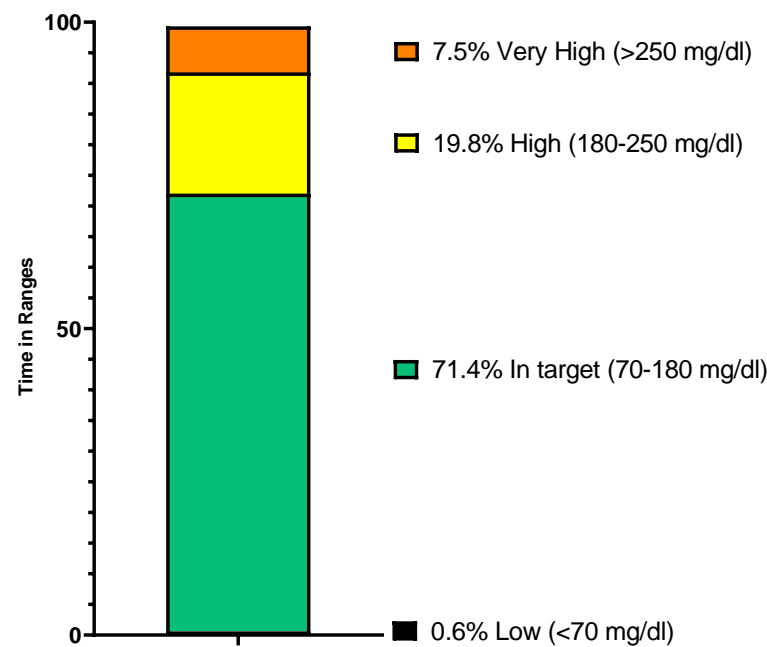
Supplemental Table 2. CGM Interference in the ICU

| Potential interference | CGM placement | Detected with Alarms | CGM discrepancy |
|--------------------------------|---------------|----------------------|---------------------------------|
| Mechanical (6) | | | |
| Pronation (1) | Arm | Yes | Lower CGM values |
| Positioning bath (1) | Arm | Yes | Lower CGM values |
| Bleeding around the sensor (1) | Abdomen | Yes | Lower CGM values / sensor error |
| Hypothermia devices (2) | Abdomen | Yes | Lower CGM values |
| Shock (2) | Abdomen | Yes | Lower CGM values / no data |

Supplemental figure 1. Correlation and validation of Initial CGM sensor values paired with a matching POC



Supplemental Figure 2. Summarized time in glucose ranges in critically ill patients



Appendix. Protocol Implementation

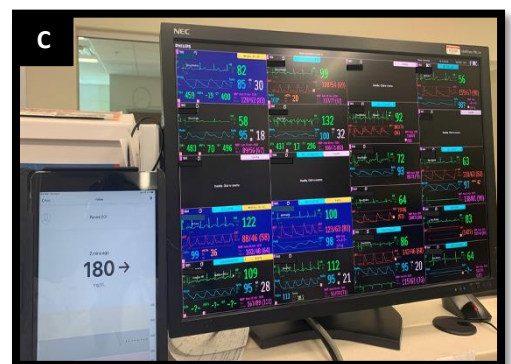
Protocol Design and implementation: We modified and adapted a protocol designed at The Ohio State University (OSU) (available at www.covidindiabetes.org) which was discussed via teleconferences with academic endocrinologists implementing CGM in ICUs. To design and implement a protocol integrating CGM with a computerized algorithm and EHR documentation, the following **key stakeholders were identified:** nursing leadership, Medication Safety Officer, critical care providers, endocrinologists, clinical pharmacists, hospital administration, laboratory staff, biomedical and clinical engineering, and information technology (IT). The protocol was adapted with the feedback from stakeholders after multiple teleconferences via Zoom, with support from OSU (EF). The adapted protocol and flowsheet were integrated in the EHR. To ensure “validation”, confirmation of less than 20% variance in 2 consecutive hourly paired values is obtained using POC values as reference. Upper and lower limits are populated automatically in the EPIC flowsheet to facilitate CGM validation. After validation, CGM can be used for hourly titration (entered in Glucommander hourly at the time of the alarm) with q6hr POC validations to ensure maintained accuracy. The protocol reverts to POC testing only for glucose levels <100 mg/dL or change in clinical status. Alarms are set at <100 mg/dL and >250 mg/dL in the *Follow* app. Glucommander alarms occur every 1-2 hours for glucose data entry. To avoid iatrogenic hypoglycemia, the target glucose range is set at 140-180mg/dL.^{15,16}

Staff training: Education material was prepared by endocrinologists (GMD, FJP) in collaboration with ICU leadership, IT specialists, and colleagues at OSU (available at covidindiabetes.org). Remote and in-person training for nursing staff was conducted during morning and evening shifts. Nurses were trained on: 1) the technology (CGM placement, use of

the G6 App); and 2) protocol for validation of sensor glucose values and documentation in the EHR, as well as situations where POC testing would be indicated.

Technology set up

- A) Smartphone receiving bluetooth signal within 20 feet from patient
- B) Externalized pump set up for hourly adjustment of insulin (optional), in accordance with the hospital approved protocol for medication pump externalization during COVID-19
- C) Glucose telemetry in nursing station with alarms



Validation Process and EHR Documentation

- D) Automated calculation of BG range (upper and lower 20% of POC) for validation of sensor value compared to POC glucose (two consecutive hours) before using CGM for CII.

Paired CGM-POC

Confirm validation

D

| Search (Alt+Comma) | 0200 | 0215 | 0316 |
|---------------------------------------|------|------|----------|
| Point of Care Tests | | | |
| POC Blood Glucose (Docked Result) | | | 136 |
| POC Blood Glucose (Manual Entry) | | | 134 |
| Continuous Glucose Monitoring (mg/dL) | 139 | | |
| CGM 20% High Range | | | 163.2 |
| CGM 20% Low Range | | | 108.8 |
| CGM and POCT Glucose Validation | | | Yes |
| Source of Sample | | | Arterial |

CGM and POCT Glucose Validation

Yes

Row Information

Acceptable range is CGM will equal POCT BG Plus or Minus 20% (Example: POC equals 200 then CGM needs to be between 160 to 240 to be validated).

If validated two consecutive times, then monitor CGM only and revalidate Q6 hours with POCT blood glucose.

If CGM or POC BG less than 100, proceed into room check patient, apply Glucometer recommended strategies until POC BG greater than 100, then revalidate CGM.

Validation range

Protocol instructions

CGM Validation Protocol

| Point-of-care (POC) glucose testing procedures in patients on Remote Continuous Glucose Monitoring (Dexcom G6 CGM) and Glucomander | |
|--|--|
| Stage | Protocol |
| Validation (CGM value is within +/- 20% of POC) | <ul style="list-style-type: none"> Check POC BG every hour until validation criteria are met When CGM value is available confirm the value is within +/- 20% of POCT and document YES/NO in flowsheet When <u>2 consecutive hourly readings meet validation criteria (YES x 2) in POC flowsheet, move to checking POC BG every 6 hours (confirm validation with CGM value)</u> Document CGM values hourly |
| When to check POC? | Revert to Q1-2 hour POC BG (per Glucomander protocol) if any POC BG falls outside of the validation criteria above (higher or lower than 20% of POC) or POC is <100 mg/dl <ul style="list-style-type: none"> Obtain 1-time POC BG if: <ol style="list-style-type: none"> No glucose or trend arrow on smartphone screen (signal loss, LOW/HIGH CGM glucose) "Urgent low soon" or 2 arrows trending down Changes in status: intubation, hemodynamic compromise, altered mentation, or nutrition |

Computerized algorithm using CGM values

E) Open-Loop CII algorithm (Glucomander software) integrated in EPIC: glucose target and trend, multiplier, insulin requirements. CGM sensor values are entered hourly in the software if CGM values meet validation criteria (see D).



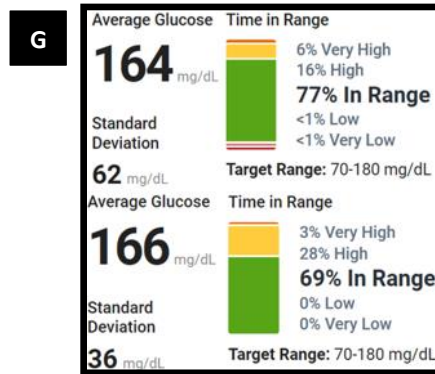
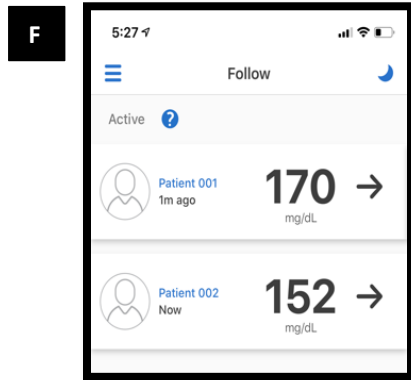
Enter BG

CGM is used if meeting validation criteria.

POC is used if CGM outside of range, change in clinical condition, or CGM or POC <100 mg/dL

Remote monitoring and population management

F) Real-time remote monitoring (cellular signal) of multiple patients by Endocrinology team and clinical pharmacist via *Follow App* to receive 24/7 alarms (BG <100 or >250 mg/dL, signal loss). **G)** Summary reports in clarity.dexcom.com (e.g. average, time in range)



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