

PRIDE Statement on the Need for a Moratorium on the CMS Plan to Cite Hospitals for Performing Point-of-Care Capillary Blood Glucose Monitoring on Critically Ill Patients

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Objective: A writing committee of the Planning Research in Inpatient Diabetes (PRIDE) group has written this consensus article on behalf of the group in response to a specific request for input from the Centers for Medicare and Medicaid Services (CMS). The purpose of this article is to respond to the March 13, 2015 statement from that agency regarding plans to enforce prohibition of the off-label use of point of care (POC) capillary blood glucose monitor (BGM) testing in most critically ill patients. The article discusses: 1) how POC BGM testing is currently regulated; 2) how POC BGM testing is currently used in the United States; and 3) how POC BGM testing can be safely and effectively regulated in the future through cooperation between the clinician, laboratory, regulatory, industry, and patient communities.

Participants: Nine members of PRIDE volunteered to write the statement on behalf of the entire group.

Evidence: Descriptions of current medical practice for critically ill patients were derived from the experience of the authors. Descriptions of the performance of various methods for measuring glucose levels for intensive insulin therapy came from a literature review.

Consensus Process: Eleven questions were developed by the PRIDE writing group. After extensive electronic and telephone discussion, the article was written and reviewed by all nine authors and then reviewed by two outside experts in the care of critically ill patients. All suggestions by the authors and the outside experts were incorporated.

Conclusions: Although the CMS is attempting to protect patients with abnormal glycemic control from harm due to inaccurate POC fingerstick capillary BGM testing, their plan will result in more harm than good. A moratorium on enforcement of the prohibition of off-label use of POC capillary BGM testing is needed. (*J Clin Endocrinol Metab* 100: 0000–0000, 2015)

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Abbreviations: BGA, blood gas analyzer; BGM, blood glucose monitor; ED, emergency department; ICU, intensive care unit; OR, operating room; PAR, post anesthesia recovery; POC, point of care.

Point-of-care (POC) blood glucose monitor (BGM) testing of capillary blood obtained by fingerstick for critically ill hospitalized patients is an integral part of glycemic management in the United States (1). This practice will become severely restricted or unavailable if new enforcement policies proposed by the Centers for Medicare & Medicaid Services (CMS) prohibiting the off-label use of these devices are enforced (2). Such monitoring for critically ill hospitalized patients is routinely practiced in virtually every US intensive care unit (ICU), operating room (OR), post anesthesia recovery (PAR), and emergency department (ED) at hospitals in the United States. For the vast majority of patients, this practice is the best method for obtaining rapid, low-cost, and actionable results for safe and effective treatment of those with diabetes and hyperglycemia or hypoglycemia. This practice is defined by the US Food and Drug Administration (FDA) as off label. The CMS is now considering immediate enforcement of its new policy for hospitals that are engaged in POC BGM testing for critically ill patients. This statement by a writing committee of the Planning Research in Inpatient Diabetes (PRIDE) group presents a discussion of: 1) how POC BGM testing is currently regulated; 2) how POC BGM testing is currently used in the United States; 3) how POC BGM testing can be safely and effectively regulated in the future through cooperation between the clinician, laboratory, regulatory, industry, and patient communities; and 4) why an immediate temporary moratorium by the CMS on enforcement is the best public policy for patients with diabetes and other states of abnormal glycemic control.

Materials and Methods

On March 13, 2015, the CMS released a statement entitled “Re-issuance of S&C 15–11. As Draft Only – For Comment. Off-Label/Modified Use of Waived Blood Glucose Monitoring Systems (BGMS)” (2). The statement concluded by stating that if there are any questions regarding this memo, they should be directed to the CMS. This article is the response of PRIDE to the CMS statement.

PRIDE is a consortium of academic healthcare professionals devoted to blood glucose management and clinical research in the inpatient setting (3). Founded in 2010 by Dr. Boris Draznin of the University of Colorado, PRIDE has membership that exceeds 75 active participants. PRIDE members frequently interact via email with discussions concerning quality improvement initiatives, evidence-based practice, and research. PRIDE is uniquely positioned to comment as a single entity on the new CMS proposals concerning the use of POC BGMS in the hospital.

Nine members of PRIDE, representing the organization, formed a writing committee to draft a response to the CMS. From March 19, 2015, until May 27, 2015, members of the writing team corresponded with each other electronically and developed the following key questions: 1) What are the roles of

the CMS and CLIA in regulating POC BGMS? 2) What is the history of the controversy with the CMS and the FDA? 3) What is the magnitude of penalties to noncompliant hospitals? 4) What are the benefits of the CMS policy? 5) How are critically ill patients currently managed using POC fingerstick capillary BGMS? 6) What alternatives are there to POC fingerstick capillary BGM testing for capillary blood specimens? 7) What are the risks of not testing with POC fingerstick capillary BGMS in critically ill patients (ICU)? 8) What are the risks of not testing with POC fingerstick capillary BGMS in critically ill patients (OR and PAR)? 9) What are the risks of not testing with POC fingerstick capillary BGMS in critically ill patients (ED)? 10) What are the benefits of a moratorium on citations? 11) What are the conclusions about fingerstick capillary POC-assisted blood glucose monitoring for critically ill patients? The PRIDE group addressed these questions in a statement intended for eventual submission to the CMS. The 11 questions and their answers follow.

1. What are the roles of the CMS and CLIA in regulating POC BGMS?

All diagnostic tests, including BGMS, are subject to CLIA '88 (Clinical and Laboratory Improvement Amendments of 1988) regulations (4). CLIA '88 sets minimum standards for quality of laboratory tests in the United States. The objective of this program is to ensure quality laboratory testing (5). CLIA '88 has improved lab quality, as evidenced by ongoing improvements in the achievement of many quality-related requirements by labs because of this program (6). The CMS enforces the CLIA regulations. Failure to comply with CLIA '88 regulations will subject a hospital and the laboratory medical director to loss of CLIA certification and privileges to bill the CMS for laboratory testing for a period of up to 2 years.

CLIA '88 categorizes laboratory testing as waived, moderate, or high complexity based on the difficulty of calibration, sample processing, analysis, maintenance, and interpretation of results. BGMS were initially categorized as waived complexity, which represents the lowest level of requirements for training and documentation. Operators of CLIA '88-waived tests only need to follow the manufacturer's instructions, pay a biennial fee to the CMS for a CLIA certificate, and allow the testing process to be inspected on an unannounced basis.

2. What is the history of the controversy with the CMS and the FDA?

The FDA issued draft guidance for professional BGM systems on January 7, 2014. This document clarified the existing FDA position on professional BGMS used in the hospital and mandated moderate-complexity status for BGMS used in professional healthcare settings, which meant that institutions would have to document operator credentials and manage a quality control program. No POC fingerstick capillary BGMS were FDA cleared for critically ill patients at that time. This meant that use of POC fingerstick capillary BGMS in critically ill patients would be considered off-label use and subject to high-complexity CLIA requirements. The CMS learned about this situation in its efforts to protect critically ill patients with abnormal glycemic control from harm due to inaccurate POC fingerstick capillary BGM testing. Soon afterward, the CMS intention to cite hospitals performing POC BGM testing in critically ill patients was announced in the form of a letter (January 13, 2014) (7) and a

guidance (February 28, 2014) (8) for laboratory directors from the New York State Department of Health.

The Diabetes Technology Society presented a public meeting in Arlington, Virginia, on May 13, 2014, to bring together the diabetes professional community, the FDA, and the CMS. At this meeting, clinicians called for a moratorium on enforcement of this policy by the CMS. The moratorium would allow hospitals the time to find alternate solutions to POC fingerstick capillary BGM testing, allow manufacturers to collect data and apply for clearance in the critically ill population, and allow the FDA to design discrete policies to facilitate clearance of needed products for critically ill hospitalized patients (9). A commentary article based on ideas from that meeting was published online in Mayo Clinic Proceedings on September 6, 2014 (10). On September 24, 2014, the FDA cleared one POC glucose monitoring system as CLIA-waived for use in hospital critical care units using arterial, venous, or heelstick samples (11). At this time, no POC BGM is actually cleared for fingerstick capillary BGM testing in critically ill patients (10). On November 21, 2014, the CMS issued a detailed memorandum (no. 15–11 CLIA) to state survey agency directors again threatening to cite hospital labs if POC fingerstick capillary BGM testing was performed off label and high-complexity requirements were not fulfilled (2). However, on March 13, 2015, the CMS temporarily withdrew and then re-issued that document with draft clarifications and a solicitation of comments (2).

3. What is the magnitude of penalties to noncompliant hospitals?

POC BGM testing of fingerstick capillary blood in a critically ill patient constitutes an off-label use of such a device that can lead to citation. If the hospital can meet CLIA standards for high-complexity testing, then it will not be cited. A cited hospital has a limited time window (generally 30 d) to respond and to bring its documentation, staffing, and licensure up to CLIA high-complexity requirements. If it does not, then the hospital may lose its CLIA certificate and be unable to perform any testing. The laboratory director will also be identified on a public list of sanctioned facilities, subjected to fines, and disqualified from receiving CMS payments for testing for at least 2 years. In the extreme cases, any person convicted of intentional violation of CLIA requirements is at risk for civil lawsuit and/or imprisonment (12).

4. What are the benefits of the CMS policy?

Critically ill patients are a vulnerable population and are frequently: 1) hemodynamically unstable; 2) receiving multiple therapeutics that can affect capillary perfusion; 3) hypoxemic; 4) anemic; 5) volume overloaded; 6) dehydrated; or 7) unable to respond to symptoms of hypoglycemia and hyperglycemia. These conditions place patients at a higher risk for POC testing inaccuracies. Critically ill patients, who are routinely on intensive glycemic control protocols, are particularly at risk.

The CMS likely formulated their policy because they recognized that: 1) no BGM system has been cleared by the FDA for POC fingerstick capillary testing in critically ill patients; and 2) the medical literature does not demonstrate sufficient accuracy and reliability of this type of technology to meet international standards for critically ill patients (13, 14). The intent by the CMS to create this policy appears to be 2-fold: 1) in spirit, to protect patients from potential POC BGM testing errors; and 2)

in process, to encourage manufacturers both to improve performance of devices and to apply for FDA approval in critically ill populations.

5. How are critically ill patients currently managed using POC fingerstick capillary BGMs?

POC capillary glucose testing is performed on critically ill patients in a variety of settings, such as the ED, OR, PAR, and ICU. Every protocol for glucose management depends on frequent and immediate access to capillary blood glucose data via fingersticks. In a typical protocol, the insulin infusion dose is adjusted hourly based on the POC BGM result for that hour and its rate of change from the previous hour. Changes in insulin infusion rates can be made instantly because POC BGM results are available within seconds after sampling. Results of POC BGM testing of fingerstick capillary blood are usually reliable, except in states of poor peripheral perfusion (15, 16) (ie, sepsis, severe dehydration, use of vasopressors, or shock), hypoxemia (17), or gross edema of the extremity from which capillary blood is being obtained (18). A definition of critically ill for the purpose of assigning which patients should or should not be monitored with a POC fingerstick capillary BGM should account for which illnesses could most affect the performance of that POC BGM, rather than who is at the greatest risk of death or where in the hospital they are being treated. A definition of critically ill must account for the measurement technology of a BGM and how the illness affects the monitor's performance. Therefore, a critical illness that is contraindicated with one monitor might not be considered a critical illness for another monitor.

6. What alternatives are there to POC fingerstick capillary BGM testing for capillary blood specimens?

The CMS statement of March 13, 2015, offered hospitals four potential alternative methods for POC fingerstick capillary BGM testing in critically ill patients. These include: 1) testing with one specific device cleared for POC BGM with waived status on specimens obtained from sources other than fingerstick capillary blood; 2) using blood gas analyzers (BGAs) and non-strip blood analyzers cleared as moderate-complexity status for critically ill patients; 3) submitting blood samples to the clinical laboratory; and 4) meeting the CLIA regulatory requirements for high-complexity testing along with any applicable state regulations so that POC BGM testing can be performed on capillary blood from critically ill patients. Unfortunately, these four alternatives do not represent viable options for replacing POC fingerstick capillary BGM testing in this population.

Arterial and venous blood are the required substrates for several alternative BGM methods but are often not available for blood glucose testing. Many critically ill patients do not have an arterial line, and using one for the purpose of glucose testing increases the risks of complications including infections (19). Phlebotomy from peripheral iv lines is unreliable. Best practice recommendations discourage drawing samples out of any central or peripheral iv lines because these lines are used to introduce drugs and fluids. Sampling from indwelling catheters can result in: 1) inaccurate glucose values if an inadequate volume of dead space blood is withdrawn; or 2) contamination of the line (20). In contrast to sampling from arterial or venous lines, capillary sampling does not lead to systemic infections. Furthermore, if blood for glucose testing is withdrawn from indwelling lines or

from a vein via phlebotomy, then larger volumes of blood must be used than are needed for fingerstick capillary testing, which requires only microliters of blood. Arterial or venous blood sampling for glucose monitoring contributes to the anemia that frequently occurs in neonates and other hospitalized patients (21). Therefore, increased withdrawal of blood samples through indwelling catheters or phlebotomy for alternative methods of glucose testing leads to increased risks and costs, without clear benefits.

Alternative 1: the Nova Biomedical StatStrip for POC BGM in critically ill patients

One alternative to off-label use of the POC BGM is the Nova Biomedical StatStrip (Nova Biomedical) that was cleared for POC BGM testing in critically ill patients in September 2014 (11). Unfortunately, this system is cleared only for venous, arterial, or neonatal heel stick blood (but not capillary specimens) on critically ill patients. This approach (compared to POC BGM testing of fingerstick capillary blood in non-neonates) confers the risks of collecting larger amounts of blood by phlebotomy or from indwelling lines. It may also increase health care expenditures and necessitate restructuring of work flow because Nova Biomedical does not currently offer a wireless interface. Most institutions have lengthy contracts with other BGM manufacturers, which would complicate a switch to the StatStrip. Considering its advantages and disadvantages, this POC BGM product, when used on critically ill non-neonates according to its label, is an inferior alternative to the current practice of POC fingerstick capillary BGM testing of fingerstick capillary blood specimens with this or other devices.

Alternative 2: POC devices cleared for testing arterial or venous blood

The CMS suggested that POC devices other than BGMs be used for critically ill patients. Such potential alternative methods could include BGAs, such as i-STAT (Abbott Point of Care), or POC nonstrip blood analyzer devices such as Piccolo Xpress (Abaxis) or HemoCue (HemoCue America) (2). Glucose testing on a BGA can provide rapid analysis from unprocessed whole blood specimens in less than 2 minutes. However, BGAs are categorized as moderate-complexity testing under CLIA '88 and require a level of additional documentation when compared to waived testing including: operator training and competency, validation of analyzer performance, ongoing analyzer correlation, enrollment in a proficiency testing program, maintenance, and mandatory biennial inspection of testing.

The cartridge-based i-STAT BGA, which is portable, is only considered CLIA waived if venous blood is used for glucose testing; otherwise this device is classified as moderate complexity. The desktop Piccolo Xpress blood analyzer is CLIA waived, but it requires refrigeration of test discs and 12 minutes to complete a measurement. The HemoCue blood analyzer is CLIA waived and portable; however, test cuvettes must be refrigerated. Testing time with HemoCue is 40–250 seconds, which is longer than with a BGM or BGA. Refrigeration of reagents requires additional staff resources in temperature monitoring and delays in testing while warming discs or cuvettes to room temperature before use. The cartridge-based epoc BGA (Epocal) is portable and is classified as CLIA moderate complexity. It can measure capillary blood. Its reliability was poor in one study (22). The YSI glucose analyzer (YSI Life Sciences) is not portable, requires fre-

quent maintenance, and is categorized as CLIA moderate complexity. Many of these POC systems are not portable or are available in limited number at most hospitals, so the testing cannot be performed at the bedside, which causes a delay in treatment. None of these POC systems, compared to currently available fingerstick capillary POC BGMs, has been shown to consistently provide better accuracy, clinical outcomes, or ease of use in critically ill patients. The risks, resource costs, and unclear benefits render this alternative as inferior to the current practice of POC fingerstick capillary BGM testing for critically ill patients.

Alternative 3: central laboratory testing

A delay of at least 30–60 minutes for a central laboratory to report blood glucose results would render current care protocols useless. Turnaround times for a central laboratory (compared to POC BGM testing) are longer because of the need to transport specimens to the laboratory, process plasma/serum off cells by centrifugation, and analyze/report results. The potential for greater reliability by a central laboratory compared to POC BGM testing of fingerstick capillary blood does not surpass the drawback of delayed turnaround time for results with this alternative.

Alternative 4: attaining high-complexity status

Current POC BGM systems can be used off label for capillary blood glucose testing on critically ill patients if a hospital can meet the stringent CLIA high-complexity requirements. A hospital would need to: 1) validate and establish institutional performance specifications for off-label BGM use in critical care settings (including accuracy, precision, analytical sensitivity and specificity, analytic measurable range, and reference ranges); 2) change workflow processes so that only registered nurses (or only lab technicians in many states) perform the fingerstick capillary POC BGM testing; and 3) monitor up to thousands of nurses or lab technicians using a stricter competency assessment. In many states, which require lab technicians to perform high-complexity tests (23), the cost of hiring/managing these employees, which are in short supply, renders this potential solution unworkable. For most hospitals in the United States, the cost in time and resources of moving to high-complexity classification for POC fingerstick capillary BGM is not realistic. Furthermore, the proposed changes by the CMS could possibly discourage an organizational commitment to diabetes care.

7. What are the risks of not testing with POC fingerstick capillary BGMs in critically ill patients (ICU)?

The CMS policy would inevitably lead to a reduction in the use of insulin infusions and a deterioration in glycemic control as a result of reduced or ill-timed glucose testing. The effect would be disastrous because hyperglycemia is extremely common in the ICU and is associated with many poor outcomes (24). Although the precise glucose target in the ICU is debated, overt hyperglycemia is no longer acceptable. There is a significant safety concern of potentially increasing rates of severe hypoglycemia in the absence of fingerstick capillary POC glucose monitoring because many clinicians from diverse specialties who are committed to glycemic control for their patients may treat aggressively despite the inability to measure glucose in a timely and regular fashion

(25). Reduced testing would also delay recognition of hypoglycemia. Professional guidelines on inpatient glycemic control already take into account the inaccuracies of capillary blood glucose measurement in ICU patients. The NICE SUGAR trial exemplified the challenges and limitations of current measurement practices, and in response, professional guidelines have based their recommended targets on the more conservative range of that study's control cohort. Professional guidelines purposefully err toward more conservative management largely because of the inability with current measurement standards to strive for lower targets. With less frequent blood glucose testing in place, it will be difficult to safely attain conservative targets and virtually impossible to safely attain lower targets (26). Even with the current availability of capillary fingerstick POC testing, it is already very challenging to sufficiently monitor patients in an expeditious manner. Moreover, the shift to alternate methods of testing such as the use of alternate sources of blood would increase costs, cause delays in care, and directly contribute to anemia and infection risk.

8. What are the risks of not testing with POC fingerstick capillary BGMs in critically ill patients (OR and PAR)?

Intra- or postoperative patients under the influence of anesthetic agents cannot alert healthcare professionals to symptoms of hypoglycemia. Surgical patients may require frequent glucose testing. An abundant literature reports that perioperative hypo- and hyperglycemia portend increased morbidity and mortality (27–29). Large glucose excursions in these patients are common and require immediate correction.

POC BGMs relay results in seconds compared to the hour that it may take to report a central laboratory glucose value. Such a delay is completely unacceptable for optimal patient care (30). Every anesthesiologist has been confronted with a patient in postanesthesia recovery that is not waking up after surgery. This delay might be secondary to residual anesthetic medications or it might be due to hypoglycemia. Only a rapid fingerstick capillary POC glucose measurement answers that question about the glucose level in time to provide lifesaving intervention.

9. What are the risks of not testing with POC fingerstick capillary BGMs in critically ill patients (ED)?

Patients can present to the ED with various conditions resulting in altered mental status. Because past medical history is frequently unknown, immediate fingerstick-based blood glucose measurement is a mandatory first-line emergent test in such situations. The American College of Emergency Physicians policy states that all patients "... require a rapid glucose determination. . ." (31) when presenting with an altered mental state. POC fingerstick capillary BGM testing takes approximately 1 minute (including time to obtain the sample) to display the result (30). This technology is vital in the ED because obtaining a central laboratory glucose result may require over an hour. An hour delay could lead to a fatal error in a patient with unrecognized, life-threatening hypoglycemia presenting with altered mental status or seizure. POC fingerstick capillary BGMs facilitate critical initial treatment when the decision paths are simply administering insulin, glucose, or neither.

10. What are the benefits of a moratorium on citations?

A moratorium by the CMS on issuing citations for off-label use of fingerstick POC BGMs on critically ill patients is reasonable because it will continue to pressure manufacturers to improve their products and obtain FDA clearance, but it will minimize the interruption of health care delivery to critically ill patients. Because fingerstick capillary blood glucose monitoring is an integral part of critical care management today, eliminating or making significant and sudden work flow changes can negatively affect patient outcomes. This would be counterproductive to the spirit of the memorandum, which is to improve patient outcomes. Therefore, a moratorium is in the interests of critically ill patients, institutions, the FDA, the CMS, and BGM manufacturers, who can all use this time productively in four ways. 1) Patients can continue uninterrupted treatment with fingerstick capillary POC BGM testing while the technology is being carefully evaluated. 2) Institutions can evaluate which patients benefit or are harmed by POC testing, and if fingerstick capillary POC BGMs need to be replaced for certain critically ill populations, then alternative work flow patterns can be identified. 3) Manufacturers and the FDA can design protocols, collect data, and interpret the data for various glucose monitoring technologies tested on different groups of critically ill patients. 4) The CMS can maintain pressure on all parties to continue to identify processes and tools that maximize patient outcomes.

11. What are the conclusions about fingerstick capillary POC-assisted blood glucose monitoring for critically ill patients?

The authors of this statement represent leading academic and hospital diabetes clinicians in the United States. It is clear that POC BGMs will need to demonstrate better performance in specific populations to the FDA than what is currently on the record (32). The CMS is attempting to protect patients with diabetes and other states of abnormal glycemic control from harm due to inaccurate testing. However, the result of their specific plan will result in more harm than good. The preferred approach is to unravel the issues one by one, but that approach will require years. There is currently no good substitute for the fingerstick-based capillary POC BGM in critically ill patients. To improve the care of diabetes patients, the best approach now is for all affected parties to work together on the problem—not to cite hospitals and clinicians for providing needed care that penalizes patients by radically altering a well-established system of diabetes care. A moratorium on enforcement of the off-label provision for fingerstick capillary POC BGM testing is needed to allow the issues to be solved without causing great harm to our patients. Upon publication, a link to the published statement will be submitted to the CMS Center for Clinical Standards and Quality/Survey and Certification Group.

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