



Letter to the Editor

Estimated strip wastage from glucose meter infection control recommendations

Dear Editor:

Portable point-of-care testing (POCT) devices, such as glucose meters and blood gas analyzers can be reservoirs of infectious and antibiotic resistant organisms in the hospital. Such devices can become contaminated during use in a patient's room or through use in a common shared testing area and carry the organism to other patient rooms during rounds and routine patient care. Nosocomial infections have been documented with the use of poorly cleaned urine measuring equipment in the general medical population [1,2] and with blood gas analyzers in the neonatal unit [3]. Recently, patients at nursing facilities in Mississippi, North Carolina, and California were diagnosed with hepatitis B infection transmitted in association with blood glucose monitoring from shared lancet holders, glucose meters, insulin vials, and poor hygiene between patients [4]. A study of blood contamination on glucose meters predicts that the frequency of meter contamination depends on the number of operators and location of the device. Meters on an intensive care unit were twice as likely to be contaminated with blood when compared to a general medical unit, and units with more operators increased the frequency of blood contamination [5]. Every rise in 100 operators increases the rate of meter contamination by 6% [5]. The US Food and Drug Administration and Centers for Disease Control recommend that POC blood testing devices, such as glucose meters and PT/INR anticoagulation meters, should be used only on one patient and not shared [6]. If dedicating POC blood testing devices to a single patient is not possible, the devices should be properly cleaned and disinfected after every use as described in the device labeling [6].

While infection control recommendations have focused on devices, the potential for supplies and reagent contamination should not be overlooked. Glucose test strips can become contaminated through handling during patient care, and studies have demonstrated the ability to culture organisms from glucose test strips collected from vials that were in use on the general medical, intensive care and gastroenterology wards [7]. While recommendations for dedicated use on single patients or disinfection and cleaning between each use exist for POCT devices, no specific recommendations have been made for glucose test strip vials and other POCT reagents. The packaging of test strips in multi-use vials and the narrow opening of vials force health-care professionals to successive manual contamination of strips by fingers and vice-versa [7]. Strict hand hygiene is recommended before manipulating test strips, and opened vials should be discarded after discharge of a patient, particularly those patients with isolation precautions [7].

We investigated the financial impact of dedicating a vial of glucose test strips to each patient requiring glucose monitoring and discarding unused strips in open vials. A count was conducted of the number of glucose test results for 100 random inpatients over a 6 month period. Patients (52 males and 48 females) represented the spectrum of intensive care, neonatal intensive care, general medical, surgical,

oncology, and cardiac units from the main academic hospital and two community hospitals within our health system (88 from the main hospital and 12 from the affiliates). Average age was 59.8 y (range 28 days to 97 y) and average length of stay was 8.4 days (range 1 to 81 days). Over the days examined in this study, an average of 278 patients a day (251–319) required glucose monitoring.

Glucose test strips are packaged individually or in vials of 25 or 50 count strips. The total number of strips used per stay was counted and the average number of strips per day was calculated (Table 1). Waste from a 25 count and 50 count vials was estimated using two case scenarios. Scenario #1 assumes that a glucose meter is shared among patients and the meter is disinfected between each use, while the test strips are dedicated to each patient and are only used for patient testing. Quality control is run at the start of each day from a different, communal vial of strips on the nursing unit. Scenario #2 assumes a dedicated meter and dedicated test strips for each patient. Since meters require two levels of quality control each day of testing, the strips from the dedicated vial will be used for both control and patient testing, because the meter never leaves the patient's side during their stay.

Recommendations to dedicate glucose testing strips to single patients would have a financial impact on institutions utilizing strips packaged in multi-use vials (Table 1). The waste per patient stay was greater for 50 strip vial packaging compared to 25 strip vial packaging. Multi-strip packaging generates waste when dedicated to individual patients as compared to single-use packages, since single-use packaging consumes only the supplies when needed and no supplies are dedicated to a single patient. This study thus supports previous recommendations that manufacturers should seek to produce single-use strips with no-touch applications to improve hospital infection control [7].

Dedicated meters and 50 strip vials seemed to waste fewer strips than a shared meter scenario with 50 strip vials. However, this data must be interpreted in consideration of the additional number of meters that an institution would have to acquire to meet the volume of patients requiring glucose monitoring. Using a meter dedicated to each patient, there is an increase in strips used (for quality control) (45.2 strips/stay vs 28.4 strips/stay). The additional control testing could cost a hospital over \$100,000 more a year from strip use. The dedicated meter model wastes fewer strips from multi-use vials, but in the end is more costly because of the large increase in strips used for quality control. Thus, the manner in which POCT is utilized (the testing scenario) impacts the overall cost of managing testing in an institution and recommendations for changing that operation (such as dedicated meters and dedicated strip vials for infection control) have direct budget impact.

This study may be limited by the number of patients and days reviewed which may have inadvertently biased some of the estimates. However, with the inability to pull automated reports for POCT from our computerized information system, we sought to manually collect sufficient data so as to estimate the potential financial impact we could expect if switching glucose meter vendors happens. Our cost estimates assume 100% efficiency of strip use, but controls sometimes fail and patients need to be repeated. So, the cost estimates

Table 1
Estimated glucose strip waste per patient stay.^a

		Number (range)
Glucose strips for patient testing/day		3.4 (1.0–7.2)
Inpatient days/stay		8.4 (1–81)
Scenario #1		Estimated annual cost
Shared meter and dedicated strips used for patient testing only		
Total strips/stay	28.4 (1–281)	\$ 171,533
Waste/stay from 25 strip vials	13.8 (0–24)	\$ 83,350
Waste/stay from 50 strip vials	33.6 (2–49)	\$ 202,940
Scenario #2		
Dedicated meter and strips used for control and patient testing		
Controls per day	2	
Strips for control tests/stay	16.8 (2–162)	
Total strips/stay	45.2 (3–443)	\$ 273,003
Waste/stay from 25 strip vials	14.3 (1–24)	\$ 86,370
Waste/stay from 50 strip vials	29.4 (1–48)	\$ 171,573

^a Scenario #1 assumes a shared meter that is cleaned between each use and dedicated strips for each patient used for patient testing only, while scenario #2 assumes a dedicated glucose meter for each patient and a dedicated vial of strips that is used to test control and patient samples. Annual cost was estimated assuming an individual glucose test strip cost of \$0.50. [Estimated annual cost = (waste/stay) × (278 patients/day) × (365 days/year) × (\$0.50/strip) / (8.4 days/stay)].

represent the minimum financial impact, and actual costs due to repeat testing would be higher. As many hospitals are in the process of switching glucose vendors, what may seem like minor differences between vendors (switching from 25 to 50 count vials or single-use packaging and from common testing vials to individual dedicated vials per patient) can have dramatic budget implications. Based on our facilities' workload of performing blood glucose meter tests, on

an average of 278 patients per day and 8.4 days per hospital stay for this patient population, the estimated annual cost of test strip waste ranged from over \$80,000 with 25-strip vials to over \$170,000 with 50-strip vials.

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