the simplified regimen was that many patients were able to adjust the dose of glargine when glucose levels changed with other health issues during the no-contact period.

Another important finding of the study is that the level of HbA\textsubscript{1c} did not correlate with duration of hypoglycemia before or after simplification of the regimen, suggesting that HbA\textsubscript{1c} level is a poor predictor of the risk of hypoglycemia. Our previous study has shown that the HbA\textsubscript{1c} levels may not correlate with estimated average glucose in older populations.\textsuperscript{7} The combination of these findings suggests that liberating the HbA\textsubscript{1c} goals in frail older patients is not adequate to protect against the risk of hypoglycemia. The type of glucose-lowering agents and the strategy for their use are important to lower the risk of hypoglycemia.

Conclusions | Our study shows that (1) simplification of insulin regimens in older adults can decrease hypoglycemia risk and disease-related distress without compromising glycomic control; and (2) HbA\textsubscript{1c} levels may not predict the risk of hypoglycemia in the older population and should not be used as the sole parameter for goal setting.

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Editor’s Note

Simplification of Insulin Regimens in Patients With Type 2 Diabetes

In many patients with inadequately controlled type 2 diabetes, insulin is added to the treatment regimen. This often includes a daily dose of a long-acting insulin, as well as rapid-acting or short-acting insulin, sometimes with a sliding scale, to control elevated glucose following meals. Thus, treatment with insulin can impose a major burden, requiring patients to check blood glucose and inject insulin multiple times per day and to appropriately adjust insulin doses. The use of rapid-acting or short-acting insulin can also increase the risk for hypoglycemia, which is of particular concern in the elderly. In a research letter published in this issue of JAMA Internal Medicine,\textsuperscript{1} Munshi et al provide preliminary data to suggest that, compared with multiple doses of insulin, a single dose of basal insulin results in less hypoglycemia with little effect on glycated hemoglobin.

The study by Munshi et al\textsuperscript{1} is small and did not include a concurrent control group, so the evidence should be considered preliminary. However, we decided to publish the study because we believe it should inspire larger trials to investigate optimum insulin regimens that minimize hypoglycemia and patient burden. While the participants in the study by Munshi et al were elderly, we see no reason why such a simplified regimen should not also be considered in younger patients with type 2 diabetes.

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Estimated Cost of Injectable Medication Waste Attributable to Syringe Dead Space

Excess waste is a well-known known driver of inefficiency in the US health care system. Medication waste contributes to this inefficiency and has recently been described among cancer medications,\textsuperscript{1} but it may also be attributable to the syringes used
to deliver injectable medications. Syringe dead space is the volume of residual fluid that remains within the syringe after the plunger is fully depressed during medication injection.\(^2\,^3\) High dead-space syringes (HDSS), compared with low dead-space syringes (LDSS), are associated with increased risk for medication waste.\(^2\,^3\) If costly injectable medications are administered using HDSS, syringe dead space may contribute to excess medication waste in the US health care system. We estimated differences in the cost of injectable medication waste attributable to HDSS and LDSS.

**Methods** | Self-administered medications were identified from BlueCross BlueShield of North Carolina. Medications that were not injectable via a syringe or needle or were not on the US market during data collection in August 2015 were excluded. Medication prescribing information and syringe/needle characteristics were collected from drug monographs, medication package inserts, and medication injection guides. The HDSS and LDSS classifications were assigned based on the following characteristics: a detachable needle (HDSS), a permanently attached or integrated needle (LDSS), and/or a conical plunger to reduce dead space in the needle hub (LDSS).\(^3\) The study did not constitute human subjects research; therefore, institutional review board approval was not sought.

Average wholesale prices were retrieved from 2015 Red Book (Truven Health Analytics). Pricing data were used to estimate the cost of a single dose of each medication, based on the recommended initial dose. Median estimates for dead-space capacity of HDSS (3.03%) and LDSS (0.30%) were factored into these calculations to account for variations in dead space for different volume syringes.\(^6\) The costs of wasted medication were then calculated per month and year by multiplying the cost of dead-space medication per dose times the number of doses in a 30-day period and 365-day period, respectively. Medications taken for a finite period of time were extrapolated only for the period indicated.

Descriptive statistics were used to characterize the cost of medication waste.

**Results** | We identified 24 self-injectable medications; 17 (71%) were administered using HDSS and 7 (29%) using LDSS. The initial volume of injection ranged from 0.25 to 5.0 mL for HDSS medications and 0.08 to 1.0 mL for LDSS medications. The median (interquartile range [IQR]) monthly medication supply cost was $4443.00 ($1540.20-$6316.80) for HDSS medications and $3411.64 ($1850.40-$5617.35) for LDSS medications (Figure 1).

When extrapolating accumulated waste, the median (IQR) cost of wastage for a single dose was $5.43 ($4.01-$17.19) for HDSS medications and $0.54 ($0.28-$1.49) for LDSS medications, and for 1 year was $1637.91 ($557.68-$2328.69) for HDSS medications and $124.52 ($67.54-$205.03) for LDSS medications (Figure 2). Waste exceeding $100.00 per month was solely due to HDSS medications.

**Discussion** | This study reveals that HDSS contribute to excess cost of injectable medication waste compared with LDSS, despite similar 1-month supply costs of LDSS and HDSS medications. Dead space from HDSS is likely to be of greatest concern for patients who self-inject medications with greater frequency and over an extended period of time. Replacing HDSS with LDSS is a practical approach to reduce the cost of medication waste. Moreover, LDSS replacement would enhance medication delivery for patients who self-inject medications, because more of the prescribed medication dose is delivered with each injection. There is an unmet need of LDSS for patients who self-inject medications.

This study has limitations. Medications were from one formulation. Average wholesale prices may not reflect the actual cost to patients. Dose calculations were based on prescribing information. In clinical practice, patient response can influence dosing, frequency, and duration of therapy.

Given that HDSS have the potential to cost the health care system a substantial amount in medication waste, efforts are warranted to endorse LDSS as the industry standard for all syringes to reduce preventable medication waste.

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**Figure 1. Cost of 1-Month Supply of Medication, by Syringe Classification**

The median cost of a 1-month supply of medication for those administered using high dead-space syringes (HDSS) compared with those administered using low dead-space syringes (LDSS). The box plot indicates median and interquartile. The error bars indicate range.

**Figure 2. Median Cost of Medication Waste Attributable to Dead Space, by Duration and Syringe Classification**

The median cost of medication waste attributable to dead space for medications administered using high dead-space syringes (HDSS) compared with medications administered using low dead-space syringes (LDSS). The error bars indicate interquartile ranges.
The prescription opioid epidemic continues with few signs of abatement. Most adolescents and adults reporting recent nonmedical use of opioid medications obtain these medications through their family or friends. Minimal research has examined knowledge and practices related to opioid medication sharing, storage, and disposal among US adults who recently received prescriptions for these medications despite this group serving as a source for individuals using opioid medications for nonmedical purposes. We conducted a national survey among US adults with recent opioid medication use to examine the pervasiveness of sharing opioid medications, medication storage and disposal practices, and the sources of information received.

Medication Sharing, Storage, and Disposal Practices for Opioid Medications Among US Adults

Methods | We sampled survey participants from a source that uses probability- and address-based sampling to construct a nationally representative panel. We sampled randomly from the general pool of adult panelists and oversampled adults with at least 1 child living in the household. Data were deidentified. A screening question restricted the sample to adults with opioid medication use during the past year. This study was reviewed and approved by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board. The study was conducted from February 24 to March 16, 2015.

Among the 4836 sampled panelists, 3281 (67.8%) completed the screening question. Among the 1055 individuals determined to be eligible based on their past-year use of opioid medications, 1032 (97.8%) completed the survey. Respondents answered questions about their practices and beliefs related to sharing, storing, and disposal of opioid medications as well as sources of information received on these topics. Statistical analyses incorporated survey weights to account for sampling design and nonresponse.

Results | A total of 20.7% (weighted percentage) reported ever having shared opioid medications with another person (Table 1). Among this group, the primary reason for sharing medication was to help the other person manage pain (73.0%). Few respondents reported being likely to let a relative (13.7%) or close friend (7.7%) use their opioid medication in the future. Some respondents reported storing their opioid medication in a locked (8.6%) or locked and latched (20.9%) location.

At the time of the survey, 440 respondents (46.7%) were still using opioid medications. More than half of the respondents had or expected to have leftover medication. Among those with leftover opioid medications, 61.3% reported keeping them for future use.

Nearly half of the adults with recent opioid medication use did not recall receiving information on safe storage (48.7%) or proper disposal (45.3%) (Table 2). Among the 505 participants who reported receiving information on safe storage practices, primary sources of information included medication packaging (46.7%), the pharmacist (44.1%), and the physician or nurse (32.3%). Among the 548 respondents who reported receiving information on proper disposal, sources included the pharmacist (34.7%), print or television news (31.3%), and medication packaging (29.6%).