Among older individuals with diabetes, intensive glucose control may lead to greater harm than benefit. Although large clinical trials have consistently shown that reducing A1C prevents microvascular complications (e.g., retinopathy and nephropathy) over time, short-term benefits of intensive glucose control in older patients with a longer duration of diabetes have yet to be demonstrated (1–4). The major risk of intensive glucose control among older individuals is hypoglycemia. Hypoglycemia risk is greatest with insulin and sulfonylureas and is increased by other conditions common among older individuals, including dementia, cognitive impairment, and chronic kidney disease (5–7).

Treatment-associated hypoglycemia is the second most common medication-related adverse event (8) and results in ~25,000 emergency...
Avoiding wasteful or unnecessary treatments is a key aspect of Choosing Wisely, an initiative launched by the American Board of Internal Medicine (ABIM) to promote safe, effective, and patient-centered care. Overtreatment of diabetes, which is characterized by excessively low blood glucose levels (hypoglycemia), can lead to adverse outcomes such as seizures and coma. Even mild hypoglycemia can cause symptoms like anxiety, palpitations, and confusion. Older patients are particularly at risk due to the accumulation of medical conditions that increase their sensitivity to hypoglycemia.

Recent guidelines and performance measures support less intensive A1C goals for older patients with diabetes (13–15), but a substantial number of older patients with diabetes are still potentially overtreated to A1C levels that likely confer greater risk than benefit (16).

Potential overtreatment of diabetes is an important issue in the Veterans Health Administration (VHA). At least 24% of veterans served by VHA have diabetes (17). A cross-sectional study of VHA patients indicated that 50% of older patients taking insulin or sulfonylureas are potentially overtreated (18). A similar proportion of older veterans with diabetes and dementia are treated to an A1C <7% (19). Despite the accumulating evidence of the negative consequences of overtreatment, providers are reluctant to de-intensify glycemic therapy. For example, one VHA study found that neither low A1C values nor limited patient life expectancy were strongly associated with de-intensification of therapy for older patients (16).

Recently, the VHA has focused on hypoglycemia safety, building on the American Board of Internal Medicine Foundation’s Choosing Wisely initiative. Choosing Wisely focuses on “advancing a national dialogue on avoiding wasteful or unnecessary medical tests, treatments, and procedures” (20). As part of this effort, a VHA Choosing Wisely Task Force prioritized reducing the number of patients with diabetes who were potentially overtreated and therefore at high risk for hypoglycemia (the Hypoglycemia Safety Initiative).

Concurrently, the Veterans Affairs (VA) New England Healthcare System (VANEHS) pursued a quality improvement (QI) initiative to reduce potential overtreatment in diabetes. The aim of this article is to share the methodology and outcomes from implementation of a risk reduction program to reduce the number of older patients potentially overtreated for diabetes.

Methods

Context

This QI project was conducted across the VANEHS. The goal was to reduce the number of potentially overtreated veterans with diabetes by encouraging primary care providers (PCPs) to reevaluate their use of diabetes medications among patients potentially overtreated and at high risk for hypoglycemia. This work met criteria for operational improvement and was exempt from institutional review board review.

Eight VA medical centers participated in the initiative between July 2013 and December 2014. The project engaged participants from throughout the organization, including clinical leaders (for direction and sponsorship), informatics specialists (for technical implementation of reports and the clinical reminder in the electronic medical record [EMR] system), and systems engineers (for project management, data analysis, and implementation expertise). A PCP at each of two pilot sites (Boston, Mass., and White River Junction, Vt.) advised on development of the QI initiative, provided feedback on usability and usefulness of the tools as they evolved, and served as a local champion for the project.

Intervention

There were three major stages of designing and implementing the intervention: 1) identifying potentially overtreated patients, 2) designing the Hypoglycemia Risk Reduction report, and 3) designing and spreading the Hypoglycemia Risk Reduction clinical reminder.

Identifying Potentially Overtreated Patients at High Risk for Hypoglycemia

Potentially overtreated patients were defined as those who were on insulin or a sulfonylurea whose most recent A1C was <7.0% and who were also >74 years of age or diagnosed with dementia or cognitive impairment (18). These criteria were based on research by Feil et al. (7). In fiscal year 2013, ~220,000 veterans were enrolled in primary care in the VANEHS. In July 2013, 2,513 veterans met the criteria for inclusion in the potentially overtreated cohort. Data were drawn from the Corporate Data Warehouse, a large VA dataset that provides clinical and administrative data for VA analytical purposes.

Designing the Hypoglycemia Risk Reduction Report

A Hypoglycemia Risk Reduction report was developed by VANEHS Clinical Informatics for use with VANEHS patients, based on a similar report developed by the VA Great Lakes Healthcare System (VAGLHS). The report was provider-specific and contained information for each potentially overtreated patient cared for by that provider, including name, age, most recent A1C value and date, and all diabetes medications prescribed with dosing instructions. PCPs at the two pilot sites received a report relevant to their panel of patients. A sample report is displayed in Table 1.

Designing and Spreading the Clinical Reminder

Clinical reminders are alerts in patients’ EMRs that prompt and guide clinicians in providing or scheduling preventive care and clin-
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Clinical interventions in a timely manner. The VANEHS Hypoglycemia Risk Reduction clinical reminder was based on a reminder used by VAGLHS to identify and address potential overtreatment. The VANEHS reminder was first implemented at the two pilot sites from October 2013 through December 2013 and then implemented at all eight VANEHS medical centers in January 2014.

The clinical reminder alerts providers at the time of routine care visits when a patient may be potentially overtreated. The reminder then leads the provider and patient through a series of questions to help assess the occurrence of hypoglycemia, as follows:

- In the past few months, how often did the veteran/caregiver report that the veteran had a low blood glucose level? If the answer is >0, then ask:
  - In the past few months, how often did the veteran/caregiver report that the veteran had blood glucose low enough to fear passing out? If the answer is >0, then ask:
    - Did the veteran/caregiver report that the veteran passed out or fell due to low blood glucose?
    - Did the veteran/caregiver report that the veteran required a visit to the emergency department or hospital because of low blood glucose?

Based on the results of these questions, the provider decides whether to de-intensify therapy and registers this decision by checking one of two boxes indicating either “No change in glycemic management at this time” or “Relax glycemic treatment.” Additional guidelines for making this decision are available from the VA/Department of Defense Management of Diabetes Mellitus Clinical Practice Guideline (13). The link to this document was made available to providers in an informational email message sent out before implementation of the clinical reminder.

**Outcome Measures**

Two key measures were selected to quantify the impact of the QI initiative on process outcomes in post-hoc analyses. Systems engineers led the improvement team in identifying, collecting, and analyzing this information. The measures were:

- Number of potentially overtreated veterans whose treatment was de-intensified using the clinical reminder
- Number of veterans potentially overtreated at baseline and 6 and 18 months after implementation

For the first measure, the total number of unique veterans who were screened with the reminder from January 2014 through December 2014 was counted. The overall percentage of screened veterans whose glycemic therapy was de-intensified was calculated. For each group with a positive response to a question about hypoglycemia occurrence and severity in the clinical reminder, the percentage whose treatment was de-intensified was calculated.

For the second measure, baseline data about the number of potentially overtreated veterans was calculated as a monthly average based on data from July 2013 through September 2013. The reminder was implemented across all VANEHS sites in January 2014. Follow-up data on the number of potentially overtreated veterans was collected 6 months after implementation of the clinical reminder from July 2014 through September 2014, and 18 months after implementation from July 2015 through September 2015. The monthly average for each follow-up period was calculated. Before-and-after comparisons of baseline with each post-intervention period were performed using *t* tests.

We assessed secular trends in the frequency of potential overtreatment among veterans not targeted by the intervention by measuring the percentage of patients who met the same clinical criteria as the intervention cohort but were 65–74 years of age.

**Results**

From January 2014 through December 2014, 2,830 unique veterans were screened using the clinical reminder. The average A1C for all veterans screened was 6.4%. Overall, glycemic therapy was de-intensified for

| Name                  | Age (years) | A1C Result (%) | A1C Date | Diabetes Medication            | Sig    | Long Sig |
|-----------------------|-------------|----------------|----------|--------------------------------|--------|----------|
| VA Boston Healthcare System |             |                |          |                                |        |          |
| Dr. Smith             |             |                |          |                                |        |          |
| Mr. A                 | 76          | 5.0            | 1/7/15   | Glyburide 2.5-mg tablet 2.5 QD | Take one tablet by mouth every day for diabetes |
| Mr. B                 | 81          | 6.0            | 1/1/15   | Glipizide 5-mg tablet 2.5 BID | Take one-half tablet by mouth twice a day for diabetes |

*BID, twice daily; QD, daily; Sig, label instructions.*

| Name                  | Age (years) | A1C Result (%) | A1C Date | Diabetes Medication            | Sig    | Long Sig |
|-----------------------|-------------|----------------|----------|--------------------------------|--------|----------|
| VA Boston Healthcare System |             |                |          |                                |        |          |
| Dr. Smith             |             |                |          |                                |        |          |
| Mr. A                 | 76          | 5.0            | 1/7/15   | Glyburide 2.5-mg tablet 2.5 QD | Take one tablet by mouth every day for diabetes |
| Mr. B                 | 81          | 6.0            | 1/1/15   | Glipizide 5-mg tablet 2.5 BID | Take one-half tablet by mouth twice a day for diabetes |

Metformin HCl 500 mg tablet 500 QD Take one tablet by mouth every day for diabetes

Table 1. Hypoglycemia Risk Reduction Sample Report
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among veterans aged 65–74 years

In comparison, we evaluated the frequency of potential overtreatment. Six months after implementation, the number of older patients at high risk for hypoglycemia resulting from potential overtreatment, PCPs’ use of a computerized clinical reminder was associated with treatment de-intensification. De-intensification was more common among patients who reported more severe symptoms or effects from hypoglycemia in the screening questions. Over time, there was a significant reduction in the number of patients in the potentially overtreated cohort. This reduction persisted 18 months after implementation of the clinical reminder.

A large number of patients who were identified as potentially overtreated and screened using the clinical reminder had no subsequent action taken with regard to de-intensification of therapy. Most of the de-intensification that occurred was reactive (i.e., triggered in response to hypoglycemia symptoms). A recent report suggests that many PCPs overestimate the benefits of tight glucose control in older adults and have concerns about the impact of relaxing A1C goals on their practice performance measures (21). Indeed, many quality metrics continue to align performance with lower A1C levels without regard to patients’ age or comorbid conditions. Although the clinical reminder could be improved to encourage more careful scrutiny of patients without symptoms (i.e., proactive de-intensification) and possibly further reduce the size of the potentially overtreated cohort, the impact of a clinical reminder may be most effective if combined with provider education, national guidelines, and performance measures with the common goal of reducing potential overtreatment. In all cases, however, the reminder should serve as a cue to perform individual assessments in potentially high-risk patients rather than a directive to de-intensify treatment.

Potential overtreatment in diabetes may serve as an ideal example of a clinical problem well-suited to QI in the form of an EMR clinical reminder. Acceptability and uptake of clinical reminders are based in part on their perceived utility and usability (22). This reminder integrates multiple clinical characteristics to enable rapid identification of potentially overtreated patients. This renders the reminder useful for complex assessments. This also benefits PCPs who might not otherwise have time to individually evaluate patients for their level of risk. The clinical reminder was also designed to be readily usable and quick to complete. Taking action in response to the assessment findings (e.g., decreasing or stopping medica-

| Screening Question | Screened Patients Reporting “Yes” (n [%]) | Average A1C Before Screening (% ±SD) | Patients Reporting “Yes” for Whom Therapy was De-Intensified (n [%]) |
|---------------------|---------------------------------------------|-------------------------------------|------------------------------------------------------------------|
| Reported low blood glucose | 261 (9.2) | 6.49 ± 0.72 | 96 (37) |
| Reported blood glucose low enough that patient feared fainting or passing out | 78 (3) | 6.57 ± 0.82 | 40 (51) |
| Reported fainting or passing out because of low blood glucose | 12 (0.4) | 6.59 ± 1.04 | 10 (83) |
| Reported visiting the emergency department or hospital because of low blood glucose | 13 (0.5) | 6.65 ± 0.93 | 8 (62) |
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ments. Therefore, although the data or professional society position state-
effects of events such as new guidelines. We are unable to account for the ef-
screened with the clinical reminder. The ini-
en as a QI initiative, there was not
Because the project was undertak-
Limitations
The study has several limitations. Because the project was undertak-
Areas for Future Work
There are several opportunities for strengthening the clinical reminder. Although the inclusion criteria for potentially overtreated patients already comprise several clinical character-
sensitivity of the criteria might be enhanced by including CKD and patient information such as emergency visits and hospitaliza-
tions with coded hypoglycemia. For patients who use glucose monitors that are reported via home telehealth systems and saved in the EMR, data could be scanned for low readings and used to identify high-risk patients. Additional clinical decision-support tools could be provided by linking to diabetes clinical practice guidelines or embedding the guidelines into the clinical reminder itself.

Nearly two-thirds of veterans reporting hypoglycemia did not have their treatment de-intensified. Providers may not de-intensify because of a determination that a specific individual is on appropriate therapy or because of clinical inertia. Future work could examine the specific reasons that providers decide against de-intensifying treatment in potentially overtreated patients. This could be explored through the addition of a question within the reminder or through qualitative work with providers that would elicit additional detail about their decision-making process.

Future studies also could explore the impact of the intervention on rates of hypoglycemia. Such a study would require validated methods for ascertaining hypoglycemia because reliance on ICD (International Classification of Diseases) codes alone is unlikely to be sufficiently sensitive.

Summary
This QI initiative employed the strength of the EMR to identify pa-
tients potentially overtreated and at high risk for hypoglycemia based on several clinical parameters and showed that prompting clinicians to ask simple questions generated a number of treatment changes. These findings suggest that a clinical reminder may be an effective means of reducing the number of patients at high risk of hypoglycemia because of overtreatment.

Disclaimer
The views expressed in this article are those of the authors and do not neces-
sarily reflect the position or policy of the Department of Veterans Affairs or the United States government.

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Duality of Interest
No potential conflicts of interest relevant to this article were reported.

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