Background: Patients recall or comprehend as little as half of what physicians convey during an outpatient encounter. To enhance recall, comprehension, and adherence, it is recommended that physicians elicit patients' comprehension of new concepts and tailor subsequent information, particularly for patients with low functional health literacy. It is not known how frequently physicians apply this interactive educational strategy, or whether it is associated with improved health outcomes.

Methods: We used direct observation to measure the extent to which primary care physicians working in a public hospital assess patient recall and comprehension of new concepts during outpatient encounters, using audiotapes of visits between 38 physicians and 74 English-speaking patients with diabetes mellitus and low functional health literacy. We then examined whether there was an association between physicians' application of this interactive communication strategy and patients' glycemic control using information from clinical and administrative databases.

Results: Physicians assessed recall and comprehension of any new concept in 12 (20%) of 61 visits and for 15 (12%) of 124 new concepts. Patients whose physicians assessed recall or comprehension were more likely to have hemoglobin A1c levels below the mean (≤8.6%) vs patients whose physicians did not (odds ratio, 8.96; 95% confidence interval, 1.1-74.9) (P=.02). After multivariate logistic regression, the 2 variables independently associated with good glycemic control were higher health literacy levels (odds ratio, 3.97; 95% confidence interval, 1.09-14.47) (P=.04) and physicians' application of the interactive communication strategy (odds ratio, 15.15; 95% confidence interval, 2.07-110.78) (P<.01).

Conclusions: Primary care physicians caring for patients with diabetes mellitus and low functional health literacy rarely assessed patient recall or comprehension of new concepts. Overlooking this step in communication reflects a missed opportunity that may have important clinical implications.

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Educatin the patient represents one of the 3 main functions of the medical encounter. Numerous studies have demonstrated that patients recall and comprehend as little as 50% of what they are told by their physicians. An important strategy for improving the effectiveness of physician communication is to ask the patient to restate information or instructions to ensure that they were understood and remembered or to assess patients' perceptions about key information and/or changes in management that were discussed. This technique, which we term the interactive communication loop (Figure 1), can address these gaps in understanding and improve patient recall and comprehension of important clinical information.
greater difficulties naming their medications and describing their indications, more frequently hold health beliefs that may interfere with adherence. They also may have difficulties processing oral communication.

Low FHL is common in public hospital settings and among Medicare-insured populations, and is independently associated with poor understanding of disease, worse health status, and higher use of services.

Ensuring recall and comprehension may be especially important for patients with low FHL and chronic health conditions such as diabetes mellitus, because these patients typically must cope with complex treatment regimens, manage visits to multiple clinicians, monitor themselves for changes in health status, and initiate positive health behaviors. We used direct observation techniques to study the communication patterns of primary care physicians and their patients with type 2 diabetes mellitus and low FHL. We measured the extent to which these physicians assess patients’ recall and comprehension of information and advice conveyed during outpatient medical encounters. We then examined whether use of the interactive communication loop was associated with better glycemic control.

**METHODS**

The study took place in 2 primary care clinics (a family practice and a general internal medicine clinic) at San Francisco General Hospital, the public hospital of the city and county of San Francisco. The clinics serve ethnically diverse and low-income patients. More than 90% of patients with type 2 diabetes mellitus at San Francisco General Hospital are cared for in a continuity fashion by University of California, San Francisco, faculty and resident primary care physicians.

The study was nested in a larger study whose aim is to examine the relationship between FHL and diabetes mellitus outcomes. Potential subjects were identified by querying the hospital system’s computerized clinical and administrative database. Patients were eligible if they had type 2 diabetes mellitus ([ICD-9](https://www.cdc.gov/nchs/icd/icd9.htm)) and spoke English or Spanish fluently. Participants had to have a primary care physician in one of the clinics for at least 12 months and had to have visited this physician within the prior 6 months. To further ensure that patients had an established relationship with their physicians and that their physicians’ communication behaviors would have had time to affect health outcomes, only patients of physicians who were senior residents or attending faculty were included. We excluded patients with any documented diagnosis of end-stage renal disease, psychotic disorder, dementia, or blindness (conditions that may interfere with accurate FHL measurement). We also provided primary care physicians with their list of eligible patients generated from the database and asked them to indicate patients meeting criteria for exclusion for an upcoming study of diabetes mellitus care at San Francisco General Hospital.

Between May 22, 2000, and December 19, 2000, all eligible patients were approached by research assistants in the waiting rooms before their clinic appointments and asked to participate in a study of diabetes mellitus care and for permission to audiotape an upcoming medical encounter. Patients were assured that the decision to participate would not affect their care and that the audiotaping could be stopped at any time during the encounter. Patients were offered $5 for their participation. Written and/or verbal consent to participate was obtained from patients before enrollment and from physicians before the study. The protocol was approved by the Human Subjects Committee of the University of California, San Francisco.

Patients who agreed to participate first had their visual acuity tested using a pocket vision screener (Rosenbaum, Granham-Field Surgical Co Inc, New York, NY); patients with a corrected visual acuity of 20/50 or worse were excluded. Patients were then administered a brief questionnaire to obtain demographic information and an abbreviated version of the Test of Functional Health Literacy in Adults, short form ([s-TOFHLA](https://www.ahrq.gov/research/findings/nhqrdr/30651.pdf)) (14-point font), a reliable and validated instrument used to assess a patient’s FHL level. The s-TOFHLA is a 36-item timed reading comprehension test that uses the modified cloze procedure; every fifth to seventh word in a passage is omitted, and 4 multiple choice options are provided. It contains 2 health care passages, the first selected from instructions for preparation for an upper gastrointestinal tract radiograph series ([Gunning-Fog Index readability grade, 4.3](https://www.ahrq.gov/research/findings/nhqrdr/30651.pdf)) and the second from the patient’s “Rights and Responsibilities” section of a Medicaid application ([Gunning-Fog Index readability grade, 10.4](https://www.ahrq.gov/research/findings/nhqrdr/30651.pdf)).

By using established convention, we considered patients to have low FHL if their s-TOFHLA score was between 0 and 22 on a scale of 0 to 36. Only English-speaking patients with low FHL (s-TOFHLA score <23) were eligible for audiotaping. We then audiotaped an outpatient encounter between the patients and their physicians. Most audiotaped encounters (50 [68%] of 74) occurred immediately after the patient’s enrollment, and the remainder took place during the next scheduled visit with the physician.

**CODING AND ANALYSIS**

Consistent with prior research, we chose a coding system designed to identify particular physician speech-related behaviors. Each audiotaped encounter was coded to identify new concepts conveyed by the physician and follow-up assessments used by the physician to assess recall and comprehension of the new concept. The duration of each encounter was also recorded.

A physician’s statement was coded as a new concept if it related to a new piece of health information or advice for the
patient or a significant change in management regarding the patient's medical condition. According to our protocol (coding manual available on request), new concepts were treated as critical events, such that we grouped statements into as few overarching concepts as possible. For example, the following physician statement contained a new health message and was coded as a separate new concept.

Physician: "It's important for you to understand that high blood pressure, especially when it is combined with your diabetes, can really damage your kidneys."

The following physician statements communicated a change in medical management or medical advice, and each was coded as a separate new concept.

Physician: "I'm going to increase your metformin to 3 times a day."

Physician: "I really think you should cut down on high-cholesterol foods."

Because of the importance of recall and comprehension on subsequent medication adherence, we classified new concepts as medication-related changes in management or non-medications-related. A physician's statement was coded as a follow-up assessment if it made reference to a new concept and met one of the following criteria: (1) it assessed the patient's recall and understanding by explicitly asking the patient to restate the new concept or (2) it elicited the patient's perceptions regarding the new concept. As with new concepts, follow-up assessments were treated as critical events; multiple queries that referred to a single new concept were counted as one follow-up assessment. The following discussion illustrates an attempt to assess patient recall and comprehension of a new concept (a change in management).

Physician: "So . . . let's make sure. What medications are we going to change?"

Patient: "I think we're going to stop this one (is it metformin?) . . . and I'm going to take glipizide twice a day. . . . I think that's the green one."

In the following example, after discussing hyperglycemia, the physician performed a follow-up assessment of this new concept by assessing the patient's perceptions regarding hyperglycemia.

Physician: "Do you know the symptoms of high blood sugar? Tell me."

Patient: "Dizzy, I think . . . I'm not sure."

Two research assistants (C.W. and C.C.) coded the audiotapes. One (C.W.) coded all of the audiotapes in their entirety, then double coded a 15% sample so that we could assess intrarater reliability; the second research assistant (C.C.) coded an additional 15% of the sample to assess intercoder reliability. Differences in coding were reconciled at regular investigator meetings. The research assistants were unaware of patients' hemoglobin A1c (HbA1c) values at coding. To calculate reliability, we used the k statistic. The intrarater reliability was 0.72 for identifying new concepts and 0.85 for identifying follow-up assessments. The intercoder reliability was 0.82 for new concepts and 0.63 for follow-up assessments.

To measure the extent to which physicians applied the interactive communication strategy, we calculated the percent of statements as medication-related changes in management or non-medications-related. Eight hundred fifty-eight patients were identified by the San Francisco General Hospital clinical database as potentially eligible for the larger cross-sectional study. One hundred forty-two patients were subsequently deemed ineligible by their noted primary care physician. Of the 716 remaining eligible patients, 250 did not make a primary care visit during the enrollment period. All of the remaining 466 patients were approached at a clinic appointment. Of these patients, 36 refused to participate. Four hundred thirty patients were recruited; 22 patients were subsequently excluded because they were too ill to participate, were intoxicated, had poor visual acuity (20/50 or worse), or had no HbA1c value on record. Four hundred eight patients completed the s-TOFHLA and the questionnaire. Of these patients, 105 were eligible for audiotaping by virtue of being English-speaking and having low FHL. Thirty encounters could not be audiotaped because the patient refused to be taped at the visit, the patient's physician refused to be taped, or the visit was not with the primary care physician. We audiotaped 75 outpatient encounters, of which 1 had to be eliminated because the tape was not clearly audible. The remaining 74 audiotapes represented visits between 74 patients and 38 physicians. Physicians were paired with as few as 1 and as many as 5 study patients (mean, 1.9).

The median s-TOFHLA score of audiotaped patients was 12, which roughly corresponds to a grade 4 to 6 reading level. On average, patients were aged 64 years, 36 (49%) were men, 63 (85%) were nonwhite, and 27 (36%) used insulin; the median time with diabetes mellitus was 8 years. The mean HbA1c value was 8.6%, and the median HbA1c value was 8.3%. Of the 74 patients, 28 (38%) received their primary care from a faculty-level physician, 40 (54%) from a female physician, and 58 (78%) from a general internist.

During audiotaped visits, physicians conveyed a total of 124 new concepts, with at least 1 new concept conveyed in 61 (82%) of 74 visits. Among these 61 visits,
physicians conveyed a mean of 2 new concepts, more than half of which (56%) involved a medication change, such as the introduction of a new medication, the discontinuation of an established medication, or a change in the dosage or frequency of a medication.

Physicians assessed recall or comprehension at least once in 12 (20%) of the 61 visits that included a new concept. These follow-up assessments were distributed among 10 physicians and 12 patients. The mean number of follow-up assessments was 0.25 (range, 0-2). The visit duration did not significantly differ between visits that included at least one follow-up assessment and visits that did not include a follow-up assessment (20.3 vs 22.1 minutes; P=.50).

Physicians assessed patient recall or comprehension for 15. Of these 15 concepts, patients failed to recall or comprehend 7 (47%). Physicians provided further explanations for each of these 7 concepts, but did not reassess to ensure a common understanding for any of these 7 tailored explanations. For only 8 (6%) of the 124 new concepts could the physician be assured that the patient recalled or comprehended the information and advice conveyed during the medical encounter.

Eleven (92%) of 12 patients whose physicians assessed their recall or comprehension at least once had a HbA1c value of 8.6% or less compared with 27 (55%) of 49 patients whose physicians did not assess recall or comprehension (odds ratio, 8.96; 95% confidence interval, 1.1-74.9; P=.02). None of the other patient or physician variables was significantly associated with glycemic control in bivariate analyses (P<.05) (Table). After multivariate logistic regression, accounting for the clustering of patients within physicians (Table), the 2 variables independently associated with good glycemic control were s-TOFHLA score greater than 12 (odds ratio, 3.97; 95% confidence interval, 1.09-14.47; P=.04) and physicians’ application of the interactive communication strategy (odds ratio, 15.15; 95% confidence interval, 2.07-110.78; P<.01). Use of the median HbA1c value of the sample as the cut point (8.3%) did not appreciably alter these results. We found no interaction between patients’ FHL level and physicians’ application of the interactive communication strategy in the prediction of patients’ glycemic control.

The elapsed time between HbA1c determination and audiotaped visit was no different between patients whose physicians assessed recall and comprehension and patients whose physicians did not (122 vs 123 days; P=.90). Moreover, the interval between patients’ HbA1c determination and their audiotaped visit was unrelated to the HbA1c value.

In an attempt to examine whether improved glycemic control was attributable to the application of the in-

Figure 2. Flow of study participants. FHL indicates functional health literacy; HbA1c, hemoglobin A1c.

Figure 3. Failure to close the interactive educational loop in physician-patient communication. Among the 124 new concepts that were conveyed, physicians assessed recall or comprehension for 15. Of these 15 concepts, patients failed to recall or comprehend 7 (47%). Physicians provided further explanations for each of these 7 concepts, but did not reassess to ensure a common understanding for any of these 7 tailored explanations. For only 8 (6%) of the 124 new concepts could the physician be assured that the patient recalled or comprehended the information and advice conveyed during the medical encounter.

Eight (6%) of the 124 new concepts could the physician be assured that the patient recalled or comprehended the information and advice conveyed during the medical encounter.

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In an attempt to examine whether improved glycemic control was attributable to the application of the in-

Figure 2. Flow of study participants. FHL indicates functional health literacy; HbA1c, hemoglobin A1c.
iterative strategy or to a more participatory or patient-centered communication style in general, we repeated our analysis using the physician as the unit of analysis, categorizing physicians into those who ever assessed recall and comprehension (n=10) vs those who never did (n=26). (Two physicians did not convey new concepts, and thus are not included.) The adjusted odds of having good glycemic control among patients of physicians who ever used interactive communication vs those who never did was 2.7 (95% confidence interval, 0.92-7.66) (P=.07).

**COMMENT**

Our study attempts to measure the extent to which physicians assess patients' recall and understanding of information conveyed during an outpatient encounter, and examines the association of this communication strategy with patient outcomes. Primary care physicians caring for patients with low FHL and diabetes mellitus assessed patients' recall and comprehension in only 1 of 5 visits and for fewer than 1 of 8 new concepts. In addition, the rare physician who did assess the patient's comprehension never completely closed the loop for patients who demonstrated lack of understanding, by failing to reassess recall and comprehension of the tailored explanation to ensure a common understanding (Figure 3).

Most new concepts conveyed during the encounters involved a change in the patient's medication regimen. Despite the importance of medication adherence in diabetes mellitus care, physicians in our study ensured comprehension of medication changes only 13% of the time.

**Patient and Physician Variables, Stratified by Glycemic Control and Odds of Good Glycemic Control**

<table>
<thead>
<tr>
<th>Patient Variables</th>
<th>≤8.6 (n = 38)</th>
<th>&gt;8.6 (n = 23)</th>
<th>Unadjusted</th>
<th>Adjusted†</th>
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<tbody>
<tr>
<td>Age, y</td>
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<tr>
<td>≥65</td>
<td>23</td>
<td>11</td>
<td>0.60 (0.21-1.70)</td>
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<td>&lt;65</td>
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<tr>
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<td></td>
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<tr>
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<td>11</td>
<td>0.57 (0.20-1.63)</td>
<td>.29 ‡</td>
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<tr>
<td>Non-African American</td>
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<td></td>
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<td>Use of insulin</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>14</td>
<td>10</td>
<td>0.76 (0.26-2.18)</td>
<td>.61 ‡</td>
</tr>
<tr>
<td>No</td>
<td>24</td>
<td>13</td>
<td></td>
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<tr>
<td>Time with diabetes, y</td>
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<td>15</td>
<td>0.39 (0.13-1.13)</td>
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<tr>
<td>&lt;8</td>
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<tr>
<td>13-22</td>
<td>20</td>
<td>8</td>
<td>2.08 (0.72-6.06)</td>
<td>.18</td>
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<td>0-12</td>
<td>18</td>
<td>15</td>
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<table>
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<th>Physician Variables</th>
<th>≤8.6 (n = 38)</th>
<th>&gt;8.6 (n = 23)</th>
<th>Unadjusted</th>
<th>Adjusted†</th>
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<tr>
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<td>0.53 (0.18-1.55)</td>
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<td>8</td>
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<td>1.24 (0.42-3.61)</td>
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<td>1.88 (0.43-8.20)</td>
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<td>Family medicine</td>
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<tr>
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</tr>
<tr>
<td>≥1</td>
<td>25</td>
<td>14</td>
<td>1.24 (0.42-3.61)</td>
<td>.70 ‡</td>
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<tr>
<td>1</td>
<td>13</td>
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<tr>
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<td>8.96 (1.07-74.90)</td>
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<tr>
<td>No</td>
<td>27</td>
<td>22</td>
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</table>

Abbreviations: CI, confidence interval; HbA1c, hemoglobin A1c; OR, odds ratio; and s-TOFHLA, Test of Functional Health Literacy in Adults, short form.

*Good glycemic control is defined as an HbA1c value of 8.6% or less. The ORs for predictor variables were derived by comparing the odds of having good glycemic control within each category.

†Adjusted for patient sex, time with diabetes (in years), s-TOFHLA score, physician sex, and assessment of recall and comprehension, and accounting for the clustering of patients within physicians using generalized estimating equations.

‡These variables were not included in the final multivariate model, because P>.25 in univariate analysis and inclusion of individual variables did not alter multivariate relationships.
We found that the physician’s assessment of recall and comprehension was associated with improved glycemic control among patients with diabetes mellitus and low FHL. While patients with the lowest FHL levels were more likely to have poor glycemic control, interactive communication was associated with good glycemic control regardless of the severity of the FHL problem.

Despite major advances in diabetes mellitus treatment, outcomes vary significantly across racial, ethnic, and sociodemographic lines. The prevalence of low FHL, especially among elderly persons, ethnic minorities, and the socioeconomically disadvantaged, coupled with the disproportionate burden that type 2 diabetes mellitus places on such individuals, suggests that problems with health communication may contribute to disparities. The infrequency and inconsistency of the application of the interactive educational strategy in our study represent a missed opportunity to improve physician-patient communication in the care of patients with communication barriers. Poor recall and comprehension are likely to be common among patients with low FHL. Low FHL seems to be a marker for an array of communication and information processing problems that extend beyond reading ability. The consequences of poor recall and comprehension may be particularly detrimental for patients with low FHL, because they may not have the resources or skills to compensate for lapses in communication.

Our finding that interactive communication was associated with improved glycemic control is consistent with prior research in physician-patient communication. Patients whose physicians asked them to restate the main concepts at the end of the encounter were more likely to retain the information than patients who received usual care. A randomized controlled trial of patient-directed communication skills training that included the promotion of information-verifying behavior by patients demonstrated that trained patients were more likely to be adherent with medications, behavioral treatments, and follow-up appointments than untrained patients. Increased information giving on the part of the physician and increased involvement on the part of the patient are associated with improved functional and physiologic status among diabetic patients. These studies and others provide insights into the potential benefits of targeting interventions to patients and physicians for improving retention and integration of key concepts in the clinical encounter. Such strategies may be particularly beneficial for populations with low FHL and chronic diseases, because health outcomes for these patients may be particularly sensitive to improvements in communication.

There may be several reasons why physicians underused the interactive educational strategy. Most physicians have not received training about how to maximize teaching efforts and tend to underestimate patients’ information needs and overestimate their own effectiveness in conveying information. Physicians may also avoid explicitly assessing patients’ recall and comprehension for fear of opening a Pandora’s box and of needing to spend more time with the patient. However, we found that encounters that included an assessment of patients’ recall or comprehension were not longer than those that did not.

Our study has several limitations. First, the design of our study calls for caution in making causal inferences. Because we used patients’ most recent HbA1c level as an indicator of their glycemic control rather than a test value obtained after the observed visit, we cannot rule out the possibility that physicians’ communication was affected by their patients’ most recent HbA1c results. While studies have demonstrated that physicians’ communication style is sensitive to the health status of their patients, physicians caring for healthier patients tend to engage in more social talk, whereas physicians caring for sicker patients engage in more questioning, information giving, facilitation, and partnership building. As such, it is unlikely that the application of the interactive communication strategy that we observed was simply an artifact of patients’ improved glycemic control.

Second, we cannot exclude the possibility that unmeasured patient-related determinants of glycemic control, such as depression or social support, or physician-associated variables, such as affect, could have confounded our results. The timing of the HbA1c determination relative to the index visit also raises concerns about the confounding influence of time on HbA1c value. However, we found no relationship between the interval of HbA1c determination to index visit and the HbA1c value.

Third, because of the few physicians and patients in our sample, and the infrequency and inconsistency with which physicians assessed recall and comprehension, we were unable to ascertain whether improved glycemic control was directly attributable to the application of the interactive strategy or to a more participatory or patient-centered communication style in general. When we repeated our analysis using the physician as the unit of analysis, the strength of the association between interactive communication and glycemic control was attenuated, and of marginal statistical significance. While these results could be interpreted as confirming our findings that interactive communication, in specific, is associated with improved glycemic control, they also suggest that there still may be unmeasured physician characteristics for which interactive communication is simply a marker or that interactive communication is but one element of a more participatory style. Larger prospective studies would be needed to definitively answer this question.

Fourth, while our study demonstrated an association between interactive communication and glycemic control, the small sample size limited our ability to accurately quantify the strength of this association. Finally, because we chose to study English-speaking patients with low FHL cared for at a public hospital’s clinics, our findings may not be generalizable to patients who have adequate FHL, do not speak English, or receive their care in different settings.

In conclusion, we found that primary care physicians caring for ethnically diverse patients with type 2 diabetes mellitus and low FHL in a public hospital rarely assessed patient recall or comprehension of new con-
cepts conveyed during an outpatient encounter. Application of this technique can improve communication by providing an opportunity for patients to acknowledge gaps in understanding; by eliciting patients’ feedback, perceptions, and questions; and by enabling education tailored to the unique needs of the patient.7,12,53 Patients whose physicians used this interactive communication strategy were more likely to have had better glycemic control regardless of the severity of their FHL limitations. Overlooking this critical step in the communication process reflects a missed opportunity to enhance patient care, particularly for this vulnerable population. Future studies should evaluate whether more consistent application of this communication technique improves patient recall, adherence, and health outcomes and, if so, how more clinicians can incorporate it into their communication with patients.

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From the Primary Care Research Center (Drs Schillinger, Grumbach, and Bindman, Miss Wang, Daher, and Leong-Grotz, and Messrs Wilson and Castro), the Department of Medicine (Drs Schillinger and Bindman), and the Department of Family and Community Medicine (Dr Grumbach), University of California, San Francisco; San Francisco General Hospital, San Francisco, Calif (Drs Schillinger, Grumbach, and Bindman, Miss Wang, Daher, and Leong-Grotz, and Messrs Wilson and Castro); VA Palo Alto Health Care System, Palo Alto, Calif (Dr Piette); and Department of Health Research and Social Policy, Stanford University School of Medicine, Stanford, Calif (Dr Piette). Dr Piette is now with the Center for Practice Transformation and Outcomes Research, VA Ann Arbor Healthcare System, and the University of Michigan Medical School, Ann Arbor.

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