Abstract—Guideline committees recommend targets of treatment based on trial data on efficacy and effectiveness. Quality-assurance initiatives apply these parameters in the general practice setting. Therefore, targets must be feasible and achievable by the practicing physicians who are judged by these targets as goals for care. We evaluated 437 patients in the Rush University Hypertension Clinic using the Health Employer Data Information Set (HEDIS) measures for 2000 to assess goal achievement in a practice-based setting. We compared guideline achievement of uncomplicated hypertensive and diabetic subjects to standards dictated by HEDIS, the 6th Joint National Committee on the Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VI), and the American Diabetic Association (ADA)/National Kidney Foundation (NKF). Overall, 276 (63%) patients achieved SBP goal, with 376 (86%) achieving DBP goal and 358 (59%) achieving both goals. However, in the 20% of patients who were diabetic, only 52% had a BP of <140 mm Hg and <90 mm Hg, whereas only 22% achieved the more stringent goals of JNC VI of <130 mm Hg systolic and <85 mm Hg diastolic and only 15% achieved the ADA/NKF goals of <130 mm Hg systolic and <80 mm Hg diastolic. Although goal was achievable in most uncomplicated hypertension, hypertension in diabetics was more difficult to control, despite being more likely to receive enhanced benefit from effective management. Goal-oriented strategy, especially in diabetic subjects, should be aggressively sought rather than relaxing goals to promote achievement. (Hypertension. 2004;43:198-202.)

Key Words: hypertension ■ diabetes mellitus ■ clinical trials ■ blood pressure

The 6th Joint National Committee on the Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VI) specified targets for goal blood pressure (BP) to be <140 mm Hg systolic and <90 mm Hg diastolic.1 In patients with certain cardiovascular sequelae (heart failure, for example) and patients with diabetes or those with decreased renal function with 1 g or more of proteinuria, targets were lower (<130 mm Hg systolic and <85 mm Hg diastolic and <125 mm Hg systolic and <75 mm Hg diastolic, respectively). It was very disappointing that only 27.4% of hypertensive patients achieved these goals. For patients with diabetes or decreased renal function, control is substantially worse and estimated to be an abysmal 11%2 and 3% to 5%,3 respectively. Control rates are surely lower for diabetics if the more stringent American Diabetic Association (ADA) and National Kidney Foundation (NKF) goals of <130 mm Hg systolic and <80 mm Hg diastolic are used.1,4,5

In response to the falling rates of BP control in the United States from 1988 to 1991 and 1991 to 1994,6 the National Committee for Quality Assurance (NCQA), which sets standards by which managed care organizations (MCOs) are compared, added hypertension control to the quality-assessment parameters of the Health Employer Data Information Set (HEDIS) for 2000. HEDIS 2000 used BP control targets specified by JNC VI for uncomplicated hypertensives but did not specify the more stringent measures for complicated hypertensives, (ie, those with diabetes, cardiovascular sequelae, or renal disease). The newest HEDIS measures have eased the criteria further from <140 mm Hg systolic BP and <90 mm Hg diastolic BP to <140 mm Hg systolic BP and <90 mm Hg diastolic BP.

Although somewhat better control rates were found under HEDIS 2000 than in NHANES 3, the majority of hypertensive subjects are not at goal. While the Hypertension Optimal Treatment (HOT) study did not prove that treating to a more aggressive goal was necessarily beneficial, it failed to support the widespread concern that overaggressive antihypertensive therapy was dangerous (the “J”-curve phenomenon). In the subset with diabetes, more aggressive treatment reduced cardiovascular endpoints.7 That trial and the United Kingdom Prospective Diabetes Study (UKPDS) demonstrated that the JNC VI recommendation to be more aggressive in diabetic hypertensive subjects was wise.8 Two more recent, large, multi-center clinical trials, Controlled Onset Verapamil Investigation of Cardiovascular Events (CONVINCE) and the Antihypertensive Lipid Lowering Trial to Prevent Heart Attack (ALLHAT), have documented that it is possible to reduce diastolic BP to
<90 mm Hg in more than 90% of subjects, although getting systolic BP to <140 mm Hg was only achieved in approximately 65%.9,10

Because these trials have established that goal BP targets can be reached in a wide variety of hypertensives, we chose to investigate whether we could match these results in an outpatient hypertension specialist clinic. Our data convincingly demonstrate that we achieved similar rates by adapting the goal-oriented treatment paradigm used successfully in clinical trials in uncomplicated hypertensive patients.11 However, in this study we chose to examine the feasibility of adhering to different guidelines in the treatment of hypertension. Specifically, we examined our diabetic hypertensive subjects, a group that is not only at higher cardiovascular risk but also has more difficult-to-control hypertension. Although guideline recommendations for uncomplicated hypertensives were feasible and achievable, we still did not achieve acceptable levels of control in diabetic hypertensive subjects.

### Methods

The design and methods of this analysis are reported in detail elsewhere.1 Briefly, 542 consecutive patients seen at the Rush University Hypertension Service from August 1998 to February 2000 were evaluated for control using the Health Employer Data Information Set 2000 criteria.12 (Table 1) Only 105 (20%) of the 542 consecutive patients seen at the Rush-Presbyterian St. Luke’s Medical Center.

BP goals vary depending on guideline committees and specific comorbidity (Table 2) For a patient’s BP to be considered at goal, systolic BP and diastolic BP must be below these targets at the visit used for analysis. The lowest BP reading was obtained from a sitting BP if available; but if not, the supine value or, lastly, the standing BP, if there were no other values recorded, was used. BP readings were recorded from the initial visit and the first visit after at least 1 year of enrollment in the clinic within the study period, using the lowest BP measurement as described. Measurements were obtained by a physician, nurse, or medical assistant who had been certified as capable of measuring BP accurately using a mercury sphygmomanometer (taking the first and fifth Korotkoff sound as systolic BP and diastolic BP values, respectively). All patients were seen in this specialty clinic by the attending physician at each visit.

Most of the patients were referred by physicians because of difficult-to-manage hypertension. Each of our physicians was well versed and committed to the goals of hypertension treatment promulgated by JNC VI and the goal-oriented approach used in clinical trials. However, no specific drug algorithm was mandated, and only commercially available antihypertensive medications were used.

### Results

We analyzed charts of 437 consecutive patients (age 61±13 years [SD]), of whom 216 (49%) were men, 57% white, 38% black, and 5% of other ethnic backgrounds (Table 3). Goal BP of <140 mm Hg SBP and <90 mm Hg DBP was found in 28% of patients at the initial visit to the clinic (mean: 152±24/90±12 mm Hg). After at least 1 year of treatment, 259 (59%) patients were at HEDIS 2000 goals (mean: 137±15/79±9 mm Hg), with an additional 27% having a diastolic BP <90 mm Hg. Neither goal was reached in only 44 (10%) patients.

Using the modified HEDIS measures for 2001, which specify a target goal of ≤140 mm Hg systolic BP and ≤90 mm Hg diastolic BP, goal was achieved in 288 (66%) of patients. An additional 103 (23%) were at only diastolic BP goal at the visit used for analysis but had systolic BP >140 mm Hg. In 34 (8%) patients, neither BP goal was reached (Figure 1).

Of the 20% of our patients who were diabetic (n=87), BP goal was reached in 52% using the HEDIS 2000 target. (Table 4) Although 7% and 11% of diabetic patients presented at ADA/NKF and JNC VI goals at the initial visit, respectively, only 15% and 22% reached the more stringent targets at the visit used for analysis (Figure 2).

### Discussion

Guideline committees who offer advice for the appropriate management of hypertension must thoughtfully compile all available data and craft them into appropriate recommendations for care that yield the maximum benefit for patients.
One of the most important tasks facing such committees is to set goals for treatment. These targets should be evidence-based when possible, but they must also be feasible and achievable by the practicing physicians who are being asked to use these targets as goals for care. Those who are charged with evaluating provider performance and establishing benchmarks for quality need to know that such goals are reasonable. If too few patients are at goal, then the goal is too stringent or some alteration in practice patterns is needed.

Our data show that in a clinic staffed by hypertension specialists, the HEDIS goals are appropriate when applied to non-diabetic patients, but extremely difficult to achieve in diabetic hypertensive patients. We chose to model this study after the HEDIS 2000 measures for hypertension, because they have already been used to provide the benchmarks to evaluate quality of care, including hypertension, in Managed Care Organizations (MCOs). A pilot study by Alexander et al, analyzing 4 MCOs (n=1169 patients) validated the HEDIS data collection and assessment methods. Alexander et al used the last BP rather than average BP for simplicity of data collection, because their analysis found that similar control rates during a measurement year can be obtained by assessing the average of BPs, those with 50% of visits controlled, or the last-visit BP. HEDIS 2000 followed this recommendation. Their data, as ours, were obtained by chart review. Once BP is available on electronic records, as laboratory data and pharmacy data often already are, quality-assurance initiatives such as this will be much more easily obtainable.

HEDIS chose to use a dichotomous approach in determining goal (at or not at goal) rather than give “partial credit” for reducing BP, although such a strategy was considered. A goal is the “object to which effort or ambition is directed.” If the goal were too difficult to achieve by the usual providers of care using commercially available drugs, the standard perhaps would be set too high. It was neither the expectation of the HEDIS Hypertension Advisory Committee nor JNC VI that goal BP would be reached in all or even most of treated hypertensive patients. Had such been the case, the goal would have been too easy to reach. The goal of <140 mm Hg and <90 mm Hg was the best estimate of a safe and achievable level at which treatment should be directed. Indeed, the HOT study later suggested that the “optimal” treatment target was approximately 138/83 mm Hg. In diabetic patients, both HOT and UKPDS suggested that even lower targets than seen in HOT yield better outcomes, especially in older individuals. This evidence was not available when JNC VI made the recommendation to more aggressively treat high BP in high-risk patients. However, this was adopted by JNC 7, with now-similar goal criteria to what is recommended by ADA/NKF of <130/80 for diabetic hypertensive patients.

Management of hypertension in this specialty clinic yielded 63% of patients with systolic BP at goal, diastolic BP at goal in 86%, and both at goal in 59%, far surpassing national survey data and the 39% goal success rate found in 257 MCOs and approximately 10 000 hypertensive patients evaluated by HEDIS 2000. Additionally, our results approached the “60/90” rule of 60% systolic BP control and 90% diastolic BP control seen in clinical trials using a similar

**TABLE 4. Comparison of HEDIS 2000 Hypertension Goal Achievement After One Year of Treatment in Diabetics and Non-Diabetics from Presentation to Analysis**

<table>
<thead>
<tr>
<th>Diabetes</th>
<th>N</th>
<th>Baseline SBP &lt;140 mm Hg (%)</th>
<th>Baseline DBP &lt;90 mm Hg (%)</th>
<th>Baseline SBP &lt;140 mm Hg and DBP &lt;90 mm Hg (%)</th>
<th>Analyzed Visit SBP &lt;140 mm Hg (%)</th>
<th>Analyzed Visit DBP &lt;90 mm Hg (%)</th>
<th>Analyzed Visit SBP &lt;140 mm Hg and DBP &lt;90 mm Hg (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>87</td>
<td>23</td>
<td>52</td>
<td>21</td>
<td>55</td>
<td>73</td>
<td>52</td>
</tr>
<tr>
<td>No</td>
<td>350</td>
<td>37</td>
<td>51</td>
<td>30</td>
<td>63</td>
<td>87</td>
<td>59</td>
</tr>
</tbody>
</table>
goal-oriented management approach. These results show that BP control rates obtained in clinical trials could indeed be translated into our clinical practice for uncomplicated hypertensives; but despite this success, diabetic hypertensive patients remained a challenge.

We modeled this study after HEDIS 2000 criteria for hypertension, because these are now widely used, simple to implement, and have been extensively validated. We were interested in our clinic’s performance based on HEDIS criteria and in evaluating the feasibility of this quality-assurance initiative. Opponents of HEDIS 2000 measures for hypertension argued that the goals established are too difficult to achieve in general practice, lobbied effectively for the modification of HEDIS criteria to ≤140/90 mm Hg, and have reported improved BP control to 51%.\cite{17} Our analysis shows that the more stringent HEDIS 2000 recommended goals for BP management were achievable and appropriate. Additionally, when the less stringent guideline criteria is applied to the same sample, the control rate improved by 7%, compared with the 12.5% reported improvement of HEDIS 2001 that used ≤140/90 mm Hg.

The goals in HEDIS 2000 are the same as for all hypertensive patients but are more stringent for diabetic patients in JNC VI and the ADA/NKF guidelines. The performance of our clinic is reasonable using HEDIS 2000, but the 22% and 15% of diabetic patients at goal using JNC VI and ADA/NKF guidelines are dismal, although better than the 3% to 5% of diabetic subjectscontrolled to <130 mm Hg SBP and <85 mm Hg DBP in the NHANES III survey. We do not feel that the JNC VI and ADA/NKF guidelines should be replaced by the more lenient HEDIS goals, but rather that still greater attention must be paid to reaching target BPs in these patients with increased cardiovascular risk.

Recent publication of JNC 7 guidelines addresses this issue by not only maintaining a BP goal of ≤140/90 mm Hg for uncomplicated hypertensives but also aligning with the ADA/NKF recommendation of ≤130/80 mm Hg for patients with diabetes.\cite{18} HEDIS measures, however, still do not address BP as a co-morbidity with diabetes. Not only is the hypertension target of HEDIS 2001 (≤140/90 mm Hg) less stringent than even uncomplicated hypertensives in JNC 7, but also HEDIS does not include BP as a risk reduction goal in the Comprehensive Diabetes Care measure that includes cholesterol, HgA1c, eye care, and monitoring for nephropathy. In our clinic, which controls a greater percentage of hypertensive subjects than average, only one fifth of diabetic patients achieved BP control. However, quality-assurance initiatives should still recommend aggressive therapy and not ignore the increased risk of cardiovascular sequelae in diabetic hypertensive patients and the additional benefit accrued should the aggressive goals be reached.\cite{19} We feel that the more stringent goals articulated in JNC 7 and other guidelines should remain because the benefit of effective BP control in diabetic hypertensive subjects is so clear and needs to remain a high priority.

We feel that this method of assessment can be generalized to other clinical settings. Data entry was simple because we used non-specific, commercially available database software, although chart review was still necessary. Should BP levels be entered at each visit, this technique can be easily adapted for efficient quality assessment without significant software or personnel costs.

The strengths of this study included consecutive enrollment of patients, adaptation of a currently available methodology, adequate sample size, ascertainment of the status of 86% of our patients, and no previous knowledge of the audit that might have encouraged data collection bias.

Patients analyzed in this study were referred from primary care physicians for difficult-to-manage hypertension. Additionally our visits are focused on hypertension management and do not involve the multitude of issues managed by a primary care physician. Although these patients might not represent the hypertensive population seen in general practice, goal achievement of a greater proportion of patients may be possible if this strategy is applied to less complicated hypertensive subjects, also. Because hypertension, especially in the presence of diabetes, represents a significant contributor to morbidity and mortality, and because the benefits of
lowering BP are clear, using a goal-oriented approach to a predetermined target could simplify management strategy. Additionally, aggressive risk intervention has been modeled to be cost-effective, especially in classes of patients with an increased risk factor profile, with use of patient education and pharmacological therapy directed toward specific BP goals.20

**Perspectives**

The goals for hypertension management that have been suggested by guideline committees and quality-assurance organizations are reasonable and achievable for uncomplicated hypertensive patients. However, they remain a challenge for diabetic hypertensive patients. The establishment of these guidelines represents the compilation of contemporary experimental data, and adherence to these guidelines would reap enormous benefit should control rates be improved by this type of surveillance and by using goal-oriented management. Despite the difficulty we and others experience in achieving goal in those patients with co-morbidities, physicians should not waiver in their resolve to treat these patients aggressively, because these high-risk individuals are the most likely to receive enhanced benefit from effective management.

**References**

Guidelines for Hypertension: Are Quality-Assurance Measures on Target?
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