PRACTICE PROFILING IN A CONTINUITY CLINIC: RESIDENTS LEARN TO MAKE THE GRADE

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Primary care physicians currently in practice need a working knowledge of managed care principles and methods. Recognizing that new physicians will need to be familiar with managed care tasks to practice effectively, the Council on Graduate Medical Education has recommended that medical educators train residents in decision-making techniques such as practice guidelines, evidenced-based medicine, decision analysis, and cost-effective medical practice [1]. Similarly, the Accreditation Council for Graduate Medical Education now urges training of resident physicians in techniques and principles of managed care [2]. Despite these directives, few residents receive education on or exposure to important managed care principles and practices [3].

With a growing emphasis on cost containment and an increased availability of comprehensive health databases, the use of practice profiling has increased greatly in the past decade. As a result, most physicians can expect to be "practice profiled" some time during their careers. It is important for new physicians to understand how practice profiling typically works and to appreciate that, while profiles can provide important information to improve care, they also can have potentially adverse consequences for physicians.

At its best, practice profiling develops and relays objective and accurate information regarding physicians' practice habits in relation to a population of patients for whom they provide care [4]. This information may be used to compare a physician's practices with those of other physicians or physician groups, or against local or national benchmarks. For example, individual physicians or physician groups may be assessed for compliance with recommended preventive health interventions such as screening for breast, cervical, or colon cancer. More sophisticated profiling systems may permit physicians to receive feedback on the use of specific medications or treatment outcomes for illnesses such as asthma, diabetes, or congestive heart failure. The use of profiles may serve to standardize care, improve cost-efficiency, and modify physician behaviors [5–15]. A meta-analysis of 12 studies concluded that practice profiling does have a small but statistically significant impact on how physicians provide care [16].

Conversely, profiles may be used by managed care organizations (MCOs) to select or remove participating providers or to affect a physician's financial remuneration. Physicians deemed to be high resource utilizers may be removed from rolls of eligible providers, which could be devastating in an area where most of the patients are insured by a few large MCOs. High utilizers also may forfeit a portion of their reimbursement (commonly termed the "withhold") based on adverse profiling results.

The potential benefits and negative consequences of profiling depend in part on the accuracy and validity of the data on which the profile is based [17]. Unfortunately, some of the most useful data for profiling are difficult to obtain as gathering them may require data monitoring over an extended time period or time-consuming chart review. As a result, MCOs often rely on administrative data sets that may present a biased or incomplete portrait of physicians' actual practices. For example, physicians caring for a transient, largely healthy group of patients may appear to have better disease or cost outcomes than physicians caring for a stable group of older patients with a greater burden of chronic illness, even though both groups of physicians have similar practice styles.

To better prepare our residents for practice in managed care, we implemented a profiling program in the resident ambulatory practice at our institution, using hypertension profiling as a model. In this paper, we describe the process, benefits, and pitfalls of profiling in the resident training setting, and make recommendations for future profiling efforts.

Background

University Medical Associates (UMA) is the Department of Internal Medicine resident-faculty continuity

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clinic at the University of Virginia (UVA) Health System. UMA serves as the ambulatory training site for all 80 internal medicine house staff. Throughout their 3-year training program, residents spend 1 or 2 half days per week at the clinic providing care to a panel of patients. Receiving 28,000 annual visits, UMA is the busiest internal medicine practice at the university. The clinic serves 6722 patients, most of whom are medically indigent and have multiple chronic illnesses. Approximately 60% of the patients seen at the clinic are women, and 40% are nonwhite, mostly African-American. The average patient age is 52 years.

The UMA practice is organized into a "firm system." This system longitudinally links 1 of 9 core faculty attending physicians with groups of 5 residents and a nurse to provide care to a specific panel of patients. Residents and their firm attending co-manage patients, with both physicians seeing the patient each visit and the resident taking first-contact responsibility. Each firm strives to provide comprehensive preventive and therapeutic care to its panel of patients in a cost-effective manner.

In 1998 and 1999, institutional analysis of cost and utilization data revealed that the UMA patient population had higher costs, emergency department utilization rates, and admission rates compared with patients receiving care at other primary care practices within the UVA Health System. Additionally, through formal (survey) and informal feedback, residents indicated that they did not feel well prepared to practice in a managed care environment. They noted a relative deficiency of focus on cost-effectiveness of care at the clinic, indicating that some attendings had not emphasized cost-effectiveness of diagnostic or therapeutic approaches. To improve the quality and cost-effectiveness of medical care provided to patients and to improve the training of residents in managed care tasks, the UMA management group designed and implemented a practice profiling program at the continuity clinic. The management group was responsible for managing operations and quality of care at the clinic and was made up of the medical director (MN) and attending faculty, residents, nurses, and clerical staff.

In designing the program, we elected to focus on physician prescribing habits within the UMA practice. Our specific objectives were to 1) examine UMA medication use to select a diagnosis amenable to a practice profiling quality improvement process, 2) assess for differences in practices and outcomes for the target diagnosis among residents' patient panels, 3) highlight opportunities for improvement in quality and cost-effectiveness of care of the target diagnosis, 4) engage residents and staff in the process of improving quality and cost-effectiveness of care, and 5) educate residents about management techniques they are likely to encounter in practice.

Practice Profiling Project

Profiling Team

To reach the specific objectives of the project, the UMA management group chartered a pharmacy profiling team in November 1999. This multidisciplinary team consisted of an attending internist (JV), 2 medical residents (including JC), 3 pharmacists, and a registered nurse with a team facilitator provided by the UVA Health System. The team believed it was important for residents and faculty to have a major role in the design of the project because feedback is most effective when physicians feel they have influence over the process or outcome upon which they are being profiled [18].

Focus on Care of Hypertensive Patients

After several initial meetings to discuss goals and priorities of the project, the team decided to use profiling techniques to focus on management of hypertension. Hypertension is the most prevalent diagnosis at the clinic, with more than 2100 patients carrying this diagnosis. Hypertension was chosen for profiling because accepted guidelines for this disease exist and because some of its associated outcomes (eg, pharmaceutical costs, blood pressure control) can be measured objectively. As a framework for evaluation of resident prescribing practices, we adopted the recommendations of the most recent Joint National Committee report (JNC-VI) on hypertension management [19]. Based on objective outcomes data, the 1997 JNC-VI report recommends initial use of diuretics or β-blockers for hypertension control unless comorbid conditions indicate another class of drug would be more appropriate (eg, angiotensin-converting enzyme [ACE] inhibitors for patients with congestive heart failure [CHF] or diabetes mellitus). (A synopsis of the JNC-VI recommendations is provided in the **Appendix** on page 41).

Profiling Methods

Analysis of antihypertensive prescribing costs. During summer 2000, the pharmacy profiling team reviewed resident prescribing practices for 4 classes of antihypertensive drugs. Using the UVA ambulatory pharmacy computerized database, the team gathered data on antihypertensive prescriptions dispensed by the pharmacy from December 1999 through May 2000. The antihypertensive classes were prospectively defined as diuretics, β-blockers, ACE inhibitors or receptor blockers, and calcium channel

blockers (CCBs). To ensure that we had a sufficient number of patients in each antihypertensive group to make meaningful comparisons and to enhance physician acceptance, the team chose to analyze by prescribing firm rather than by individual practitioner. The team selected the cost of dispensed antihypertensive medications (total cost and cost per antihypertensive drug class) as a primary outcome measure for profiling. The costs for each of the 4 medications were calculated by multiplying the institutional cost per pill by the number of pills dispensed in the 6-month review interval. The institutional cost per pill is the UVA pharmacy acquisition price, which is typically near or below the discounted wholesale price. Each prescription dispensed was allocated to a specific firm based on the known assignment of patients to the residents comprising each of the 8 firms. Costs of prescriptions dispensed were summed by antihypertensive class and by firm for the 6-month review period. Keeping with customary managed care practice, we computed per member per month (PMPM) costs for antihypertensive drugs for each firm by dividing the antihypertensive costs attributed to each firm by the total number of patients within each firm.

Analysis of clinical outcomes. To examine clinical outcomes and assess possible confounding factors, the team audited records of a stratified sample of UMA patients to document hypertension control. Control of hypertension was determined based on the last blood pressure reading recorded in the clinic chart during the study period. Based on overall antihypertensive prescribing PMPM cost, we divided the firms into a higher-cost group and a lower-cost group, each consisting of 4 firms. Because the pharmacy data did not permit us to identify hypertensive patients by medical record number, we reviewed 400 randomly selected charts to identify a total of 181 patients with hypertension for chart data abstraction. Of these, 88 patients had been treated by lower-cost firms, and 93 patients had been treated by higher-cost firms. The remaining 219 patients did not have hypertension and were not analyzed further. Data abstracted from each chart included age, sex, race, presence of diabetes or CHF, glycosylated hemoglobin level, and systolic and diastolic blood pressure at last clinic visit. Statistical tests (Chi-square analysis for nominal variables, *t* tests for continuous variables) were conducted to determine whether patients of lower-cost firms had lower, similar, or higher mean blood pressures compared with higher-cost firms. We also evaluated for differences between higher- and lower-cost firms (ie, frequency of diabetes or CHF, mean age, or sex distribution) that might confound a relationship between group assignment and mean blood pressure.

Table 1. UMA Clinic Antihypertensive Drug Costs During 6-Month Review Period

Drug Class	No. of Prescriptions	Total Cost ($)*	Mean Cost/ Prescription ($)
Diuretics	1350	218	0.16
β-Blockers	1283	4300	3.35
Calcium channel blockers	2127	46,927	22.06
ACE inhibitors	3032	47,167	15.56
Total	7792	98,612	12.66

ACE = angiotensin-converting enzyme; UMA = University Medical Associates.

*Data are based on University of Virginia pharmacy drug acquisition costs for the period December 1999 through May 2000.

Results

The total number and total cost of antihypertensives prescribed at the UMA clinic during the 6-month review period are shown in **Table 1**. For the clinic overall, ACE inhibitors (39% of total) and CCBs (27%) were prescribed more often than diuretics (17%) or β-blockers (16%). This pattern is in sharp contrast to JNC-VI recommendations, which stress initial use of diuretics and/or β-blockers (Appendix). There was substantial variation between firms in terms of PMPM costs (**Figure 1**) and the antihypertensive classes prescribed. The most striking example of variation is seen in the prescribing patterns for CCBs and β-blockers (**Figure 2**). Variation in drug utilization within classes of antihypertensives also was noted (**Figure 3**).

Bivariable analyses revealed that the higher-cost and lower-cost groups of firms did not differ in age, sex, prevalence of diabetes or CHF, or diabetic control. A lower mean arterial pressure (97.6 mm Hg versus 103.0 mm Hg, $P = 0.024$) was noted for the lower-cost group, which suggests that higher costs do not always purchase better outcomes. Careful review of the data failed to suggest a plausible alternative explanation.

The most cost-efficient firm (Firm E, Figure 1) used more diuretics and β-blockers overall and used less expensive drugs within a class (Figures 2 and 3). We estimated that pharmaceutical expenditures for the practice could be reduced by 17% if all firms adopted the prescribing habits of the most cost-efficient firm.

Dissemination of Data

In September 2000, we presented the profiling data to all 80 UMA residents and internal medicine faculty in small

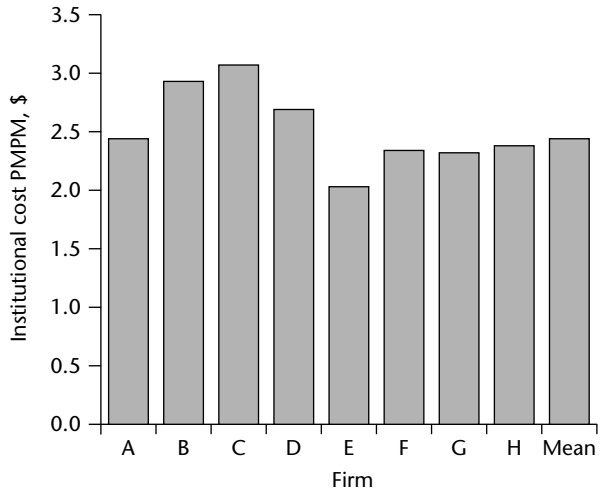

Figure 1. Antihypertensive drug costs per member per month (PMPM) attributed to University Medical Associates firms for the period December 1999 through May 2000. Data are based on University of Virginia pharmacy drug acquisition costs for the review period.

group settings of 2 or 3 firms. The information, which included details of methods and summary graphs in handout form, was presented by the medical director (MN) and pharmacy profiling attending team leader (JV) during the regular half hour preclinic education sessions. Firm identity was blinded for the data presented to make this initial profiling effort less threatening to the physicians. Presenters facilitated discussion about antihypertensive prescribing and reactions to the profiling data and also distributed an information tool for resident and attending physicians. The tool consisted of an 11″ × 14″ cardstock paper that fit in a laboratory coat pocket. Printed on one side of the card were the UVA pharmacy retail costs for all commonly prescribed drugs. On the reverse side was a synopsis of the JNC-VI recommendations adopted for use in the UMA clinic (Appendix) along with specific tips for cost-effective drug prescribing unique to the UVA Health System, including details of UVA pharmacy policies. The pharmacy profiling group had prepared the pocket card over a 4-month period preceding and overlapping with review of the profiling data. The card was reviewed by a small focus group of faculty and residents prior to dissemination.

Impact of Profiling Project

The residents' qualitative responses to the profiling program were very positive. Several residents commented in the dissemination sessions that they valued feedback on performance and expressed interest in obtaining additional data about hypertension and other diseases. Residents generally were eager for feedback, and the profiling data were widely and spontaneously discussed during clinic sessions for several weeks. Firm members and attendings were quite inquisitive regarding the performance of their own firm, but blinding was maintained.

Residents frequently commented that the profiling presentations and subsequent discussion enhanced their knowledge of managed care methods. They were appropriately quick to request further details about potential inaccuracies in the collected data and potential confounders that might bias profiling results. The residents also acknowledged the importance and challenges of managing the care of a population of patients as compared with considering only their own individual patient's care. We believe that the generally positive response to the profiling project reflects a budding commitment among residents to both the continuous quality improvement (CQI) process and care of populations of patients.

At the conclusion of 9 months of working together, the physicians and staff comprising the pharmacy profiling team noted an increased level of collegiality. They attributed this improvement to working collaboratively on a multidisciplinary team to improve the treatment of a common illness. One resident member (JC) elected to present the team's work as his senior resident research project. His work generated strong interest at the department-wide "Research Day" and also received an award when presented at a regional American College of Physicians-American Society of Internal Medicine Associates meeting. After reviewing the results of the profiling project, the Chair of Internal Medicine and the Vice Chair for Clinical Affairs of the hospital offered support to expand our profiling and management efforts within the UMA practice. Thus, this initial hypertension project has led to development of profiling and management projects for other chronic illnesses, all of which involve volunteer residents and faculty. One year later, we are busy with asthma, chronic pain, and diabetes care improvement projects. In addition, preliminary analysis of 2001 antihypertensive prescribing data shows a small decrease in UMA's antihypertensive costs, which is in contrast to trends toward higher prescribing costs nationwide.

Recommendations for Avoiding Profiling Pitfalls

Profiling at the UMA clinic was well accepted and had a positive impact on house staff. A number of strategies helped the project to succeed, including concentrating on gathering accurate data and gaining buy-in (**Table 2**).

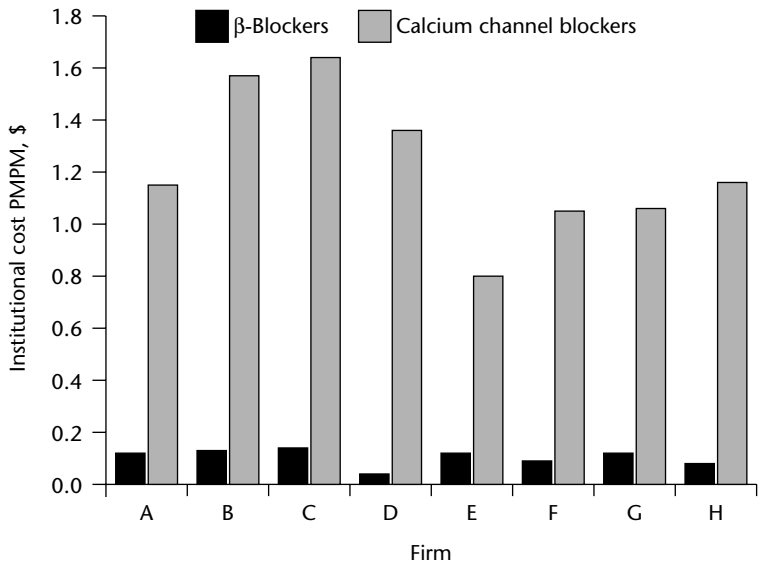

Figure 2. Variation in calcium channel blocker and β-blocker prescribing patterns among University Medical Associates firms. Data are based on University of Virginia pharmacy drug acquisition costs for the period December 1999 through May 2000. PMPM = per member per month.

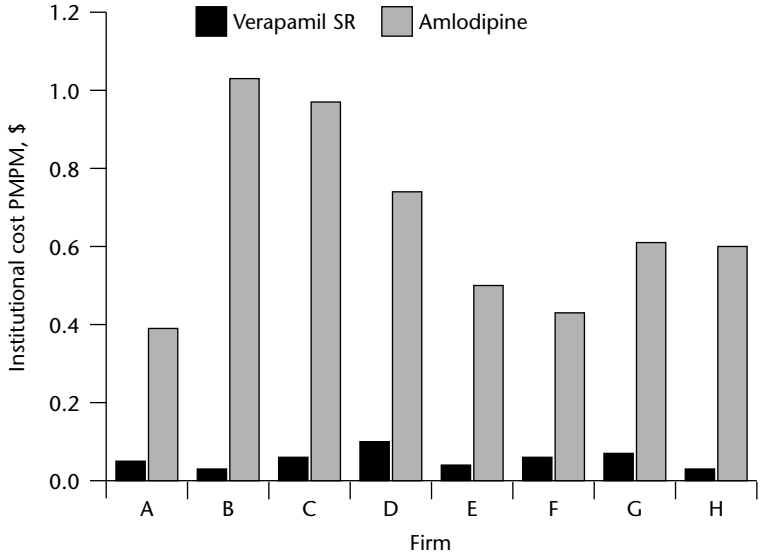

Figure 3. Variation in prescribing patterns for specific calcium channel blockers among University Medical Associates firms. Data are based on University of Virginia pharmacy drug acquisition costs for the period December 1999 through May 2000. PMPM = per member per month; SR = sustained release.

In the following sections, we discuss how these strategies can be used to avoid pitfalls of profiling.

Data Issues

Profiling is best suited to illnesses and processes with outcomes that can be assessed readily and frequently. Unfortunately, it is often difficult to distill clinical outcomes in the outpatient setting into variables that are easy to measure and track. Selecting illnesses for which accurate data can be gathered is vital. Without accurate data, provider buy-in is lost and chances for behavior change are reduced [17]. Providers are quick to challenge data and dismiss feedback if they perceive the data to be inaccurate, unfairly applied, or lacking face validity. In the UMA profiling project, faculty were able to use the data accuracy issue to discuss several interesting questions relevant to managed care, such as equity of profiling, correcting for outliers, potential case mix problems, and coding accuracy (eg, Were all antihypertensive agents coded appropriately? Were all patients linked to the correct resident? Could patients be receiving antihypertensive medication for other indications?). The feedback sessions highlighted the importance of physicians appropriately challenging questionable aspects of the data rather than blindly accepting an attractively presented profile report. In this case, our ability to access

Table 2. Keys to Practice Profiling in a Residency Training Program

Choose locally relevant illnesses and goals.
Ensure that reasonable outcome measures are available for assessment.
Gain resident, faculty, and staff buy-in by involving them in the profiling process.
Gain administrative backing for data accessibility and resources for analysis.
Focus heavily on data accuracy and face validity in order to influence behavior.
Provide profiling feedback to providers in the most comfortable form and setting.
Recognize that the process will involve continuous evolution and refinement.
Once successful, generalize the profiling process to other medical conditions and practice processes.

administrative data for a defined group of patients and to link the data to a clinical outcome measure (ie, blood pressure) improved profiling acceptance. The profiling project has provided stimulus for increased computerization in order to capture data more accurately and efficiently and decrease reliance on chart audits.

Patient Population and Panel Size

It is important to have sufficiently large numbers of patients whose individual outcomes can be aggregated into meaningful units of analysis. By profiling a common event such as antihypertensive prescribing using natural aggregates of residents and attendings (firms), one can feel comfortable that observed differences are not due to chance (type I error) and that important differences are not overlooked (type II error).

Feedback and Confidentiality

Residents are eager for feedback on their performance. However, prior to disseminating results, program directors and medical directors should ascertain whether residents prefer to receive results individually or in groups and whether colleagues or management staff will have access to resident-specific data. In our experience, group feedback to the firms with masked identifiers was well accepted and appeared to ease anxiety about individual practice performance.

We are currently conducting our second year of antihypertensive profiling by firm with firm identities unblinded. The following comments on our observations thus far are preliminary, may not be generalizable, and reflect qualitative comments. We have observed greater interest in the results but no less acceptance of the profiling data by resident and attending physicians. We speculate that this may be the result of sensitive and incremental introduction of profiling coupled with an absence of any direct financial consequence to the profilees. It is worth noting that discussions with residents indicate they also would like feedback on individual performance but would prefer that individual-specific data not be disseminated among all colleagues. Interestingly, the majority stated they would not object to firm attendings having access to each resident's outcomes provided they felt the data collected were accurate.

Case Mix Adjustment

If the population studied is not uniform and numbers are small, variations in performance may reflect the influence of confounding factors unrelated to physician practices. Additionally, severity of illness is difficult to measure systematically, especially in a population of chronically ill patients; therefore, it may be appropriate to approach and present the data as only a "first look" to generate further analysis of practice patterns.

Resource Issues

Profiling requires time, personnel, and technologic support to be successful. Many resident clinics have few resources to devote specifically to profiling projects. Engaging residents to participate in the data gathering and analysis is one mechanism of reducing project costs. To actively involve residents, it is important to provide them with incentives and protected time to participate. Incentives may be as simple as allowing residents to turn the work of a team into a research project in the area profiled, or allowing participating residents to see fewer patients on clinic days. Simple things such as availability of food at team meetings and basic recognition of residents' contribution to the project among peers and faculty can boost participation.

Obtaining administrative support to procure necessary resources may present a more difficult challenge to overcome. We obtained support (ie, funding and personnel) from our department and institution by incorporating practice profiling as one part of a larger effort to provide high quality and cost-effective care. We were able to persuade leadership that such projects, if successful over time, would save the institution money through decreased utilization and costs of long-term complications of chronic illness. Institutional and departmental leadership demonstrated support both for the profiling initiative and also for the broader improvement measures

at UMA. Leadership provided faculty salary support to hire 4 new core faculty and support staff. In addition, they arranged direct input from faculty in the Department of Health Evaluation Sciences who had experience with more conventional managed care practices. These faculty provided input to this specific profiling project as well as the broader initiative to improve care at UMA.

Conclusion

The profiling efforts at UMA have stimulated meaningful discussions about benefits and pitfalls of profiling in a resident training setting. We recognize, however, that our profiling project differs in several ways from the profiling physicians may encounter once they complete residency training. Several important differences may limit the generalizability of our findings and observations beyond this setting. First, UMA data were aggregated on a group (firm) level to enable meaningful comparisons. MCOs often profile on an individual provider level, and this may positively or negatively influence physician receptivity and interest in profiling data. Second, our profiling results had no direct financial impact on residents. Physicians in private practice may experience significant financial and career consequences based on performance on profiled outcomes. Third, as part of a team, our physicians selected the profiled outcomes and methods of analysis. In contrast, physicians who contract with large MCOs may have little say in the mechanism or focus of profiling projects. Finally, our project used significant amounts of data gleaned from chart audits. MCOs more often use less expensive measures generated by administrative databases; these data may be less accurate or may be a poor measure of quality of care provided.

The UMA hypertension practice profiling project represents a successful first step toward our goals of improving the quality and cost-effectiveness of care provided at the resident clinic practice and enhancing resident training in managed care tasks. Relevant information on practice patterns and variation among providers was obtained for the first time. Opportunities for improvement in quality and cost-effectiveness of care were identified. Using a multidisciplinary approach, we developed educational interventions that hold the promise of improved patient outcomes in the future. Residents actively participated in the project, leading to increased commitment to CQI initiatives and awareness of population-based interventions. Resident, faculty, and staff relations improved as a result of working collaboratively on the project. Team members began to recognize the values and perspectives of other team members and the constituents they represented. Working toward an identified goal also enhanced collaboration.

Perhaps most importantly, residents gained both theoretical knowledge and practical experience in some of the nuts-and-bolts practices of managed care. Designing and implementing practice profiling programs in the residency setting can provide both valuable clinical information and a concrete example of managed care methods residents can expect to encounter in the future.

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Appendix. Summary of the Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-VI)

Step 1: Diagnosis and Classification

Base diagnosis on average of 2 or more readings at 2 or more visits.

Criteria are for patients without acute illness off blood pressure (BP) medications.

No coffee or tobacco for 30 minutes prior to BP check.

Have patient sit/rest for 5 minutes prior to BP check; use correct cuff size.

When staging hypertension, if initial readings at 1 visit differ by more than 5 mm Hg, consider additional readings.

If systolic and diastolic categories are different, use higher category.

Systolic (mm Hg)	Diastolic (mm Hg)	Category
< 120	< 80	Optimal
< 130	< 85	Normal
130–139	85–89	High-normal
140–159	90–99	Hypertension stage 1
160–179	100–109	Hypertension stage 2
> 180	> 110	Hypertension stage 3

Step 2: Evaluation of Hypertension

Evaluation of documented hypertension has 3 objectives:

1. Identify known causes of hypertension.
2. Assess presence or absence of target organ damage (TOD) or clinical cardiovascular disease (CCD) and extent of disease and response to therapy.
3. Identify other risk factors or disorders that may define prognosis or guide therapy.

Once the diagnosis of hypertension has been established, a medical history and physical examination with attention to general health and habits, TOD, and potential secondary causes of high blood pressure (HBP) should be performed. Examination should include funduscopic evaluation, neurologic examination, and examination of carotid arteries, thyroid gland, heart, lungs, abdomen (bruits, enlarged kidneys, aortic pulsation), and extremities. Routine initial testing also should include urinalysis, complete blood count, 12-lead electrocardiography, and measurement of creatinine, potassium, sodium, total cholesterol plus high-density lipoprotein or profile, and glucose (preferably fasting).

Optional tests to evaluate for TOD or potential secondary causes are based on initial evaluation. These tests might include 24-hour urinary protein or spot microalbuminuria assessment, creatinine clearance, measurement of glycosylated hemoglobin, serum calcium, uric acid, thyroid-stimulating hormone, plasma aldosterone/renin ratio, and ankle brachial index and limited echocardiography. See Step 6. Resistant Hypertension for additional details.

Step 3: Risk Stratification

To guide therapeutic decision making, risk stratification should be performed to incorporate other independent risk factors for cardiovascular disease. Risk factors include the following:

Major Risk Factors	TOD/CCD
Smoking	Peripheral vascular disease
Dyslipidemia	Stroke or transient ischemic attack
Diabetes mellitus	Nephropathy
Sex (men, postmenopausal women)	Retinopathy
Age > 60 years	Heart disease (left-ventricular hypertrophy, angina or prior myocardial infarction, heart failure or prior revascularization)
Family history (men < 55 years, women < 65 years)	

From JNC-VI, patients can be grouped into 3 risk groups:

1. Group A: no risk factors, no TOD, no CCD
2. Group B: at least 1 risk factor but no diabetes, TOD, or CCD
3. Group C: diabetes, or TOD, or CCD, regardless of other risk factors

Step 4: Initial Treatment Approach

Using these risk groups and stage of hypertension, JNC-VI recommends the following treatment:

BP Stage	Group A	Group B	Group C
High-normal (130–139/85–89)	Lifestyle modification	Lifestyle modification	Drug therapy
Stage 1 (140–159/90–99)	Lifestyle modification (up to 12 months)	Lifestyle modification (up to 6 months)	Drug therapy
Stages 2 and 3 (> 160/> 100)	Drug therapy	Drug therapy	Drug therapy

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Appendix. (*continued*)

Step 5: Initial Antihypertensive Therapy Choice

"When the decision has been made to begin antihypertensive therapy and there are no indications for another type of drug, a diuretic or β-blocker should be chosen because numerous RCTs have shown a reduction in morbidity and mortality with these agents."

The following UMA-preferred agents are based on dosing frequency, side effects, and retail University of Virginia pharmacy cost:

- β-Blocker: atenolol, metoprolol
- Diuretic: hydrochlorothiazide, triamterene/hydrochlorothiazide
- Angiotensin-converting enzyme inhibitors: enalapril, benazepril, lisinopril
- Calcium channel blockers: verapamil sustained-release

Step 6: Resistant Hypertension

Resistant hypertension is defined as failure to control blood pressure to < 140/90 mm Hg (or systolic BP to < 160 mm Hg for isolated systolic HBP) despite patient compliance with an appropriate 3-drug regimen (including a diuretic) at near maximal doses. Causes of resistance include:

- Volume overload: excess salt intake, inadequate diuretic, fluid retention from other HBP medications, progressive renal disease
- Nonadherence to therapy
- Pseudoresistance: cuff size too small, "white coat HBP," pseudohypertension in elderly
- Drug-related causes: dose too low, inappropriate agent, and drug actions and interactions including sympathomimetics, nasal decongestants, appetite suppressants, caffeine, oral contraceptive pills, adrenal steroids, licorice (in chewing tobacco), erythropoietin, antidepressants, nonsteroidal anti-inflammatory drugs, and cocaine or other illicit drugs
- Associated conditions including smoking, ethanol > 1 oz/day, increasing obesity, insulin resistance, sleep apnea, chronic pain, anxiety, panic attacks, dementia
- Secondary causes

Step 7: Evaluation for Secondary Causes

Evaluation for secondary causes of hypertension should be guided by review of patient history, examination, and initial laboratory data. When these data suggest the need, it is appropriate to review the patient with an attending to plan further evaluation. Appropriate evaluation may include referral to a specialist or selected testing as listed.

NOTE: This summary is not a substitute for informed decision making and does not provide exhaustive recommendations to cover all clinical situations. Exceptions to the principles outlined above are expected and reasonable. (Adapted from The sixth report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure. Arch Intern Med 1997;157: 2413–46.)