Clinical Practice Guidelines and Quality of Care for Older Patients With Multiple Comorbid Diseases

Implications for Pay for Performance

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Context Clinical practice guidelines (CPGs) have been developed to improve the quality of health care for many chronic conditions. Pay-for-performance initiatives assess physician adherence to interventions that may reflect CPG recommendations.

Objective To evaluate the applicability of CPGs to the care of older individuals with several comorbid diseases.

Data Sources The National Health Interview Survey and a nationally representative sample of Medicare beneficiaries (to identify the most prevalent chronic diseases in this population); the National Guideline Clearinghouse (for locating evidence-based CPGs for each chronic disease).

Study Selection Of the 15 most common chronic diseases, we selected hypertension, chronic heart failure, stable angina, atrial fibrillation, hypercholesterolemia, diabetes mellitus, osteoarthritis, chronic obstructive pulmonary disease, and osteoporosis, which are usually managed in primary care, choosing CPGs promulgated by national and international medical organizations for each.

Data Extraction Two investigators independently assessed whether each CPG addressed older patients with multiple comorbid diseases, goals of treatment, interactions between recommendations, burden to patients and caregivers, patient preferences, life expectancy, and quality of life. Differences were resolved by consensus. For a hypothetical 79-year-old woman with chronic obstructive pulmonary disease, type 2 diabetes, osteoporosis, hypertension, and osteoarthritis, we aggregated the recommendations from the relevant CPGs.

Data Synthesis Most CPGs did not modify or discuss the applicability of their recommendations for older patients with multiple comorbidities. Most also did not comment on burden, short- and long-term goals, and the quality of the underlying scientific evidence, nor give guidance for incorporating patient preferences into treatment plans. If the relevant CPGs were followed, the hypothetical patient would be prescribed 12 medications (costing her $406 per month) and a complicated nonpharmacological regimen. Adverse interactions between drugs and diseases could result.

Conclusions This review suggests that adhering to current CPGs in caring for an older person with several comorbidities may have undesirable effects. Basing standards for quality of care and pay for performance on existing CPGs could lead to inappropriate judgment of the care provided to older individuals with complex comorbidities and could create perverse incentives that emphasize the wrong aspects of care for this population and diminish the quality of their care. Developing measures of the quality of the care needed by older patients with complex comorbidities is critical to improving their care.

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THE AGING OF THE POPULATION and the increasing prevalence of chronic diseases pose challenges to the development and application of clinical practice guidelines (CPGs). In 1999, 48% of Medicare beneficiaries aged 65 years or older had at least 3 chronic medical conditions and 21% had 5 or more.[1] Health care costs for individuals with at least 3 chronic conditions accounted for 89% of Medicare's annual budget.[1] Comorbidity is associated with poor quality of life, physical disability, high health care use, multiple medications, and increased risk for adverse drug events and mortality.[2-4] Optimizing care for this population is a high priority.[5]

Clinical practice guidelines are based on clinical evidence and expert consensus to help decision making about treating specific diseases.[6] Clinical practice guidelines help to define standards of care and focus efforts to improve quality.[7,8] Most CPGs address single diseases in accordance with modern medicine's focus on disease and pathophysiology.[9] However, physi-

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cians who care for older adults with multiple diseases must strike a balance between following CPGs and adjusting recommendations for individual patients' circumstances. Difficulties escalate with the number of diseases the patient has.[10]

The limitations of current single-disease CPGs may be highlighted by the growth of pay-for-performance initiatives, which reward practitioners for providing specific elements of care.[8] Because the specific elements of care are based on single-disease CPGs, pay-for-performance may create incentives for ignoring the complexity of multiple comorbid chronic diseases and dissuade clinicians from caring for individuals with multiple comorbid diseases. Quality-of-care standards based on these CPGs also may lead to unfair and inaccurate judgments of physicians' care for this population.

We examined how CPGs address comorbidity in older patients and explored what happens when multiple single-disease CPGs are applied to a hypothetical 79-year-old woman with 5 common chronic diseases. We discuss the results in the context of incentives that are created by pay for performance and related health care initiatives.

METHODS

CPGs Included in the Review

To identify the diseases most prevalent in older individuals in the United States, we reviewed data from the National Health Interview Survey and a nationally representative sample of Medicare beneficiaries (5% of the Standard Analytic File).[1,11] We defined a chronic disease as being present when a patient had 2 outpatient claims or 1 inpatient claim for the disease during 1999.

From the 15 most common chronic diseases, we selected 9 that are usually managed in primary care: hypertension, chronic heart failure, stable angina, atrial fibrillation, hypercholesterolemia, diabetes mellitus, osteoarthritis, chronic obstructive pulmonary disease, and osteoporosis. We excluded depression and dementia to focus on patients who would be most likely to adhere to recommendations and understand health information.[12,13] Among the 5% sample in 2001, half of the beneficiaries had at least 2 of these 9 chronic diseases and 80% had at least 1 other condition.[1] We identified the most recently released (as of March 1, 2005) evidence-based CPGs promulgated for each chronic disease by national and international medical organizations using the National Guideline Clearinghouse.[14-42]

Data Abstraction

Our review was based on standards for developing and rating the quality of CPGs.[43-48] Indications of high quality included describing the target population, grading the quality of evidence supporting recommendations, discussing therapeutic goals, addressing quality of life, and incorporating patient preferences. We examined the concepts of competing risks and burden of treatment for patients and caregivers because these issues are central in the care of older adults with multiple diseases.[49,50]

Two investigators (C.M.B. and J.D.) independently abstracted data from each CPG about applicability to individuals aged 65 years or older with multiple comorbid diseases and the quality of evidence for this population; indications for treatment, feasibility of treatment, or modified goals for treating the index disease in the setting of comorbid diseases; and duration of therapy necessary to achieve benefit in the context of life expectancy. We reviewed CPGs for discussion of patient-centered aspects of medical decision making including effects on quality of life defined as explicit discussion of quality of life, physical function, or symptoms such as pain and dyspnea; differentiation between short- and long-term effects, goals of treatment (eg, cure, arresting progression of disease, preventing complications, or managing symptoms); incorporation of patient preferences or shared decision making; and burden of following recommendations on patients and their unpaid caregivers defined as explicit discussion of burden, or of the aggregate weight or intensity of therapy to either patients or caregivers. Of 117 abstraction decisions, investigators disagreed on 22. All were resolved by consensus after discussion between reviewers. Most disagreements involved statements that appeared ambiguous to the reviewers; some explanation is provided in the tables and additional details are available on request from the authors.

Hypothetical Patient

We examined the feasibility of combining the treatment recommendations from relevant CPGs for a hypothetical 79-year-old woman with osteoporosis, osteoarthritis, type 2 diabetes mellitus, hypertension, and chronic obstructive pulmonary disease, all of moderate severity. We abstracted the recommendations (medications, self-monitoring, tests, environmental change, diet, exercise, involvement of specialists and other clinicians, and frequency of follow-up) from the relevant CPGs and assembled a comprehensive treatment plan using explicit instructions from CPGs whenever possible.[19-40] We attempted to develop a treatment plan as simple and inexpensive as possible. When several options existed, we selected generic medications with the least frequent daily dosing and least potential for adverse effects. To reduce complexity of treatment, when possible we chose medications recommended for more than 1 condition and combined self-care activities whenever possible. We identified conflicts that emerged when relevant CPGs were applied (eg, potential adverse effects on other diseases when treating the target disease, interactions between recommended medications, and interactions between food and medications).

We tabulated the number of medications and medication doses per day. We quantified the complexity of the medication regimen by summing the number of different dosage schedules, weighted for dosing frequency (eg, once per day = 1; 3 times per day = 3).[51] A regimen with 7 different medications consisting of 4 drugs taken once per day and 3 drugs taken twice per day generates a complexity score of 3 (1 + 2).

A regimen with 1 drug taken once per day (nightly), 2 drugs taken twice per day, and 1 drug taken 3 times per day has a complexity score of 6 (1 + 2 + 3). We estimated the cost of the regimen and calculated anticipated out-of-pocket costs with coverage by Medicare's Part D.[52]

RESULTS

Applicability of CPGs to Older Adults With Comorbid Illness

Although 7 of the 9 CPGs discussed older adults or comorbid diseases, only 4 CPGs (diabetes, osteoarthritis, atrial fibrillation, and angina) addressed older individuals with multiple comorbidities (TABLE 1 and TABLE 2).[15-42] The CPGs addressing osteoarthritis, osteoporosis, and chronic obstructive pulmonary disease did not discuss the quality of evidence underlying recommendations for older patients. Only the CPGs addressing diabetes and atrial fibrillation discussed the quality of evidence for older persons with several chronic diseases (Table 1 and Table 2). The diabetes CPG notes the absence of evidence favoring tight glycemic control for older patients and suggests that looser control may be appropriate for older adults or individuals with a limited life expectancy.

Seven CPGs made recommendations for treating the target disease in conjunction with a single other chronic disease (Table 1 and Table 2). Discussing possible adverse effects of following the recommendations, the osteoarthritis CPG recommended gastroprotective agents in older patients taking certain anti-inflammatory drugs and mentioned that clinical trials excluded patients at high risk of bleeding. Only the CPGs for diabetes, chronic heart failure, angina, and hypercholesterolemia gave general guidance about treatment in the presence of several chronic diseases (Table 1 and Table 2). The CPGs addressing chronic heart failure and hypercholesterolemia discussed treatment in the setting of other cardiac diseases but not of noncardiac diseases.

Only the diabetes CPG discussed the relationship between life expectancy and the time needed to treat to achieve ben-

Table 1. Relevance of Clinical Practice Guidelines for the Treatment of Older Patients With Diabetes Mellitus, Hypertension, Osteoarthritis, Osteoporosis, and Chronic Obstructive Pulmonary Disease (COPD)

	Chronic Disease Addressed by Guideline				
	Diabetes Mellitus[19-32]	Hypertension[39]	Osteoarthritis[33-36]	Osteoporosis[40]	COPD[37,38]
Guideline addressed treatment for type of patient?	Older: yes Multiple comorbidities: yes Both: yes	Older: yes Multiple comorbidities: no Both: no	Older: yes Multiple comorbidities: yes Both: yes†	Older: no Multiple comorbidities: no Both: no	Older: no Multiple comorbidities: no Both: no
Quality of evidence discussed for type of patient?	Older: yes Multiple comorbidities: yes Quality of evidence poor, requires extrapolation for nutrition recommendations	Older: yes Multiple comorbidities: no Quality of evidence good for treating hypertension in older patients	Older: no Multiple comorbidities: no	Older: no Multiple comorbidities: no	Older: no Multiple comorbidities: no
Specific recommendations for patients with 1 comorbid condition?	Yes Diseases: hypercholesterolemia, hypertension, congestive heart failure, chronic kidney disease, cardiovascular disease, peripheral vascular disease, benign prostatic hypertrophy	Yes Diseases: coronary artery disease, diabetes mellitus, metabolic syndrome, sleep apnea, chronic kidney disease, gout, left ventricular hypertrophy, erectile dysfunction, peripheral vascular disease, congestive heart failure, stroke, dementia,* renal transplantation, renal artery stenosis, urinary outflow obstruction	Yes Diseases/drugs: anticoagulants, glucocorticoids, peptic ulcer disease, chronic kidney disease, hypertension, congestive heart failure	No	No
Specific recommendations for patients with several comorbid conditions?	Yes	No	No	No	No
Time needed to treat to benefit from treatment in the context of life expectancy discussed?	Yes	No	No	No	No

*Limited to the possible effects of antihypertensive treatment on preventing cognitive decline, not management of hypertensive patients with mild cognitive impairment or dementia.
†Limited to patients at highest risk of gastrointestinal tract bleeding with certain therapies.

efit (Table 1). The angina CPG discussed life expectancy in the context of interventions that could lead to invasive procedures but did not address duration of treatment required to achieve benefit.

Inclusion of Patient-Centered Domains in CPGs

None of the CPGs discussed the burden of comprehensive treatment on patients or caregivers. Three (hypertension, angina, and hypercholesterolemia) acknowledged patients' financial burden; the diabetes CPG mentioned the discomfort and inconvenience of self-monitoring blood glucose. The atrial fibrillation CPG noted that quality of life can be affected by drug interactions and the need for frequent blood tests in patients taking warfarin. None discussed balancing short- and long-term goals, such as when short-term quality of life is better without a treatment that provides long-term benefits. The osteoporosis and hypercholesterolemia CPGs did not discuss quality of life. Seven of the CPGs discussed patients' preferences about medical care, but this was often without guidance for incorporating preferences. Only the chronic heart failure CPG explicitly discussed preferences for end-of-life treatment.

Applying CPGs to a Hypothetical Patient

Applying the relevant CPGs to the hypothetical 79-year-old patient, we generated a possible treatment schedule that would result if all the recommendations in the CPGs were followed (TABLE 3 and BOX). The patient would take 12 separate medications with a medication complexity score of 14.[51] This regimen requires 19 doses per day, taken at 5 times during a typical day, assuming that albuterol "as needed" is taken twice daily, plus weekly alendronate.

Some nonpharmacological recommendations apply to more than 1 disease. Fourteen nonpharmacological activities are recommended for this patient if all nutritional recommendations are pooled into one. The CPGs also recommend one-time educational and rehabilitative interventions, and monitoring of the patient's chronic diseases from daily to biennial intervals depending on the type of monitoring. It theoretically would be possible to compress all monitoring into 2 to 4 primary care visits and 1 ophthalmologic visit per year. However, patients often have several clinicians,[53] although in some regions and managed care settings most care may be provided by a primary care team.[54] All elements of the treatment plan cannot easily be addressed in a 15-minute office visit.[55,56]

Interactions that could result from concurrent adherence to all 5 CPGs (TABLE 4) include between a medica-

Table 2. Relevance of Clinical Practice Guidelines for the Treatment of Older Patients With Atrial Fibrillation, Chronic Heart Failure, Angina, and Hypercholesterolemia

	Chronic Disease Addressed by Guidelines			
	Atrial Fibrillation[15]	Chronic Heart Failure[18]	Angina[16,17]	Hypercholesterolemia[41,42]
Guideline addressed treatment for type of patient?	Older: yes Multiple comorbidities: yes Both: yes	Older: yes Multiple comorbidities: yes Both: no	Older: yes Multiple comorbidities: yes* Both: yes*	Older: yes Multiple comorbidities: yes† Both: no
Quality of evidence discussed for type of patient?	Older: yes Multiple comorbidities: yes Average age of patients in clinical trials younger than population average, trials excluded those at high risk for bleeding	Older: yes Multiple comorbidities: no Absence of older persons in large clinical trials	Older: yes Multiple comorbidities: no Few older patients were included in clinical trials for 1 possible intervention	Older: yes‡ Multiple comorbidities: no
Specific recommendations for patients with 1 comorbid condition?	Yes Diseases: congestive heart failure, hypertension, diabetes mellitus, angina, left ventricular hypertrophy, Wolff-Parkinson-White syndrome, hypertrophic cardiomyopathy, hyperthyroidism, pregnancy, chronic obstructive pulmonary disease	Yes Diseases: hypertension, diabetes mellitus, hypercholesterolemia, angina, atrial fibrillation, chronic obstructive pulmonary disease	Yes Diseases: hypertension, diabetes mellitus, hypercholesterolemia, congestive heart failure, aortic valve stenosis, valvular heart disease, asthma, heart block, hypertrophic cardiomyopathy, atrial fibrillation, peripheral vascular disease, hyperthyroidism, chronic kidney disease, depression, migraines	Yes Diseases: hypertension, diabetes mellitus, cardiovascular disease
Specific recommendations for patients with several comorbid conditions?	No	Yes: only for combination of cardiovascular diseases	Yes*	Yes: only for combination of diabetes mellitus and cardiovascular disease†
Time needed to treat to benefit from treatment in the context of life expectancy discussed?	No	No	No	No

*Limited to weighing severe comorbidity likely to limit life expectancy when considering treatment procedures that would lead to revascularization; asking patients in follow-up about presence of new comorbid illnesses; and the effect of severity of or treatment for comorbidities on angina. Older patients with severe angina and several comorbid illnesses may be satisfied with a reduction in symptoms that enables an improvement in physical disability.
†Limited to multiple comorbid conditions that increase cardiovascular risk (no discussion of comorbidities other than combination of diabetes mellitus and cardiovascular disease).
‡Secondary prevention trials included older persons. Guideline reports that PROSPER authors state that statin use can be extended to older persons. Conflicting data on cancer risk with statins; statins have no effect on cognition or progression of disability.

tion and a disease other than the target disease, between medications for different diseases, and between food and medications. Recommendations may also contradict one another. If the hypothetical osteoporotic, diabetic patient has peripheral neuropathy, the osteoporosis CPG recommends that she perform weight-bearing exercise, while the diabetes CPG cautions that some patients with advanced peripheral neuropathy should avoid weight-bearing exercise.

The patient's medications would cost her $406.45 per month, or $4877 annually, assuming no prescription drug coverage (TABLE 5).[52] Beginning in 2006, she would be able to purchase drug insurance under Medicare's new Part D. If her income is above 150% of the federal poverty level (as it was for more than 60% of Medicare beneficiaries), she would pay an out-of-pocket premium of about $420, a $250 deductible, $500 of the next $2000, and 100% of the next $3000 (in her case, $2627). Thus, assuming current prices, with drug insurance, she would pay $3797 per year plus $373 for any future drug expenses for that year.[57] The nonpharmacological interventions recommended involve additional expenses to patients, informal caregivers, Medicare, and other insurers.

Table 3. Treatment Regimen Based on Clinical Practice Guidelines for a Hypothetical 79-Year-Old Woman With Hypertension, Diabetes Mellitus, Osteoporosis, Osteoarthritis, and COPD*

Time	Medications†	Other
7:00 AM	Ipratropium metered dose inhaler 70 mg/wk of alendronate	Check feet Sit upright for 30 min on day when alendronate is taken Check blood sugar
8:00 AM	500 mg of calcium and 200 IU of vitamin D 12.5 mg of hydrochlorothiazide 40 mg of lisinopril 10 mg of glyburide 81 mg of aspirin 850 mg of metformin 250 mg of naproxen 20 mg of omeprazole	Eat breakfast 2.4 g/d of sodium 90 mmol/d of potassium Low intake of dietary saturated fat and cholesterol Adequate intake of magnesium and calcium Medical nutrition therapy for diabetes‡ DASH‡
12:00 PM		Eat lunch 2.4 g/d of sodium 90 mmol/d of potassium Low intake of dietary saturated fat and cholesterol Adequate intake of magnesium and calcium Medical nutrition therapy for diabetes‡ DASH‡
1:00 PM	Ipratropium metered dose inhaler 500 mg of calcium and 200 IU of vitamin D	
7:00 PM	Ipratropium metered dose inhaler 850 mg of metformin 500 mg of calcium and 200 IU of vitamin D 40 mg of lovastatin 250 mg of naproxen	Eat dinner 2.4 g/d of sodium 90 mmol/d of potassium Low intake of dietary saturated fat and cholesterol Adequate intake of magnesium and calcium Medical nutrition therapy for diabetes‡ DASH‡
11:00 PM	Ipratropium metered dose inhaler	
As needed	Albuterol metered dose inhaler	

Abbreviations: ADA, American Diabetes Association; COPD, chronic obstructive pulmonary disease; DASH, Dietary Approaches to Stop Hypertension.

*Clinical practice guidelines used: (1) Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure VII.[39] (2) ADA[19-32]; glycemic control is recommended; however, specific medicines are not described. (3) American College of Rheumatology[33-36]; recent evidence about the safety and appropriateness of cyclooxygenase inhibitors, particularly in individuals with comorbid cardiovascular disease, led us to omit them from the list of medication options, although they are discussed in the reviewed clinical practice guidelines. (4) National Osteoporosis Foundation[40]; this regimen assumes dietary intake of 200 IU of vitamin D. (5) National Heart, Lung, and Blood Institute and World Health Organization.[37,38]

†Taken orally unless otherwise indicated. The medication complexity score of the regimen for this hypothetical woman is 14, with 19 doses of medications per day, assuming 2 as needed doses of albuterol metered dose inhaler plus 70 mg/wk of alendronate.

‡DASH and ADA dietary guidelines may be synthesized, but the help of a registered dietitian is specifically recommended. Eat foods containing carbohydrate from whole grains, fruits, vegetables, and low-fat milk. Avoid protein intake of more than 20% of total daily energy; lower protein intake to about 10% of daily calories if overt nephropathy is present. Limit intake of saturated fat (<10% of total daily energy) and dietary cholesterol (<200-300 mg). Limit intake of *trans*unsaturated fatty acids. Eat 2 to 3 servings of fish per week. Intake of polyunsaturated fat should be about 10% of total daily energy.

COMMENT

This review provides evidence that CPGs do not provide an appropriate, evidence-based foundation for assessing quality of care in older adults with several chronic diseases. Although CPGs provide detailed guidance for managing single diseases, they fail to address the needs of older patients with complex comorbid illness. While some recommend interventions for specific pairs of diseases, CPGs rarely address treatment of patients with 3 or more chronic diseases—a group that includes half of the population older than 65 years.[1] When we developed a treatment plan for a hypothetical patient using a conservative regimen created in accordance with CPGs, she was treated with multiple medications with high complexity, with the attendant risks of medication errors, adverse drug events, drug interactions, and hospitalization.[4,58-60] The recommended regimens may present the patient with an unsustainable treatment burden, making independent self-management and adherence difficult.[12,13,50,51,61-63]

It is evident that CPGs, designed largely by specialty-dominated committees for managing single diseases, provide clinicians little guidance about caring for older patients with multiple chronic diseases. The use of single-disease CPGs as a basis for evaluating the quality of care and determining physician reimbursement through pay-for-performance measures could create inappropriate incentives in the care of older adults with multiple diseases.[7,8]

Payment to physicians in pay-for-performance programs is frequently based in part on their meeting quality-of-care standards created for single diseases according to a calculated rate of adherence to the standard within an eligible

population.[64,65] While these standards are not explicitly taken directly from CPGs, they are often derived from CPG recommendations. The Medicare Payment Advisory Commission recommended that Medicare adopt pay for performance for physician reimbursement.[66] The Commission suggests a trial period during which physician reimbursement would be based on adoption of information technology measures, with feedback to individual physicians on performance on condition-specific claims-based process measures, followed by a "date certain" when condition-specific claims-based process measures would be included in physician pay for performance.[66] Medicare initiatives and demonstrations incorporating pay for performance are becoming increasingly common.[67]

The CPGs are not designed for use in quality assessment, so transforming CPGs into performance standards and applying these standards to the care of older patients with complex comorbidity is problematic.[8] These guidelines are recommendations based on varying levels of evidence and assume application of clinical judgment and patient preferences, both of which would be difficult to measure in a pay-for-performance scheme.[15,17,18,30,33,38-41] Quality indicators must balance scientific evidence against what is practical and feasible to measure rather than what is a higher priority (eg, assessing yearly screening for retinopathy rather than aggressive blood pressure control in diabetics).[56] Many indicators have upper age limits (eg, <75 years), thereby excluding a large percentage of Medicare beneficiaries and removing incentives to focus on these patients. Most indicators do not address burden of comorbid disease. While it would be feasible to omit "sick" patients from computations for reporting purposes, this would remove the pay-for-performance incentive for improving care for such patients.[68,69]

Assessing physicians on the basis of the care they provide for individual diseases obscures the complexity of treating real, and particularly older, patients with several chronic diseases.

Box. Recommendations Based on Clinical Practice Guidelines for a Hypothetical 79-Year-Old Woman With Hypertension, Diabetes Mellitus, Osteoarthritis, Osteoporosis, and COPD*

Patient Tasks

- Joint protection
- Energy conservation
- Exercise
  - Non–weight-bearing if severe foot disease present or weight-bearing for osteoporosis
  - Aerobic exercise for 30 min on most days
  - Muscle strengthening
  - Range of motion
- Avoid environmental exposures that might exacerbate chronic obstructive pulmonary disease (COPD)
- Wear appropriate footwear
- Limit intake of alcohol
- Maintain normal body weight (body mass index of between 18.5 and 24.9)

Clinician Tasks

- Administer vaccine
  - Pneumonia
  - Influenza annually
- Check blood pressure at all clinician visits and sometimes at home†
- Evaluate self-monitoring of blood glucose
- Foot examination at all clinician visits if neuropathy present; otherwise check feet for protective sensation, structure, biomechanics, vascular status, and skin integrity annually
- Laboratory tests
  - Microalbuminuria annually if not already present
  - Creatinine level and electrolytes at least 1 to 2 times per year
  - Cholesterol levels annually
  - Liver function biannually
  - Glycosylated hemoglobin level biannually to quarterly, depending on level of control
- Referrals
  - Physical therapy
  - Ophthalmologic examination
  - Pulmonary rehabilitation
  - Dual-energy x-ray absorptiometry scan every other year
- Patient education
  - High-risk foot conditions, foot care, and foot wear
  - Osteoarthritis
  - COPD medication and delivery system training
  - Diabetes mellitus

*See asterisk footnote in Table 3 for a list of the clinical practice guidelines used.
†Ambulatory blood pressure monitoring is helpful if "white coat hypertension" is suspected and no target organ damage, apparent drug resistance, hypotensive symptoms with antihypertensive medication, or episodic hypertension.

Table 4. Potential Treatment Interactions for a Hypothetical 79-Year-Old Woman with 5 Chronic Diseases

		Type of Interaction		
Type of Disease	Medications With Potential Interactions	Medication and Other Disease	Medications for Different Diseases	Medication and Food
Hypertension	Hydrochlorothiazide, lisinopril	Diabetes: diuretics increase serum glucose and lipids*	Diabetes medications: hydrochlorothiazide may decrease effectiveness of glyburide	NA
Diabetes	Glyburide, metformin, aspirin, and atorvastatin	NA	Osteoarthritis medications: NSAIDs plus aspirin increase risk of bleeding Diabetes medications: glyburide plus aspirin may increase the risk of hypoglycemia; aspirin may decrease effectiveness of lisinopril	Aspirin plus alcohol: increased risk of gastrointestinal tract bleeding Atorvastatin plus grapefruit juice: muscle pain, weakness Glyburide plus alcohol: low blood sugar, flushing, rapid breathing, tachycardia Metformin plus alcohol: extreme weakness and heavy breathing Metformin plus any type of food: medication absorption decreased
Osteoarthritis	NSAIDs	Hypertension: NSAIDs: raise blood pressure†; NSAIDs plus hypertension increase risk of renal failure	Diabetes medications: NSAIDs in combination with aspirin increase risk of bleeding Hypertension medications: NSAIDs decrease efficacy of diuretics	NA
Osteoporosis	Calcium, alendronate	NA	Diabetes medications: calcium may decrease efficacy of aspirin; asprin plus alendronate can cause upset stomach Osteoporosis medications: calcium may lower serum alendronate level	Alendronate plus calcium: take on empty stomach (>2 h from last meal) Alendronate: avoid orange juice Calcium plus oxalic acid (spinach and rhubarb) or phytic (bran and whole cereals): eating these foods may decrease amount of calcium absorbed (>2 h from last meal)
Chronic obstructive pulmonary disease	Short-acting β-agonists	NA	NA	NA

Abbreviations: NA, no interaction is known; NSAIDs, nonsteroidal anti-inflammatory drugs.
*Thiazide-type diuretics may worsen hyperglycemia, but effect thought to be small and not associated with increased incidence of cardiovascular events.
†This interaction is noted to be particularly relevant for individuals with diabetes; no recommendation for treatment is given.

Table 5. Cost of Medications to Patient*

Disease and Medication	Monthly Cost, $
Hypertension	
Hydrochlorothiazide	13.99
Lisinopril	24.99
Diabetes mellitus	
Glyburide	24.00
Metformin	51.99
Enteric-coated aspirin	1.21
Lovastatin	62.99
Osteoarthritis	
Naproxen	10.99
Omeprazole	93.99
Osteoporosis	
Alendronate	65.99
Calcium plus vitamin D	4.33
Chronic obstructive pulmonary disease	
Ipratropium	37.99
Albuterol	13.99
Total	**406.45**

*Assuming no prescription drug coverage.

Patients in whom single-disease standards cannot or should not be attained, but who are eligible to be in the population base for a given standard may become "medical hot potatoes" if their physician receives lower pay-for-performance scores as a result.[70] Current pay-for-performance initiatives can create financial incentives for physicians to focus on certain diseases and younger or healthier Medicare patients. These initiatives perpetuate the single-disease approach to care and fail to reward physicians for addressing the complex issues that confront patients with several chronic diseases. Standards that define quality of patient care regardless of a patient's health status and preferences by placing emphasis on attaining high rates of adherence to CPGs rather than the more difficult task of weighing burden, risks, and benefits of complex therapies in shared decision making could ultimately undermine quality of care.[68,71] If quality assessment focuses on younger or healthier patients, there is additonal risk that these problems will go unnoticed.

Quality-of-care standards are needed for older individuals with several chronic diseases. Critical but currently unreimbursed processes of high-quality care for this population include care coordination, patient and caregiver education, empowerment for self-management, and shared decision making that incorporates individual preferences and circumstances. These processes should be incorporated into quality-of-care standards in pay-for-performance initiatives.[49,68,72]

Standards for developing CPGs note the importance of identifying the target population and incorporating quality of life and patient preferences to improve adherence of both physicians and patients.[6,43,47,73,74] The CPGs we examined do not give explicit guidance on how to do this. Providing optimal care, as defined by several CPGs, for the patient with comorbid conditions quickly becomes difficult in terms of cost, medi-

cation complexity, and the magnitude of the task. Practicing physicians adjust CPG recommendations for individual patients, judging risks and reacting to patient preferences, but best practices for making these adjustments remain undefined.[61,75] Coexisting diseases may increase or decrease the benefit of an intervention for a target disease.[49] Future CPGs that address how to incorporate quality of life and the risks, benefits, and burden of recommended treatments for older adults with comorbidity would be more useful than currently existing CPGs, but training physicians to use CPGs while incorporating these principles is also critical.[8] The guidelines could address common comorbidities, but more obscure comorbidities would be difficult to address. Clinical practice guidelines addressing several combinations of comorbid diseases would be more unwieldy and based on scant evidence. To provide evidence for optimal care of older patients with several chronic diseases, future trials should include older patients with representative comorbidities and should investigate shared decision making among those patients, their caregivers, and physicians.[76,77]

A few noteworthy efforts address these issues. A recent CPG for older adults with diabetes discusses the quality of evidence and gives practical advice about geriatric syndromes and prioritizing care for older persons with several chronic diseases.[78] The Assessing Care of Vulnerable Elders Project proposes quality-of-care markers for chronic diseases and geriatric syndromes in frail older adults and recognizes that goals of care and preferences affect definitions of quality.[79] Patient-reported measures of quality of care address access, continuity, coordination, communication, and empowerment for patient and family involvement.[80] Some pay-for-performance standards include provision of educational resources and measures of patient experience.[64,81]

Our analysis has several limitations. First, we did not attempt to examine all CPGs. Instead, we selected CPGs generated by prominent professional organizations and published in widely read journals, which are likely to have a high impact on clinical practice. There may be less well-known CPGs that provide better guidance for the care of older adults with multiple chronic diseases. Second, in designing the treatment regimen for our hypothetical patient, we used our clinical judgment when the CPGs were not explicit in their recommendations—a task clinicians face daily. While other clinicians might arrive at slightly different regimens, we believe they would have similar complexity.

For the present, widely used CPGs offer little guidance to clinicians caring for older patients with several chronic diseases. The use of CPGs as the basis for pay-for-performance initiatives that focus on specific treatments for single diseases may be particularly unsuited to the care of older individuals with multiple chronic diseases. Quality improvement and pay-for-performance initiatives within the Medicare system should be designed to improve the quality of care for older patients with multiple chronic diseases; a critical first step is research to define measures of the quality of care needed by this population, including care coordination, education, empowerment for self-management, and shared decision making based on the individual circumstances of older patients.

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