

tem's buy-in to the concept of addressing factors that have historically been considered outside medicine's zone of influence or responsibility. Gaining the support of frontline clinicians for referring their patients to community-based resources will also require a continuous process for ensuring that such resources are both reliable and safe. Health systems will have to determine the appropriate intervals for updating information on those resources, identifying positive outliers, and conducting focus groups.

We believe it's time for delivery systems to adopt strategies that increase our awareness of the community-based challenges

our patients face in achieving good health outcomes and to offer care plans that confront those challenges. Our approach and other similar efforts probably won't provide a complete solution, but we're confident that more thoughtful performance-measurement paradigms can support the exploration and implementation of programs to ensure healthy outcomes for all our patients.

Disclosure forms provided by the authors are available with the full text of this article at NEJM.org.

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Reimagining Quality Measurement

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The quality-measurement enterprise in U.S. health care is troubled. Physicians, hospitals, and health plans view measurement as burdensome, expensive, inaccurate, and indifferent to the complexity of care delivery. Patients and their caregivers believe that performance reporting misses what matters most to them and fails to deliver the information they need to make good decisions. In an attempt to overcome these troubles, measure developers are creating ever more measures, and payers are requiring their use in more settings and tying larger financial rewards or penalties to performance. We believe that doing more of the same is misguided: the time has come to reimagine quality measurement.

A fruitful alternative approach, in our view, would be guided by three principles: quality measurement should be integrated with care delivery rather than existing as a parallel, separate enterprise; it should acknowledge and address the challenges that confront doctors every day — common and uncommon diseases, patients with multiple coexisting illnesses, and efficient management of symptoms even when diagnosis is uncertain; and it should reflect individual patients' preferences and goals for treatment and health outcomes and enable ongoing development of evidence on treatment heterogeneity.¹

A measurement system embodying these principles would require a view of the whole person and would have three com-

ponents: a comprehensive inventory of each patient's health and health care needs, a mechanism for matching potential evidence-based interventions to those needs, and an assessment of patients' health goals and preferences. Together, these components would serve both care delivery and quality measurement by enabling the development of a proactive care plan for each patient from which an individualized quality score could be derived. Such a quality score would reflect both the appropriateness of individualized care plans and the degree to which they are being carried out effectively, both for individual patients and for the population cared for by a given physician, medical group, or health care system or within a particular community.

Patients with multiple chronic conditions might be the best focus for system designers aiming to test an alternative to the current quality-measurement approach. According to the Centers for Disease Control and Prevention, more than one quarter of U.S. adults have two or more chronic conditions,² but much remains unknown about this population of patients — the most appropriate and useful combination of services for them to receive, for instance, and the best method for integrating explicit consideration of their preferences. Moreover, focusing on these patients would provide an opportunity to learn about the outcomes associated with diverse treatment choices.³

The table provides an illustrative guide to what such a system might look like from the perspective of individual patients. It defines one possible quality-measurement and care delivery matrix for two women between the ages of 45 and 64 years who both have hypertension, diabetes, knee osteoarthritis, and depression. (In one Kaiser Permanente region, we identified 1118 patients with just these four conditions among 2.6 million adult members.) In this example, the patients also have an acute care episode for a sprained ankle.

The starting point (which might be the baseline measure in a newly implemented system) could be an inventory of the patient's needs and current state. The example includes her clinical status (e.g., recent blood pressure), her functional status (e.g., pain, depression), current management of her conditions (e.g., medication management, types of referrals), and recommended preventive care ser-

vices. The inventory defines a selection of guidelines from which the system designers could assemble the key evidence-based interventions to be considered (including monitoring for complications or disease progression) and interventions to be avoided (e.g., knee arthroscopy, advanced imaging for a sprain) by the patient's care team. The comprehensive list of key clinical considerations would then enable designers to identify the areas in which it's important to elicit the patient's personal goals and preferences. The example includes two patients with the same clinical status but different preferences — one prefers to take medications; the other prefers to avoid them. Clinicians will recognize the contents of the table's last column as the next steps in an individualized care plan. The quality-measurement approach, also highlighted in the last column, could assess both whether the care plan was consistent with guidelines and whether it reflected a patient's preferences. Subsequent rounds of measurement could evaluate whether the care plan was achieving the agreed-on goals.

Implementing such a reimagined approach would require investments in methods and systems. Although the type of system we're proposing would be designed to enable better integration of complex care management and appropriate quality measurement for individual patients and their care teams, most of the key elements could be developed centrally.

As we see it, six work streams might be needed. First, a method would be required for constructing an integrated patient dashboard that displayed the key di-

mensions and elements of health status for each patient (similar to what is shown in the table). Graphical displays that both doctors and patients could use easily would enhance the appeal of this approach.

Second, methods could be developed for selecting best-in-class guidelines and translating them into the critical steps of a checklist that prioritized interventions deemed most likely to improve a patient's health status. But third, a systematic approach would be needed for identifying areas of conflict and overlap among the selected guidelines⁴ — for example, which medications that are recommended for osteoarthritis should be avoided because they might increase blood pressure or exacerbate depression symptoms and how the benefits of exercise for multiple conditions might be persuasively conveyed.

Fourth, it would be important to find a systematic way of identifying the treatment choices for which patients' preferences matter — for instance, when different interventions have equivalent outcomes (e.g., medication vs. cognitive behavioral therapy for depression) or when a patient's tolerance for various side effects warrants a conversation.

Fifth, system designers would need to identify the data flows that are required and the enterprise information-systems functionality that would best support a nimble and flexible measurement approach. Such requirements could be used to set the bar for the next generation of electronic health records, decision support systems, methods of collecting patient-reported information, and knowledge-management systems.

Illustrative Quality-Measurement and Care Delivery Matrix for Two Women between the Ages of 45 and 64 Years with the Same Medical Conditions.*					
Current Care Opportunities	Current Needs Inventory	Source of Selected Relevant Guidelines	Goals and Preferences		Care Management Plan and Approach to Quality Measurement
			Patient 1	Patient 2	
Hypertension	Blood pressure, 145/90 mm Hg while taking two antihypertensive agents	Eighth Joint National Committee (JNC-8)	Blood-pressure goal: 135/85 mm Hg; willing to add a medication	Blood-pressure goal: 140/85 mm Hg; willing to try lifestyle modification	Achieve blood pressure consistent with patient's goals with either medications (Patient 1) or improvements in diet or exercise (Patient 2)
Diabetes	Glycated hemoglobin level, 8.0% while taking an oral hypoglycemic agent	American Diabetes Association	Glycated hemoglobin goal: 7.5% or less; willing to add a medication	Glycated hemoglobin goal: 8.0% or less; willing to try lifestyle modification	Achieve glycated hemoglobin level consistent with patient's goals with either medications (Patient 1) or improvements in diet or exercise (Patient 2)
Knee osteoarthritis	Pain limits functioning, with an interference score of 6 on the Brief Pain Inventory (ranging from 1 to 10, with higher scores indicating more interference)	American College of Rheumatology	Prefers medication	Prefers physical therapy	Submit orders for preferred treatment approach; no arthroscopy
Depression	Score of 17 on the Patient Health Questionnaire-9 (PHQ-9, ranging from 1 to 27, with higher scores indicating more severe disease)	Institute for Clinical Systems Improvement	Goal: Score of 12 on PHQ-9; prefers medication	Goal: Score of 12 on PHQ-9; prefers psychotherapy	Submit orders for preferred treatment approach; achieve patient-selected goal for number of mentally healthy days per month
Preventive care	Body-mass index, 28; inactive	U.S. Preventive Services Task Force (A and B recommendations)	Goals: adherence to all preventive care recommendations; become more active	Goals: avoidance of vaccines; adherence to other recommendations; become more active	Determine adherence to agreed-on preventive services and number of days with 30 minutes of activity in past month
Acute care	Sprained ankle	Ottawa Imaging Rules	No preference elicited	No preference elicited	Do not order advanced imaging

* The body-mass index is the weight in kilograms divided by the square of the height in meters.

Finally, methods could be developed and tested for constructing quality scores for different units of analysis. Individualized scores could be aggregated in several ways to elucidate the performance of physicians, groups, health plans, hospitals, and other entities. We believe that one approach to creating individualized quality scores would be to divide the number of quality goals that have been achieved at selected points in time by the number of care elements being tracked, but alternative scoring methods could be developed and tested. Reflecting on the number of distinct combinations of conditions that physicians encounter underscores both the complexity of clinical care and the need to support care delivery by integrating quality measurement and improvement into care management.

Skeptics may argue that such an approach would be too complicated to implement, but today's medical practice was also unimaginable in earlier times. Even as recently as 20 years ago, for example, we could not have predicted that smartphones and decision support in electronic health records could deliver more relevant information more quickly and more reliably than our well-worn *Washington Manuals*. We believe that with proper vetting by physicians and patients and creative design of truly meaningful health information technology, a reimagined measurement system could make today's performance-measurement enterprise seem like a quaint relic from an earlier era.

The opinions expressed in this article are those of the authors and do not necessarily represent those of Kaiser Permanente, the Department of Veterans Affairs, or RAND.

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This interactive graphic covering our current knowledge of the Ebola virus and the history of disease outbreaks has now been updated with information on convalescent therapies and on drug and vaccine development.