

# The Challenges of Measuring, Improving, and Reporting Quality in Primary Care

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**ABSTRACT**

We propose a new set of priorities for quality management in primary care, acknowledging that payers and regulators likely will continue to insist on reporting numerical quality metrics. Primary care practices have been described as complex adaptive systems. Traditional quality improvement processes applied to linear mechanical systems, such as isolated single-disease care, are inappropriate for nonlinear, complex adaptive systems, such as primary care, because of differences in care processes, outcome goals, and the validity of summative quality scorecards. Our priorities for primary care quality management include patient-centered reporting; quality goals not based on rigid targets; metrics that capture avoidance of excessive testing or treatment; attributes of primary care associated with better outcomes and lower costs; less emphasis on patient satisfaction scores; patient-centered outcomes, such as days of avoidable disability; and peer-led qualitative reviews of patterns of care, practice infrastructure, and intrapractice relationships.

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**INTRODUCTION**

The US National Quality Strategy has 3 overarching aims: improve the quality of care, improve the health of the population, and reduce the cost of care.<sup>1</sup> The achievement of these aims depends, in part, on the collection and reporting of quality measures, more than 400 of which are endorsed currently by the US National Quality Forum.<sup>2</sup> Supporters of quality metrics and physician scorecards, such as those required for patient-centered medical home (PCMH) certification, assume that better health can be achieved by following guidelines developed for single diseases, and that a summation of single-disease guidelines accurately describe the quality of work delivered by a primary care practice. These assumptions are aligned with traditional strategies for process and quality improvement (QI), such as Six Sigma and lean thinking, that have been powerful tools in mechanical systems and disease-specific care processes.<sup>3,4</sup>

Many people think that systems are improved by deconstructing the overall system performance and management into component elements.<sup>5</sup> In contrast, primary care is better conceptualized as a complex adaptive system—where learning people and institutions (“agents” in the complex adaptive system vernacular) interact with the environment in nonlinear patterns and self-organize, resulting in unpredictable, emerging creative behaviors rather than rigidly adhering to a standardized set of linear processes for diagnosing and treating single diseases.<sup>6-8</sup> Failure to appreciate these complexities leads some to erroneously conclude that practices have failed by not implementing standardized interventions.<sup>6</sup>

Well-aligned quality measures for primary care should promote accountable performance and boost clinicians’ motivation by rewarding them for managing complexity, solving problems, and thinking creatively when addressing the unique circumstances of each patient.<sup>9,10</sup> Instead, misaligned

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QI metrics and other mandates as electronic health records (EHRs)<sup>11</sup> have contributed to burnout among physicians, especially those in primary care,<sup>12</sup> causing some to advocate for the Quadruple Aim by adding the goal of enhancing professional satisfaction and well-being to the Triple Aim.<sup>13</sup> Most importantly, many primary care physicians believe the existing metrics may paradoxically encourage poor quality of care.<sup>14,15</sup>

Given primary care's central role in health care, we believe that the inappropriate application of traditional QI strategies and misaligned metrics undermines primary care, and in turn, all patient care. We challenge the notion that care process strategies, outcome goals, and reporting devices that may work in mechanical areas of health care are valid in primary care (Table 1).<sup>4</sup> We offer alternative approaches that we believe will better support primary care's important responsibilities in helping us achieve our national quality goals.

## CARE PROCESSES IN LINEAR AND COMPLEX NONLINEAR ENVIRONMENTS

### Process Complexity

Industrial QI approaches have improved health care delivery in mechanical linear domains, such as elective spine surgery,<sup>16</sup> ventilator-associated pneumonia bundles,<sup>17,18</sup> and central line bundles,<sup>19,20</sup> where processes do not change appreciably for different patients. These processes have relatively few variables—5 for ventilator bundles and 8 for central lines—and it is reasonable to assume that measurable process steps are causally connected to patient-oriented outcomes. Such is not the case for primary care, which is more complex than other specialties (eg, cardiology, psychiatry, and obstetrics/gynecology), because so many more inputs and outputs are managed during each visit.<sup>21,22</sup>

For example, a study of primary care physicians' workflow calculated a mean of 37 tasks performed per

**Table 1. Differences in Processes and Outcomes Between Care Isolated to a Single Disease and Primary Care**

Construct	Isolated Single Disease with Linear Mechanical Processes	Primary Care Nonlinear Adaptive Processes
<b>Care process</b>		
Process complexity	Few variables to be measured and controlled Example: central line bundles	Numerous variables that make accurate measurement problematic Example: patients with multiple medications, comorbidities, and socioeconomic challenges
Process standardization	Standard processes use consistent raw materials Example: antibiotics administered just before the incision is made in elective surgeries	Variable processes with variable raw materials Example: a wide range of disease severities and treatment options for the same diagnosis: eg, migraine, chronic low back pain, and fibromyalgia
Process controls	Machines and unconscious patients are largely controlled by their human operators Example: procedure not started until the pre-surgical checklist is completed and chlorhexidine antiseptic has been applied	The patient "machine" is controlled by a milieu of forces, including caregiver biases, unique patient beliefs, socioeconomic status, and the external environment Example: medication nonadherence associated with poverty, which is not controllable by the physician or the health care team
<b>Outcome goals</b>		
Goal clarity: multimorbidity	All team members and machines work toward one clear goal Example: titanium artificial hip placed in the appropriate position	There is no one right answer or goal, only an individualized understanding of risks and benefits where ideally the patients chooses the best answer for him or her Example: another round of chemotherapy for a patient with metastatic cancer vs hospice care
Goal clarity: unique patient priorities	Patients and caregivers agree on clear outcome Example: minimum days intubated on mechanical ventilation	Patients have different goals or priorities from their caregivers' recommendations Example: a diabetic patient who does not want to start taking insulin to reduce her blood glucose because of concerns about the affordability of the medicine and a belief that insulin killed her aunt
Goal timing	Standard processes have fixed expectations of the timing of interventions Example: daily trials of endotracheal tube extubation	The timing and order of addressing patient concerns are highly variable Example: the primary care physician and patient may negotiate and agree that a vague symptom be given more time to evolve, with no testing or treatment ordered the first time the concern is mentioned
<b>Inadequate summative quality scorecards</b>		
Poor risk-adjustment tools	Coexisting patient complexities rarely affect process metrics Example: postoperative thrombosis prophylaxis	Coexisting patient complexities often affect patient outcomes Example: any number of social determinant factors affect disease- and patient-oriented outcomes
Goal target number	Six Sigma-level outcomes Example: 0% infection rate or 100% vaccination uptake	Outcomes are dependent on a multitude of social and behavioral cofactors Example: much less than 100% of a population wants colon cancer screening no matter how strongly it is recommended and incentivized
Scorecard comprehensiveness	List of metrics for a physician represents most of the work performed Example: an overall rating for an orthopedist who only replaces hips and knees	Few simplistic quality measures capture only a tiny fraction of the work performed by a primary care physician. The alternative is a long, cumbersome list that is costly and burdensome to maintain and of questionable validity

visit in no discernable pattern within visit or physician, concluding "the number and sequence of tasks is varied and unpredictable."<sup>23</sup> This complexity is problematic for certain QI techniques, which have a practical limit on the number of variables that can be reliably measured and controlled. Typically, if more than 20 variables are included in a process control algorithm, the impact of measurement inaccuracies, for instance, results in cumulative noise that makes distinguishing individual variable effects very difficult (Thomas Edgar, PhD, Chair, Department of Chemical Engineering, University of Texas at Austin, personal communication).

### Process Standardization

Traditional QI assumes that the highest quality is achieved when a linear process occurs the same way each time.<sup>4</sup> Primary care, however, depends on meeting a wide variety of patient needs. More than one-third of health problems initially encountered at a primary care center do not lend themselves to a diagnosis, and about one-half are unlikely to result in a definitive diagnosis that would trigger a standard care pathway.<sup>24</sup> Care of patients in the primary care setting must account for each patient's comorbidities, disease severity, medication tolerance, beliefs, desires, and socioeconomic factors. Given the paucity of evidence, primary care physicians must often rely on creativity, problem solving, and adaptability to develop a custom care plan.

### Process Controls

Input variables in processes, such as hospital central line bundles, are largely controlled by clinicians (washing hands, using chlorhexidine antiseptics, etc). In contrast, complex adaptive systems have no single point of control.<sup>5</sup> Input variables for primary care processes and health outcomes are often beyond the control of the physician and patient,<sup>25</sup> such as socioeconomic factors<sup>26</sup> and poverty.<sup>27</sup> Some successes in hot spots of improving care for disadvantaged populations<sup>28</sup> may be generalizable, but the improved outcomes of these programs were more likely achieved by creating care plans adapted to the unique circumstances of high-risk patients. Additionally, for these approaches to spread more rapidly and consistently to other vulnerable populations, physician payment models must change.<sup>29</sup>

## DIFFERING OUTCOME GOALS IN LINEAR AND COMPLEX ENVIRONMENTS

Outcomes may be prioritized differently by independent agents in a complex adaptive system, may vary depending on the external environment of the system, and likely change with time,<sup>3,4</sup> creating challenges for

policy makers attempting to measure the outcomes of primary care centers in different settings.

### Outcome Goal Clarity: Multimorbidity

A body of literature concludes that specialists are more likely than generalists to follow disease-specific guidelines, but this literature assumes one correct diagnostic or treatment option based on the organ of interest.<sup>30</sup> For example, if a patient with a history of a heart attack develops erectile dysfunction after starting a  $\beta$ -blocker, what is the correct measure of quality? The cardiac disease-specific answer would be to continue the  $\beta$ -blocker. The primary care physician addresses the human factors; a patient-centered discussion of risks and benefits might cause the patient to accept a small increased risk of sudden death in return for a viable sex life and therefore choose to discontinue the  $\beta$ -blocker. When primary care physicians deviated from single-disease guidelines, reasons were deemed medically appropriate in most cases.<sup>31,32</sup>

### Outcome Goal Clarity: Unique Patient Priorities

Traditional QI assumes that patients want and will do what experts say is best. In reality, however, human beings have a wide range of priorities that may not be aligned with those of their caregivers. Dr Iona Heath, former president of the Royal College of General Practitioners, commented on a reform proposal for the National Health Service by a British think tank in 2011, "... patients are presented as units of health need, indistinguishable but for their medical histories. They are assumed to be uniformly rational and committed to making decisions designed to promote their health ...."<sup>33</sup> She concluded, "I find no evidence of any understanding [by the think tank authors] that patients can also be abusive, manipulative, and self-destructive." Although most patients are well meaning and cooperative, their personal goals, attitudes, and beliefs often confound guideline writers and physicians. Primary care physicians provide the most patient-centered care when they attempt to understand the meaning behind varying patient priorities and adjust diagnostic and treatment plans accordingly.

### Goal Timing

In traditional QI metrics, there is little variance of the timing of intervention goals. For example, the Center for Medicare and Medicaid Services (CMS) core quality indicator set includes a hospital metric that aspirin will be prescribed to every patient with an acute myocardial infarction at hospital discharge.<sup>34</sup> In primary care, the best time frame to attempt to achieve an idealized goal (if ever) is more complex. A well-supported patient with new-onset diabetes might achieve and

tolerate a hemoglobin A<sub>1c</sub> of <7.0% within a matter of months. For another patient who recently experienced the loss of a spouse with a resulting change in diet and activity, a hemoglobin of A<sub>1c</sub> <10% might represent a more reasonable goal until the social stressors improve.

## SUMMATIVE QUALITY SCORECARDS AND QUALITY OF A PRIMARY CARE PRACTICE

A rigid list of quality metrics purporting to summarize the quality of a primary care practice disregards the reality of a complex adaptive system, where adaptability and learning cause the practice to self-organize and prioritize practice aspects most worthy of improvement efforts while recognizing these priorities evolve with time.<sup>5</sup> Complex interactions and interdependencies emerge within such a system that cannot be understood or predicted simply by measuring individual elements of the system. One cannot assume that the whole is merely a sum of the measurable parts.<sup>8,35</sup> These realities imply that measures based on linear models, such as Ambulatory Diagnostic Groups and the Ambulatory Severity Index, are inadequate summaries of primary care quality.<sup>36</sup>

### Poor Risk-Adjustment Tools

Risk adjustment of summative quality scorecards is crucial to insure that primary care physicians and practices are evaluated fairly, because the characteristics of the associated patient population have a large effect on the reported results of standard QI metrics. Studies of these quality scorecards conclude that caring for complex patients in a safety-net setting strongly predicts failure to meet common quality goals in hospitals<sup>37,38</sup> and primary care settings.<sup>39-41</sup> The National Quality Forum has recognized that socioeconomic factors are important contributors to patient outcomes, that current measurements do not account for these factors, and that adequate risk adjustments for quality outcomes do not currently exist.<sup>42</sup> QI leaders have discussed attempting risk adjustment for patient panels,<sup>43</sup> but rigorous methods are lacking, and existing models give different results.<sup>44</sup> As a result, current summative quality scorecards disadvantage physicians who care for the most vulnerable patient populations. Physicians who are more attentive to the social and cultural context, and who adjust care plans accordingly, are more likely to deliver positive patient outcomes,<sup>45</sup> though measuring such contextual care takes considerable effort.<sup>46</sup>

### Goal Target Number

There is a clash of expectations between the reality of primary care and traditional notions of industrial QI, such as Six Sigma targets, which imply adherence

to process measures 99.99966% of the time.<sup>47</sup> Uptake of recommended tests or treatments is never 100% in the outpatient setting, even in populations with little socioeconomic deprivation. In vulnerable populations, patient preferences and daily practicalities often disrupt recommended ambulatory care. For example, in primary care, even though many patients say they are willing to undergo colon cancer screening when asked by their physicians,<sup>48</sup> uptake of recommended screening is low, often measured at less than 50% of eligible patients.<sup>49,50</sup> Even in primary care centers of excellence, chronic disease targets are met and sustained less than 50% of the time despite extra resources, such as health coaches.<sup>51</sup> The impossibility of achieving 100% uptake makes it much more difficult to draw a summative conclusion about which primary care practices are providing high-quality care when contrasted against elective surgeries where nearly 100% compliance with preoperative antibiotic guidelines could reasonably be achieved.

### Scorecard Comprehensiveness

The comprehensiveness of services offered by primary care physicians creates a tension between (1) the desire of funders of health care systems—such as Medicare and insurance companies—to be reassured with numerical data that participating primary care practices provide high-quality care, and (2) the practical limits, practice burdens, and dubious validity of data collection and reporting. On the one hand, a few well-chosen measures will represent only a fraction of the work delivered at primary care centers. CMS has just begun to evaluate patient-oriented outcome measures, and only for hip and knee replacement surgery.<sup>52</sup> For a practice that mostly performs such surgeries, this metric may allow policy makers to determine whether the practice is performing well. A 2-disease measure would be inappropriate and inadequate for primary care physicians.<sup>22</sup>

On the other hand, hundreds of measures become cumbersome and expensive to collect and report. Even worse is that these myriad measures will still be unlikely to capture the richness of the interactions between the primary care practice professionals and patients. Direct observational research of family physicians has shown that even when diagnoses are clustered into groups (eg, low back pain syndromes and headaches), 25 of these clusters account for only 60% of the diagnoses.<sup>53</sup> Family physicians have been observed to manage nearly 500 different diagnoses in 3,344 recorded patient encounters in a national study.<sup>22</sup> Such a complex interaction of variables makes it unrealistic to represent a complex adaptive system with a finite number of dependent and independent variables.<sup>8</sup> The cost to a practice is also burdensome. Just to main-

tain a PCMH certification has been estimated to cost \$120,000 per physician per year.<sup>54</sup> Thus, given the current state of inadequate measurement in primary care, summative scorecards, such as a PCMH certification, which purport to distinguish “good” and “bad” primary care practices, are woefully inadequate at best and misleading at worst. Scorecards constructed using EHR data represent an ideal case as imagined by system designers that often include incomplete or inaccurate information and differ from the reality experienced by patients and physicians.<sup>55</sup>

## MOVING FORWARD

It is challenging to evaluate complex adaptive systems that often do not comprise easily observable processes that lead to easily measurable outcomes.<sup>5,8,35,56</sup> Instead, these systems, such as in primary care, often have a plurality of aims and interests that sometimes conflict; they are influenced by their external environment, whose effects on the system could be minimal or profound; and the impact of the external forces often change with time.<sup>5,8</sup> In traditional QI of mechanical processes, measurements are often at the level of an individual step. Ideally, it is more appropriate to measure complex adaptive systems at the level of the final outcome of interest.<sup>5</sup>

Which is not to suggest that all aspects of a complex adaptive system are completely unmeasurable. Parts of a primary care practice may be fairly linear and simple, others might best be imagined as a complicated set of linear processes, and other parts reflect an adaptive system.<sup>36</sup> At the macro level, decades of research show that places with more family physicians or general practitioners are associated with better health outcomes at a lower cost.<sup>57</sup> At the practice level, it may be meaningful to measure and improve such processes as registration times or managing preventive services, though complexity science theory concludes that one cannot also assume that those process changes necessarily lead to better population health.

The British Quality and Outcome Framework (QOF) pay-for-performance system is instructive in many ways for some of the changes and metrics proposed for primary care in America, and it raises the question of whether the pursuit of numeric goals has come at the cost of loss of therapeutic relationships, trust, and less effective primary care. The QOF may be a good example of the disconnect between a series of disease-specific measures and overall population outcomes.<sup>58</sup> The QOF system, which has been in place more than 10 years, has resulted in only modest improvements in quality often that do not endure,<sup>59</sup> decreased the person-centeredness and continuity of

care,<sup>58</sup> decreased quality of care for diseases not part of their pay-for-performance system,<sup>58</sup> cost many billions of pounds to implement,<sup>60</sup> decreased physician morale,<sup>61</sup> and did not decrease premature mortality.<sup>62</sup> The Scottish National Health Service announced it will abandon the QOF system in 2017.<sup>63</sup> This disappointing result is likely explained by the top-down nature of the QOF evaluation, which removed some of the freedoms of the practices to self-organize, an important feature of a complex adaptive system.

Ideally in complex adaptive systems, the role of the evaluator changes from the top-down mandates of QOF.<sup>8</sup> The evaluator takes on the task of designing and implementing transforming feedback loops across systems, not merely compiling lists of single-disease measurements. This role falls into 2 major categories: absorbing uncertainty and making learning the primary outcome. Health care payers and regulators are not typically comfortable with uncertainty and will likely continue to insist on numerical metrics and quality scorecards, but more relevant and feasible measures for primary care are needed.<sup>64</sup> There have been several attempts to mandate a complex set of rules to govern health care.<sup>4</sup> When these have not yielded desired results, the instincts of payers and regulators has been to create even more rules. Complexity science asserts that these instincts take us in the wrong direction.<sup>4</sup> Acknowledging these external regulatory pressures, however, we propose the following principles for the next generation of quality metrics and scorecards in US primary care (summarized in Table 2).

### Shared-Decision Reporting

Future quantitative quality scorecards should borrow a concept from the British National Health Service QOF pay-for-performance system currently called exception reporting.<sup>65</sup> British general practitioners are given a list of reasons that allow them to remove individual patients from quality reports. Examples include patients new to their panel, patients who decline recommended tests or treatments, and patients with comorbidities that render a disease-specific quality metric inappropriate. Exception reporting may not be the best label; we concur with others who suggested alternative descriptions, such as patient choice or shared decisions.<sup>66</sup>

### Target Ranges Without Absolute Goals

Quality scorecards should never include metrics where 0% or 100% are the targets. Intermountain Health expects variance of 5% to 15% in some of its quality measures and scrutinizes physicians for complying with a protocol too much.<sup>67</sup> Targets should also be adjusted for socioeconomic status, though existing identifiable covariates have not proven to be very useful.

**Table 2. Proposals for Improved Quality Metrics and Reporting in Primary Care**

Shared-decision reporting
Target ranges without absolute goals
Measure when physicians do not order tests or treatments
Measure other aspects of primary care capacity associated with better outcomes
Comprehensiveness of services offered at the primary care center
Physician-patient continuity
Smaller practice size
Rate of generic prescription writing
Increased office visit time for complex patients
Access to local clinic professionals 24/7
Careful selection of referral specialists
De-emphasize measures of patient satisfaction
Measure outcomes more important to patients
Peer-led qualitative reviews of patterns of care

### Measure When Physicians Do Not Order Tests or Treatments

Physicians should be measured and acknowledged when they do not subject their patients to interventions of dubious value. In traditional QI, process measures almost always dictate what should be done, not what should be avoided. The true value of primary care often occurs when physicians choose to not order a test, refer a patient to another physician, or start a new treatment.<sup>68</sup> The Choosing Wisely campaign provides a thoughtful framework to develop new metrics to reduce unnecessary tests and treatments.<sup>69</sup>

### Measure Other Aspects of Primary Care Capacity Associated With Better Outcomes

Other aspects of primary care are associated with better outcomes or lower costs and should be measured. Examples include the comprehensiveness of services provided by family physicians that is associated with lower Medicare costs and hospitalizations<sup>70</sup>; increased physician-patient continuity associated with lower costs and fewer complications of common chronic conditions,<sup>71</sup> fewer hospitalizations,<sup>72</sup> and lower overall mortality<sup>72</sup>; smaller primary care practice size associated with reduced hospitalizations from preventable conditions<sup>74</sup>; and the rate of generic prescription writing associated with lower costs.<sup>75</sup> Other measures associated with lower total costs for larger primary care systems could include increased time for office visits for complex patients, 24/7 access to local clinic professionals, and careful selection of referral specialists.<sup>76</sup>

A better measurement of a practice may be that it regularly undertakes self-reflection and measures its patient care, with regulators worrying less about exactly what each practice is attempting to measure and improve. Doing so would encourage the positive features

of a complex adaptive system: self-organization, emergence, and coevolution with the practice's environment.<sup>55</sup>

### De-emphasize Measures of Patient Satisfaction

Improved patient satisfaction scores have been linked to inappropriate services, such as prescribing unnecessary antibiotics.<sup>77</sup> A full review of the advantages and disadvantages of patient satisfaction scores is beyond the scope of this article, other than to note that patients' goals and treatment preferences are not the same as patient satisfaction, and there is evidence that greater patient satisfaction scores are associated with worse outcomes, including higher mortality rates.<sup>78-80</sup> The enormous gaps in knowledge about the relevance of patient satisfaction scores to quality demand caution and further research in this area.

## LOFTIER PROPOSALS

### Measure Outcomes More Important to Patients

A lofty goal would be to measure more patient-centric outcomes at a population level, such as premature death rates (adjusted for age, comorbidities, and socioeconomic factors), disability (absence from work or school, limitation of activities, etc), ease of access, and some measures of patient experience of care (eg, respect, feeling heard, sensitivity, and treatment burden). Such measures may be more difficult to develop and implement, and they may often be statistically insignificant, even for a relatively large primary care practice, but they are likely to be more meaningful for achieving societal goals.<sup>81,82</sup>

### Peer-Led Reviews of Patterns of Care

Perhaps a better approach to reassure payers, regulators, and patients of high-quality primary care would be to replace most quantitative measures with adequately funded peer-reviewed assessments of patterns of care, as proposed recently in Scotland.<sup>63</sup> Peer-reviewed assessments would also be more consistent with evaluation principles of a complex adaptive system, where qualitative assessments of relationships between agents provides a more meaningful understanding of the quality of care provided than externally mandated numeric targets.<sup>35,56</sup>

### Final Thoughts

Family physicians' comfort with complexity, ambiguity, and uncertainty—and their ongoing relationships with their patients—allow them to negotiate flexible diagnostic and treatment plans with their patients based on patient-specific risk factors and probabilities of serious disease.<sup>68,84</sup> At its heart, traditional QI assumes there is a definitive and measurable right answer in a given situation. In contrast, primary care physicians often deliver high-value care by doing the best they

can with the patient care cards they are dealt., knowing that perfection will never be achieved. Adaptability rather than standardization should be the cornerstone of complex primary care and chronic disease care.<sup>85</sup> The national trends of rigid metrics and simplistic noncomprehensive scorecards must be reversed for primary care to do an even better job of delivering better patient care at a lower cost. At a minimum, measures that better respect the complexity and value of primary care would help promote the sustainable primary care workforce that is desperately needed.

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**Key words:** quality improvement; primary health care; health policy; complex adaptive systems

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