

Payers and providers must complement existing quality measures with sentinel indicators of system performance. An ideal value measurement tool enables efficient, continuous and objective measurement of the processes and outcomes that lead to value.

Executive summary

As health care moves from volume- to value-based care, payers and providers need a road map for achieving value, defined in this paper as the ratio of health outcomes to the cost of achieving those outcomes.¹ The dominant high-value paradigm is the Institute for Healthcare Improvement's (IHI) Triple Aim that promotes enhancements to the patient experience of care, improvements in population health and a reduction of per capita costs.² How do payers and providers know whether they are meeting these goals and delivering high value? This paper tackles that question.

Providers and payers want to lower total costs of care. To do this, they must focus on population health improvement that's fueled by metrics, incentives and clinical systems that align behavior across time, place and discipline.^{4,5}

Current measurements fall short. Accountable care organizations (ACO) know that most quality measures are limited in scope. These measures focus on processes of questionable importance, and they do not acknowledge shared accountability or costs. They also fail to align provider behaviors for system change. Quality measures often target specific diseases and often assume that poor performance stems from individual failure rather than a flawed system.⁶

What if quality measures encompassed not only entire populations but also all interactive elements of a primary care system centered on the IHI's Triple Aim?⁴ What if powerful composite measures provided a single assessment of system performance and value? And what if these measures were cost-effective, did not require special data collection, and could measure value and improvement continuously?

3M Health Information Systems (3M) proposes that payers and providers can complement existing quality measures with sentinel indicators of system performance and outcome metrics that they can aggregate into a composite view for value-based payment. 3M Value Index Score (VIS) is built on proven principles of high-quality primary care, and it can help providers and payers focused on the IHI's Triple Aim.

The road to value

The United States spends more on health care than any other industrialized country, 9 yet this extraordinary expense has not translated into better outcomes. Clearly, spending more is not the answer to achieving better quality. Indeed, higher costs have sometimes been associated with poorer outcomes. 10 Providers and payers must rein in costs while improving quality, a goal the healthcare industry is pursuing with the fundamental shift from volume- to value-based care. 11

The 'value agenda,' as described by Porter,¹² centers health system transformation on maximizing value for patients. Porter defines value as "the health outcomes achieved that matter to patients relative to the cost of achieving those outcomes." ¹ The IHI's Triple Aim, a leading force behind healthcare transformation efforts (including multiple CMS initiatives), specifies three linked goals essential to achieving a value-based healthcare system: Improving the patient experience of care, improving population health and reducing per capita costs.²

To achieve higher value through the IHI's Triple Aim, health system managers must assume greater responsibility for the populations they serve.³ They must move beyond silos of treatment that approach disease by disease and episode by episode. They must treat the individuals holistically by aligning micro and macro system processes within and across provider locations and provider types. Health system managers cannot 'right every wrong,' but they can measure, promote and reward system processes that facilitate the best chances for successful health outcomes in a framework of shared accountability. ^{4,5,13}

Payers and providers want proven roadmaps for system change. The right value measurement tools can help provide this critical guidance.



The central role of measurement

A value-based approach to health care is one that is person-centered, population-focused, outcomes-based and cost-effective. Value measurement is essential to transforming care and achieving these goals. Transformation is not a linear process, and it often requires many starts and restarts. It's important to have a measurement approach that easily allows for continuous feedback. Without frequent feedback, it's difficult to know whether efforts are effective and when to make course corrections.

Unfortunately, current measurement schemes are not up to the task. ¹⁴ The challenge for ACOs, as posed by Elliot Fisher⁶ and others, ¹⁵ is that current disease-specific quality measures for integrated delivery systems are limited in scope, and they don't recognize shared accountability. These measures also don't consider costs, and they're not practical for aligning provider behaviors for system change.

Current quality measures typically target specific diseases and are often built on the assumption that "poor performance is a consequence of individual failure, rather than flawed systems." Providers and payers need measures that address each population as a whole and encompass all of the interactive elements of a primary care system that contribute to achieving the IHI's Triple Aim. Providers and payers also need a single measure of value that they can disaggregate for specific performance improvement initiatives. A bevy of disparate micro clinical measures cannot provide this utility. Instead, composite measures summarizing performance on multiple dimensions could guide and reward health care improvements. By signifying the critical components of care in a person-centered system, composites can become accelerants for improvement. The use of these measures must also be cost-effective. The most common quality measures currently in use often require special and expensive data collection, rendering them both burdensome and impractical for continuous value measurement and improvement.

Value measurement should be inexpensive and continuous, providing feedback on individual providers and overall system performance, helping identify opportunities for improvement and innovation.



Providers and payers must complement existing quality measures with sentinel indicators of system performance. These new operational and outcome-based metrics ideally enable efficient, continuous and objective measurement of the processes and outcomes that lead to value.

The current state of value measurement

Although hundreds of quality measures exist, there are many factors that limit the utility of these measures for population health management and system improvement. Thus, the call for a new set of complementary measures is needed.

The following sections describe why and how existing approaches to value measurement fall short.

Over-reliance on process measures and surrogate markers

Donabedian established the structure, process, outcomes paradigm for quality measurement and emphasized the need to define the causal processes at work linking these factors. He also discussed the importance of delineating the level at which quality is assessed—the provider, person, or population/community—and the need for measurement to match the level.

This paper focuses on delineating each level of population health and calls for a systemic view when measuring the quality of care at each of those levels. It also advocates for attention to explicit models representing the essential components of population health processes and outcomes. The disease-specific process orientation of most current measures does not meet this need.

In a 2013 analysis of its nearly 700 endorsed measures and other sources, the National Quality Forum (NQF) identified multiple gaps in measurement, including the need for measures on care coordination, population health, patient-reported outcomes and efficient use of resources. These are the very features that make up a well-functioning care system and that providers and payers must view together to understand population health. Absent from the report was a recognition of the need for ongoing broad-based measures of outcomes.

Porter defines outcomes as "the results of care in terms of patients' health over time," distinct from processes designed to achieve those results or biologic indicators of them. Unfortunately, the dominant paradigm for measurement is a reliance on surrogates or biomarkers as substitutes for clinical endpoints— and this is problematic. 19

For example, many payers assess the percentage of a provider's patients with diabetes who had foot exams or low LDL. Although these metrics may correspond with clinical guidelines, they don't necessarily address more direct patient concerns (e.g., preventable encounters with the healthcare system, functional status, severity of disease status or quality of life). Some of these outcomes are difficult to measure routinely; however, it's feasible to collect other outcomes as part of a systemic performance measurement model.



The focus is on specific diseases or settings

Currently, most quality measures focus on specific diseases and settings rather than the person or population as a whole. While measuring disease-specific activities can help providers and payers understand and improve disease-specific issues, there is strong evidence to suggest that micro improvements are not sustainable. These micro improvements also come at the cost of improvements in other areas of primary care. In addition, disease-specific measures don't allow for accurate provider comparisons because they don't take panel disease variance into consideration.

Measuring is burdensome, expensive, infrequent and incomplete

Quality measurement systems often require data collection efforts outside of the normal workflow. Almost all systems require costly, disruptive and time-consuming medical record reviews. These data collection processes prevent frequent measurement that limits opportunities for feedback and improvement.

Greater adoption of EMRs won't solve the problem, as EMRs don't include information about comprehensive coverage across time, place and discipline. They also don't include standard requirements for content and measurement. Relying on contemporary EMRs for value measurement can produce serious gaps in information as well as potentially misleading pictures of performance.²¹⁻²⁴



Essential qualities of a value measurement tool

An ideal value measurement tool enables efficient, continuous, objective and reliable measurement of the processes and outcomes that lead to value across the full spectrum of primary care and patient populations. Such a tool can also identify the critical path elements required for system change and clearly quantify overall progress toward an identified goal. Because cost is a crucial component of the value equation, the tools also correlates outcomes with total cost of care (TCC).

When considering how to measure value in a primary care system, providers and payers must ask the following questions:

- 1. Will the measurement have a meaningful impact on the IHI's Triple Aim? To achieve the Triple Aim, providers and payers must direct balanced attention to the many tasks of macro and micro integration across providers, patients and medical neighborhoods within systems of care.³ A meaningful performance measure for lasting transformation will capture indicators of success in each of these areas:
- Disease prevention²⁶
- Access²⁵
- Coordination and follow-up, especially for persons with chronic conditions^{25,5,27}
- Judicious stewardship of resources²⁸
- Effectiveness as demonstrated by superior impacts on health status^{3,4}

2. Is the measurement consistent with the principles of primary care?²⁹

These principles are:

- First-contact care

 (i.e., improving accessibility and reducing unnecessary specialist care)
- Person-focused- rather than disease-focused care over time
- Comprehensive care (i.e., patients receive care for most problems within the primary care system)
- Coordination of care, when necessary

 Does the measurement support system change? A measure must be able to help providers and payers assess improvement across the entire primary care system.

For example, reducing preventable readmissions requires the following:

- Efficiency and quality during the hospital stay
- Communication between the hospital and post-acute provider at the time of discharge
- Tracking and follow-up post-discharge

A measure must cross multiple aspects of care delivery to demonstrate change for lasting value.

- 4. Does the measurement support continuous improvement? As noted above, a measure's ability to support continuous improvement is directly related to its frequency of production and validity for the construct being evaluated, in this case system transformation for better population health.
- 5. Does the measurement minimize administrative burden? Measures based on easily-collected data not only reduce the administrative burden on providers and health systems, but they also help drive continuous improvement by facilitating the ongoing feedback necessary to effect change.
- 6. Does the measurement include a composite score? Unlike disparate scores from multiple measures, a composite score provides a comprehensive view of overall provider and system performance. Organizations such as the Agency for Healthcare Research and Quality (AHRQ), the NQF and the American Medical Association's Physician Consortium for Performance Improvement® (PCPI®) have all recognized the significant value of using composite measures. As noted by PCPI, composite measures may help to "accelerate improvement of care...by focusing attention on the reliable delivery of all important components of care."

Physicians can report composite scores as an overall score and as individual disaggregated measures, allowing them to focus on the full scope of patient care. More broadly, composite measures support system change by enabling valid comparisons across providers for performance emulation and improvement.

7. Is the measurement risk-adjusted? Provider performance on quality measures varies with the degree of illness, age and other factors in a patient population. As the complexity of care grows, so does the challenge of delivering high-value care. Ignoring risk adjustment can lead to false differences that are compounded by physician clustering. Risk adjustment removes baseline differences and accounts for individual patient burden of illness, thereby converting the question from 'Are the outcomes from Provider A better than outcomes from Provider B?' to 'Are Provider A and Provider B outcomes better than what can be expected for the group of patients attributed to them?'

- 8. Can provider intervention influence the measure? An objective measure must include domains of care that providers can influence. However, as noted above, the measurement must also consider the total system of care to determine where change may be necessary. For transformation to occur, the entire enterprise must be engaged and committed to implementing the necessary infrastructure.
- Does the measurement correlate with TCC? Reducing overall costs of care is central to the IHI's Triple Aim and health care affordability.

A tool designed to support value measurement must demonstrate an association between better outcomes and lower TCC.

10. Is the measurement reliable?
Simply put, are the measures well-researched and reliable, and do they yield consistent results over time?

These are ten important and difficult properties to achieve. The next section introduces a composite value score that has these properties and is currently in use to promote lasting value in health care as part of value-based purchasing programs.

Taking value measurement to the next level: The 3M VIS

The 3M VIS is a value measurement system designed to meet the criteria noted above. Drawing on nationally-recognized healthcare measures, 3M VIS takes measurement to the next level by comprehensively capturing the interactive elements of primary care that can contribute directly to the IHI's Triple Aim. There is often an inverse relationship with TCC and 3M VIS, meaning a higher VIS correlates with a lower TCC. Understanding how and why this occurs is critical to the value equation.

3M VIS is an enterprise tool for measuring system change and the components that are necessary for that change. It produces a single, holistic, composite score that clearly quantifies how well a provider takes care of his or her entire patient population within a system of care, based on six critical primary care domains.

These six domains derive from 15 measures of key processes and outcomes that lead to value in health care.

As shown in Table 1, the six domains of 3M VIS encompass fundamental components of high-value primary care expected to drive outcomes that matter to patients: primary, secondary and tertiary prevention;

panel health status change; continuity of care; chronic and follow-up care; and efficiency. Each measure within these domains is well-researched, and many are based on broadly-accepted quality measures. The composite score uses mathematical transformation to ensure that each measure is on the same scale so that an overall average can be determined, with each measure and domain weighted equally. In the next section, we review the properties of 3M VIS that enforce its utility and validity.

Table 1. Six domains of 3M VIS encompass components of high-value primary care

3M Vis Domains	Measure Concepts	Expected Outcomes	Measures (*= Risk Adjusted)
Primary and secondary prevention	Visits to educate, immunize and screen for prevention of disease (e.g., infant well care, adult screening)	Education, motivation, immunization and screening that prevents or leads to early discovery and treatment of disease	Well-child visits for infants Well-child visits for children 3-6 Breast cancer screening Colorectal cancer screening index
Tertiary prevention	Admissions and emergency department (ED) visits for symptoms and diseases that are amenable to ambulatory care treatment	Access to effective primary care reduces the incidence of ambulatory care sensitive condition (ACSC) admissions and ED visits	ACSC concept translated into potentially preventable admissions and ED visits*
Panel health status change	Disease progression among panel members with chronic disease	Good primary care delays disease progression in the chronically ill.	Change in type and severity of 3M™ Clinical Risk Groups (3M CRGs)*
Continuity	Level of engagement and continuity for panel members	Consistent patient engagement and care coordination increases adherence and the identification of health problems as well as decreases hospitalization and ED use	Continuity of Care Index* Any PCP Visit?
Chronic and follow-up care	Chronic and follow-up care processes and outcomes	Follow-up care reduces readmissions, and a regular source of chronic care improves patient outcomes.	3M" Potentially Preventable Readmissions (PPR)* Post-discharge follow-up Three chronic care visits
Efficiency	Judicious stewardship of pharmaceutical and ancillary resources	Stewardship of resources is possible through better patient engagement and coordination with specialists	Potentially preventable services* Generic prescribing*

The benefits of using 3M VIS

- Impacts the IHI Triple Aim in a meaningful way. 3M VIS incorporates measures that impact population health (e.g., access, continuity, disease prevention and judicious stewardship).
- 2. Is consistent with the principles of primary care. The principles of primary care are the driving force behind 3M VIS. As shown in Table 2, 3M VIS domains correspond with core features of effective primary care as described and researched by Barbara Starfield and others.^{29, 32}
- **3. Supports system change.** The composition of 3M VIS is uniquely designed to drive overall system transformation.

The six 3M VIS domains comprise key measures of change across the full continuum of primary care, prompting improvements in provider performance as well as productive and sustainable changes in the systems with which they interact.

Focusing on process improvements in a singular disease doesn't lead to noticeable improvements in the overall 3M VIS nor does it meet the goals of the Triple Aim.

To illustrate, a model of the interacting dynamics of 3M VIS is presented in Figure 1. The domains work together to produce better outcomes, thereby reducing the TCC.

4. Supports continuous quality improvement. 3M VIS supports continuous improvement because all measures are derived from regularly refreshed administrative data, enabling ongoing near-time measurement and reporting on patterns and change efforts. With a continuous data source, it's possible to rapidly review scoring information at all levels within a healthcare system through 3M VIS dashboards. This includes the ability chart progress for individual providers, a physician group, a region, or an ACO or network.

- 5. Minimizes administrative cost and burden. 3M VIS is rate-based—not event-driven. This eliminates the potentially costly and time-consuming need to obtain conclusive proof and pass judgment on any one particular instance of care. Rather than focusing on a specific admission or ancillary service, for example, the 3M VIS indicates whether overall admissions matched anticipated rates for a similar population. The same is true for the volume of ancillary services. Using this information, a provider can see how he or she performs over time compared to the system average.
- 6. Delivers a composite view of performance. As a composite measure, 3M VIS combines multiple related concepts of primary care into a single construct for value, delivering a single number that is more useful, reliable and representative than any individual number tied to a single component of care. The potential power of composites for measuring health care has been well recognized;³⁰ however, until 3M VIS, this capability has remained largely unrealized.

The power of the composite is further enhanced by the ability to deconstruct 3M VIS into related actionable sub-metrics. In essence, the overall score is the gauge of system health, and the domains/measures are the interacting pieces necessary for success. Targets for change can be set as improvements against baseline performance or against a policy goal to close the gaps in excellence.

Principles of primary care	3M VIS domains	
Person-focused care	Primary and secondary prevention	
First contact for care	Tertiary prevention	
Comprehensive care	Panel health status change Chronic and follow-up care	
Coordination of care	Continuity Efficiency	

Table 2. 3M VIS is consistent with the principles of primary care

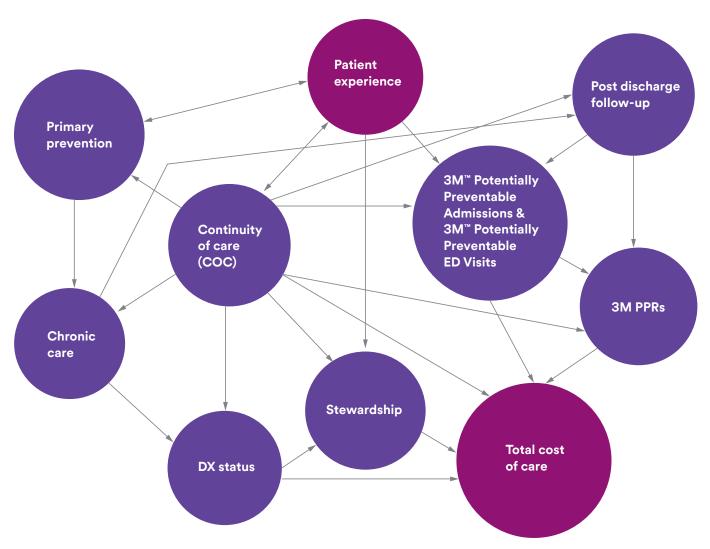


Figure 1. 3M VIS metrics working together to influence the IHI's Triple Aim within a system of care

- 7. Adjusts to variations in populations. Certain measures are risk-adjusted using 3M CRGs. Doing so addresses concerns regarding inaccurate performance assessment and inequitable peer-to-peer comparisons by accounting for baseline differences in patient panels.
- 8. Can be influenced by provider interventions. This includes direct interventions as well as greater engagement and coordination within the overall healthcare system. For example, there is substantial evidence that primary care physicians can have a salutary impact on a variety of 3M VIS domains, including ACSCs, 3, 34-37 coordination of care, 38, 39 chronic disease progression⁴⁰⁻⁴² and readmissions. 43-45
- 9. Is associated with lower cost of care. Better 3M VIS performance is associated with lower TCC in any setting in which it has been tested.

 One example is displayed in Figure 2. Providers with a poor (i.e., negative) 3M VIS have a higher than expected TCC. Those with a higher 3M VIS have lower than expected costs.



Reliability and validity of 3M VIS

3M VIS is well-established from five different perspectives:

- Claims data reliability. 3M VIS integrates administrative data across multiple locations, disciplines and timespans. Substantial research has validated the reliability of claims data to monitor disease status, healthcare processes and outcomes.46-53 3M VIS overcomes concerns with low sensitivity in single source claims data by using multi-source longitudinal claims data via 3M CRG software.54 Used for risk-adjustment and calculating some quality measures in 3M VIS, 3M CRGs are built on longitudinal claims data from all settings over extended periods of time. Users can easily aggregate information, creating a reliable, accurate and comprehensive picture of a patient's disease burden. 3M CRGs also consider recent data and the recurrence of important indicators, producing strong specificity and sensitivity.
- Psychometrics. 3M VIS has good psychometric values, with statistically significant modest correlations between domains and the overall score, indicating a unified construct without troubling redundancy. In addition, the average correlation for individual measures to their domains ranges between .60 and .79.
- Demonstrated reliability. Based on a data set of approximately 3,500 providers with 50 percent retention rates and three years of experience using 3M VIS, there is a correlation of .71 from year to year, meeting the American Medical Association's established target of .70 in timeover-time correlation for composite physician profiling measures.³⁰

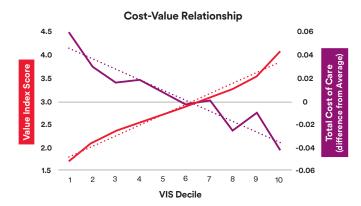


Figure 2. Better 3M VIS performance is associated with lower TCC in this analysis that also correlates with a variety of other studies performed on the metric.

- Face validity. 3M VIS has clear face validity

 (i.e., the degree to which a measure appears to
 perform its intended purpose in terms of assessment).

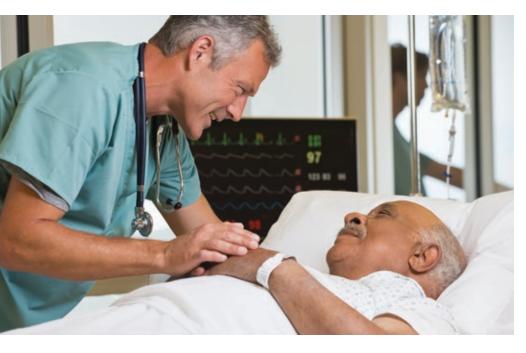
 Intended to measure change within the primary care
 system, 3M VIS is consistent with key principles of
 effective primary care^{25, 29} and, as seen in Table 2,
 includes domains that address each one.
- Lineage. Each domain draws on well-researched, well-established metrics and concepts, described in the next section.



3M VIS domains and support evidence

The domains of 3M VIS

- Primary and secondary prevention has four measures for wellchild and adult screening services designed for early detection or prevention of disease. Services and exclusions are based on the Healthcare Effectiveness Data and Information Set (HEDIS)[®].55
- Tertiary prevention uses the ACSC concept translated into potentially preventable ED visits and initial admissions.⁵⁶
- Panel health status change (i.e., disease progression) is a new measure that represents a long-studied concept in the academic literature that, to date, has been mostly applied in studies using health status surveys, many of which are impractical for ongoing measurement. More recent literature supports the utility of new classification systems to track disease progression in populations.^{57,50-51} 3M VIS uses an advanced system (i.e., 3M CRGs)⁵⁴ to assess health status changes of panel members with chronic conditions compared to a benchmarked similar panel. The domain is consistent with calls for measuring disease burden as a key outcome in the pursuit of population health⁴ and for measurement frameworks that conceptualize reductions in the occurrence and severity and disease progression across populations. These measurements form the basis for evaluating improvements in health more broadly than the current focus on specific diseases.⁵⁸
- Continuity has two measures as well as the percentage of panel members with an identified PCP. Without at least one PCP visit annually, it's unlikely that a panel member's health needs are adequately addressed. Also included in this domain is the riskadjusted COC score.59 One of the oldest and most widely-used measures⁶⁰ for COC, the COC score was a numerical response to Shortell's concept⁶¹ that the fewer sources of care, the greater the likelihood that a patient will experience continuity of care, less duplication of unnecessary services, and better follow-up and adherence. Higher COC scores have been favorably associated with these desirable primary care processes and outcomes: Decreased ACSC admissions;62-63 more well-child visits, screenings, and immunizations;⁶⁴⁻⁶⁵ reduced ED use;⁶⁶⁻⁶⁷ decreased costs of care;⁶⁸⁻⁶⁹ and better clinical outcomes of care. 70-71 The COC score is the basis for the only claims-based measure for care coordination endorsed by the AHRQ in its Care Coordination Measures Atlas.72



- Chronic and follow-up care has three measures for the physician's provision of post-hospital care and engagement with panel members who have chronic conditions. The measures are rates determined by the 3M™ PPR grouping software,73 a post-discharge physician visit74-75 and the occurrence of at least three visits annually for chronic care. The last measure is an innovative approach to setting threshold requirements for chronic care management and is derived from concepts expressed in the Chronic Care Model by Wagner, et al. 76-77 This model is based on the premise that high-quality chronic care is characterized by productive interactions between the practice team and patients, involving assessment, self-management support, optimization of therapy and follow-up.78 After consultations with clinicians, it was determined that at least three visits would be necessary to achieve this model. The purpose of these visits would be to conduct an annual exam; manage complications, comorbidities, and exacerbations; monitor and manage recurring and complex medication regimens; conduct case management sessions with the patient; and educate, encourage, and provide selfmanagement support for the patient.81
- Efficiency represents judicious stewardship of two key healthcare resources (i.e., pharmaceuticals and ancillary services). One measure captures the use of generic prescriptions, and the other measure represents the cost of ancillaries that have high variation. The second measure is similar in concept to the ideas expressed in the Choosing Wisely campaign⁸⁰ and is implemented in 3M VIS using potentially preventable services.⁵⁸

3M VIS in action

Payers currently use 3M VIS to differentiate and reward provider performance within commercial and public payer ACOs, fee-for-service environments and patient-centered medical home arrangements. It has provided measurable value to payers and providers in a variety of settings. First employed in 2011, 3M VIS has been tested and improved based on the experience of almost two million patients and more than 7,000 providers. Generally, 3M VIS deployments are designed to improve a network mean, or overall distribution of performance (cost and quality), by using 3M VIS in an incentive and reporting plan designed to improve performance.

Benefits of 3M VIS

- Meaningfully impacts the IHI's Triple Aim
- Remains consistent with principles of primary care
- Drives system change
- Uses claims data for analysis
- Supports continuous measurement and improvement
- Ensures low administrative burden and cost
- Includes a composite rate-driven, risk-adjusted score
- Provides population- and person-focused analysis
- Captures processes and outcomes that lead to value
- Allows 'apples-to-apples' comparisons of providers
- Responds to provider interventions
- Correlates with TCC
- Provides reliable and valid data



Conclusion

In response to spiraling costs that have not yielded corresponding improvements, the healthcare industry is changing its focus from volume to value. Consequently, the drive toward accountable care and value-based purchasing has pushed value measurement front and center for payers and providers.

A holistic systems approach to value measurement plays an essential role in monitoring and shaping meaningful change in primary care and achieving the IHI Triple Aim. Yet traditional quality metrics are generally comprised of narrow, disparate process- and disease-specific measures that don't adequately capture the full primary care experience for entire populations or allow equal peer-to-peer comparisons. These metrics also often require burdensome data collection, which curbs their utility for continuous measurement and improvement.

3M VIS addresses these challenges with a population-based, claims-derived composite measurement designed to reflect systemic changes in care delivery with minimal administrative burden. Built on the principles of primary care, the tool includes continuously reported, well- researched, risk-adjusted measures of the processes and outcomes that drive value. These measures are rolled up into a single composite score to provide an objective and comprehensive overview of performance that users can easily deconstruct to provide a roadmap for improvement. As studies have demonstrated 3M VIS to be associated with TCC, 3M VIS complements cost measures in defining true value within a primary care system.

Ultimately, 3M VIS offers insight that can help providers better understand and improve patterns of care for all patients. It can also assist ACOs in their efforts to support providers and the systems surrounding them to transform care. Finally, it can help objectively determine and reward the achievement of value-based care.

For more information on how 3M helps payers, providers and government agencies navigate the journey to value- based care, please visit www.3m.com/his/vbc.

References

- 1. Porter ME. What Is Value in Health Care? N Engl J Med. 2010;363(26):2477-2481. doi:10.1056/NEJMp1011024.
- 2. Berwick DM, Nolan TW, Whittington J. The Triple Aim: Care, Health, And Cost. Health Aff (Millwood). 2008;27(3):759 -769. doi:10.1377/hlthaff.27.3.759.
- 3. McCarthy D, Klein S. The Triple Aim Journey: Improving Population Health and Patients' Experience of Care, While Reducing Costs. Commonwealth Fund. 2010:1-12. Available at: what domains of activity will most influence Triple Aim? Accessed March 17, 2014.
- 4. Stiefel M, Nolan K. A Guide to Measuring the Triple Aim: Population Health, Experience of Care, and Per Capita Cost. Cambridge, Massachusetts: Institute for Healthcare Improvement. 2012. Available at: http://mobile.commonwealthfund.org/~/media/Files/Publications/Case%20Study/2010/Jul/Triple%20Aim%20v2/1421_McCarthy_triple_aim_journey_overview.pdf. Accessed March 17, 2014.
- 5. Burns LR, Pauly MV. Accountable Care Organizations May Have Difficulty Avoiding The Failures Of Integrated Delivery Networks Of The 1990s. *Health Aff (Millwood)*. 2012;31(11):2407-2416. doi:10.1377/hlthaff.2011.0675.
- 6. Fisher ES, Shortell SM. Accountable care organizations: Accountable for what, to whom, and how. *JAMA*. 2010;304(15):1715-1716. doi:10.1001/jama.2010.1513.
- 7. Performance Measurement: Accelerating Improvement. *Inst Med.* Available at: http://www.iom.edu/Reports/2005/Performance-Measurement-Accelerating-Improvement.aspx. Accessed April 1, 2014.
- 8. National Quality Forum. Composite Performance Measure Evaluation Guidance. 2013. Available at: http://www.qualityforum.org/Publications/2013/04/Composite_Performance_Measure_Evaluation_Guidance.aspx. Accessed March 16, 2014.
- 9. Squires DA. The Commonwealth Fund: Explaining High Health Care Spending in the United States: An International Comparison of Supply, Utilization, Prices, and Quality. 2012. Available at: http://www.commonwealthfund.org/~/media/Files/Publications/Issue%20Brief/2012/May/1595_Squires_explaining_high_hlt_care_spending_intl_brief.pdf. Accessed March 16, 2014.
- 10. Hussey PS, Wertheimer S, Mehrotra A. The Association Between Health Care Quality and Cost, A Systematic Review. *Ann Intern Med.* 2013;158(1):27-34. doi:10.7326/0003-4819-158-1-201301010-00006.
- 11. VanLare JM, Conway PH. Value-Based Purchasing National Programs to Move from Volume to Value. N Engl J Med. 2012;367(4):292-295. doi:10.1056/NEJMp1204939.
- 12. Porter ME, Lee TH. The strategy that will fix health care: providers must lead the way in making value the overarching goal. Harv Bus Rev. 2013;91(10):50+.
- 13. Fisher ES. Building a Medical Neighborhood for the Medical Home. *N Engl J Med.* 2008;359(12):1202-1205. doi:10.1056/NEJMp0806233.
- 14. Bankowitz R, Bechtel C, Corrigan JM, DeVore S, Fisher ES, Nelson G. A Framework For Accountable Care Measures. Health Aff Blog. 2013. Available at: http://healthaffairs.org/blog/2013/05/09/aframework-for-accountable-care-measures/. Accessed March 17, 2014.
- 15. DeVore S, Champion RW. Driving Population Health Through Accountable Care Organizations. *Health Aff (Millwood)*. 2011;30(1):41-50. doi:10.1377/hlthaff.2010.0935.
- 16. Donabedian A. The quality of care: How can it be assessed? *JAMA*. 1988;260(12):1743-1748. doi:10.1001/jama.1988.03410120089033.
- 17. NQF. 2012 NQF Measure Gap Analysis. Available at: https://www.qualityforum.org/Publications/2013/03/2012_NQF_Measure_Gap_Analysis.aspx. Accessed March 17, 2014.
- 18. Porter ME. What Is Value in Health Care? Supplementary Appendix 2, Measuring health outcomes: the outcomes hierarchy. *N Engl J Med.* 2010;363(26):2477-2481. doi:10.1056/NEJMp1011024.
- 19. Yudkin JS, Lipska KJ, Montori VM. The idolatry of the surrogate. BMJ. 2011;343(dec28 1):d7995-d7995. doi:10.1136/bmj. d7995.

The next evolution in healthcare value measurement: 3M[™] Value Index Score

- 20. Gillam SJ, Siriwardena AN, Steel N. Pay-for-Performance in the United Kingdom: Impact of the Quality and Outcomes Framework—A Systematic Review. *Ann Fam Med.* 2012;10(5):461-468. doi:10.1370/afm.1377.
- 21. Greiver M, Barnsley J, Glazier RH, Harvey BJ, Moineddin R. Measuring data reliability for preventive services in electronic medical records. *BMC Health Serv Res.* 2012;12(1):116. doi:10.1186/1472-6963-\12-116.
- 22. Fernandopulle R, Patel N. How The Electronic Health Record Did Not Measure Up To The Demands Of Our Medical Home Practice. *Health Aff (Millwood)*. 2010;29(4):622-628. doi:10.1377/hlthaff.2010.0065.
- 23. Parsons A, McCullough C, Wang J, Shih S. Validity of electronic health record-derived quality measurement for performance monitoring. *J Am Med Inform Assoc.* 2012;19(4):604-609. doi:10.1136/amiajnl-2011-000557.
- 24. Chan KS, Fowles JB, Weiner JP. Review: Electronic Health Records and the Reliability and Validity of Quality Measures: A Review of the Literature. *Med Care Res Rev.* 2010;67(5):503-527. doi:10.1177/1077558709359007.
- 25. Bodenheimer T, Ghorob A, Willard-Grace R, Grumbach K. The 10 Building Blocks of High-Performing Primary Care. *Ann Fam Med.* 2014;12(2):166-171. doi:10.1370/afm.1616.
- 26. Krist AH, Shenson D, Woolf SH, et al. Clinical and Community Delivery Systems for Preventive Care: An Integration Framework. *Am J Prev Med.* 2013;45(4):508-516. doi:10.1016/j.amepre.2013.06.008.
- 27. Naylor MD, Aiken LH, Kurtzman ET, Olds DM, Hirschman KB. The Importance Of Transitional Care In Achieving Health Reform. *Health Aff (Millwood)*. 2011;30(4):746-754. doi:10.1377/hlthaff.2011.0041.
- 28. Morden NE, Colla CH, Sequist TD, Rosenthal MB. Choosing Wisely The Politics and Economics of Labeling Low-Value Services. *N Engl J Med.* 2014;370(7):589-592. doi:10.1056/NEJMp1314965.
- Starfield B, Shi L, Macinko J. Contribution of primary care to health systems and health. Milbank Q. 2005;83(3):457-502. doi:10.1111/j.1468-0009.2005.00409.x.
- 30. American Medical Association. Measures Development, Methodology, and Oversight Advisory Committee:

 Recommendations to PCPI® Work Groups on Composite Measures. 2010. Available at: http://www.ama-assn.org/resources/doc/cqi/composite-measures-framework.pdf.
- 31. Bobko P, Roth PL, Buster MA. The Usefulness of Unit Weights in Creating Composite Scores: A Literature Review, Application to Content Validity, and Meta-Analysis. *Organ Res Methods*. 2007;10(4):689-709. doi:10.1177/1094428106294734.
- 32. Starfield B, Horder J. Interpersonal continuity: old and new perspectives. Br J Gen Pract. 2007;57(540):527-529.
- 33. Basu J, Friedman B, Burstin H. Primary care, HMO enrollment, and hospitalization for ambulatory care sensitive conditions: a new approach. *Med Care*. 2002;40(12):1260-1269.
- 34. Caminal J, Starfield B, Sánchez E, Casanova C, Morales M. The role of primary care in preventing ambulatory care sensitive conditions. *Eur J Public Health*. 2004;14(3):246-251.
- 35. Flores G, Abreu M, Tomany-Korman S, Meurer J. Keeping children with asthma out of hospitals: parents' and physicians' perspectives on how pediatric asthma hospitalizations can be prevented. Pediatrics. 2005;116(4):957-965. doi:10.1542/peds.2005-0712.
- 36. Gibson OR, Segal L, McDermott RA. A systematic review of evidence on the association between hospitalisation for chronic disease related ambulatory care sensitive conditions and primary health care resourcing. *BMC Health Serv Res.* 2013;13(1):336. doi:10.1186/1472-6963-13-336.
- 37. Laditka JN, Laditka SB, Probst JC. More may be better: evidence of a negative relationship between physician supply and hospitalization for ambulatory care sensitive conditions. *Health Serv Res.* 2005;40(4):1148-1166. doi:10.1111/j.1475-6773.2005.00403.x.
- 38. Reid R, McKendry R. Patient-Focused Care Over Time: Issues Related to Measurement, Prevalence and Strategies for Improvement Among Patient Populations. 2003. Available at: http://74.81.206.232/Migrated/PDF/ResearchReports/OGC/barer_final.pdf.
- 39. Glazier RH, Klein-Geltink J, Kopp A, Sibley LM. Capitation and enhanced fee-for-service models for primary care reform: a population-based evaluation. *Can Med Assoc J.* 2009;180(11):E72 -E81. doi:10.1503/cmaj.081316.
- 40. Rothman AA, Wagner EH. Chronic Illness Management: What Is the Role of Primary Care? *Ann Intern Med.* 2003;138(3):256-261. doi:10.7326/0003-4819-138-3-200302040-00034.

- 41. Beaglehole R, Epping-Jordan J, Patel V, et al. Improving the prevention and management of chronic disease in low-income and middle-income countries: a priority for primary health care. *The Lancet*. 2008;372(9642):940-949. doi:10.1016/S0140-6736(08)61404-X.
- 42. Stellefson M, Dipnarine K, Stopka C. The Chronic Care Model and Diabetes Management in US Primary Care Settings: A Systematic Review. *Prev Chronic Dis.* 2013;10. doi:10.5888/pcd10.120180.
- 43. Tang N. A primary care physician's ideal transitions of care—where's the evidence? *J Hosp Med Off Publ Soc Hosp Med*. 2013;8(8):472-477. doi:10.1002/jhm.2060.
- 44. McAlister FA, Youngson E, Bakal JA, Kaul P, Ezekowitz J, Walraven C van. Impact of physician continuity on death or urgent readmission after discharge among patients with heart failure. *Can Med Assoc J.* 2013;185(14):E681-E689. doi:10.1503/cmaj.130048.
- 45. Pugh JA, Wang C-P, Espinoza SE, et al. Influence of Frailty-Related Diagnoses, High-Risk Prescribing in Elderly Adults, and Primary Care Use on Readmissions in Fewer than 30 Days for Veterans Aged 65 and Older. *J Am Geriatr Soc.* 2014;62(2):291-298. doi:10.1111/jgs.12656.
- 46. Asch SM, Sloss EM, Hogan C, Brook RH, Kravitz RL. Measuring Underuse of Necessary Care Among Elderly Medicare Beneficiaries Using Inpatient and Outpatient Claims. *JAMA*. J Am Med Assoc. 2000;284(18):2325-2333. doi:10.1001/jama.284.18.2325.
- 47. Schenck AP, Klabunde CN, Warren JL, et al. Data Sources for Measuring Colorectal Endoscopy Use Among Medicare Enrollees. Cancer Epidemiol Biomarkers Prev. 2007;16(10):2118-2127. doi:10.1158/1055-9965.EPI-07-0123.
- 48. Li X, Hilsden R, Hossain S, Fleming J, Winget M. Validation of administrative data sources for endoscopy utilization in colorectal cancer diagnosis. *BMC Health Serv Res.* 2012;12:358. doi:10.1186/1472-6963-12-358.
- 49. Segal JB, Bridges JFP, Chang H-Y, et al. Identifying Possible Indicators of Systematic Overuse of Health Care Procedures With Claims Data. *Med Care*. 2014;52(2):157-163. doi:10.1097/MLR.000000000000052.
- 50. Bernstein RH. New Arrows in the Quiver for Targeting Care Management: High-Risk Versus High-Opportunity Case Identification. *J Ambulatory Care Manage*. 2007;30(1):39-51.
- 51. Zhao Y, Ash AS, Ellis RP, Slaughter JP. Disease Burden Profiles: An Emerging Tool for Managing Managed Care. *Health Care Manag Sci.* 2002;5(3):211-219. doi:10.1023/A:1019711617120.
- 52. He D, Mathews SC, Kalloo AN, Hutfless S. Mining high-dimensional administrative claims data to predict early hospital readmissions. *J Am Med Inform Assoc.* 2014;21(2):272-279. doi:10.1136/amiajnl-2013-002151.
- 53. Wennberg JE, Fisher ES, Stukel TA, Sharp SM. Use of Medicare claims data to monitor provider specific performance among patients with severe chronic illness. *Health Aff Proj Hope*. 2004;Suppl Variation:VAR5-18. doi:10.1377/hlthaff.var.5.
- 54. Hughes JS, Averill RF, Jon Eisenhandler, et al. Clinical Risk Groups (CRGs): A Classification System for Risk-Adjusted Capitation-Based Payment and Health Care Management. Med Care. 2004;42(1):81-90.
- 55. NCQA. HEDIS Qual Meas » HEDIS Meas » HEDIS 2014. 2014. Available at: http://www.ncqa.org/HEDISQualityMeasurement/HEDISMeasures/HEDIS2014.aspx. Accessed March 16, 2014.
- 56. Goldfield N, Kelly WP, Patel K. Potentially preventable events: an actionable set of measures for linking quality improvement and cost savings. *Qual Manag Health Care*. 2012;21(4):213-219. doi:10.1097/QMH.0b013e31826d1d3a.
- 57. Fuller RL, Goldfield NI, Averill RF, Eisenhandler J, Vertrees JC. Adjusting Medicaid Managed Care Payments for Changes in Health Status. *Med Care Res Rev.* 2013;70(1):68-83. doi:10.1177/1077558712458540.
- 58. Starfield B, Hyde J, Gérvas J, Heath I. The concept of prevention: a good idea gone astray? *J Epidemiol Community Health*. 2008;62(7):580-583. doi:10.1136/jech.2007.071027.
- 59. Bice TW, Boxerman SB. A Quantitative Measure of Continuity of Care. Med Care. 1977;15(4):347-349.
- 60. Jee SH, Cabana MD. Indices for Continuity of Care: A Systematic Review of the Literature. *Med Care Res Rev.* 2006;63(2):158-188. doi:10.1177/1077558705285294.
- 61. Shortell SM. Continuity of Medical Care: Conceptualization and Measurement. Med Care. 1976;14(5):377-391.

- 62. Tom JO, Tseng C-W, Davis J, Solomon C, Zhou C, Mangione-Smith R. Missed Well-Child Care Visits, Low Continuity of Care, and Risk of Ambulatory Care-Sensitive Hospitalizations in Young Children. *Arch Pediatr Adolesc Med.* 2010;164(11):1052-1058. doi:10.1001/archpediatrics.2010.201.
- 63. Cheng S-H, Chen C-C, Hou Y-F. A Longitudinal Examination of Continuity of Care and Avoidable Hospitalization: Evidence From a Universal Coverage Health Care System. *Arch Intern Med.* 2010;170(18):1671-1677. doi:10.1001/archinternmed.2010.340.
- 64. Flores AI, Bilker WB, Alessandrini EA. Effects of Continuity of Care in Infancy on Receipt of Lead, Anemia, and Tuberculosis Screening. *Pediatrics*. 2008;121(3):e399 -e406. doi:10.1542/peds.2007-1497.
- 65. Christakis DA, Mell L, Wright JA, Davis R, Connell FA. The association between greater continuity of care and timely measles-mumps-rubella vaccination. *Am J Public Health*. 2000;90(6):962-965.
- 66. Brousseau DC, Meurer JR, Isenberg ML, Kuhn EM, Gorelick MH. Association Between Infant Continuity of Care and Pediatric Emergency Department Utilization. *Pediatrics*. 2004;113(4):738-741.
- 67. Christakis DA, Mell L, Koepsell TD, Zimmerman FJ, Connell FA. Association of Lower Continuity of Care With Greater Risk of Emergency Department Use and Hospitalization in Children. Pediatrics. 2001;107(3):524 -529. doi:10.1542/peds.107.3.524.
- 68. Chen C-C, Chen S-H. Better continuity of care reduces costs for diabetic patients. Am J Manag Care. 2011;17(6):420-427.
- 69. Hussey PS, Schneider EC, Rudin RS, Fox D, Lai J, Pollack C. Continuity and the costs of care for chronic disease. *JAMA* Intern Med. 2014. doi:10.1001/jamainternmed.2014.245.
- 70. Christakis DA, Feudtner C, Pihoker C, Connell FA. Continuity and Quality of Care for Children With Diabetes Who Are Covered by Medicaid. *Ambul Pediatr.* 2001;1(2):99-103. doi:10.1367/1539-4409(2001)001<0099:CAQOCF>2.0.CO;2.
- 71. Christakis DA, Wright JA, Zimmerman FJ, Bassett AL, Connell FA. Continuity of Care Is Associated With Well-Coordinated Care. Ambul Pediatr. 2002;3(2):82-86. doi:10.1367/1539-4409(2003)003<0082:COCI AW>2.0.CO;2.
- 72. McDonald K, Schultz E, Albin L. Care Coordination Atlas Version 3. 2010. Available at: http://www.ahrq.gov/qual/careatlas/. Accessed December 21, 2011.
- 73. Goldfield NI, McCullough EC, Hughes JS, et al. Identifying potentially preventable readmissions. *Health Care Financ Rev.* 2008;30(1):75-91.
- 74. Hernandez AF, Greiner MA, Fonarow GC, et al. Relationship between early physician follow-up and 30-day readmission among Medicare beneficiaries hospitalized for heart failure. *JAMA*. 2010;303(17):1716-1722. doi:10.1001/jama.2010.533.
- 75. Ryan J, Kang S, Dolacky S, Ingrassia J, Ganeshan R. Change in Readmissions and Follow-up Visits as Part of a Heart Failure Readmission Quality Improvement Initiative. *Am J Med.* 2013;126(11):989-994. e1. doi:10.1016/j.amjmed.2013.06.027.
- 76. Coleman K, Austin BT, Brach C, Wagner EH. Evidence On The Chronic Care Model In The New Millennium. *Health Aff* (Millwood). 2009;28(1):75-85. doi:10.1377/hlthaff.28.1.75.
- 77. Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness: The chronic care model, part 2. *JAMA*. 2002;288(15):1909-1914. doi:10.1001/jama.288.15.1909.
- 78. Ellen N, Martin M. Caring For People With Chronic Conditions: A Health System Perspective: A Health System Perspective. McGraw-Hill International; 2008.
- 79. Østbye T, Yarnall KSH, Krause KM, Pollak KI, Gradison M, Michener JL. Is there time for management of patients with chronic diseases in primary care? *Ann Fam Med.* 2005;3(3):209-214. doi:10.1370/afm.310.
- 80. Cassel CK, Guest JA. Choosing wisely: Helping physicians and patients make smart decisions about their care. *JAMA*. 2012;307(17):1801-1802. doi:10.1001/jama.2012.476.

