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Roundtable on Value & Science-Driven Health Care

September 27, 2012



The National Academies of Sciences Building Lecture Room 2101 Constitution Avenue, NW Washington, DC 20418



ROUNDTABLE ON VALUE & SCIENCE-DRIVEN HEALTH CARE

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Agenda and Membership

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IOM ROUNDTABLE ON VALUE & SCIENCE-DRIVEN HEALTH CARE

♦ Members Meeting

SEPTEMBER 27, 2012 THE NATIONAL ACADEMY OF SCIENCES, LECTURE ROOM 2100 C STREET, NW, WASHINGTON, DC

Meeting Goals

- 1. Review Best Care at Lower Cost with Members and solicit insights on key follow-up opportunities.
- 2. Discuss state of play on selected Collaborative Projects: patient demand for better value, care assessment, and shared decision-making, core metrics for the triple aim, and new research approaches to evidence generation.
- 3. Consider ways in which Member initiatives, within and across organizations, might foster action supportive to Report follow-up and Collaborative projects.

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9:00 am Welcome and introductions

Opening remarks

Mark McClellan, The Brookings Institution and Roundtable Chair Michael McGinnis, Institute of Medicine

9:30 am	Best Care at Lower Cost: Roundtable follow-up on the IOM report

Summary of Committee findings and opportunities

Mark Smith, California HealthCare Foundation

Promoting learning through stakeholder leadership

Helen Darling, National Business Group on Health

Open discussion

10:30 am Break

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Building a learning health care city

David Meltzer, University of Chicago

Embedding continuous improvement in all aspects of care

George Halvorson, Kaiser Permanente

Open discussion

12:00pm	Lunch keynote: Continuously improving in incentivizing quality and value
	Gary Loveman, Caesars Entertainment and Business Roundtable Health Committee
	Open Discussion
1:00 pm	Roundtable activities within key report foci
	Involving patients in health and health care <i>Roundtable project:</i> Patient demand workshop <i>Lyn Paget</i> , Health Policy Partners
	Applying new approaches for generating evidence Roundtable project: Large simple trials and knowledge generation in the Learning Health System Workshop Ralph Horwitz, GlaxoSmithKline
	Assessing our progress in making the transition Roundtable project: Core metrics for better care, lower costs, and better health Samuel Nussbaum, WellPoint
	Open Discussion
3:00 pm	Summary and next steps
	Comments from the Chair

Mark McClellan, The Brookings Institution and Roundtable Chair

Comments and thanks from the IOM

Michael McGinnis, Institute of Medicine

3:30 pm Adjourn

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The Roundtable

Chair

Mark B. McClellan, MD, PhD Director, Engelberg Center The Brookings Institution

Members

Bruce G. Bodaken, MPhil Chairman & CEO Blue Shield of California

Paul Chew, MD Chief Science Officer & CMO Sanofi US

Helen Darling, MA President National Business Group on Health

Susan DeVore Chief Executive Officer Premier, Inc.

Richard Fante, MBA Regional VP, Americas AstraZeneca PLC

Judith Faulkner, MS Founder and CEO Epic Systems

Patricia A. Gabow, MD Chief Executive Officer Denver Health

Atul Gawande, MD, MPH General and Endocrine Surgeon Brigham and Women's Hospital

Gary L. Gottlieb, MD, MBA President & CEO Partners HealthCare System

James A. Guest, JD President & CEO Consumers Union

George C. Halvorson Chairman & CEO Kaiser Permanente **James Heywood** Chairman PatientsLikeMe

Ralph I. Horwitz, MD SVP, Clinical Evaluation Sciences GlaxoSmithKline

Brent C. James, MD, Mstat Chief Quality Officer Intermountain Healthcare

Michael M.E. Johns, MD Chancellor Emory University

Craig A. Jones, MD Director Vermont Blueprint for Health

James L. Madara, MD Chief Executive Officer American Medical Association

Mary D. Naylor, PhD, RN Director, NewCourtland Center University of Pennsylvania

William D. Novelli, MA Former CEO, AARP Professor, Georgetown University

Sam R. Nussbaum, MD Chief Medical Officer WellPoint, Inc.

Jonathan B. Perlin, MD, PhD Chief Medical Officer HCA, Inc.

Richard Platt, MD, MS Chair, Population Medicine Harvard Medical School

John W. Rowe, MD Former Chairman & CEO, Aetna Professor, Columbia University **Mark D. Smith, MD, MBA** President & CEO California HealthCare Foundation

Glenn D. Steele, MD, PhD President & CEO Geisinger Health System

Reed V. Tuckson, MD Executive VP & Chief of Medical Affairs UnitedHealth Group

Ex-Officio

Agency for Healthcare Research and Quality Carolyn M. Clancy, MD, Director

Centers for Disease Control and Prevention Thomas Frieden, MD, MPH, Director

Centers for Medicare & Medicaid Services Marilyn Tavenner, MHA, RN, Administrator **Patrick Conway, MD, MS,** CMO

Department of Defense (Health Affairs) Jonathan Woodson, MD, Assistant Secretary

Department of Veterans Affairs Robert A. Petzel, MD, Under Secretary (Health)

Food and Drug Administration Margaret A. Hamburg, MD, Commissioner **Stephen Spielberg, MD, PhD,** Deputy Commissioner

Health Resources and Services Administration Mary Wakefield, PhD, RN, Administrator

National Institutes of Health Francis Collins, MD, PhD, Director Susan Shurin, MD, Director, NHLBI

Office of the National Coordinator for Health IT Farzad Mostashari, MD, ScM, National Coordinator

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Best Care at Lower Cost

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Best Care at Lower Cost The Path to Continuously Learning Health Care in America



Health care in America has experienced an explosion in knowledge, innovation, and capacity to manage previously fatal conditions. Yet, paradoxically, it falls short on such fundamentals as quality, outcomes, cost, and equity. Each action that could improve quality—developing knowledge, translating new information into medical evidence, applying the new evidence to patient care—is marred by significant shortcomings and inefficiencies that result in missed opportunities, waste, and harm to patients.

The full extent of these shortcomings is visible when considering how other industries routinely operate compared with many aspects of health care. Builders rely on blueprints to coordinate the work of carpenters, electricians, and plumbers. Banks offer customers financial records that are updated in real time. Automobile manufacturers produce thousands of vehicles that are standardized at their core, while tailored at the margins. While health care must accommodate many competing priorities and human factors unlike those in other industries, the health care system could learn from these industries how to better meet specific needs, expand choices, and shave costs. Americans would be better served by a more nimble health care system that is consistently reliable and that constantly, systematically, and seamlessly improves. In short, the country needs health care that learns by avoiding past mistakes and adopting newfound successes.

In response to widespread demand for an improved health care system, the Institute of Medicine (IOM) convened a committee to explore health care challenges and to recommend ways to create a continuously learning health care system. Its work was supported by the Robert Wood Johnson Foundation, the Blue Shield of California Foundation, and the Charina Endowment Fund, and it builds on landmark IOM reports published in the past two decades, including *To Err Is Human: Building a Safer Health System, Crossing the Qual*-

Americans would be better served by a more nimble health care system that is consistently reliable and that constantly, systematically, and seamlessly improves. ity Chasm: A New Health System for the 21st century, and Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care. The IOM offers its recommendations in Best Care at Lower Cost: The Path to Continuously Learning Health Care in America.

Building an Adaptive System

Because health care is complex and constantly changing, the committee set out to chart a transition to a system that learns, in real time and with new tools, how to better manage problems. Indeed, such opportunities now exist that were not available just a decade ago. Vast computational power is increasingly affordable, and connectivity allows information to be accessed in real time. Human and organizational capabilities offer expanded ways to improve the reliability and efficiency of health care. And health care organizations and providers recognize that effective care must be delivered by collaborative teams of clinicians, each member playing a vital role. Yet simply acknowledging such opportunities does not necessarily result in putting them to good use.

The responsibility for building a continuously learning health care system rests on many shoulders because the stakes are high. As the IOM committee reports, every missed opportunity for improving health care results in unnecessary suffering. By one estimate, almost 75,000 needless deaths could have been averted in 2005 if every state had delivered care on par with the best performing state. Current waste diverts resources; the committee estimates \$750 billion in unnecessary health spending in 2009 alone.

Data generated in health care delivery whether clinical, delivery process, or financial should be collected in digital formats, compiled, and protected as resources for managing care, capturing results, improving processes, strengthening public health, and generating knowledge.

The Department of Health and Human Services (HHS) can encourage not only this digital capacity, but also the development of distributed

data research networks and expanded access to health data resources to improve care, lower costs, and enhance public health. Payers and medical product companies also should contribute more data to research groups to generate new insights. Patients should participate in developing robust data utility; use new tools, such as personal portals, to better manage their own care; and be involved in building new knowledge, such as through patient-reported outcomes.

Delivering Reliable Clinical Knowledge to Patients

Improving the data infrastructure and data utility would require revising and streamlining research regulations to improve care, promote capture of clinical data, and generate knowledge. Regulators can clarify and improve rules governing the collection and use of clinical data to safeguard patient privacy while promoting the seamless use of such data for better care coordination and management, improved care, and enhanced knowledge.

Decision support tools and knowledge management systems can be included routinely in health care delivery to ensure that decisions are informed by the best evidence.

FIGURE: A Continuously Learning Health Care System



Current waste diverts resources; the committee estimates \$750 billion in unnecessary health spending in 2009 alone.

Among possible actions, clinicians and health care organizations can adopt tools that deliver reliable clinical knowledge to patients. Research organizations, advocacy organizations, professional specialty societies, and care delivery organizations can facilitate the development, accessibility, and use of evidence-based and harmonized clinical practice guidelines. Also, education programs should evolve so that health professionals learn new methods for accessing, managing, and applying evidence, with an emphasis on engaging in lifelong learning; understanding human behavior and social science; and delivering safe care in an interdisciplinary environment. Agencies and organizations that fund research should support investigations into improving the usefulness and accessibility of patient outcome data and scientific evidence for clinicians and patients.

Health providers should place a higher premium on fully involving patients in their own health care to the extent that patients choose. Clinicians should employ high-quality, reliable tools and skills for sharing decision making with patients, tailored to clinical needs, patient goals, social circumstances, and the degree of control that patients prefer. Health care delivery organizations should monitor and assess patients' perspectives and use those insights to improve care; establish patient portals to facilitate data sharing among clinicians, patients, and families; and make high-quality tools available for shared decision making with patients.

In addition, the federal Agency for Healthcare Research and Quality, partnering with the Centers for Medicare & Medicaid Services (CMS), other payers, and stakeholders, should support developing and testing a reliable set of measures of patient-centeredness for consistent use across the health care system. CMS and other payers should promote and measure patient-centered care through payment models, contracting policies, and public reporting programs. And digital technology developers and health product innovators should develop tools to assist individuals in managing their health and health care.

Improving the Policy Environment

The culture of health care is central to promoting learning at every level. The prevailing approach to paying for health care, based predominantly on individual services and products, encourages wasteful and ineffective care. Instead, payments should reward desired care outcomes and movement toward providing the best care at lower cost. Payers should adopt outcome- and value-oriented payment models, contracting policies, and benefit design to reward and support high-quality, teambased care focused on patients' needs.

Health care delivery organizations, clinicians, and payers should increase the availability of information about the quality, price, and outcomes of care, and professional specialty societies should encourage transparency in the information provided by their members. Likewise, payers should promote transparency to help their members make better decisions. And consumer and patient organizations should disseminate this information to spur conversations and promote informed decision making.

The adoption of a learning health care sys-

Committee on the Learning Health Care System in America

Mark D. Smith (Chair) President and Chief Executive Officer, California HealthCare Foundation

James P. Bagian Professor of Engineering Practice, University of Michigan

Anthony Bryk President, Carnegie Foundation for the Advancement of Teaching

Gail H. Cassell Former Vice President, Scientific Affairs, Eli Lilly and Company

James B. Conway Senior Fellow, Institute for Healthcare Improvement

Helen B. Darling President, National Business Group on Health

T. Bruce Ferguson Chairman, Department of Cardiovascular Sciences, East Carolina University

Ginger L. Graham Former President and Chief Executive Officer, Amylin Pharmaceuticals and Former Group Chairman, Guidant Corporation

George C. Halvorson Chairman and Chief Executive Officer, Kaiser Permanente

Study Staff

Robert Saunders Study Director Leigh Stuckhardt

Program Associate

Senior Program Assistant Brian Powers

Senior Program Assistant (through July 2012) Valerie Rohrbach Senior Program Assistant

Consultants

Rona Briere Briere Associates, Inc.

Study Sponsors

The Robert Wood Johnson Foundation The Blue Shield of California Foundation The Charina Endowment Fund

Brent James Chief Quality Officer, Intermountain Health Care, Inc Craig Jones Director, Vermont Blueprint for Health

Gary Kaplan Chairman and Chief Executive Officer, Virginia Mason Health System

Arthur A. Levin Director, Center for Medical Consumers

Eugene Litvak President and Chief Executive Officer, Institute for Healthcare Optimization

David O. Meltzer Director, Center for Health and the Social Sciences, University

of Chicago Mary D. Naylor

Director, NewCourtland Center for Transitions and Health, University of Pennsylvania School of Nursing

Rita F. Redberg Professor of Medicine, University of California, San Francisco

Paul C. Tang Vice President, Chief Innovation and Technology Officer, Palo Alto Medical Foundation

Claudia Grossman Senior Program Officer Isabelle Von Kohorn Program Officer Barret Zimmermann Program Assistant

J. Michael McGinnis Senior Scholar

Alisa Decatur Briere Associates, Inc. tem will require broad participation by patients, families, clinicians, care leaders, and those who support their work. Health care delivery organizations should develop organizational cultures that encourage continuous improvement by incorporating best practices, transparency, open communication, staff empowerment, coordination, teamwork, and mutual respect, and that align incentives accordingly. Also, specialty societies, education programs, specialty boards, licensing boards, and accreditation organizations should incorporate basic concepts and specialized applications of continuous learning and improvement into health professionals' education, licensing, certification, and accreditation requirements.

Conclusion

The entrenched challenges of the U.S. health care system demand a transformed approach. Left unchanged, health care will continue to underperform; cause unnecessary harm; and strain national, state, and family budgets. The actions required to reverse this trend will be notable, substantial, sometimes disruptive—and absolutely necessary.

The imperatives are clear, but the changes are possible—and they offer the prospect for best care at lower cost for all Americans.



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Best Care at Lower Cost The Path to Continuously Learning Health Care in America

The Best Care at Lower Cost: The Path to Continuously Learning Health Care in America report offers findings, conclusions, and recommendations for implementation by key stakeholders to achieve a health care system that is consistently reliable and that constantly, systematically, and seamlessly improves.

TABLE: Characteristics of a Continuously Learning Health Care System

Science and Informatics

- Real-time access to knowledge—A learning health care system continuously and reliably captures, curates, and delivers the best available evidence to guide, support, tailor, and improve clinical decision making and care safety and quality.
- Digital capture of the care experience—A learning health care system captures the care experience on digital platforms for real-time generation and application of knowledge for care improvement.

Patient-Clinician Relationships

• Engaged, empowered patients—A learning health care system is anchored on patient needs and perspectives and promotes the inclusion of patients, families, and other caregivers as vital members of the continuously learning care team.

Incentives

- Incentives aligned for value—In a learning health care system, incentives are actively aligned to encourage continuous improvement, identify and reduce waste, and reward high-value care.
- **Full transparency**—A learning health care system systematically monitors the safety, quality, processes, prices, costs, and outcomes of care, and makes information available for care improvement and informed choices and decision making by clinicians, patients, and their families.

Culture

- Leadership-instilled culture of learning—A learning health care system is stewarded by leadership committed to a culture of teamwork, collaboration, and adaptability in support of continuous learning as a core aim.
- **Supportive system competencies**—In a learning health care system, complex care operations and processes are constantly refined through ongoing team training and skill building, systems analysis and information development, and creation of the feedback loops for continuous learning and system improvement.

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Best Care at Lower Cost

The Path to Continuously Learning Health Care in America

Recommendations

Foundational Elements

Recommendation 1: The Digital Infrastructure

Improve the capacity to capture clinical, care delivery process, and financial data for better care, system improvement, and the generation of new knowledge. Data generated in the course of care delivery should be digitally collected, compiled, and protected as a reliable and accessible resource for care management, process improvement, public health, and the generation of new knowledge.

Strategies for progress toward this goal:

- Health care delivery organizations and clinicians should fully and effectively employ digital systems that capture patient care experiences reliably and consistently, and implement standards and practices that advance the interoperability of data systems.
- The National Coordinator for Health Information Technology, digital technology developers, and standards organizations should ensure that the digital infrastructure captures and delivers the core data elements and interoperability needed to support better care, system improvement, and the generation of new knowledge.
- Payers, health care delivery organizations, and medical product companies should contribute data to research and analytic consortia to support expanded use of care data to generate new insights.
- Patients should participate in the development

of a robust data utility; use new clinical communication tools, such as personal portals, for selfmanagement and care activities; and be involved in building new knowledge, such as through patient-reported outcomes and other knowledge processes.

- The Secretary of Health and Human Services (HHS) should encourage the development of distributed data research networks and expand the availability of departmental health data resources for translation into accessible knowledge that can be used for improving care, lowering costs, and enhancing public health.
- Research funding agencies and organizations, such as the National Institutes of Health, the Agency for Healthcare Research and Quality (AHRQ), the Veterans Health Administration (VHA), the Department of Defense (DoD), and the Patient-Centered Outcomes Research Institute (PCORI), should promote research designs and methods that draw naturally on existing care processes and that also support ongoing quality improvement efforts.

Recommendation 2: The Data Utility

Streamline and revise research regulations to improve care, promote the capture of clinical data, and generate knowledge. Regulatory agencies should clarify and improve regulations governing the collection and use of clinical data to ensure patient privacy but also the seamless use of clinical data for better care coordination and

BEST CARE AT LOWER COST The Path to Continuously Learning Health Care in America management, improved care, and knowledge enhancement.

Strategies for progress toward this goal:

- The Secretary of HHS should accelerate and expand the review of the Health Insurance Portability and Accountability Act and institutional review board policies with respect to actual or perceived regulatory impediments to the protected use of clinical data, and clarify regulations and their interpretation to support the use of clinical data as a resource for advancing science and care improvement.
- Patient and consumer groups, clinicians, professional specialty societies, health care delivery organizations, voluntary organizations, researchers, and grantmakers should develop strategies and outreach to improve understanding of the benefits and importance of accelerating the use of clinical data to improve care and health outcomes.

Care Improvement Targets

Recommendation 3: Clinical Decision Support

Accelerate integration of the best clinical knowledge into care decisions. Decision support tools and knowledge management systems should be routine features of health care delivery to ensure that decisions made by clinicians and patients are informed by current best evidence.

Strategies for progress toward this goal:

- Clinicians and health care organizations should adopt tools that deliver reliable, current clinical knowledge to the point of care, and organizations should adopt incentives that encourage the use of these tools.
- Research organizations, advocacy organizations, professional specialty societies, and care delivery organizations should facilitate the development, accessibility, and use of evidence-based and harmonized clinical practice guidelines.
- Public and private payers should promote the adoption of decision support tools, knowledge management systems, and evidence-based clinical practice guidelines by structuring payment and contracting policies to reward effective, evidence-based care that improves patient health.
- Health professional education programs should teach new methods for accessing, managing, and applying evidence; engaging in lifelong learning; understanding human behavior and social science; and delivering safe care in an interdisciplinary environment.
- Research funding agencies and organizations should promote research into the barriers and

systematic challenges to the dissemination and use of evidence at the point of care, and support research to develop strategies and methods that can improve the usefulness and accessibility of patient outcome data and scientific evidence for clinicians and patients.

Recommendation 4: Patient-Centered Care

Involve patients and families in decisions regarding health and health care, tailored to fit their preferences. Patients and families should be given the opportunity to be fully engaged participants at all levels, including individual care decisions, health system learning and improvement activities, and community-based interventions to promote health.

Strategies for progress toward this goal:

- Patients and families should expect to be offered full participation in their own care and health and encouraged to partner, according to their preference, with clinicians in fulfilling those expectations.
- Clinicians should employ high-quality, reliable tools and skills for informed shared decision making with patients and families, tailored to clinical needs, patient goals, social circumstances, and the degree of control patients prefer.
- Health care delivery organizations, including programs operated by the DoD, VHA, and Health Resources and Services Administration, should monitor and assess patient perspectives and use the insights thus gained to improve care processes; establish patient portals to facilitate data sharing and communication among clinicians, patients, and families; and make high-quality, reliable tools available for shared decision making with patients at different levels of health literacy.
- AHRQ, partnering with the Centers for Medicare & Medicaid Services (CMS), other payers, and stakeholder organizations, should support the development and testing of an accurate and reliable core set of measures of patient-centeredness for consistent use across the health care system.
- CMS and other public and private payers should promote and measure patient-centered care through payment models, contracting policies, and public reporting programs.
- Digital technology developers and health product innovators should develop tools to assist individuals in managing their health and health care, in addition to providing patient supports in new forms of communities.

Recommendation 5: Community Links

Promote community-clinical partnerships and services aimed at managing and improving health at the community level. Care delivery and community-based organizations and agencies should partner with each other to develop cooperative strategies for the design, implementation, and accountability of services aimed at improving individual and population health.

Strategies for progress toward this goal:

- Health care delivery organizations and clinicians should partner with community-based organizations and public health agencies to leverage and coordinate prevention, health promotion, and community-based interventions to improve health outcomes, including strategies related to the assessment and use of web-based tools.
- Public and private payers should incorporate population health improvement into their health care payment and contracting policies and accountability measures.
- Health economists, health service researchers, professional specialty societies, and measure development organizations should continue to improve measures that can readily be applied to assess performance on both individual and population health.

Recommendation 6: Care Continuity

Improve coordination and communication within and across organizations. Payers should structure payment and contracting to reward effective communication and coordination between and among members of a patient's care team.

Strategies for progress toward this goal:

- Health care delivery organizations and clinicians, partnering with patients, families, and community organizations, should develop coordination and transition processes, data sharing capabilities, and communication tools to ensure safe, seamless patient care.
- Health economists, health service researchers, professional specialty societies, and measure development organizations should develop and test metrics with which to monitor and evaluate the effectiveness of care transitions in improving patient health outcomes.
- Public and private payers should promote effective care transitions that improve patient health through their payment and contracting policies.

Recommendation 7: Optimized Operations

Continuously improve health care operations to reduce waste, streamline care delivery, and focus on activities that improve patient health. Care delivery organizations should apply systems engineering tools and process improvement methods to improve operations and care delivery processes.

Strategies for progress toward this goal:

- Health care delivery organizations should utilize systems engineering tools and process improvement methods to eliminate inefficiencies, remove unnecessary burdens on clinicians and staff, enhance patient experience, and improve patient health outcomes.
- CMS, AHRQ, PCORI, quality improvement organizations, and process improvement leaders should develop a learning consortium aimed at accelerating training, technical assistance, and the collection and validation of lessons learned about ways to transform the effectiveness and efficiency of care through continuous improvement programs and initiatives.

Supportive Policy Environment

Recommendation 8: Financial Incentives

Structure payment to reward continuous learning and improvement in the provision of best care at lower cost. Payers should structure payment models, contracting policies, and benefit designs to reward care that is effective and efficient and continuously learns and improves.

Strategies for progress toward this goal:

- Public and private payers should reward continuous learning and improvement through outcomeand value-oriented payment models, contracting policies, and benefit designs. Payment models should adequately incentivize and support highquality team-based care focused on the needs and goals of patients and families.
- Health care delivery organizations should reward continuous learning and improvement through the use of internal practice incentives.
- Health economists, health service researchers, professional specialty societies, and measure development organizations should partner with public and private payers to develop and evaluate metrics, payment models, contracting policies, and benefit designs that reward high-value care that improves health outcomes.

Recommendation 9: Performance Transparency

Increase transparency on health care system perfor-

mance. Health care delivery organizations, clinicians, and payers should increase the availability of information on the quality, prices and cost, and outcomes of care to help inform care decisions and guide improvement efforts.

Strategies for progress toward this goal:

- Health care delivery organizations should collect and expand the availability of information on the safety, quality, prices and cost, and health outcomes of care.
- Professional specialty societies should encourage transparency on the quality, value, and outcomes of the care provided by their members.
- Public and private payers should promote transparency in quality, value, and outcomes to aid plan members in their care decision making.
- Consumer and patient organizations should disseminate this information to facilitate discussion, informed decision making, and care improvement.

Recommendation 10: Broad Leadership

Expand commitment to the goals of a continuously learning health care system. Continuous learning and improvement should be a core and constant priority for all participants in health care—patients, families, clinicians, care leaders, and those involved in supporting their work.

Strategies for progress toward this goal:

- Health care delivery organizations should develop organizational cultures that support and encourage continuous improvement, the use of best practices, transparency, open communication, staff empowerment, coordination, teamwork, and mutual respect and align rewards accordingly.
- Leaders of these organizations should define, disseminate, support, and commit to a vision of continuous improvement; focus attention, training, and resources on continuous learning; and build an operational model that incentivizes continuous improvement and ensures its sustainability.
- Governing boards of health care delivery organizations should support and actively participate in fostering a culture of continuous improvement, request continuous feedback on the progress being made toward the adoption of such a culture, and align leadership incentive structures accordingly.
- Clinical professional specialty societies, health professional education programs, health professions specialty boards, licensing boards, and accreditation organizations should incorporate basic concepts and specialized applications of

continuous learning and improvement into health professions education; continuing education; and licensing, certification, and accreditation requirements. [®]

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BEST CARE AT LOWER COST

The Path to Continuously Learning Health Care in America

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Summary

Health care in America presents a fundamental paradox. The past 50 years have seen an explosion in biomedical knowledge, dramatic innovation in therapies and surgical procedures, and management of conditions that previously were fatal, with ever more exciting clinical capabilities on the horizon. Yet American health care is falling short on basic dimensions of quality, outcomes, costs, and equity. Available knowledge is too rarely applied to improve the care experience, and information generated by the care experience is too rarely gathered to improve the knowledge available. The traditional systems for transmitting new knowledge—the ways clinicians are educated, deployed, rewarded, and updated—can no longer keep pace with scientific advances. If unaddressed, the current shortfalls in the performance of the nation's health care system will deepen on both quality and cost dimensions, challenging the well-being of Americans now and potentially far into the future.

Consider the impact on American services if other industries routinely operated in the same manner as many aspects of health care:

- If banking were like health care, automated teller machine (ATM) transactions would take not seconds but perhaps days or longer as a result of unavailable or misplaced records.
- If home building were like health care, carpenters, electricians, and plumbers each would work with different blueprints, with very little coordination.
- If shopping were like health care, product prices would not be posted, and the price charged would vary widely within the same store, depending on the source of payment.
- If automobile manufacturing were like health care, warranties for cars that require manufacturers to pay for defects would not exist. As a result, few factories would seek to monitor and improve production line performance and product quality.
- If airline travel were like health care, each pilot would be free to design his or her own preflight safety check, or not to perform one at all.

The point is not that health care can or should function in precisely the same way as all other sectors of people's lives—each is very different from the others, and every industry has room for improvement. Yet if some of the transferable best practices from banking, construction, retailing, automobile manufacturing, flight safety, public utilities, and personal services were adopted as standard best practices in health care, the nation could see patient care in which

- records were immediately updated and available for use by patients;
- care delivered was care proven reliable at the core and tailored at the margins;
- patient and family needs and preferences were a central part of the decision process;
- all team members were fully informed in real time about each other's activities;
- prices and total costs were fully transparent to all participants;
- payment incentives were structured to reward outcomes and value, not volume;
- errors were promptly identified and corrected; and
- results were routinely captured and used for continuous improvement.

Unfortunately, these are not features that would describe much of health care in America today. Health care can lag behind many other sectors with respect to its ability to meet patients' specific needs, to offer choice, to adapt, to become more affordable, to improve—in short, to learn. Americans should be served by a health care system that consistently delivers reliable performance and constantly improves, systematically and seamlessly, with each care experience and transition.

In the face of these realities, the Institute of Medicine (IOM) convened the Committee on the Learning Health Care System in America to explore the most fundamental challenges to health care today and to propose actions that can be taken to achieve a health care system characterized by continuous learning and improvement. This study builds on earlier IOM studies on various aspects of the health care system, from *To Err Is Human: Building a Safer Health System* (IOM, 1999), on patient safety; to *Crossing the Quality Chasm: A New Health System for the 21st Century* (IOM, 2001a), on health care quality; to *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care* (IOM, 2002), on health care disparities. The study process was also facilitated and informed by the published summaries of workshops conducted under the auspices of the IOM Roundtable on Value & Science-Driven Health Care. Over the past 6 years, 11 workshop summaries have been produced, exploring various aspects of the challenges and opportunities in health care today, with a particular focus on the foundational elements of a learning health system.

Meeting the challenges discussed at those workshops has taken on great urgency as a result of two overarching imperatives:

- to manage the health care system's ever-increasing **complexity**, and
- to curb ever-escalating **costs.**

The convergence of these imperatives makes the status quo untenable. At the same time, however, opportunities exist to address these problems—opportunities that did not exist even a decade ago:

- vast **computational power** that is affordable and widely available;
- **connectivity** that allows information to be accessed in real time virtually anywhere;

• the recognition that effective care must be delivered by **collaborations between teams of clinicians and patients,** each playing a vital role in the care process.

The committee undertook its work to consider how these opportunities for best care at lower cost can be leveraged to meet the challenges outlined above. The committee, whose work was supported by the Robert Wood Johnson Foundation, the Charina Endowment Fund, and the Blue Shield of California Foundation, was charged with (1) identifying how the effectiveness and efficiency of the current health care system can be transformed through tools and incentives for continuous assessment and improvement, and (2) developing recommendations for actions that can be taken to that end. This report explores the imperatives for change, describes the emerging tools that make transformation possible, sets forth a vision for a continuously learning health care system, and delineates a path for achieving this vision. Detailed findings are presented throughout the report, together with the conclusions and recommendations they support, which are also highlighted in this summary.

The title of the report underscores that care that is based on the best available evidence, takes appropriate account of individual preferences, and is delivered reliably and efficiently *best care*—is possible today. When such care is routinely implemented, moreover, it is generally less expensive than the less effective, less efficient care that is now too commonly provided. Moreover, the transition to best care envisioned in this report is urgently needed given the budgetary, economic, and health pressures facing the nation's health care system.

THE IMPERATIVES

Decades of rapid innovation and technological improvement have created an extraordinarily complex health care system. Clinicians and health care staff work tirelessly to care for their patients in an increasingly complex, inefficient, and stressful environment. Certain breakthrough innovations have benefited millions of patients, but the aggregate impact of the flood of new interventions has introduced challenges for both clinicians and patients in treating and managing health conditions. In addition to the challenge of complexity, and in part because of it, health care often falls short of its potential in the quality of care delivered and the patient outcomes achieved. These shortfalls are occurring even as costs are rising to unsustainable levels. Additionally, new opportunities emerging from technology, industry, and policy can be leveraged to help mold the system into one characterized by continuous learning and improvement. In this context, the committee identified three imperatives for achieving a continuously learning health care system that provides the best care at lower cost: (1) managing rapidly increasing complexity; (2) achieving greater value in health care; and (3) capturing opportunities from technology, industry, and policy.

Managing Rapidly Increasing Complexity

The complexity of health care has increased in multiple dimensions—in the everincreasing treatment, diagnostic, and care management options available; in the rapidly rising levels of biomedical and clinical evidence; and in administrative complexities, from complicated workflows to fragmented financing. The complexity due to ever-increasing treatment options can be illustrated by the evolution of care for two common conditions—heart disease and cancer.

During much of the twentieth century, heart attacks commonly were treated with weeks of bed rest. Today, advanced diagnostics allow for customized treatments for patients; interventions such as percutaneous coronary interventions and coronary artery bypass grafts can reopen blocked vessels and restore blood flow to the heart; and pharmaceutical therapies, such as thrombolytics and beta-blockers, improve survival and reduce the chances of subsequent heart attacks (Certo, 1985; Nabel and Braunwald, 2012). Similarly, five decades ago, breast cancer was detected from a physical exam, and mastectomy was the recommended treatment. Today, multiple imaging technologies exist for the detection and diagnosis of the disease, and once diagnosed, the cancer can be further classified and treated according to genetic characteristics and hormone receptor status (Harrison, 1962; IOM, 2001b; Kasper and Harrison, 2005).

As a result of improved scientific understanding, new treatments and interventions, and new diagnostic technologies, the U.S. health care system now is characterized by more to do, more to know, and more to manage than at any time in history. As one quantification of this increase, the volume of the biomedical and clinical knowledge base has rapidly expanded, with research publications having risen from more than 200,000 a year in 1970 to more than 750,000 in 2010 (see Figure S-1). The result is a paradox: advances in science and technology have improved the ability of the health care system to treat diseases, yet the sheer volume of new discoveries stresses the capabilities of the system to effectively generate and manage knowledge and apply it to regular care. These advances have occurred at the same time as, and sometimes have contributed to, challenges in health care quality and value.



FIGURE S-1 Number of journal articles published on health care topics per year from 1970 to 2010. Publications have increased steadily over 40 years, with the rate of increase becoming more pronounced starting approximately in 2000.

SOURCE: Data obtained from online searches at PubMed: http://www.ncbi.nlm.nih.gov/pubmed/.

Conclusion: Diagnostic and treatment options are expanding and changing at an accelerating rate, placing new stresses on clinicians and patients, as well as potentially impacting the effectiveness and efficiency of care delivery.

Beyond the increasing stores of biomedical and clinical knowledge, changes in disease prevalence and patient demographics have altered the landscape for care delivery. The prevalence of chronic conditions, for example, has increased over time. In 2000, 125 million people suffered from such conditions; by 2020, that number is projected to grow to an estimated 157 million (Anderson, 2010). The role of chronic diseases has changed as the demographics of the population have shifted. In general, the population has gotten older; in the past decade, the portion of the population over age 65 has increased at 1.5 times the rate of the rest of the population (Howden and Meyer, 2011). Almost half of those over 65 receive treatment for at least one chronic disease (Schneider et al., 2009), and more than 20 percent receive treatment for multiple chronic diseases (Schneider et al., 2009); fully 75 million people in the United States have multiple chronic conditions (Parekh and Barton, 2010).

Managing these multiple conditions requires a holistic approach, as the use of various clinical practice guidelines developed for single diseases may have adverse effects (Boyd et al., 2005a; Parekh and Barton, 2010; Tinetti et al., 2004). For example, existing clinical practice guidelines would suggest that a hypothetical 79-year-old woman with osteoporosis, osteoarthritis, type 2 diabetes, hypertension, and chronic obstructive pulmonary disease should take as many as 19 doses of medication per day. Such guidelines might also make conflicting recommendations for the woman's care. If she had peripheral neuropathy, guidelines for osteoporosis would recommend that she perform weight-bearing exercise, while guidelines for diabetes would recommend that she avoid such exercise (Boyd et al., 2005a). These situations create uncertainty for clinicians and patients as to the best course of action to pursue as they attempt to manage the treatments for multiple conditions.

Conclusion: Chronic diseases and comorbid conditions are increasing, exacerbating the clinical, logistical, decision-making, and economic challenges faced by patients and clinicians.

Care delivery also has become increasingly demanding. It would take an estimated 21 hours a day for individual primary care physicians to provide all of the care recommended to meet their patients' acute, preventive, and chronic disease management needs (Yarnall et al., 2009). Clinicians in intensive care units, who care for the sickest patients in a hospital, must manage in the range of 180 activities per patient per day—from replacing intravenous fluids, to administering drugs, to monitoring patients' vital signs (Donchin et al., 2003). In addition, rising administrative burdens and inefficient workflows mean that hospital nurses spend only about 30 percent of their time in direct patient care (Hendrich et al., 2008; Hendrickson et al., 1990; Tucker and Spear, 2006). These pressures are not limited to clinicians; patients often find the health care system uncoordinated, opaque, and stressful to navigate. One study found that for 1 of every 14 tests, either the patient was not informed of a clinically significant abnormal test result, or the clinician failed to record reporting the result to the patient (Casalino et al., 2009).

With specialization, moreover, clinicians must coordinate with multiple other providers; for their health care, Medicare patients now see an average of seven physicians, including five

specialists, split among four different practices (Pham et al., 2007). One study found that in a single year, a typical primary care physician coordinated with an average of 229 other physicians in 117 different practices just for Medicare patients (Pham et al., 2009). The involvement of multiple providers tends to blur accountability. One survey found that 75 percent of hospital patients were unable to identify the clinician in charge of their care (Arora et al., 2009).

Conclusion: Care delivery has become increasingly fragmented, leading to coordination and communication challenges for patients and clinicians.

Achieving Greater Value in Health Care

In addition to, and sometimes as a result of, the challenge of complexity, health care quality and outcomes often fall short of their potential. A decade after the IOM (1999) estimated that 44,000 to 98,000 patients died each year from preventable medical errors, recent studies have reported that as many as one-third of hospitalized patients may experience harm or an adverse event, often from preventable errors (Classen et al., 2011; Landrigan et al., 2010; Levinson, 2010). While infections and complications once were viewed as routine consequences of medical care, it is now recognized that strategies and evidence-based interventions exist that can significantly reduce the incidence and severity of such events.

Similarly, medical care often is guided insufficiently by evidence, with Americans receiving only about half of the preventive, acute, and chronic care recommended by current research and evidence-based guidelines (McGlynn et al., 2003). Sometimes this occurs because available evidence is not applied to clinical care, while in other cases evidence is not available.

As a result of all of these factors, the nature and quality of health care vary considerably among states, with serious health and economic consequences. If all states could provide care of the quality delivered by the highest-performing state, an estimated 75,000 fewer deaths would have occurred across the country in 2005 (McCarthy et al., 2009; Schoenbaum et al., 2011).

Conclusion: Health care safety, quality, and outcomes for Americans fall substantially short of their potential and vary significantly for different populations of Americans.

These deficiencies in care quality have occurred even as expenses have risen significantly. Health care costs¹ have increased at a greater rate than the economy as a whole for 31 of the past 40 years, and now constitute 18 percent of the nation's gross domestic product (CMS, 2012; Keehan et al., 2011). The growth in health care costs has contributed to stagnation in real income for American families. Although income has increased by 30 percent over the past decade, these gains have effectively been eliminated by a 76 percent increase in health care costs (Auerbach and Kellermann, 2011). These high costs have strained families' budgets and put health insurance coverage out of reach for many, contributing to the 50 million Americans without coverage (DeNavas-Walt et al., 2011).

¹ In this report, *price* refers to the amount charged for a given health care service or product. It is important to note that there are frequently multiple prices for the same service or product, depending on the patient's insurance status and payer, as well as other factors. *Cost* is the total sum of money spent at a given level (episodes, patients, organizations, state, national), or price multiplied by the volume of services or products used.

In addition to unsustainable cost growth, there is evidence that a substantial proportion of health care expenditures is wasted, leading to little improvement in health or in the quality of care. Estimates vary on waste and excess health care costs, but they are large. The IOM workshop summary *The Healthcare Imperative: Lowering Costs and Improving Outcomes* contains estimates of excess costs in six domains: unnecessary services, services inefficiently delivered, prices that are too high, excess administrative costs, missed prevention opportunities, and medical fraud (IOM, 2010). These estimates, presented by workshop speakers with respect to their areas of expertise and based on assumptions from limited observations, suggest the substantial contribution of each domain to excessive health care costs (see Table S-1).

		Estimate of
Category	Sources	Excess Costs
Unnecessary Services	 Overuse—beyond evidence-established levels Discretionary use beyond benchmarks Unnecessary choice of higher-cost services 	\$210 billion
Inefficiently Delivered Services	 Mistakes—errors, preventable complications Care fragmentation Unnecessary use of higher-cost providers Operational inefficiencies at care delivery sites 	\$130 billion
Excess Administrative Costs	 Insurance paperwork costs beyond benchmarks Insurers' administrative inefficiencies Inefficiencies due to care documentation requirements 	\$190 billion
Prices That Are Too High	Service prices beyond competitive benchmarksProduct prices beyond competitive benchmarks	\$105 billion
Missed Prevention Opportunities	Primary preventionSecondary preventionTertiary prevention	\$55 billion
Fraud	• All sources—payers, clinicians, patients	\$75 billion
SOURCE: Adapted with p	ermission from IOM, 2010.	

TABLE S-1 Estimated Sources of Excess Costs in Health Care (2009)
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Although these estimates have unknown overlap, the sum of the individual estimates— \$765 billion—suggests the significant scale of waste in the system. Two other independent and differing analytic approaches—considering regional variation in costs and comparing costs across countries—produce similar estimates, with total excess costs approaching \$750 billion in 2009 (Farrell et al., 2008; IOM, 2010; Wennberg et al., 2002). While there are methodological issues with each method for estimating excess costs, the consistently large figures produced by each signal the potential for reducing health care costs while improving quality and health outcomes.

At this level, health care waste exceeds the 2009 budget for the Department of Defense by more than \$100 billion (OMB, 2010). Health care waste also amounts to more than 1.5 times the nation's total infrastructure investment in 2004, including roads, railroads, aviation, drinking water, telecommunications, and other structures.² To put these estimates in the context of health care expenditures, the estimated redirected funds could provide health insurance coverage for more than 150 million workers (including both employer and employee contributions), which exceeds the 2009 civilian labor force.³ And the total projected waste could pay the salaries of all of the nation's first response personnel, including firefighters, police officers, and emergency medical technicians, for more than 12 years.⁴

Conclusion: The growth rate of health care expenditures is unsustainable, with waste that diverts major resources from necessary care and other priorities at every level—individual, family, community, state, and national.

In sum, as illustrated in Figure S-2, each stage in the processes that shape the health care received—knowledge development, translation into medical evidence, application of evidence-based care—has prominent shortcomings and inefficiencies that contribute to a large reservoir of missed opportunities, waste, and harm. The threats to the health and economic security of Americans are clear, present, and compelling.

 $^{^{2}}$ The Department of Defense budget was calculated from the fiscal year 2009 outlays listed in the Fiscal Year 2011 U.S. Government Budget (OMB, 2010); the comparison of health care waste with the national infrastructure investment was drawn from a Congressional Budget Office analysis, with inflation adjusted according to the Consumer Price Index (CPI) (Congressional Budget Office, 2008).

³ The average premiums for a single worker were calculated using the Kaiser Family Foundation's 2009 Employer Health Benefits survey, with the size of the civilian labor force drawn from Bureau of Labor Statistics estimates for 2009 (Kaiser Family Foundation and Health Research & Educational Trust, 2009; U.S. Bureau of Labor Statistics, 2012).

⁴ The comparison with expenditures on first responders was calculated from the annual salary data for firefighters, police officers, and emergency medical technicians provided in the 2009 National Compensation Survey, while the total number of individuals in those occupations was drawn from the 2009 Occupational Employment Statistics (U.S. Bureau of Labor Statistics, 2010a,b).



FIGURE S-2 Schematic of the health care system today.

Capturing Opportunities from Technology, Industry, and Policy

As noted earlier, new opportunities exist to address the challenges outlined above. Just as the information revolution has transformed many other fields, growing stores of data and computational abilities hold the same promise for improving clinical research, clinical practice, and clinical decision making. In the past three decades, for example, computer processing speed has grown by 60 percent a year on average, while the capacity to share information over telecommunications networks has risen by an average of 30 percent a year (Hilbert and López, 2011). These advances in computing and connectivity have the potential to improve health care by expanding the reach of knowledge, increasing access to clinical information when and where needed, and assisting patients and providers in managing chronic diseases. Studies also have found that using such electronic systems can improve safety-one study reported a 41 percent reduction in potential adverse drug events following the implementation of a computerized patient management system (computerized physician order entry, or CPOE), while another estimated that overall medication error rates dropped by 81 percent (Bates et al., 1998, 1999; Potts et al., 2004). Projections are for 90 percent of office-based physicians to have access to fully operational electronic health records by 2019, up from 34 percent in 2011 (Congressional Budget Office, 2009; Hsiao et al., 2011). Since these capacities are relatively early in their development in the health care arena, there is substantial room for progress as they are implemented in the field. However, multiple nontechnological developments, such as supportive care processes, governance, and patient and public engagement, will be necessary if these technologies are to reach their full potential.

Conclusion: Advances in computing, information science, and connectivity can improve patient-clinician communication, point-of-care guidance, the capture of experience, population surveillance, planning and evaluation, and the generation of real-time knowledge—features of a continuously learning health care system.

In addition to advances in computing and connectivity, new organizational capabilities have been developed in diverse industries to improve safety, quality, reliability, and value. Advances in safety alone, for instance, enabled domestic commercial commuter airlines to report no fatalities from 2007 to 2010 (Bureau of Transportation Statistics, 2011). New capabilities in

systems engineering, operations management, and production can be adapted to health care settings to improve performance. In one study, the use of checklists inspired by the aviation industry eliminated catheter-related bloodstream infections in the intensive care units of most hospitals in the study and resulted in an 80 percent decrease in infections per catheter-day (Pronovost et al., 2006, 2009). Commercial strategies to improve the reliability of the delivery of goods and services have potential applicability to health care as well. A pharmacy unit, for example, undertook systematic problem solving and reduced the time spent searching for medications by 30 percent and the frequency of out-of-stock medications by 85 percent (Spear, 2005).

Conclusion: Systematic, evidence-based process improvement methods applied in various sectors to achieve often striking results in safety, quality, reliability, and value can be similarly transformative for health care.

Across the United States, moreover, there is growing momentum to implement novel partnerships and collaborations to test delivery system innovations aimed at high-value, highquality health care. In many settings, stakeholders at all levels-federal, state, and local governments; public and private insurers; health care delivery organizations; employers; patients and consumers; and others-are working together with the shared objectives of controlling health care costs and improving health care quality. States ranging from Massachusetts to Utah to Vermont have introduced new initiatives aimed at expanding health insurance coverage, improving care quality and value, and advancing the overall health of their residents. Multiple initiatives by employers, specialty societies, patient and consumer groups, health care delivery organizations, health plans, and others-such as the American Board of Internal Medicine (ABIM) Foundation's Choosing Wisely® campaign and the Good Stewardship project—are focused on improving the health care system. Other initiatives currently under way range from the Patient-Centered Primary Care Collaborative, which seeks to spread patient-centered medical homes; to community-based initiatives, such as the Aligning Forces for Quality program and the Chartered Value Exchange project; to all-payer databases being established in various states around the country. And drawing on their experiences in improving outcomes and lowering costs through initiatives in their own institutions, a group of health care delivery leaders has developed A CEO Checklist for High-Value Health Care, which describes system-change approaches that can be adopted in most health care settings to improve outcomes and reduce costs of care (Cosgrove et al., 2012) (see Appendix B). The convergence of these novel partnerships, a changing health care landscape, and investments in knowledge infrastructure has created a unique opportunity to achieve continuously learning health care.

Conclusion: Innovative public- and private-sector health system improvement initiatives, if adopted broadly, could support many elements of the transformation necessary to achieve a continuously learning health care system.

THE VISION

The committee believes that achieving a learning health care system—one in which science and informatics, patient-clinician partnerships, incentives, and culture are aligned to promote and enable continuous and real-time improvement in both the effectiveness and efficiency of care—is both necessary and possible for the nation. Table S-2 lists the fundamental characteristics of such a system, according to the major dimensions in play.

TABLE S-2 Characteristics of a Continuously Learning Health Care System

Science and Informatics

Real-time access to knowledge—A learning health care system continuously and reliably captures, curates, and delivers the best available evidence to guide, support, tailor, and improve clinical decision making and care safety and quality.

Digital capture of the care experience—A learning health care system captures the care experience on digital platforms for real-time generation and application of knowledge for care improvement.

Patient-Clinician Partnerships

Engaged, empowered patients—A learning health care system is anchored on patient needs and perspectives and promotes the inclusion of patients, families, and other caregivers as vital members of the continuously learning care team.

Incentives

Incentives aligned for value—In a learning health care system, incentives are actively aligned to encourage continuous improvement, identify and reduce waste, and reward high-value care.

Full transparency—A learning health care system systematically monitors the safety, quality, processes, prices, costs, and outcomes of care, and makes information available for care improvement and informed choices and decision making by clinicians, patients and their families.

Culture

Leadership-instilled culture of learning—A learning health care system is stewarded by leadership committed to a culture of teamwork, collaboration, and adaptability in support of continuous learning as a core aim.

Supportive system competencies—In a learning health care system, complex care operations and processes are constantly refined through ongoing team training and skill building, systems analysis and information development, and creation of the feedback loops for continuous learning and system improvement.

There are challenges to implementing this vision in real-world clinical environments. Clinicians routinely report moderate or high levels of stress, feel there is not enough time to meet their patients' needs, and find their work environment chaotic (Burdi and Baker, 1999; Linzer et al., 2009; Trude, 2003). Furthermore, they struggle to deliver care while confronting inefficient workflows, administrative burdens, and uncoordinated systems. These time pressures, stresses, and inefficiencies limit clinicians from focusing on additional tasks and initiatives, even those that have important goals for improving care. Similarly, professionals working in health care organizations are overwhelmed by the sheer volume of initiatives currently under way to improve various aspects of the care process, initiatives that appear to be unconnected with the organization's priorities. Often, these initiatives may be successful in one setting yet may not translate to other parts of the same organization.

Given such real-world impediments, initiatives that focus merely on incremental improvements and add to a clinician's daily workload are unlikely to succeed. Just as the quantity of clinical information now available exceeds the capacity of any individual to absorb and apply it, the number of tasks needed for regular care outstrips the capabilities of any individual. Significant change can occur only if the environment, context, and systems in which these professionals practice are reconfigured so that the entire health care infrastructure and culture support learning and improvement. Figure S-3 illustrates the committee's vision of how systematically capturing and translating information generated by clinical research and care delivery can close now open-ended learning loops.



FIGURE S-3 Schematic of a learning health care system.
THE PATH

The path to achieving the vision of a learning health care system entails generating and using real-time knowledge to improve outcomes; engaging patients, families, and communities; achieving and rewarding high-value care; and creating a new culture of care.

Generating and Using Real-Time Knowledge to Improve Outcomes

Although unprecedented and increasing levels of information are available in journals, guidelines, and other sources, patients and clinicians often lack practical access to guidance that is relevant, timely, and useful for the circumstances at hand. For example, fewer than half of the clinical guidelines for the nine most common chronic conditions consider older patients with multiple comorbid chronic conditions, even though, as noted earlier, 75 million Americans fall in that category (Boyd et al., 2005b; Parekh and Barton, 2010). In the case of localized prostate cancer, for instance, which treatment works best for a given patient—from watchful waiting, to radical prostatectomy, to radiation and chemotherapy—is unknown. Furthermore, the evidence base for clinical guidelines and recommendations needs to be strengthened. In some cases, 40 to 50 percent of the recommendations made in guidelines are based on expert opinion, case studies, or standards of care rather than on more systematic trials and studies (Chauhan et al., 2006; IOM, 2008, 2011a; Tricoci et al., 2009).

New methods are needed to address current limitations in clinical research. The cost of current clinical research methods averages \$15-\$20 million for larger studies—and much more for some—yet there are concerns about generalizing study results to all practice conditions and patient populations (Holve and Pittman, 2009, 2011). Given the increasing number of new medical treatments and technologies, the complexity of managing multiple chronic diseases, and the growing personalization of treatments and diagnostics, the challenge is to produce and deliver practical evidence that clinicians and patients can apply to clinical questions.

Conclusion: Despite the accelerating pace of scientific discovery, the current clinical research enterprise does not sufficiently address pressing clinical questions. The result is decisions by both patients and clinicians that are inadequately informed by evidence.

Meeting this challenge will require new approaches for generating clinical evidence that reduce the expense and effort of conducting research and improve the clinical applicability of research findings while retaining the rigorous reliability of the process. The issue is not determining which research method is best for a particular condition, but which method provides the information most appropriate to a particular clinical need. Each study must be well tailored to provide useful, practical, and reliable results for the condition at hand.

Opportunities for achieving these aims leverage the expanded capacity of the digital infrastructure along with new statistical and research techniques. Computational capabilities present promising, as yet unrealized, opportunities for care improvement, while advances in statistical analysis, simulation, and modeling can supplement traditional methods for conducting trials. The application of computing capacity and new analytic approaches enables the development of real-time research insights from patient populations. For example, one study found that real-time analysis of clinical data from electronic health records could have identified the increased risk of heart attack associated with one diabetes drug within 18 months of its introduction, as opposed to the 7-8 years between the medication's introduction and the point at

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which concerns were raised publicly (Brownstein et al., 2010). Computational capabilities also hold promise for hastening the derivation of important new insights from the care experience. A comprehensive disease registry for heart attack patients in Sweden, for example, has contributed to a 65 percent reduction in 30-day mortality and a 49 percent decrease in 1-year mortality from heart attacks (Larsson et al., 2012).

Conclusion: Growing computational capabilities to generate, communicate, and apply new knowledge create the potential to build a clinical data infrastructure to support continuous learning and improvement in health care.

Harnessing this potential for care improvement will require systematic approaches that address the regulatory, commercial, communications, and technological challenges involved. Results of surveys of health researchers suggest that the current formulation and interpretation of privacy rules have increased the cost and time to conduct research, impeded collaboration, and hampered the recruiting of subjects (IOM, 2009; Ness, 2007). Privacy is a highly important societal and personal value, but the current rules, with their inconsistent interpretation, offer a relatively limited security advantage to patients while impeding the pace and scope of new insights from health research and care improvement.

Conclusion: Regulations governing the collection and use of clinical data often create unnecessary and unintended barriers to the effectiveness and improvement of care and the derivation of research insights.

The current system for capturing and using new knowledge is already flawed and, absent change, is likely to be overwhelmed by the pace of knowledge growth. The diffusion of new evidence can take considerable time; in the case of thrombolytic drugs for heart attack treatment, for example, 13 years elapsed between when they were shown to be effective and when most experts recommended the treatment (Antman et al., 1992). Substantial work is required to identify high-quality evidence that minimizes the risk of contradiction by later studies and is sufficiently robust to provide insight on application to a particular patient's clinical circumstances. This is time-consuming work, which goes on while clinical patterns are being formed.

Realizing the prospect of faster, deeper knowledge bases will require parallel advances in the approaches to gathering and assessing evidence, making evidence-based recommendations, translating those recommendations to practice, and reinforcing their use through relevant policies. Computing capacity can help with assessment as well as dissemination. Technological tools, such as decision support tools that can be broadly embedded in electronic health records, hold promise for improving the application of evidence. One study found that digital decision support tools helped clinicians apply clinical guidelines, improving health outcomes for diabetics by 15 percent (Cebul et al., 2011).

Conclusion: As the pace of knowledge generation accelerates, new approaches are needed to deliver the right information, in a clear and understandable format, to patients and clinicians as they partner to make clinical decisions.

Engaging Patients, Families, and Communities⁵

The structure, incentives, and culture of the health care system are poorly aligned to engage patients and respond to their needs. While clinicians supply information and advice based on their scientific expertise in treatment and intervention options, as well as potential outcomes, patients, their families, and other caregivers bring personal knowledge regarding the suitability— or lack thereof—of different treatments for the patient's circumstances and preferences. Information from *both* sources is needed to select the right care option, particularly since studies have found that patients and clinicians have differing views on the importance of different health goals and health care risks (Lee et al., 2010a,b). At the same time, it is important to note that patient-centered care does not mean simply agreeing to every patient request. Rather, it entails meaningful awareness, discussion, and engagement among patient, family, and clinician on the evidence, risks and benefits, options, and decisions in play.

Currently, patients often are insufficiently involved in their care decisions. Even when they are encouraged to play a role in decisions about their care, they often lack understandable, reliable information—from evidence on the efficacy and risks of different treatment options to information on the quality of different providers and health care organizations—that is customized to their needs, preferences, and health goals. Fewer than half of patients receive clear information on the benefits and trade-offs of treatments for their condition, and fewer than half are satisfied with their level of control in medical decision making (Degner et al., 1997; Fagerlin et al., 2010; IOM, 2011b; Lee et al., 2011, 2012; Sepucha et al., 2010).

To improve patients' involvement in their care decisions, communication tools need to be developed and customized to patient circumstances. Given the complexity of health care, even highly educated people may have difficulty finding and understanding health information and applying it to their own care or that of their loved ones (IOM, 2004), and those who produce health care information need to consider how that information will be received and used by patients (Maurer et al., 2012). Technology offers opportunities for clinicians to engage patients by meeting with them where they are. These opportunities include improving communications outside of traditional clinical visits by providing new venues for care; assisting patients in managing their own health; and explaining options for shared clinical decisions, a capability that highlights health professionals' need to assume new roles in partnering with patients in the use of reliable online sources of health information (Brach et al., 2012).

Patient-centered care takes on increasing importance in light of research linking such care to better health outcomes, lower costs, an enhanced care experience, better quality of life, and other benefits. Patient and family involvement in health care decisions has been associated in primary care settings with reduced pain and discomfort, faster recovery in physical health, and improvements in emotional health (Stewart et al., 2000). Well-informed patients also often choose less aggressive and costly therapies. For example, it has been reported that informed patients are up to 20 percent less likely than other patients to choose elective surgery (O'Connor et al., 2009; Stacey et al., 2011). Similarly, patient-centered communication in primary care visits has been correlated with fewer diagnostic tests and referrals (Epstein et al., 2005; Stewart et al., 2000), as well as with annual charges in the range of 33 percent lower (Bertakis and Azari, 2011a,b).

⁵ While the term *patients* is used in this report for brevity, it always refers to patients, families and other caregivers, and the public. Similarly, the term *communities* includes all forms of community, such as those defined by geography, culture, disease or condition, occupation, and workplace.

Not all care delivered in the name of patient-centeredness reduces costs or improves outcomes. For example, one study found that patient-centeredness was associated with better outcomes but also higher costs (Bechel et al., 2000). Other studies have yielded mixed results with respect to cost, quality, and value for care models that aim to implement different aspects of patient-centeredness, such as disease management and care coordination programs (Nelson, 2012; Peikes et al., 2009). This may be related in part to the difficulty of identifying what truly constitutes patient-centered care, with well-meaning but poorly informed efforts producing changes that are superficial and adding little value to the experience. In the name of patient-centeredness, for example, some health care organizations have adopted luxury, hotel-like amenities or renovated their facilities. Although some of these initiatives may appeal to patient tastes, they do not achieve the true goals of patient-centered care and may increase costs while not directly addressing the patient's needs, preferences, or goals most important to improving quality, health, and value.

This report builds on the definition of patient-centered care offered in *Crossing the Quality Chasm*: "providing care that is respectful of and responsive to individual patient preferences, needs, and values and ensuring that patient values guide all decisions" (IOM, 2001a). The concept encompasses multiple dimensions, including respect for patients' values, preferences, and needs; coordination and integration of care; information, communication, and education; physical comfort; emotional support; and involvement of family and friends. This definition provides a framework for care to be fully patient-centered.

Conclusion: Improved patient engagement is associated with better patient experience, health, and quality of life and better economic outcomes, yet patient and family participation in care decisions remains limited.

Given the increasing incidence of chronic diseases, the complexity of modern health care, and the multiple determinants of health, the challenges facing the health care system cannot be met by any individual or organization acting alone. Yet care often is poorly coordinated among clinicians both within and across settings. In one survey, roughly 25 percent of patients noted that a test had to be repeated, often because the results had not been shared by another provider (Stremikis et al., 2011). This inadequate, sometimes absent, continuity of care endangers patients and contributes to system waste. For example, almost one-fifth of Medicare patients are rehospitalized within 30 days, often without seeing their primary care provider in the interim (Jencks et al., 2009). Comprehensive health care also requires accounting for factors typically outside of the traditional health care—medical care accounts for only 10 to 20 percent of overall health prospects—but in such factors as behavior, social circumstances, and environment. Thus close clinical-community coordination is required to protect and improve health (McGinnis et al., 2002).

Conclusion: Coordination and integration of patient services currently are poor. Improvement in this area will require strong and sustained avenues of communication and cooperation between and among clinical and community stewards of services.

Achieving and Rewarding High-Value Care

Health care payment policies strongly influence how care is delivered, whether new scientific insights and knowledge about best care are diffused broadly, and whether improvement initiatives succeed. Clinicians reimbursed for each service tend to recommend more visits and services than clinicians who are reimbursed under other payment methods. In one study, initiation of encounter- and procedure-based reimbursement for primary care led to an increased number of encounters and procedures, with visits increasing from 11 to 61 percent depending on the specialty (Helmchen and Lo Sasso, 2010). As with most aspects of health care, a variety of financial incentives and payment models currently are in use. However, most of these models tend to pay clinicians and health care organizations without a specific focus on patient health and value, which has contributed to waste and inefficiency. One study found, on average, only a 4.3 percent correlation between the quality of care delivered and the price of the medical service, with higher prices often being associated with lower quality (Office of the Attorney General of Massachusetts, 2011).

Conclusion: The prevailing approach to paying for health care, based predominantly on individual services and products, encourages wasteful and ineffective care.

Given the clear need for change, several health care organizations and health insurers across the nation have been testing new models of paying for care and organizing care delivery. While many individual initiatives have demonstrated success, evidence is conflicting on which payment models might work best and under what circumstances. Yet it is clear that high-value care—the best care for the patient, with the optimal result for the circumstances, delivered at the right price—requires that payment and practice incentives be structured to reward the best outcomes for the patient.

To transition to a health care payment system that rewards value, assessment techniques are needed to identify and encourage high-value care. In part, this is a clinical effectiveness issue. Unnecessary and marginal treatments and tests have the potential for side effects and harm. But at its core, health care value is a basic representation of the efficient use of individual and societal resources—time, money—for individual and societal benefit. Because measures of value must fundamentally balance the results of care with the costs required to achieve the results, accurate information is needed on the various dimensions of cost, as well as the various dimensions of health—health status, quality of life, quality of care, satisfaction, and population health.

Measurement itself is only part of the improvement process. Transparency on results produces data that clinicians can use for improvement initiatives, provides information that patients and consumers can use to select care and providers, and draws attention to high-value health care providers and organizations. Several transparency initiatives have been correlated both with improving performance on those measures reported and with encouraging organizations to undertake improvement activities. Following public reporting of pneumonia care measures, for example, rates of compliance with the measures rose from 72 percent to 95 percent in 8 years (Joint Commission, 2011). Results from another initiative showed that providing financial incentives together with helping clinicians monitor their practice patterns against those of others decreased spending by 2 percent per quarter while improving the overall quality of care (Chernew et al., 2011; Mechanic et al., 2011; Song et al., 2011). While further

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work is needed to improve the practical implementation of transparency and minimize negative consequences, greater transparency is necessary to provide the information needed to promote continuous learning and improvement.

Conclusion: Transparency of process, outcome, price, and cost information, both within health care and with patients and the public, has untapped potential to support continuous learning and improvement in patient experience, outcomes, and cost and the delivery of high-value care.

Creating a New Culture of Care

Although financial incentives can be important to the pace at which change occurs, they do not operate in a vacuum. The culture of health care is central to promoting learning at every level. Continuous improvement requires systematic problem solving, the application of systems engineering techniques, operational models that encourage and reward sustained quality and improved patient outcomes, transparency on cost and outcomes, and strong leadership with a vision devoted to improving health care processes. The goal is to create continuously learning organizations that generate and transfer knowledge from every patient interaction to yield greater performance predictability and reliability.

As with many other aspects of the health care enterprise, there is great diversity in the organizations that deliver care, from small group practices, to independent practice associations, to individual hospitals, to large integrated delivery systems. Each brings different strengths and weaknesses, and each plays a significant and important role in delivering high-quality, high-value care. Given the dramatic differences in local health care infrastructures, substantial heterogeneity will persist for the foreseeable future. Yet the need for a new culture of care is common to all types of health care organizations; all need to build their capabilities to continuously learn and improve.

Most vital to building a continuously learning organization is leadership and governance that defines, disseminates, and supports a vision of continuous improvement (Cosgrove et al., 2012). One study found that hospitals ranking in the top 5 percent for heart attack outcomes had a strong leadership and governance commitment to improvement, good communication and coordination, shared values and culture, and experience with problem solving and learning (Curry et al., 2011). An organization's leadership—and that leadership's visible priorities—sets its tone, defines and communicates its goals, motivates its staff, and marshals the necessary resources. By defining and visibly emphasizing a vision that encourages and rewards learning and improvement, leadership at all levels of the organization prompt its disparate elements to work together toward a common end.

If leadership provides the top-down mission of an organization, the organization's culture represents the social scaffolding that empowers system transformation. Organizational culture can encourage strong communication and coordination among clinicians, provide psychological safety that encourages open communication, and support innovation and creativity. This culture of care considers the needs and abilities of individual patients and how they can be engaged as members of the care team. Further, an organization's commitment to teaming, partnership, and continuity is fundamental in fostering a culture of continuous learning and improvement. In a large, multifacility integrated health system, for example, an intervention that focused on teamwork training, coaching, and communication skills saw an 18 percent reduction in annual mortality among participating facilities, with adverse events continuing to decrease, versus only a 7 percent reduction among nonparticipating facilities (Neily et al., 2010, 2011).

Continuous learning requires dedicated learning processes—mechanisms that help the organization constantly capture knowledge and implement improvements. Achieving systemsbased problem solving requires an organizational culture that incentivizes experimentation among staff—one that recognizes failure as key to the learning process and does not penalize employees if their experiments are unsuccessful. These processes can take many forms, yet they share certain essential elements: systematic problem solving and experimentation, learning from past experience and from others, and the use of internal transparency as a tool to motivate further improvement. Beyond systems-based problem solving, systems that continuously learn and improve also need to be adept at transferring the knowledge they gain throughout the organization. While each of these factors is important, it is the organization's operational model—the way it aligns goals, resources, and incentives—that makes learning actionable. An organization's operational model can incentivize continuous learning, help control variability and waste that do not contribute to quality care, recoup savings to invest in improving care processes and patient health, and make improvement sustainable.

Conclusion: Realizing the potential of a continuously learning health care system will require a sustained commitment to improvement, optimized operations, concomitant culture change, aligned incentives, and strong leadership within and across organizations.

ACTIONS FOR CONTINUOUS LEARNING, BEST CARE, AND LOWER COSTS

Based on the findings and conclusions derived in the course of its work, the committee offers recommendations for specific actions that would accelerate progress toward continuous learning, best care, and lower costs. As displayed in Box S-1, these recommendations can be grouped into three categories: foundational elements, care improvement targets, and a supportive policy environment.

BOX S-1 Categories of the Committee's Recommendations

Foundational Elements

Recommendation 1: *The digital infrastructure.* Improve the capacity to capture clinical, care delivery process, and financial data for better care, system improvement, and the generation of new knowledge.

Recommendation 2: *The data utility.* Streamline and revise research regulations to improve care, promote the capture of clinical data, and generate knowledge.

Care Improvement Targets

Recommendation 3: *Clinical decision support.* Accelerate integration of the best clinical knowledge into care decisions.

Recommendation 4: *Patient-centered care.* Involve patients and families in decisions regarding health and health care, tailored to fit their preferences.

Recommendation 5: *Community links.* Promote community-clinical partnerships and services aimed at managing and improving health at the community level.

Recommendation 6: *Care continuity.* Improve coordination and communication within and across organizations.

Recommendation 7: *Optimized operations.* Continuously improve health care operations to reduce waste, streamline care delivery, and focus on activities that improve patient health.

Supportive Policy Environment

Recommendation 8: *Financial incentives.* Structure payment to reward continuous learning and improvement in the provision of best care at lower cost.

Recommendation 9: *Performance transparency.* Increase transparency on health care system performance.

Recommendation 10: *Broad leadership.* Expand commitment to the goals of a continuously learning health care system.

Following are the committee's recommendations, which are supported by the material presented in the full report; also identified are the stakeholders whose engagement is necessary for the implementation of each recommendation. Each recommendation describes the core improvement aim for the area, followed by specific strategies representing initial steps that stakeholders should take in acting on the recommendation. Additional activities will have to be undertaken by numerous stakeholder groups to sustain and advance the continuous improvement required.

Foundational Elements

Recommendation 1: The Digital Infrastructure

Improve the capacity to capture clinical, care delivery process, and financial data for better care, system improvement, and the generation of new knowledge. Data generated in the course of care delivery should be digitally collected, compiled, and protected as a reliable and accessible resource for care management, process improvement, public health, and the generation of new knowledge.

- *Health care delivery organizations* and *clinicians* should fully and effectively employ digital systems that capture patient care experiences reliably and consistently, and implement standards and practices that advance the interoperability of data systems.
- The National Coordinator for Health Information Technology, digital technology developers, and standards organizations should ensure that the digital infrastructure captures and delivers the core data elements and interoperability needed to support better care, system improvement, and the generation of new knowledge.
- *Payers, health care delivery organizations,* and *medical product companies* should contribute data to research and analytic consortia to support expanded use of care data to generate new insights.
- *Patients* should participate in the development of a robust data utility; use new clinical communication tools, such as personal portals, for self-management and care activities; and be involved in building new knowledge, such as through patient-reported outcomes and other knowledge processes.
- The *Secretary of Health and Human Services* should encourage the development of distributed data research networks and expand the availability of departmental health data resources for translation into accessible knowledge that can be used for improving care, lowering costs, and enhancing public health.
- Research funding agencies and organizations, such as the National Institutes of Health, the Agency for Healthcare Research and Quality, the Veterans Health Administration, the Department of Defense, and the Patient-Centered Outcomes Research Institute, should promote research designs and methods that draw naturally on existing care processes and that also support ongoing quality improvement efforts.

Recommendation 2: The Data Utility

Streamline and revise research regulations to improve care, promote the capture of clinical data, and generate knowledge. Regulatory agencies should clarify and improve regulations governing the collection and use of clinical data to ensure patient privacy but also the seamless use of clinical data for better care coordination and management, improved care, and knowledge enhancement.

Strategies for progress toward this goal:

- The *Secretary of Health and Human Services* should accelerate and expand the review of the Health Insurance Portability and Accountability Act (HIPAA) and institutional review board (IRB) policies with respect to actual or perceived regulatory impediments to the protected use of clinical data, and clarify regulations and their interpretation to support the use of clinical data as a resource for advancing science and care improvement.
- Patient and consumer groups, clinicians, professional specialty societies, health care delivery organizations, voluntary organizations, researchers, and grantmakers should develop strategies and outreach to improve understanding of the benefits and importance of accelerating the use of clinical data to improve care and health outcomes.

Care Improvement Targets

Recommendation 3: Clinical Decision Support

Accelerate integration of the best clinical knowledge into care decisions. Decision support tools and knowledge management systems should be routine features of health care delivery to ensure that decisions made by clinicians and patients are informed by current best evidence.

Strategies for progress toward this goal:

- *Clinicians and health care organizations* should adopt tools that deliver reliable, current clinical knowledge to the point of care, and organizations should adopt incentives that encourage the use of these tools.
- *Research organizations, advocacy organizations, professional specialty societies,* and *care delivery organizations* should facilitate the development, accessibility, and use of evidence-based and harmonized clinical practice guidelines.
- *Public and private payers* should promote the adoption of decision support tools, knowledge management systems, and evidence-based clinical practice guidelines by structuring payment and contracting policies to reward effective, evidence-based care that improves patient health.
- *Health professional education programs* should teach new methods for accessing, managing, and applying evidence; engaging in lifelong learning;

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understanding human behavior and social science; and delivering safe care in an interdisciplinary environment.

• *Research funding agencies and organizations* should promote research into the barriers and systematic challenges to the dissemination and use of evidence at the point of care, and support research to develop strategies and methods that can improve the usefulness and accessibility of patient outcome data and scientific evidence for clinicians and patients.

Recommendation 4: Patient-Centered Care

Involve patients and families in decisions regarding health and health care, tailored to fit their preferences. Patients and families should be given the opportunity to be fully engaged participants at all levels, including individual care decisions, health system learning and improvement activities, and community-based interventions to promote health.

- *Patients and families* should expect to be offered full participation in their own care and health and encouraged to partner, according to their preference, with clinicians in fulfilling those expectations.
- *Clinicians* should employ high-quality, reliable tools and skills for informed shared decision making with patients and families, tailored to clinical needs, patient goals, social circumstances, and the degree of control patients prefer.
- *Health care delivery organizations,* including programs operated by the *Department of Defense, Veterans Health Administration,* and *Health Resources and Services Administration,* should monitor and assess patient perspectives and use the insights thus gained to improve care processes; establish patient portals to facilitate data sharing and communication among clinicians, patients, and families; and make high-quality, reliable tools available for shared decision making with patients at different levels of health literacy.
- The Agency for Healthcare Research and Quality, partnering with the Centers for Medicare & Medicaid Services, other payers, and stakeholder organizations, should support the development and testing of an accurate and reliable core set of measures of patient-centeredness for consistent use across the health care system.
- The *Centers for Medicare & Medicaid Services* and *other public and private payers* should promote and measure patient-centered care through payment models, contracting policies, and public reporting programs.
- *Digital technology developers* and *health product innovators* should develop tools to assist individuals in managing their health and health care, in addition to providing patient supports in new forms of communities.

Recommendation 5: Community Links

Promote community-clinical partnerships and services aimed at managing and improving health at the community level. Care delivery and community-based organizations and agencies should partner with each other to develop cooperative strategies for the design, implementation, and accountability of services aimed at improving individual and population health.

Strategies for progress toward this goal:

- *Health care delivery organizations* and *clinicians* should partner with *community-based organizations* and *public health agencies* to leverage and coordinate prevention, health promotion, and community-based interventions to improve health outcomes, including strategies related to the assessment and use of web-based tools.
- *Public and private payers* should incorporate population health improvement into their health care payment and contracting policies and accountability measures.
- *Health economists, health service researchers, professional specialty societies,* and *measure development organizations* should continue to improve measures that can readily be applied to assess performance on both individual and population health.

Recommendation 6: Care Continuity

Improve coordination and communication within and across organizations. Payers should structure payment and contracting to reward effective communication and coordination between and among members of a patient's care team.

- *Health care delivery organizations* and *clinicians*, partnering with *patients*, *families*, and *community organizations*, should develop coordination and transition processes, data sharing capabilities, and communication tools to ensure safe, seamless patient care.
- *Health economists, health service researchers, professional specialty societies,* and *measure development organizations* should develop and test metrics with which to monitor and evaluate the effectiveness of care transitions in improving patient health outcomes.
- *Public and private payers* should promote effective care transitions that improve patient health through their payment and contracting policies.

Recommendation 7: Optimized Operations

Continuously improve health care operations to reduce waste, streamline care delivery, and focus on activities that improve patient health. Care delivery organizations should apply systems engineering tools and process improvement methods to improve operations and care delivery processes.

Strategies for progress toward this goal:

- *Health care delivery organizations* should utilize systems engineering tools and process improvement methods to eliminate inefficiencies, remove unnecessary burdens on clinicians and staff, enhance patient experience, and improve patient health outcomes.
- The Centers for Medicare & Medicaid Services, the Agency for Healthcare Research and Quality, the Patient-Centered Outcomes Research Institute, quality improvement organizations, and process improvement leaders should develop a learning consortium aimed at accelerating training, technical assistance, and the collection and validation of lessons learned about ways to transform the effectiveness and efficiency of care through continuous improvement programs and initiatives.

Supportive Policy Environment

Recommendation 8: Financial Incentives

Structure payment to reward continuous learning and improvement in the provision of best care at lower cost. Payers should structure payment models, contracting policies, and benefit designs to reward care that is effective and efficient and continuously learns and improves.

- *Public and private payers* should reward continuous learning and improvement through outcome- and value-oriented payment models, contracting policies, and benefit designs. Payment models should adequately incentivize and support high-quality team-based care focused on the needs and goals of patients and families.
- *Health care delivery organizations* should reward continuous learning and improvement through the use of internal practice incentives.
- *Health economists, health service researchers, professional specialty societies,* and *measure development organizations* should partner with *public and private payers* to develop and evaluate metrics, payment models, contracting policies, and benefit designs that reward high-value care that improves health outcomes.

Recommendation 9: Performance Transparency

Increase transparency on health care system performance. Health care delivery organizations, clinicians, and payers should increase the availability of information on the quality, prices and cost, and outcomes of care to help inform care decisions and guide improvement efforts.

Strategies for progress toward this goal:

- *Health care delivery organizations* should collect and expand the availability of information on the safety, quality, prices and cost, and health outcomes of care.
- *Professional specialty societies* should encourage transparency on the quality, value, and outcomes of the care provided by their members.
- *Public and private payers* should promote transparency in quality, value, and outcomes to aid plan members in their care decision making.
- *Consumer and patient organizations* should disseminate this information to facilitate discussion, informed decision making, and care improvement.

Recommendation 10: Broad Leadership

Expand commitment to the goals of a continuously learning health care system. Continuous learning and improvement should be a core and constant priority for all participants in health care—patients, families, clinicians, care leaders, and those involved in supporting their work.

- *Health care delivery organizations* should develop organizational cultures that support and encourage continuous improvement, the use of best practices, transparency, open communication, staff empowerment, coordination, teamwork, and mutual respect and align rewards accordingly.
- *Leaders* of these organizations should define, disseminate, support, and commit to a vision of continuous improvement; focus attention, training, and resources on continuous learning; and build an operational model that incentivizes continuous improvement and ensures its sustainability.
- *Governing boards of health care delivery organizations* should support and actively participate in fostering a culture of continuous improvement, request continuous feedback on the progress being made toward the adoption of such a culture, and align leadership incentive structures accordingly.
- Clinical professional specialty societies, health professional education programs, health professions specialty boards, licensing boards, and accreditation organizations should incorporate basic concepts and specialized applications of continuous learning and improvement into health professions education; continuing education; and licensing, certification, and accreditation requirements.

Given the interconnected nature of the problems to be solved, it will be important to take the actions identified above in concert. To elevate the quantity of evidence available to inform clinical decisions, for example, it is necessary to increase the supply of evidence by expanding the clinical research base; make the evidence easily accessible by embedding it in clinical technological tools, such as clinical decision support; encourage use of the evidence through appropriate payment, contracting, and regulatory policies and cultural factors; and assess progress toward the goal using reliable metrics and appropriate transparency. The absence of any one of these factors will substantially limit overall improvement. To guide success, progress on the recommendations in this report should be monitored continuously.

ACHIEVING THE VISION

Implementing the actions detailed above and achieving the vision of continuous learning and improvement will depend on the exercise of broad leadership by the complex network of decentralized and loosely associated individuals and organizations that make up the health care system. Given the complexity of the system and the interconnectedness of its different actors and sectors, no one actor or sector alone can bring about the scope and scale of transformative change necessary to develop a system that continuously learns and improves. Each stakeholder brings different strengths, skills, needs, and expertise to the task of improving the system, faces unique challenges, and is accountable for different aspects of the system's success. There is a distinct need for collaboration between and among stakeholders to produce effective and sustainable change.

As the end users of all health care services, patients are central to the success of any improvement initiative. Any large-scale change will require the participation of patients as partners, with the system building trust on every dimension. Patients can promote learning and improvement by engaging in their own care; setting high expectations for their care in terms of quality, value, and the use of scientific evidence and selecting clinicians, organizations, and plans that meet those expectations; sharing decision making with their clinicians; and, with the help of their caregivers, directly applying evidence to their self-care and self-management on an ongoing basis.

Partnering with patients are the health care professionals who deliver care. Physicians, nurses, pharmacists, and other health professionals represent the front lines of health care delivery and the primary interface for patients and consumers. Expanding the supply of clinical information, promoting the use of evidence, and better involving patients in their care are all contingent upon the engagement and teaming of health professionals.

By convening their constituent professionals and providing a forum for action, professional societies have important roles in achieving the vision of a learning health care system. Through guidelines, performance measures, quality improvement initiatives, and data infrastructures for assessing performance with respect to specific procedures or conditions, these societies can take a leadership role in improving quality, safety, and efficiency.

Health care delivery organizations, because of their size and care capacities, have several levers by which they can steward progress toward a continuously improving system, such as using new practice methods, setting standards, and sharing resources and information with other care delivery organizations. Furthermore, through investments in health information technology, these organizations can build their capacity to perform near-real-time research, speeding the generation of practical evidence and its translation to the bedside.

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Those who finance care also have opportunities to leverage their unique position to improve the quality and efficiency of care. As organizations that interact directly with patients, public and private payers can support patients as they seek to maintain healthy behaviors and access quality health care services, while their payment and contracting policies have a strong influence on how clinicians practice. Similarly, employers can support efforts to improve quality and value by using their purchasing power to drive improvement efforts through contracts with providers and insurers, the design of benefit plans, and the provision of incentives and information for employees.

Digital technology developers, health product innovators, and regulators are additional stakeholders that need to be engaged in achieving the vision of a learning health care system. Digital technology developers create the products and infrastructure necessary to meet the growing demand for capturing, storing, retrieving, and sharing information in virtually every aspect of health care. Continuous improvement in diagnostic and treatment options is contingent on a safe and innovative product development enterprise. Health product innovators, by conducting clinical research and devising new treatments and interventions, can develop novel products for diagnosis and treatment. Essential partners in this arena are regulators, including the Food and Drug Administration, who can work to develop streamlined methods for ensuring that safe, effective products are brought to market without delay.

A learning health care system depends on evidence to promote improvements in care delivery processes and patient care and overall system improvement. Consequently, health researchers are critical partners in generating knowledge on the effectiveness and value of interventions and care protocols. A commitment to practical and efficient research methods across the spectrum of the research enterprise—the design and operation of clinical trials, the development of clinical registries and clinical databases, the creation of standards and metrics, modeling and simulation studies, studies of health services and care delivery processes, and the aggregation of study results into systematic reviews and clinical guidelines—is foundational for a learning system. Through their programmatic and funding activities, private philanthropies, as well as agencies and organizations such as the Agency for Healthcare Research and Quality, the National Institutes of Health, and the Patient-Centered Outcomes Research Institute have a central role to play in the stewardship and strategic direction of these activities.

Missed opportunities for better health care have real human and economic impacts. If the care in every state was at the quality delivered by the highest performing state, there would have been an estimated 75,000 fewer deaths across the country in 2005 (McCarthy et al., 2009; Schoenbaum et al., 2011). Current waste diverts resources from productive use—an estimated \$750 billion lost (IOM, 2010). It is only through shared commitments, in alignment with a supportive policy environment, that the opportunities offered by science and information technology can be captured to address the health care system's growing challenges and to ensure that it reaches its full potential to provide the best care for each patient. The nation's health and economic futures—best care at lower cost—depend on the ability to steward the evolution of a continuously learning health care system.

- Anderson, G. F. 2010. *Chronic care: Making the case for ongoing care*. Princeton, NJ: Robert Wood Johnson Foundation.
- Antman, E. M., J. Lau, B. Kupelnick, F. Mosteller, and T. C. Chalmers. 1992. A comparison of results of meta-analyses of randomized control trials and recommendations of clinical experts. Treatments for myocardial infarction. *Journal of the American Medical Association* 268(2):240-248.
- Arora, V., S. Gangireddy, A. Mehrotra, R. Ginde, M. Tormey, and D. Meltzer. 2009. Ability of hospitalized patients to identify their in-hospital physicians. *Archives of Internal Medicine* 169(2):199-201.
- Auerbach, D. I., and A. L. Kellermann. 2011. A decade of health care cost growth has wiped out real income gains for an average US family. *Health Affairs* 30(9):1630-1636.
- Bates, D. W., L. L. Leape, D. J. Cullen, N. Laird, L. A. Petersen, J. M. Teich, E. Burdick, M. Hickey, S. Kleefield, B. Shea, M. Vander Vliet, and D. L. Seger. 1998. Effect of computerized physician order entry and a team intervention on prevention of serious medication errors. *Journal of the American Medical Association* 280(15):1311-1316.
- Bates, D. W., J. M. Teich, J. Lee, D. Seger, G. J. Kuperman, N. Ma'Luf, D. Boyle, and L. Leape. 1999. The impact of computerized physician order entry on medication error prevention. *Journal of the American Medical Informatics Association* 6(4):313-321.
- Bechel, D. L., W. A. Myers, and D. G. Smith. 2000. Does patient-centered care pay off? Joint Commission Journal on Quality Improvement 26(7):400-409.
- Bertakis, K. D., and R. Azari. 2011a. Determinants and outcomes of patient-centered care. *Patient Education and Counseling* 85(1):46-52.
- Bertakis, K. D., and R. Azari. 2011b. Patient-centered care is associated with decreased health care utilization. *Journal of the American Board of Family Medicine* 24(3):229-239.
- Boyd, C. M., J. Darer, C. Boult, L. P. Fried, L. Boult, and A. W. Wu. 2005a. Clinical practice guidelines and quality of care for older patients with multiple comorbid diseases. *Journal of the American Medical Association* 294(6):716.
- Boyd, C. M., J. Darer, C. Boult, L. P. Fried, L. Boult, and A. W. Wu. 2005b. Clinical practice guidelines and quality of care for older patients with multiple comorbid diseases: Implications for pay for performance. *Journal of the American Medical Association* 294(6):716-724.
- Brach, C., B. Dreyer, P. Schyve, L. M. Hernandez, C. Baur, A. J. Lemerise, and R. Parker. 2012. *Attributes of a health literate organization*. Washington, DC: Institute of Medicine, National Academies of Science.
- Brownstein, J. S., S. N. Murphy, A. B. Goldfine, R. W. Grant, M. Sordo, V. Gainer, J. A. Colecchi, A. Dubey, D. M. Nathan, J. P. Glaser, and I. S. Kohane. 2010. Rapid identification of myocardial infarction risk associated with diabetes medications using electronic medical records. *Diabetes Care* 33(3):526-531.
- Burdi, M. D., and L. C. Baker. 1999. Physicians' perceptions of autonomy and satisfaction in California. *Health Affairs* 18(4):134.
- Bureau of Transportation Statistics. 2011. *National transportation statistics*. Washington, DC: Research and Innovation Technology Administration, U.S. Department of Transportation.
- Casalino, L. P., D. Dunham, M. H. Chin, R. Bielang, E. O. Kistner, T. G. Karrison, M. K. Ong, U. Sarkar, M. A. McLaughlin, and D. O. Meltzer. 2009. Frequency of failure to inform patients of clinically significant outpatient test results. *Archives of Internal Medicine* 169(12):1123-1129.
- Cebul, R. D., T. E. Love, A. K. Jain, and C. J. Hebert. 2011. Electronic health records and quality of diabetes care. *New England Journal of Medicine* 365(9):825-833.

Certo, C. M. 1985. History of cardiac rehabilitation. *Physical Therapy* 65(12):1793-1795.

Charmel, P. A., and S. B. Frampton. 2008. Building the business case for patient-centered care. *Healthcare Financial Management* 62(3):80-85.

- Chauhan, S. P., V. Berghella, M. Sanderson, E. F. Magann, and J. C. Morrison. 2006. American College of Obstetricians and Gynecologists practice bulletins: An overview. *American Journal of Obstetrics and Gynecology* 194(6):1564-1572.
- Chernew, M. E., R. E. Mechanic, B. E. Landon, and D. G. Safran. 2011. Private-payer innovation in Massachusetts: The 'alternative quality contract.' *Health Affairs (Millwood)* 30(1):51-61.
- Classen, D. C., R. Resar, F. Griffin, F. Federico, T. Frankel, N. Kimmel, J. C. Whittington, A. Frankel, A. Seger, and B. C. James. 2011. 'Global trigger tool' shows that adverse events in hospitals may be ten times greater than previously measured. *Health Affairs (Millwood)* 30(4):581-589.
- CMS (Centers for Medicare & Medicaid Services). 2012. National health expenditures summary and GDP: Calendar years 1960-2010. http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/downloads/tables.pdf (accessed August 31, 2012).
- Congressional Budget Office. 2008. Issues and options in infrastructure investment. Washington, DC: Congressional Budget Office.
- Congressional Budget Office. 2009. *Health Information Technology for Economic and Clinical Health Act.* Washington, DC: Congressional Budget Office.
- Cosgrove, D., M. Fisher, P. Gabow, G. Gottlieb, G. C. Halvorson, B. James, G. Kaplan, J. Perlin, R. Petzel, G. Steele, and J. Toussaint. 2012. A CEO checklist for high-value health care. Discussion Paper, Institute of Medicine, Washington, DC. http://www.iom.edu/CEOChecklist (accessed August 31, 2012).
- Curry, L. A., E. Spatz, E. Cherlin, J. W. Thompson, D. Berg, H. H. Ting, C. Decker, H. M. Krumholz, and E. H. Bradley. 2011. What distinguishes top-performing hospitals in acute myocardial infarction mortality rates? A qualitative study. *Annals of Internal Medicine* 154(6):384-390.
- Degner, L. F., L. J. Kristjanson, D. Bowman, J. A. Sloan, K. C. Carriere, J. O'Neil, B. Bilodeau, P. Watson, and B. Mueller. 1997. Information needs and decisional preferences in women with breast cancer. *Journal of the American Medical Association* 277(18):1485-1492.
- DeNavas-Walt, C., B. D. Proctor, and J. C. Smith. 2011. Income, poverty, and health insurance coverage in the United States: 2010. Washington, DC: U.S. Census Bureau.
- Donchin, Y., D. Gopher, M. Olin, Y. Badihi, M. Biesky, C. L. Sprung, R. Pizov, and S. Cotev. 2003. A look into the nature and causes of human errors in the intensive care unit. *Quality & Safety in Health Care* 12(2):143-147.
- Epstein, R. M., P. Franks, C. G. Shields, S. C. Meldrum, K. N. Miller, T. L. Campbell, and K. Fiscella. 2005. Patient-centered communication and diagnostic testing. *Annals of Family Medicine* 3(5):415-421.
- Epstein, R. M., K. Fiscella, C. S. Lesser, and K. C. Stange. 2010. Why the nation needs a policy push on patient-centered health care. *Health Affairs (Millwood)* 29(8):1489-1495.
- Fagerlin, A., K. R. Sepucha, M. P. Couper, C. A. Levin, E. Singer, and B. J. Zikmund-Fisher. 2010. Patients' knowledge about 9 common health conditions: The decisions survey. *Medical Decision Making* 30(Suppl. 5):S35-S52.
- Farrell, D., E. Jensen, B. Kocher, N. Lovegrove, F. Melhem, L. Mendonca, and B. Parish. 2008. Accounting for the cost of US health care: A new look at why Americans spend more. Washington, DC: McKinsey Global Institute.
- Harrison, T. R. 1962. *Principles of internal medicine*. 4th ed. New York: Blakiston Division, McGraw-Hill.
- Helmchen, L. A., and A. T. Lo Sasso. 2010. How sensitive is physician performance to alternative compensation schedules? Evidence from a large network of primary care clinics. *Health Economics* 19(11):1300-1317.
- Hendrich, A., M. P. Chow, B. A. Skierczynski, and Z. Lu. 2008. A 36-hospital time and motion study: How do medical-surgical nurses spend their time? *The Permanente Journal* 12(3):25-34.
- Hendrickson, G., T. M. Doddato, and C. T. Kovner. 1990. How do nurses use their time? *Journal of Nursing Administration* 20(3):31-37.

- Hilbert, M., and P. López. 2011. The world's technological capacity to store, communicate, and compute information. *Science* 332(6025):60-65.
- Holve, E., and P. Pittman. 2009. A first look at the volume and cost of comparative effectiveness research in the United States. Washington, DC: AcademyHealth.
- Holve, E., and P. Pittman. 2011. The cost and volume of comparative effectiveness research. In *Learning what works: Infrastructure required for comparative effectiveness research (workshop summary)*, edited by L. Olsen, C. Grossman, and J. M. McGinnis. Washington, DC: The National Academies Press. Pp. 89-96.
- Howden, L. M., and J. A. Meyer. 2011. Age and sex composition: 2010. Washington, DC: U.S. Census Bureau, U.S. Department of Commerce.
- Hsiao, C.-J., E. Hing, T. C. Socey, and B. Cai. 2011. Electronic health record systems and intent to apply for meaningful use incentives among office-based physician practices: United States, 2001-2011. Hyattsville, MD: National Center for Health Statistics.
- IOM (Institute of Medicine). 1999. *To err is human: Building a safer health system*. Washington, DC: National Academy Press.
- IOM. 2001a. *Crossing the quality chasm: A new health system for the 21st century.* Washington, DC: National Academy Press.
- IOM. 2001b. *Mammography and beyond: Developing technologies for the early detection of breast cancer*. Washington, DC: National Academy Press.
- IOM. 2002. Unequal treatment: Confronting racial and ethnic disparities in health care. Washington, DC: National Academy Press.
- IOM. 2004. *Health literacy: A prescription to end confusion*. Washington, DC: The National Academies Press.
- IOM. 2008. *Knowing what works in health care: A roadmap for the nation*. Washington, DC: The National Academies Press.
- IOM. 2009. Beyond the HIPAA privacy rule: Enhancing privacy, improving health through research. Washington, DC: The National Academies Press.
- IOM. 2010. The healthcare imperative: Lowering costs and improving outcomes: Workshop series summary, Learning health system series. Washington, DC: The National Academies Press.
- IOM. 2011a. Clinical practice guidelines we can trust. Washington, DC: The National Academies Press.
- IOM. 2011b. Patients charting the course: Citizen engagement in the learning health system (a workshop summary). Washington, DC: The National Academies Press.
- Jencks, S. F., M. V. Williams, and E. A. Coleman. 2009. Rehospitalizations among patients in the Medicare fee-for-service program. *New England Journal of Medicine* 360(14):1418-1428.
- Joint Commission. 2011. Improving America's hospitals: The Joint Commission's annual report on quality and safety. http://www.jointcommission.org/assets/1/6/TJC_Annual_Report_2011_9_13_11_.pdf (accessed September 25, 2011).
- Kaiser Family Foundation and Health Research & Educational Trust. 2009. *Employer health benefits:* 2009 annual survey. Menlo Park, CA: Kaiser Family Foundation and Health Research & Educational Trust.
- Kasper, D. L., and T. R. Harrison. 2005. *Harrison's principles of internal medicine*. 16th ed., 2 vols. New York: McGraw-Hill, Medical Publications Division.
- Keehan, S. P., A. M. Sisko, C. J. Truffer, J. A. Poisal, G. A. Cuckler, A. J. Madison, J. M. Lizonitz, and S. D. Smith. 2011. National health spending projections through 2020: Economic recovery and reform drive faster spending growth. *Health Affairs (Millwood)* 30(8):1594-1605.
- Landrigan, C. P., G. J. Parry, C. B. Bones, A. D. Hackbarth, D. A. Goldmann, and P. J. Sharek. 2010. Temporal trends in rates of patient harm resulting from medical care. *New England Journal of Medicine* 363(22):2124-2134.

PREPUBLICATION COPY: UNCORRECTED PROOFS

- Larsson, S., P. Lawyer, G. Garellick, B. Lindahl, and M. Lundström. 2012. Use of 13 disease registries in 5 countries demonstrates the potential to use outcome data to improve health care's value. *Health Affairs (Millwood)* 31(1):220-227.
- Lee, C. N., R. Dominik, C. A. Levin, M. J. Barry, C. Cosenza, A. M. O'Connor, A. G. Mulley, Jr., and K. R. Sepucha. 2010a. Development of instruments to measure the quality of breast cancer treatment decisions. *Health Expectations* 13(3):258-272.
- Lee, C. N., C. S. Hultman, and K. Sepucha. 2010b. Do patients and providers agree about the most important facts and goals for breast reconstruction decisions? *Annals of Plastic Surgery* 64(5):563-566.
- Lee, C. N., J. Belkora, Y. Chang, B. Moy, A. Partridge, and K. Sepucha. 2011. Are patients making highquality decisions about breast reconstruction after mastectomy? *Plastic and Reconstructive Surgery* 127(1):18-26.
- Lee, C. N., Y. Chang, N. Adimorah, J. K. Belkora, B. Moy, A. H. Partridge, D. W. Ollila, and K. R. Sepucha. 2012. Decision making about surgery for early-stage breast cancer. *Journal of the American College of Surgeons* 214(1):1-10.
- Levinson, D. R. 2010. Adverse events in hospitals: National incidence among Medicare beneficiaries. Washington, DC: U.S. Department of Health and Human Services, Office of Inspector General.
- Linzer, M., L. B. Manwell, E. S. Williams, J. A. Bobula, R. L. Brown, A. B. Varkey, B. Man, J. E. McMurray, A. Maguire, B. Horner-Ibler, M. D. Schwartz, and MEMO (Minimizing Error, Maximizing Outcome) Investigators. 2009. Working conditions in primary care: Physician reactions and care quality. *Annals of Internal Medicine* 151(1):28-36, W26-29.
- Maurer, M., P. Dardess, K. L. Carman, K. Frazier, and L. Smeeding. 2012. *Guide to patient and family engagement: Environmental scan report.* Rockville, MD: Agency for Healthcare Research and Quality.
- McCarthy, D., S. How, C. Schoen, J. Cantor, and D. Belloff. 2009. *Aiming higher: Results from a state scorecard on health system performance*. New York: Commonwealth Fund Commission on a High Performance Health System.
- McGinnis, J. M., P. Williams-Russo, and J. R. Knickman. 2002. The case for more active policy attention to health promotion. *Health Affairs (Millwood)* 21(2):78-93.
- McGlynn, E. A., S. M. Asch, J. Adams, J. Keesey, J. Hicks, A. DeCristofaro, and E. A. Kerr. 2003. The quality of health care delivered to adults in the United States. *New England Journal of Medicine* 348(26):2635-2645.
- Mechanic, R. E., P. Santos, B. E. Landon, and M. E. Chernew. 2011. Medical group responses to global payment: Early lessons from the 'alternative quality contract' in Massachusetts. *Health Affairs* (*Millwood*) 30(9):1734-1742.
- Nabel, E. G., and E. Braunwald. 2012. A tale of coronary artery disease and myocardial infarction. *New England Journal of Medicine* 366(1):54-63.
- Neily, J., P. D. Mills, Y. Young-Xu, B. T. Carney, P. West, D. H. Berger, L. M. Mazzia, D. E. Paull, and J. P. Bagian. 2010. Association between implementation of a medical team training program and surgical mortality. *Journal of the American Medical Association* 304(15):1693-1700.
- Neily, J., P. D. Mills, N. Eldridge, B. T. Carney, D. Pfeffer, J. R. Turner, Y. Young-Xu, W. Gunnar, and J. P. Bagian. 2011. Incorrect surgical procedures within and outside of the operating room: A follow-up report. *Archives of Surgery* 146(11):1235-1239.
- Nelson, L. 2012. Lessons from Medicare's demonstration projects on disease management and care coordination. Washington, DC: Congressional Budget Office.
- Ness, R. B. 2007. Influence of the HIPAA privacy rule on health research. *Journal of the American Medical Association* 298(18):2164-2170.
- O'Connor, A. M., C. L. Bennett, D. Stacey, M. Barry, N. F. Col, K. B. Eden, V. A. Entwistle, V. Fiset, M. Holmes-Rovner, S. Khangura, H. Llewellyn-Thomas, and D. Rovner. 2009. Decision aids for

people facing health treatment or screening decisions. *Cochrane Database of Systematic Reviews* (3):CD001431.

- Office of the Attorney General of Massachusetts. 2011. *Examination of health care cost trends and cost drivers pursuant to G.L. c. 118g, § 6¹/₂(b).* http://www.mass.gov/ago/docs/healthcare/2011-hcctd-full.pdf (accessed August 30, 2012).
- OMB (Office of Management and Budget). 2010. Fiscal year 2011 budget of the U.S. government. Washington, DC: OMB.
- Parekh, A. K., and M. B. Barton. 2010. The challenge of multiple comorbidity for the US health care system. *Journal of the American Medical Association* 303(13):1303-1304.
- Peikes, D., A. Chen, J. Schore, and R. Brown. 2009. Effects of care coordination on hospitalization, quality of care, and health care expenditures among Medicare beneficiaries: 15 randomized trials. *Journal of the American Medical Association* 301(6):603-618.
- Pham, H. H., D. Schrag, A. S. O'Malley, B. Wu, and P. B. Bach. 2007. Care patterns in Medicare and their implications for pay for performance. *New England Journal of Medicine* 356(11):1130-1139.
- Pham, H. H., A. S. O'Malley, P. B. Bach, C. Saiontz-Martinez, and D. Schrag. 2009. Primary care physicians' links to other physicians through Medicare patients: The scope of care coordination. *Annals of Internal Medicine* 150(4):236-242.
- Potts, A. L., F. E. Barr, D. F. Gregory, L. Wright, and N. R. Patel. 2004. Computerized physician order entry and medication errors in a pediatric critical care unit. *Pediatrics* 113(1 Pt. 1):59-63.
- Pronovost, P., D. Needham, S. Berenholtz, D. Sinopoli, H. T. Chu, S. Cosgrove, B. Sexton, R. Hyzy, R. Welsh, G. Roth, J. Bander, J. Kepros, and C. Goeschel. 2006. An intervention to decrease catheter-related bloodstream infections in the ICU. *New England Journal of Medicine* 355(26):2725-2732.
- Pronovost, P. J., C. A. Goeschel, K. L. Olsen, J. C. Pham, M. R. Miller, S. M. Berenholtz, J. B. Sexton, J. A. Marsteller, L. L. Morlock, A. W. Wu, J. M. Loeb, and C. M. Clancy. 2009. Reducing health care hazards: Lessons from the commercial aviation safety team. *Health Affairs (Millwood)* 28(3):w479-489.
- Schneider, K. M., B. E. O'Donnell, and D. Dean. 2009. Prevalence of multiple chronic conditions in the United States' Medicare population. *Health and Quality of Life Outcomes* 7:82.
- Schoenbaum, S. C., C. Schoen, J. L. Nicholson, and J. C. Cantor. 2011. Mortality amenable to health care in the United States: The roles of demographics and health systems performance. *Journal of Public Health Policy* 32(4):407-429.
- Sepucha, K. R., A. Fagerlin, M. P. Couper, C. A. Levin, E. Singer, and B. J. Zikmund-Fisher. 2010. How does feeling informed relate to being informed? The decisions survey. *Medical Decision Making* 30(Suppl. 5):S77-S84.
- Song, Z., D. G. Safran, B. E. Landon, Y. He, R. P. Ellis, R. E. Mechanic, M. P. Day, and M. E. Chernew. 2011. Health care spending and quality in year 1 of the alternative quality contract. *New England Journal of Medicine* 65(10):909-918.
- Spear, S. J. 2005. Fixing health care from the inside, today. *Harvard Business Review* 83(9):78.
- Stacey, D., C. L. Bennett, M. J. Barry, N. F. Col, K. B. Eden, M. Holmes-Rovner, H. Llewellyn-Thomas, A. Lyddiatt, F. Legare, and R. Thomson. 2011. Decision aids for people facing health treatment or screening decisions. *Cochrane Database of Systematic Reviews* (10):CD001431.
- Stewart, M., J. B. Brown, A. Donner, I. R. McWhinney, J. Oates, W. W. Weston, and J. Jordan. 2000. The impact of patient-centered care on outcomes. *Journal of Family Practice* 49(9):796-804.
- Stremikis, K., C. Schoen, and A.-K. Fryer. 2011. A call for change: The 2011 Commonwealth Fund survey of public views of the U.S. health system. New York: Commonwealth Fund.
- Tinetti, M. E., S. T. Bogardus, and J. V. Agostini. 2004. Potential pitfalls of disease-specific guidelines for patients with multiple conditions. *New England Journal of Medicine* 351(27):2870-2874.

PREPUBLICATION COPY: UNCORRECTED PROOFS

- Tricoci, P., J. M. Allen, J. M. Kramer, R. M. Califf, and S. C. Smith, Jr. 2009. Scientific evidence underlying the ACC/AHA clinical practice guidelines. *Journal of the American Medical Association* 301(8):831-841.
- Trude, S. 2003. So much to do, so little time: Physician capacity constraints, 1997-2001. *Tracking report/Center for Studying Health System Change* (8):1.
- Tucker, A. L., and S. J. Spear. 2006. Operational failures and interruptions in hospital nursing. *Health Services Research* 41(3 Pt. 1):643-662.
- U.S. Bureau of Labor Statistics. 2010a. *May 2009 national occupational employment and wage estimates*. http://www.bls.gov/oes/2009/may/oes_nat.htm (accessed May 22, 2012).
- U.S. Bureau of Labor Statistics. 2010b. *National compensation survey: Occupational earnings in the United States*, 2009. http://www.bls.gov/ncs/ocs/sp/nctb1346.pdf (accessed May 22, 2012).
- U.S. Bureau of Labor Statistics. 2012. Labor force statistics from the current population survey. http://data.bls.gov/pdq/SurveyOutputServlet?request_action=wh&graph_name=LN_cpsbref1 (accessed May 23, 2012).
- Wennberg, J. E., E. S. Fisher, and J. S. Skinner. 2002. Geography and the debate over Medicare reform. *Health Affairs (Millwood)* (Suppl. Web Exclusives):W96-114.
- Yarnall, K. S. H., K. Krause, K. Pollak, M. Gradison, and J. Michener. 2009. Family physicians as team leaders: "Time" to share the care. *Preventing Chronic Disease* 6(2).

Background on Upcoming Roundtable Activities



DRIVING PATIENT DEMAND FOR SHARED DECISIONS, BETTER VALUE, AND CARE IMPROVEMENT

A project of the IOM Roundtable on Value & Science-Driven Health Care

Activity: Identify and explore issues, attitudes, and approaches to increasing patient engagement in and demand for: (1) shared decision-making and better communication about the evidence in support of testing and treatment options; (2) the best value from their expenditures for the health care they receive; and (3) ensuring that the data generated in the course of their care experience is used to improve the care of others.

Compelling aim: Delivering better care for lower costs and creating a health care system that learns and improves continuously. To accomplish this aim, this project will address one of the most essential preconditions for the progress needed—building awareness and demand from patients and consumers. The information and insights developed in the course of exploring patients' attitudes, beliefs, and motivations on the issues will be used to develop multi-sectoral strategies to better engage patients in the changes necessary.

Issue: Patient-centeredness—the idea that all features of the health care enterprise, including evidence generation, care delivery, and financing should be designed around achieving optimal patient outcomes, satisfaction, and wellbeing—is a central tenet of health care delivery. Involving patients in their own health decisions yields better adherence to testing and treatment recommendations, higher satisfaction, and better health outcomes. Increasing patient concern about costs offers the opportunity to promote value-oriented care. And engaging patients in support of the use of their clinical and outcomes data can yield care improvements that benefit all patients. On the other hand, there are numerous challenges to centering the system's efforts around patient needs and preferences. Patients are unaware of evidence and quality gaps, and the public is reluctant to engage questions of cost, waste, quality, and value in the health care system. The specter of unintended sharing of personal health information has led to regulations that limit the flow of clinical data and patient hesitancy in accepting the use of their clinical data to accelerate learning. Candid communication between patients and clinicians is strained by patient perceptions that evidence might restrict their options or prevent personalized care, and by clinician perceptions that acknowledging evidence shortfalls will undermine patient confidence. This workshop seeks to identify strategies to build patient engagement in—and demand for—a more robust research enterprise, evidence-based shared decision-making, and high value health care.

Approach: Operating under the auspices of the IOM Roundtable on Value & Science-Driven Health Care, an IOM expert workshop will be convened, planned by an IOM-appointed stakeholder committee, to identify and discuss what is known about patient attitudes, behaviors, and motivations related to evidence, shared decision making, costs and prices in care, privacy, and use of data to improve the effectiveness and science-base for care. It will explore issues and strategies for improvement.

Deliverables: An IOM workshop summary will be published, reviewing challenges, defining key questions, and exploring options to accelerate progress on the issue of engaging patients in all aspects of a continuously learning health system.

Related IOM work: Patients Charting the Course: Citizen Engagement and the Learning Health System (2011); The Healthcare Imperative: Lowering Costs and Improving Outcomes (2010); Value in Health Care: Accounting for Cost, Quality, Safety, Outcomes, and Innovation (2010); Crossing the Quality Chasm: A New Health System for the 21st Century (2001); Patient-Clinician Communication: Principles & Expectations (2011); Learning What Works: Infrastructure Required for Comparative Effectiveness Research—Workshop Summary (2011); Clinical Data as the Basic Staple for Health Learning—Workshop Summary (2011); Health Literacy, eHealth, and Communication: Putting the Consumer First. Workshop Summary (2009); Speaking of Health: Assessing Health Communication Strategies for Diverse Populations (2002); Science and Risk Communication: A Mini-Symposium Sponsored by the Roundtable on Environmental Health Sciences, Research, and Medicine (2001); Redesigning the Clinical Effectiveness Research Paradigm (2010)

IOM Staff Contacts: Leigh Stuckhardt (lstuckhardt@nas.edu), Isabelle Von Kohorn (ivonkohorn@nas.edu)

The National Academy of Sciences

The National Academy of Sciences (NAS) is a non-governmental organization comprised of the nation's leading scientists. Chartered by Congress and President Abraham Lincoln in 1863, NAS is called upon to serve as the adviser to the Government and to the nation on matters of scientific research and policy. Presidential Executive Orders have defined the special relationship of the Academy to Government and cited its unique capacity to marshal scientific expertise of the highest caliber for independent and objective science policy advice. As matters of health and medicine became more compelling and specialized, the Institute of Medicine (IOM) was established under the charter of the NAS in 1970 as the nation's adviser on health, health science, and health policy. Like its sister organizations, the National Academy of Sciences and the National Academy of Engineering, IOM members (65 each year) are elected by the current membership and drawn from nation's leading authorities in medicine, health, the life sciences, and related policies.

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The National Academies, including the IOM, work outside the framework of government, although often at the request of Congress or government agencies. The IOM is charged with ensuring that objective and scientifically informed analysis and independent guidance are brought to bear on the most difficult and challenging health issues facing the nation. Working together in consensus committees, public forums, and collaborative efforts, invited experts carry out the technical and policy studies commissioned to produce advice on compelling health challenges, meetings and symposia convened on matters of widespread interest, and projects to catalyze recommended action. Each year, more than 2000 national experts—members and nonmembers—volunteer their time, knowledge and expertise to advance the nation's health through the IOM.

Rights and responsibilities under the Congressional Charter

The three National Academies have a long tradition of providing national advice and leadership, which rests on their ability to convene experts and other diverse stakeholders charged with considering important issues of science, engineering, and health policy in an objective, independent, and trusted environment that assures rigorous analysis. Because the National Academies provide the Federal Government with a unique service, activities are accorded a special status by charter and the implementing Executive Orders of the President. Specifically, "when a department or agency of the executive branch of the Government determines that the Academy, because of its unique qualifications, is the only source that can provide the measure of expertise, independence, objectivity, and audience acceptance necessary to meet the department's or agency's program requirements, acquisition of services by the Academy may be obtained on a noncompetitive basis if otherwise in accordance with applicable law and regulations." (Executive Order 12832)



LARGE SIMPLE TRIALS AND KNOWLEDGE GENERATION IN A CONTINUOUSLY LEARNING HEALTH SYSTEM

A project of the IOM Clinical Effectiveness Research Innovation Collaborative

Activity: A public workshop convened by the Institute of Medicine Roundtable on Value & Science-Driven Health Care in collaboration with the Forum on Drug Discovery, Development, and Translation to explore the potential for large simple trials (LSTs) to improve the speed and reliability of clinical effectiveness research in a continuously learning health system.

Compelling aim: Faster, reliable, ongoing generation of knowledge for continuous improvement in the effectiveness of treatments and interventions. Achievement of this aim will be accomplished through exploration of the methodological, structural, regulatory, and cultural issues and strategies central to accelerating the use of LSTs in a learning health system.

Issue: A core component of a continuously learning health system lies in the development of evidence on the effectiveness of diagnosis, treatment, and management of disease, which serves as the basis to inform medical decision making. The classic randomized controlled trial has made important contributions to demonstrating the efficacy of various interventions, and occasionally been called the "gold standard". Yet, recognition of the cost, timing, and applicability limitations of RCTs has increased, and the implications of those limitations are becoming acute in the context of the rapidly increasing complexity of clinical decisions and the need for guidance on care that is effective and efficient. RCTs are time and resource intensive, and often fail to deliver actionable data for real-world patient populations. Fundamental to a learning health system is the ability to improve the speed and practicality of knowledge generation. With the development of new technologies capable of acquiring, managing, linking, and analyzing large quantities of data, the potential for methods innovation, including the ability to draw research insights more effectively from routine clinical care experiences, is growing. The increased use of innovative methodologies such as LSTs, and their incorporation into routine clinical care, will drive the necessary transformation.

Approach: A planning committee will develop an agenda to engage key stakeholders in considering LST design, examples of successful LSTs, relative advantages of LSTs, the infrastructure needed to build LST capacity as a routine function of care, and the structural, cultural, and regulatory barriers hindering the development of such LST capacity.

Deliverable: An IOM workshop summary, or an individually-authored IOM Discussion Paper, or both, reviewing issues and opportunities, key next steps, and stakeholder responsibilities.

Related IOM work: Public Engagement and Clinical Trials: New Models and Disruptive Technologies (2011); Learning What Works: Infrastructure Required for Comparative Effectiveness Research (2011); Redesigning the Clinical Effectiveness Research Paradigm (2010); Building a National Framework for the Establishment of Regulatory Science for Drug Development (2010); Transforming Clinical Research in the United States (2010).

IOM contact: Claudia Grossmann, PhD (cgrossmann@nas.edu)

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CORE METRICS FOR BETTER CARE, LOWER COSTS, AND BETTER HEALTH

A project of the IOM Roundtable on Value & Science-Driven Health Care

Activity: Identify issues, options and approaches to promoting and aligning existing national, regional, and institutional measurement systems to assess progress toward achieving better care for individuals, lower per capita costs, and better health for populations—what has been called the "triple aim" of health and health care services—as the natural outcomes of a continuously learning and improving health system.

Compelling aim: Acceleration of the nation's progress toward better care, better health, and lower costs in each aspect of health and health care. Achievement of this aim is expected through the identification of core measures that are accurate, actionable, real-time, and continuous, that can be comparably and seamlessly collected through efforts at the national, state and local levels, and that are readily accessible to guide priority decisions by individuals, clinicians, health care organizations, payers, employers, public health policy decision makers and related community stakeholders.

Issue: The Institute of Medicine's Roundtable on Value & Science-driven Health Care was chartered "to develop a *learning health system* that is designed to generate and apply the best evidence for the collaborative healthcare choices of each patient and provider; to drive the process of discovery as a natural outgrowth of patient care; and to ensure innovation, quality, safety, and value in health care." Essentially, this mission is aimed to achieve outcomes that that have been termed in health policy circles as health care's triple aim: better care for individuals, better health for a population, and lower costs. Currently, the US is doing poorly at achieving these aims. Americans receive only about 50% of recommended care and have population health indicators-among them, life expectancy and preterm birth-below those of comparable nations. To achieve these mediocre outcomes, the US spends far more per capita. Because these dynamics are unsustainable, the country is poised for transformative change. On the assumption that "what gets measured gets done," the metrics used to inform and guide individual and program decisions are key. Currently multiple data systems at each assessment level-clinical, local, state, national-and various program requirements mandate collection of certain data for assessment. Because these capacities and requirements have been developed for different purposes, limited attention has been addressed to the essential needs for priority, parsimony, compatibility, comparability, and utility across programs and geographic areas for reliable insights on progress toward better care, lower costs, and better health.

Approach: An expert Planning Committee will be appointed by the National Academies to oversee the development and conduct of an Institute of Medicine workshop to consider: measures core for insights on health care, costs, and status; existing requirements and sources of data currently available; perspectives of decision-makers and program managers using the data to guide program decisions; challenges and barriers confronted; successful pilot models to address the challenges, and strategies moving forward.

Deliverable(s): A publication will be produced highlighting key themes from the discussion and identifying possibilities for collaborative and individual action, and strategies for progress.

Related IOM work: The Learning Health System Series (2007-2011), Child and Adolescent Health and Health Care Quality: Measuring What Matters (2011), State of the USA Health Indicators (2008), Performance Measurement: Accelerating Improvement (2005), Crossing the Quality Chasm (2001), To Err is Human (1999)

The National Academy of Sciences

The National Academy of Sciences (NAS) is a non-governmental organization comprised of the nation's leading scientists. Chartered by Congress and President Abraham Lincoln in 1863, NAS is called upon to serve as the adviser to the Government and to the nation on matters of scientific research and policy. Presidential Executive Orders have defined the special relationship of the Academy to Government and cited its unique capacity to marshal scientific expertise of the highest caliber for independent and objective science policy advice. As matters of health and medicine became more compelling and specialized, the Institute of Medicine (IOM) was established under the charter of the NAS in 1970 as the nation's adviser on health, health science, and health policy. Like its sister organizations, the National Academy of Sciences and the National Academy of Engineering, IOM members (65 each year) are elected by the current membership and drawn from nation's leading authorities in medicine, health, the life sciences, and related policies.

The Institute of Medicine

The National Academies, including the IOM, work outside the framework of government, although often at the request of Congress or government agencies. The IOM is charged with ensuring that objective and scientifically informed analysis and independent guidance are brought to bear on the most difficult and challenging health issues facing the nation. Working together in consensus committees, public forums, and collaborative efforts, invited experts carry out the technical and policy studies commissioned to produce advice on compelling health challenges, meetings and symposia convened on matters of widespread interest, and projects to catalyze recommended action. Each year, more than 2000 national experts—members and nonmembers—volunteer their time, knowledge and expertise to advance the nation's health through the IOM.

Rights and responsibilities under the Congressional Charter

The three National Academies have a long tradition of providing national advice and leadership, which rests on their ability to convene experts and other diverse stakeholders charged with considering important issues of science, engineering, and health policy in an objective, independent, and trusted environment that assures rigorous analysis. Because the National Academies provide the Federal Government with a unique service, activities are accorded a special status by charter and the implementing Executive Orders of the President. Specifically, "when a department or agency of the executive branch of the Government determines that the Academy, because of its unique qualifications, is the only source that can provide the measure of expertise, independence, objectivity, and audience acceptance necessary to meet the department's or agency's program requirements, acquisition of services by the Academy may be obtained on a noncompetitive basis if otherwise in accordance with applicable law and regulations." (Executive Order 12832)

Additional Roundtable Background Materials





SYSTEMS ENGINEERING FOR BEST CARE INNOVATION COLLABORATIVE

Joint IOM/NAE activity of the Roundtable on Value & Science-Driven Health Care

Activity: The Institute of Medicine and the National Academy of Engineering propose to bring together leaders from the disciplines of medicine, engineering, and information technology to work with patients and clinicians to develop practical systems-based solutions for better care and lower costs.

Compelling aim: Engineering principles can improve the quality, safety, and value achieved by health care, assist clinicians in managing the increasing complexity of modern care, while laying the foundation for a continuously learning health system. The Collaborative will serve to identify important opportunities for joint action; facilitate joint projects initially aimed at eliminating patient injury; foster information exchange about successful systems approaches to care improvement; and explore compelling conceptual, evaluation, and research questions.

Issue: Central elements of daily life, from assuring clean water to promoting aviation safety to automobile manufacturing to developing new imaging technologies, have benefited from broader application of engineering principles. Similarly, engineering offer a powerful, yet underutilized, method of accelerating improvement in the health system. Various organizations have successfully implemented its tools and techniques to prevent health care acquired infections and promote safety, deliver best practices reliably, and optimize their general operations. Greater application of these principles can link people, processes, structures, and technology in an integrated and interdependent whole, creating reliable high-performing "systems" approaches that can be implemented at scale and achieve sustainably high levels of patient safety and outcomes, and improve value. Prior joint IOM/NAE activities over the past decade have illustrated possibilities, and a joint demonstration is now also being proposed for diabetes control.

Approach: Building on these IOM/NAE partnerships, this Collaborative will be co-convened by IOM and NAE under the auspices of the IOM Roundtable on Value & Science-Driven Health Care, and will work to foster systems engineering for health improvement. Participants will come from teams already working as medicine-engineering partnerships on patient safety and related care improvements, health care institutions with active process re-engineering under way, information technology experts, and key change agents and opinion leaders who can move promising results into practice. The Collaborative will serve to steward discussion and counsel on activities under way (e.g. Moore patient safety projects, IOM/NAE diabetes project), identify additional project opportunities, share information about successful systems approaches to care improvement, and explore compelling conceptual, evaluation, and research questions.

Deliverable(s): Systematic exchange of information on system-based initiatives underway; discussion papers on successes and challenges to tools and techniques, opportunities for improvement, and best practices; vehicles for brokering expertise and encouraging collaboration among diverse organizations; and initiation of joint projects as indicated.

Related IOM/NAE work: Systems Engineering to Enable and Accelerate Value-Driven Health Care in Diabetes (Proposed); Engineering a Learning Healthcare System: A Look at the Future (2011); Building a Better Delivery System: A New Engineering/Health Care Partnership (2005)

IOM contact: Robert Saunders, PhD (<u>rsaunders@nas.edu</u>) **NAE contact:** Proctor Reid, PhD (<u>pried@nas.edu</u>)

The National Academy of Sciences

The National Academy of Sciences (NAS) is a non-governmental organization comprised of the nation's leading scientists. Chartered by Congress and President Abraham Lincoln in 1863, NAS is called upon to serve as the adviser to the Government and to the nation on matters of scientific research and policy. Presidential Executive Orders have defined the special relationship of the Academy to Government and cited its unique capacity to marshal scientific expertise of the highest caliber for independent and objective science policy advice. As matters of health and medicine became more compelling and specialized, the Institute of Medicine (IOM) was established under the charter of the NAS in 1970 as the nation's adviser on health, health science, and health policy. Like its sister organizations, the National Academy of Sciences and the National Academy of Engineering, IOM members (65 each year) are elected by the current membership and drawn from nation's leading authorities in medicine, health, the life sciences, and related policies.

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The National Academy of Engineering

Founded in 1964, the National Academy of Engineering (NAE) is a private, independent, nonprofit institution that provides engineering leadership in service to the nation. The mission of the National Academy of Engineering is to advance the well-being of the nation by promoting a vibrant engineering profession and by marshalling the expertise and insights of eminent engineers to provide independent advice to the federal government on matters involving engineering and technology. The NAE has more than 2,000 peer-elected members and foreign associates, senior professionals in business, academia, and government who are among the world's most accomplished engineers. They provide the leadership and expertise for numerous projects focused on the relationships between engineering, technology, and the quality of life.

Rights and responsibilities under the Congressional Charter

The three National Academies have a long tradition of providing national advice and leadership, which rests on their ability to convene experts and other diverse stakeholders charged with considering important issues of science, engineering, and health policy in an objective, independent, and trusted environment that assures rigorous analysis. Because the National Academies provide the Federal Government with a unique service, activities are accorded a special status by charter and the implementing Executive Orders of the President. Specifically, *"when a department or agency of the executive branch of the Government determines that the Academy, because of its unique qualifications, is the only source that can provide the measure of expertise, independence, objectivity, and audience acceptance necessary to meet the department's or agency's program requirements, acquisition of services by the Academy may be obtained on a noncompetitive basis if otherwise in accordance with applicable law and regulations." (Executive Order 12832)*

Roundtable on Value & Science-Driven Health Care

INSTITUTE OF MEDICINE

OF THE NATIONAL ACADEMIES

Advising the nation • Improving health

Innovation Collaboratives Quarterly Update

July 2012

Best Practices | Clinical Effectiveness Research | Digital Learning Evidence Communication | Value Incentives

The five Innovation Collaboratives of the IOM <u>Roundtable on Value & Science-Driven Health Care</u> are *ad hoc* convening activities to foster stakeholder action on issues central to ensuring that health and health care deliver the best in science and value.

Spring 2012 Meetings

Clinical Effectiveness Research

May 8, 2012 Focus:

- Digital health data and the research infrastructure
- Value of digitally-supported clinical research

Follow-up projects:

- Return on investment for clinical effectiveness research
- Regulatory streamlining to support CER
- Multiple Chronic Conditions & Clinical Practice Guidelines May 29, 2012

Focus:

• Clinical practice guidelines for co-occurring chronic conditions

Management of patients with multiple chronic conditions

Follow-up projects:

- Explore harmonization of MCC guideline components (HHS)
- Emphasize whole-person, patient-centered guidelines (HHS)

Evidence Communication

June 7, 2012

Focus:

- Findings on evidence communication strategies
- Proposals for improving medical decisions

Follow-up projects:

- Principles to guide evidence communication
- Opinions and values for sharing health data

Harmonizing the Conflict of Interest Disclosure Process June 11, 2012

Focus:

- Review requirements of existing disclosure practices
- Consider barriers to harmonizing the COI process
- Follow-up projects:
 - Publish paper on approach to harmonized system
 - Steering committee to work on implementation

Value Incentives

June 15, 2012

Focus:

- Value incentives in health care reform
- Methods to engage providers in improving value

Follow-up projects:

- Publish paper on accelerating the spread of pilots
- Stakeholder meeting on value and sustainability in Medicaid

Summer and Upcoming Meetings

Digitally Informed Clinical Decisions July 10

> Digital Learning August 23

Roundtable Meeting September 27

> Best Practices October 23

Workshop on Large Simple Trials November 26-27

Workshop on Core Metrics for Better Care, Lower Costs, and Better Health December 5-6

<u>Visit our website</u> to see updates on meetings

Spotlight on Upcoming Workshop

Large Simple Trials (LST)

Faster, reliable, ongoing generation of knowledge for continuous improvement in treatments and interventions

Core to continuous learning health care is the development of real-time evidence to inform medical decision making and product development. With the increased collection of large quantities of data, the potential for methods innovation in research is growing. However, the current research and drug development paradigm—reliance on traditional randomized controlled trials—is burdensome in terms of time and costs. Increased use of innovative clinical trial methods, such as large simple trials that rely on larger, more inclusive populations, and the incorporation of optimized data collection systems into routine care settings could serve to speed the transformation towards a learning health system.

The workshop will:

- Explore accelerating the use of LSTs to improve the speed and practicality of knowledge generation for medical decision making
- Consider concepts, examples, and advantages of LSTs
- Discuss the infrastructure needed to build LST capacity
- Identify structural, cultural, and regulatory barriers to enhancing LST capacity and to public engagement
- Suggest strategies for accelerating LST uptake in the US

Collaborative Projects

Collaborative	Project	Next step	Date
Best Practices	 Principles and values for effective team-based care 	Publish discussion paper	Jul 2012
	 Core metrics for better care, lower costs, and better health 	Winter workshop	Dec 2012
<u>Clinical Effectiveness</u> <u>Research</u>	 Using clinical data for care improvement 	Collection of examples	Sept 2012
	 Regulation change to enhance effectiveness of research 	Hastings commentary	Oct 2012
	 Innovative approaches to simplified trials 	Fall workshop	Nov 2012
Digital Learning	 Improving data quality from the digital health utility 	Publish summary report	Aug 2012
	 Returns on investment from the digital health infrastructure 	Discussion paper in progress	Oct 2012
<u>Evidence</u> Communication	• Explore digital tools that support informed clinical decision-making	Hold stakeholder meeting	Jul 2012
	 Identify successful strategies for communicating about evidence 	Publish discussion paper	Aug 2012
Value Incentives	 Explore circumstances surrounding pilot project scale-up 	Draft discussion paper	Aug 2012
	 Inventory of prominent value innovation projects 	Finalize taxonomy	Aug 2012
	 Consider strategies to improve the value of Medicaid 	Fall meeting	Oct 2012

Related IOM Activities

IOM Reports:

Issues in Studying the Safety of Approved Drugs

For the Public's Health: Investing in a Healthier Future

Envisioning a Transformed Clinical Trials Enterprise in the US

IOM Activities:

Forum on Aging, Disability, & Independence

How are we doing? Please send us comments and thoughts for improvement.

> <u>E-mail the Team</u> 500 5th Street, NW Washington, DC 20001

Recent Discussion Papers

<u>A CEO Checklist for</u> <u>High-Value Health Care</u>

Health Research as a Public Good

Coming Soon Core Principles & Values of Effective Team-Based Care

> Communicating Evidence in Health Care

Demanding Value from Our Health Care

Recent Commentaries

Our Learning Health Care System Journey John Halamka

A Glide Path to High-Value Health Care Janet Corrigan

Applying Innovation to the Work of Government: A Case Study of the Office of the National Coordinator for Health IT Farzad Mostashari

> Bringing Knowledge Home Paul Grundy

Care Transformation at Emory Hospital William Bornstein and Michael Johns

The IOM IC Quarterly Update is provided to you as a participant in the work of one or more of the IOM's five Innovation Collaboratives, sponsored by the IOM's Roundtable on Value & Science-Driven Health Care. If you would no longer like to receive this mailing, please <u>click here</u>.

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IOM VSRT Discussion Paper List

Title	Author(s)	Release Date
Patient-Clinician Communication: Basic Principles	Lyn Paget et al.	June 2011
and Expectations		
The Common Rule and Continuous Improvement	Harry Selker et al.	October 2011
in Health Care		
A CEO Checklist for High Value Health Care	Delos Cosgrove et al.	June 2012
Demanding Value from Our Health Care	Peggy O'Kane et al.	July 2012
Communicating with Patients on Health Care	Chuck Alston et al.	September 2012
Evidence		
Core Principles & Values of Effective Team-Based	Pam Mitchell, Matt	October 2012
Care	Wynia, et al.	
Harmonizing Reporting on Potential Conflicts of	Allen Lichter, R.	October 2012
Interest	McKinney et al.	
Institutional Return on Investment from the Digital	Jon Perlin et al.	TBD
Infrastructure		
Speeding the Movement of Successful Pilots to	Peter Hussey et al.	TBD
Effective Practice		
Making the Case for Continuous Learning from	Mick Murray et al.	TBD
Routinely Collected Data		
Learning What Works Best Update	John Rowe et al.	TBD

IOM VSRT Commentary List

Title	Author(s)	Release Date
Benefit Design Should Reflect Value	Leonard Schaeffer, Dana Goldman	01/31/12
Innovating to Improve Care and Manage Costs	Sheri McCoy	01/31/12
Free Employee Flu Shots Pay Prevention Dividends	Donna Shalala	01/31/12
Walking Our Way to Better Health	George Halvorson	01/31/12
Taking Aim at the Right Targets	Mark Chassin	02/10/12
Controlling Costs: A Distinction and Our Choice	Tom Daschle	02/24/12
Surgical Complexity Initiative	Robert Petzel	03/09/12
Continuous Adoption of Best Practices-The New	Richard Umbdenstock	03/23/12
Normal		
A Path to Accountable Care	Bruce Bodaken	04/06/12
Healing Humankind One Patient at a Time	Eugene Washington, et al.	04/20/12
Trying to Practice What I Preached	Steven Schroeder	05/04/12
Care Transformation at Emory Healthcare	Mike Johns, Bill Bornstein	05/18/12
Bringing Knowledge Home	Paul Grundy	06/01/12
Applying Innovation to the Work of Government	Farzad Mostashari	06/15/12
A Glide Path to High-Value Health Care	Janet Corrigan, Tom Valuck	06/29/12
Our Learning Health Care System Journey	John Halamka	07/13/12
The Promise of Lean Processes	Patricia Gabow	07/27/12
Improving ROI in Health Care by Reducing Overuse	Helen Darling	08/10/12
&		
More Hospitals Begin To Apply Lessons from Seven	Carolyn Clancy	08/24/12
Pillars Process		
The First Step Toward Value-Based Health Care	Denis Cortese	09/7/12
Less Is More	Rita Redberg	09/21/12
Personalized Medicine: Innovation to Clinical	Bill Frist	10/5/12
Execution		
Improved Patient Outcomes in 3 Years	Glenn Steele	10/19/12
Rapid Evidence Adoption to Improve Health	Patrick Conway	11/2/12
Outcomes		
The Lean Approach to Health Care	Gary Kaplan	11/16/12
Transforming the Public Health System: What Are	Georges Benjamin	11/30/12
we Learning?		

Biographies and Meeting Logistics



ROUNDTABLE ON VALUE & SCIENCE-DRIVEN HEALTH CARE

Member Biographies

Mark B. McClellan, MD, PhD (Chair) became the Director of the Engelberg Center for Healthcare Reform at the Brookings Institution in July 2007. The Center studies ways to provide practical solutions for access, quality and financing challenges facing the U.S. health care system. In addition, Dr. McClellan is the Leonard D. Schaeffer Chair in Health Policy Studies. Dr. McClellan has a highly distinguished record in public service and in academic research. He is the former administrator for the Centers for Medicare and Medicaid Services (2004-2006) and the former commissioner of the Food and Drug Administration

(2002-2004). He also served as a member of the President's Council of Economic Advisers and senior director for health care policy at the White House (2001–2002). In these positions, he developed and implemented major reforms in health policy. Dr. McClellan was also an associate professor of economics and associate professor of medicine (with tenure) at Stanford University, from which he was on leave during his government service. He directed Stanford's Program on Health Outcomes Research and was also associate editor of the *Journal of Health Economics*, and co-principal investigator of the Health and Retirement Study (HRS), a longitudinal study of the health and economic status of older Americans. His academic research has been concerned with the effectiveness of medical treatments in improving health, the economic and policy factors influencing medical treatment decisions and health outcomes, the impact of new technologies on public health and medical expenditures, and the relationship between health status and economic well being. Dr. McClellan is a Member of the Institute of Medicine of the National Academy of Sciences and a Research Associate of the National Bureau of Economic Research. A graduate of the University of Texas at Austin, Dr. McClellan earned his M.P.A. from Harvard's Kennedy School of Government in 1991, his M.D. from the Harvard-MIT Division of Health Sciences and Technology in 1992, and his Ph.D. in economics from MIT in 1993.

Bruce G. Bodaken, MPhil is chairman, president and chief executive officer of Blue Shield of California, a 3.3 million member not-for-profit health plan that serves the commercial, individual and government markets in California. Bodaken joined Blue Shield in 1994 as president and chief operating officer. Previously, he served as senior vice president and associate chief operating officer of FHP International Corporation in Southern California. Prior to embarking on a career in health care, he taught philosophy at the college level at the University of Colorado. Bodaken serves on the board of directors of the California Business Roundtable, WageWorks, and the University of California, Berkeley's Health Services Management Program. He is co-author of *The Managerial Moment of Truth*, published by Simon & Schuster in 2006. Bodaken received his bachelor's degree from Colorado State University, and earned a masters degree in philosophy and was A.B.D. in the doctoral program at the University of Colorado.

Paul Chew, MD is Senior Vice-President, Chief Science Officer, Chief Medical Officer at Sanofi-Aventis, US. Between 2007 and 2009 Dr. Chew held the position of President, U.S. Research & Development and Vice President, Therapeutic Department Head, Metabolism, Diabetes and Thrombosis in which role he was responsible for Lovenox, Lantus, and the therapeutic development portfolio. In addition, he is currently a member of the PhRMA Science & Regulatory Affairs Executive Committee and the Institute of Medicine Value & Science-Driven Healthcare Roundtable. Prior to sanofi-aventis, Dr. Chew was Vice-President, Global Head of Metabolism and Diabetes at Aventis Pharmaceuticals, 2001-2004. Prior to joining Aventis, Dr. Chew was at the Bristol-Myers Squibb Company, starting in 1992 as Medical Director of Clinical Cardiovascular Development. Dr. Chew held numerous positions of increasing R&D responsibility at BMS; Dr. Chew was Vice President, U.S. Medical Affairs from 1999-2001 where he was responsible for Plavix, Avapro, Glucophage, and Pravachol. Prior to industry, Dr. Chew was Assistant Professor of Medicine at The Johns Hopkins Hospital, Attending Physician in Radiology, Director of the Pacemaker Clinic and a member

of the Interventional Cardiology staff. Research interests included acute interventional cardiology, cardiac biomechanics, and statistical modeling of pericardial biomechanics. Dr. Chew obtained his medical education at The Johns Hopkins School of Medicine, serving his internal medicine training and cardiology fellowship at The Johns Hopkins Hospital. Dr. Chew is board-certified in Internal Medicine and Cardiovascular Diseases.

Carolyn M. Clancy, MD was appointed Director of the Agency for Healthcare Research and Quality (AHRQ) on February 5, 2003 and reappointed on October 9, 2009. Prior to her appointment, Dr. Clancy was Director of AHRQ's Center for Outcomes and Effectiveness Research. Dr. Clancy, a general internist and health services researcher, is a graduate of Boston College and the University of Massachusetts Medical School. Following clinical training in internal medicine, Dr. Clancy was a Henry J. Kaiser Family Foundation Fellow at the University of Pennsylvania. Before joining AHRQ in 1990, she was also an assistant professor in the Department of Internal Medicine at the Medical College of Virginia. Dr. Clancy holds an academic appointment at George Washington University School of Medicine (Clinical Associate Professor, Department of Medicine) and serves as Senior Associate Editor, Health Services Research. She serves on multiple editorial boards including the Annals of Internal Medicine, Annals of Family Medicine, American Journal of Medical Quality, and Medical Care Research and Review. She is a member of the Institute of Medicine and was elected a Master of the American College of Physicians in 2004. In 2009, was awarded the 2009 William B. Graham Prize for Health Services Research. Her major research interests include improving health care quality and patient safety, and reducing disparities in care associated with patients' race, ethnicity, gender, income, and education. As Director, she launched the first annual report to the Congress on health care disparities and health care quality.

Francis S. Collins, MD, PhD is the director of the National Institutes of Health (NIH). Dr. Collins, a physician-geneticist noted for his landmark discoveries of disease genes and his leadership of the Human Genome Project, served as director of the National Human Genome Research Institute (NHGRI) at the NIH from 1993-2008. With Dr. Collins at the helm, the Human Genome Project consistently met projected milestones ahead of schedule and under budget. This remarkable international project culminated in April 2003 with the completion of a finished sequence of the human DNA instruction book. On March 10, 2010, Dr. Collins was named a co-recipient of the Albany Medical Center Prize in Medicine and Biomedical Research for his leading role in this effort. In addition to his achievements as the NHGRI director, Dr. Collins' own research laboratory has discovered a number of important genes, including those responsible for cystic fibrosis, neurofibromatosis, Huntington's disease, a familial endocrine cancer syndrome, and most recently, genes for type 2 diabetes and the gene that causes Hutchinson-Gilford progeria syndrome. Dr. Collins received a B.S. in chemistry from the University of Virginia, a Ph.D. in physical chemistry from Yale University, and an M.D. with honors from the University of North Carolina at Chapel Hill. Prior to coming to the NIH in 1993, he spent nine years on the faculty of the University of Michigan, where he was a Howard Hughes Medical Institute investigator. He is an elected member of the Institute of Medicine and the National Academy of Sciences. Dr. Collins was awarded the Presidential Medal of Freedom in 2007. In a White House ceremony on October 7, 2009, Dr. Collins received the National Medal of Science, the highest honor bestowed on scientists by the United States government.

Patrick Conway, MD, MSc is Chief Medical Officer for the Centers for Medicare & Medicaid Services (CMS) and Director of the Office of Clinical Standards and Quality. This office is responsible for all quality measures for CMS, value-based purchasing programs, quality improvement programs in all 50 states, clinical standards and survey and certification of Medicare and Medicaid health care providers across the nation, and all Medicare coverage decisions for treatments and services. The office budget exceeds \$1.5 billion annually and is a major force for quality and transformation across Medicare, Medicaid, CHIP, and the U.S. health care system. Previously, he was Director of Hospital Medicine and an Associate Professor at Cincinnati Children's Hospital. He was also AVP Outcomes Performance, responsible for leading measurement, including the electronic health record measures, and facilitating improvement of health outcomes across the health care system. Previously, he was Chief Medical Officer at the Department of Health and Human Services (HHS) in the Office of the Assistant Secretary for Planning and Evaluation. In 2007-08, he was a White House Fellow assigned to the Office of Secretary in HHS and the Director of the Agency for Healthcare Research and

Quality. As Chief Medical Officer, he had a portfolio of work focused primarily on quality measurement and links to payment, health information technology, and policy, research, and evaluation across the entire Department. He also served as Executive Director of the Federal Coordinating Council on Comparative Effectiveness Research coordinating the investment of the \$1.1 billion for CER in the Recovery Act. He was a Robert Wood Johnson Clinical Scholar and completed a Master's of Science focused on health services research and clinical epidemiology at the University of Pennsylvania and Children's Hospital of Philadelphia. Previously, he was a management consultant at McKinsey & Company, serving senior management of mainly health care clients on strategy projects. He has published articles in journals such as *JAMA*, *New England Journal of Medicine, Health Affairs*, and *Pediatrics* and given national presentations on topics including health care policy, quality of care, comparative effectiveness, hospitalist systems, and nurse staffing. He is a practicing pediatric hospitalist, completed pediatrics residency at Harvard Medical School's Children's Hospital Boston, and graduated with High Honors from Baylor College of Medicine. He is married with three children.

Helen B. Darling, MA is President of the National Business Group on Health, a national non-profit, membership organization devoted exclusively to providing practical solutions to its employer-members' most important health care problems and representing large employers' perspective on national health policy issues. Its 318 members, including 66 of the Fortune 100 in 2010, purchase health and disability benefits for over 55 million employees, retirees and dependents. Helen was the 2009 recipient of WorldatWork's Keystone Award, its highest honor in recognition of sustained contributions to the field of Human Resources and Benefits. She received the President's Award by the American College of Occupational and Environmental Medicine in 2010. She was given a lifetime appointment in 2003 as a National Associate of the National Academy of Sciences for her work for the Institute of Medicine. Helen serves on: the Committee on Performance Measurement of the National Committee for Quality Assurance (Co-chair for 10 years); the Medical Advisory Panel, Technology Evaluation Center, (Blue Cross Blue Shield Association); the Institute of Medicine's Roundtable on Value and Science-Driven Health Care, the Medicare Coverage Advisory Committee, and the National Advisory Council of AHRQ. She is on the Board of Directors of the National Quality Forum and the Congressionally-created Reagan-Udall Foundation. Previously, she directed the purchasing of health benefits and disability at Xerox Corporation for 55 thousand US employees. Darling was a Principal at William W. Mercer and Practice Leader at Watson Wyatt. Earlier in her career, Darling was an advisor to Senator David Durenberger, on the Health Subcommittee of the Senate Finance Committee. She directed three studies at the Institute of Medicine for the National Academy of Sciences. Darling received a master's degree in Demography/Sociology and a bachelor's of science degree in History/English, cum laude, from the University of Memphis.

Susan DeVore is President and CEO of the Premier healthcare alliance, the nation's leading alliance of hospitals, health systems and other providers dedicated to improving healthcare performance. An alliance of more than 2,600 hospitals and health systems and more than 90,000 non-acute care sites. Premier uses the power of collaboration to lead the transformation to high quality, cost-effective healthcare. Premier's membership includes more than 40 percent of all U.S. health systems. With the ultimate goal of helping its members improve the health of their local communities, Premier builds, tests and scales models that improve quality, safety and cost of care. Through successful initiatives such as the Hospital Quality Incentive Demonstration with CMS, and QUEST: High Performing Hospitals collaborative, the alliance has driven improvements in evidence-based care and safety, as well as significant reductions in mortality, harm and cost. Premier is a leader in the accountable care movement and recently announced a joint-venture with IBM to develop industry-leading population analytics tools. Under DeVore's leadership, Premier has built an industry leading code of ethics, has been named five times as one of the World's Most Ethical Companies by Ethisphere and has won the Malcolm Baldrige National Quality Award. DeVore is an industry-leading thinker who was named to Modern Healthcare's top 100 most influential people in healthcare. She is on the Board of the Healthcare Leadership Council, National Center for Healthcare Leadership as well as the Medicare Rights Center.

Richard Fante, MBA serves as President of AstraZeneca US as well as CEO North America. Rich Fante is responsible for AstraZeneca's North American businesses including: AstraZeneca US and Canada. AstraZeneca is one of the world's leading pharmaceutical companies. Rich is accountable for driving growth and maximizing contribution in North America to AstraZeneca's global business. Previously, Rich served as Vice President, Brand Strategy & Portfolio Operations, leading the development and execution of marketing strategies for all AstraZeneca brands in the United States. He has held a number of leadership roles in his 13 years at AstraZeneca, including Vice President—Primary Care for the gastrointestinal and respiratory franchises. Before joining Astra USA in 1995, Rich worked for Lederle Laboratories in New Jersey, where he began his career in sales. He received his bachelor's degree in biology from Princeton University, and his MBA from the University of North Carolina Kenan-Flagler Business School.

Judith R. Faulkner is CEO and founder of Epic Systems Corporation. With a BS in Mathematics from Dickinson College, an MS and an honorary doctorate in Computer Science from the University of Wisconsin, she taught computer science for several years in the UW system and then worked as a healthcare software developer, creating one of the first databases organized around a patient record. She founded Epic in 1979 and guided it from its modest beginnings as a clinical database company to its current place as a leading provider of integrated healthcare software. Epic was rated the #1 overall software vendor by KLAS and is in the Leaders Quadrant of Gartner's Magic Quadrant for U.S. Enterprise CPR Systems. Judy was honored by HIMSS as one of the "50 in 50" memorable contributors to healthcare IT throughout HIMSS's 50-year history. She currently serves on the HIT Policy Committee, the Privacy and Security sub-committee, the University of Wisconsin Computer Science Board of Visitors, and the Institute of Medicine's Roundtable.

Thomas R. Frieden, MD, MPH is the Director of the Centers for Disease Control and Prevention (CDC) and Administrator of the Agency for Toxic Substances and Disease Registry (ATSDR). Dr. Frieden has worked to control both communicable and noncommunicable diseases in the United States and around the world. From 1992-1996, he led New York City's program that rapidly controlled tuberculosis, including reducing cases of multidrug-resistant tuberculosis by 80 percent. He then worked in India for five years where he assisted with national tuberculosis control efforts. As Commissioner of the New York City Health Department from 2002-2009, he directed one of the world's largest public health agencies, with an annual budget of \$1.7 billion and more than 6,000 staff. A physician with training in internal medicine, infectious diseases, public health, and epidemiology, Dr. Frieden is especially known for his expertise in tuberculosis control. Dr. Frieden previously worked for CDC from 1990 until 2002. He began his career at CDC as an Epidemiologic Intelligence Service (EIS) Officer at the New York City Health Department. Dr. Frieden received both his medical degree and master's of public health degree from Columbia University and completed infectious disease training at Yale University. He has received numerous awards and honors and has published more than 200 scientific articles.

Patricia A. Gabow, MD is CEO of Denver Health, one of the nation's most efficient, highly-regarded integrated healthcare systems. Dr. Gabow joined the medical staff at Denver Health in 1973 as Renal Division chief, and is known for scientific work in polycystic kidney disease, and now health services research. Author of more than 150 publications, Dr. Gabow is a Professor of Medicine, University of Colorado School of Medicine. She received her MD degree from the University of Pennsylvania School of Medicine, trained in Internal Medicine at University of Pennsylvania Hospital and Harbor General Hospital in Torrance, California, and in Nephrology at San Francisco General Hospital and University of Pennsylvania School of Medicine. She has received numerous awards including the AMA Nathan Davis Award for Outstanding Public Servant, election to the Colorado Women's Hall of Fame, and the National Healthcare Leadership Award. She received a Lifetime Achievement Award from the Denver Business Journal and from the Bonfils-Stanton Foundation; the Innovators in Health Award, New England Healthcare Institute; and the David E. Rogers Award from the Association of American Medical Colleges. Dr. Gabow was awarded honorary degrees by the University of Denver and the University of Colorado and is a Master of the American College of Physicians. She is active in numerous health care organizations including the National Association of Public Hospitals, the Commonwealth Commission for a High Performing Health System and she is a commissioner to the Medicaid and CHIP Payment and Access Commission (MACPAC).

Atul Gawande MD, MPH is a surgeon, writer, and public health researcher. He practices general and endocrine surgery at Brigham and Women's Hospital in Boston. He is also Associate Professor of Surgery at Harvard Medical School and Associate Professor in the Department of Health Policy and Management at the Harvard School of Public Health. His research work currently focuses on systems innovations to transform safety and performance in surgery, childbirth, and care of the terminally ill. He serves as lead advisor for the World Health Organization's Safe Surgery Saves Lives program. He is also founder and chairman of Lifebox, an international not-for-profit implementing systems and technologies to reduce surgical deaths globally. He has been a staff writer for the New Yorker magazine since 1998. He has written three New York Times bestselling books: COMPLICATIONS, which was a finalist for the National Book Award in 2002; BETTER, which was selected as one of the ten best books of 2007 by Amazon.com; and THE CHECKLIST MANIFESTO. He has won two National Magazine Awards, AcademyHealth's Impact Award for highest research impact on health care, a MacArthur Award, and selection by Foreign Policy Magazine and TIME magazine as one of the world's top 100 influential thinkers.

Gary L. Gottlieb, MD, MBA serves as President and CEO of Partners HealthCare, assuming the position January 2010. Dr. Gottlieb comes to this role with a deep and rich history with Partners. He served as President of Brigham and Women's/ Faulkner Hospitals since March of 2002. He is also a Professor of Psychiatry at Harvard Medical School. Dr. Gottlieb was recruited by Partners to become the first chairman of Partners Psychiatry in 1998 and he served in that capacity through 2005. In 2000, he added the role of President of the North Shore Medical Center where he served until early 2002. Prior to coming to Boston, Dr. Gottlieb spent 15 years in positions of increasing leadership in health care in Philadelphia. In 1983, he arrived at the University of Pennsylvania as a Robert Wood Johnson Foundation Clinical Scholar. Through that program, he earned an M.B.A with Distinction in Health Care Administration from Penn's Wharton Graduate School of Business Administration. Dr. Gottlieb went on to establish Penn Medical Center's first program in geriatric psychiatry and developed it into a nationally recognized research, training and clinical program. Dr. Gottlieb rose to become Executive Vice-Chair and Interim Chair of Penn's Department of Psychiatry and the Health System's Associate Dean for Managed Care. In 1994, he became Director and Chief Executive Officer of Friends Hospital in Philadelphia. In addition to his noteworthy academic, clinical and management record, Dr. Gottlieb has published extensively in geriatric psychiatry and health care policy. He is a past President of the American Association of Geriatric Psychiatry. Dr. Gottlieb received his BS cum laude from the Rensselaer Polytechnic Institute and his M.D. from the Albany Medical College of Union University in a six-year accelerated biomedical program. He completed his internship and residency and served as Chief Resident at New York University/Bellevue Medical Center. Now, as a recognized community leader in Boston, Dr. Gottlieb also focuses his attention on workforce development and disparities in health care. He was appointed by Mayor Thomas Menino as Chairman of the Private Industry Council, the City's workforce development board, which partners with education, labor, higher education, the community and government, to provide oversight and leadership to public and private workforce development programs. In 2004-2005, he served as co-chair of the Mayor's Task Force to Eliminate Health Disparities. Dr. Gottlieb believes Partners HealthCare mission is its compass - to inspire, to nurture, to challenge the best and the brightest to step forward and care for the sickest and neediest in our community and around world.

James A. Guest, JD became President and Chief Executive Officer of Consumers Union (CU) in February 2001 after a long career in public service and the consumer interest, including 21 years as Chair of CU's Board of Directors. CU publishes *Consumer Reports* and ConsumerReports.org. The organization was founded in 1936 when advertising first flooded the mass media. Consumers lacked any reliable source of information they could depend on to help them distinguish hype from fact and good products from bad ones. Since then CU has filled that vacuum with a broad range of consumer information and a succession of presidents serving as passionate and outspoken consumer champions. Mr. Guest continues that tradition, fighting on Capitol Hill and in the media for the consumer's right to know about, and be protected from, unsafe and misleading products and services. Under his leadership, the organization is currently pursuing a high-profile campaign to improve the safety, quality, accessibility, and value of the health-care marketplace. This has included the successful launch of several new initiatives such as ConsumerReportsHealth.org and the Consumer Reports Health Ratings Center, which serve to educate and empower consumers to make more informed health-care

decisions and to help change the market. Mr. Guest also is the President of Consumers International, a global federation of 250 organizations from 115 countries. Mr. Guest's public service career has spanned more than three decades. After graduating from Harvard law school and completing a Woodrow Wilson fellowship in economics at MIT, he worked as legislative assistant to Senator Ted Kennedy. In the early 1970s, Mr. Guest moved to Vermont where he served as Banking and Insurance Commissioner, Secretary of State, and Secretary of Development and Community Affairs. Over the last 20 years, he has headed several public policy and advocacy groups including Handgun Control Inc. and the Center to Prevent Handgun Violence, as well as Planned Parenthood of Maryland. He was also the founding Executive Director of the American Pain Foundation, a national consumer information, education, and advocacy organization for pain prevention and management. Mr. Guest credits his very first job for introducing him to one of his biggest influences in consumer advocacy. He worked as the paperboy for Dr. Colston Warne—the first Chair of CU's Board of Directors and a leader in the consumer movement.

George C. Halvorson was named chairman and chief executive officer of Kaiser Permanente, headquartered in Oakland, California in March 2002. Kaiser Permanente is the nation's largest nonprofit health plan and hospital system, serving about 8.6 million members and generating \$42 billion in annual revenue. George Halvorson has won several awards for his commitment to health technology and for his leadership and achievements in advancing health care quality. The development, implementation, and maintenance of Kaiser Permanente's information technology infrastructure represent a multi-billion dollar strategic investment that provides comprehensive care coordination and continually improving quality of care and service to members. He is the author of five comprehensive books on the U.S. health care system including the recently released Health Care Will Not Reform Itself: A User's Guide to Refocusing and Reforming American Health Care. Mr. Halvorson lends his time and expertise to a number of organizations, including the Institute of Medicine, the American Hospital Association, and the Commonwealth Fund. He serves on the boards of the America's Health Insurance Plans and the board of the Alliance of Community Health Plans. Halvorson chairs the International Federation of Health Plans and co-chairs the 2010 Institute for Healthcare Improvement Annual National Forum on Quality Improvement in Health Care. In 2009, he chaired the World Economic Forum's Health Governors meetings in Davos. Prior to joining Kaiser Permanente, Mr. Halvorson was president and chief executive officer of HealthPartners, headquartered in Minneapolis. With more than 30 years of health care management experience, he has also held several senior management positions with the Health Central Hospital System, Health Accord International, and Blue Cross and Blue Shield of Minnesota.

Margaret A. Hamburg, MD is the Commissioner of the Food and Drug Administration (FDA). Dr. Hamburg graduated from Harvard Medical School, and completed her residency in internal medicine at what is now New York Presbyterian Hospital-Weill Cornell Medical Center, one of the top-ten hospitals in the nation. She conducted research on neuroscience at Rockefeller University in New York, studied neuropharmacology at the National Institute of Mental Health on the National Institutes of Health campus in Bethesda, Md., and later focused on AIDS research as Assistant Director of the National Institute of Allergy and Infectious Diseases. In 1990, Dr. Hamburg joined the New York City Department of Health and Mental Hygiene as Deputy Health Commissioner, and within a year was promoted to Commissioner, a position she held until 1997. Dr. Hamburg's accomplishments as New York's top public health official included improved services for women and children, needle-exchange programs to reduce the spread of HIV (the AIDS virus), and the initiation the first public health bio-terrorism defense program in the nation. Her most celebrated achievement, however, was curbing the spread of tuberculosis. Dr. Hamburg's innovative approach has become a model for health departments world-wide. In 1994, Dr. Hamburg was elected to the membership in the Institute of Medicine, one of the youngest persons to be so honored. Three years later, at the request of President Clinton, she accepted the position of Assistant Secretary for Policy and Evaluation in the U.S. Department of Health and Human Services (HHS). In 2001, Dr. Hamburg became Vice President for Biological Programs at the Nuclear Threat Initiative, a foundation dedicated to reducing the threat to public safety from nuclear, chemical, and biological weapons. Since 2005, and until her confirmation as Commissioner of the FDA, Dr. Hamburg served as the Initiative's Senior Scientist.

James Allen Heywood, is the Co-Founder and Chairman of PatientsLikeMe and the d'Arbeloff Founding Director of the ALS Therapy Development Institute. An MIT engineer, Jamie entered the field of translational research and medicine when his brother Stephen was diagnosed with ALS at age 29. His innovations are transforming biotechnology and pharmaceutical development, personalized medicine, and patient care. As co-founder and chairman of PatientsLikeMe, Jamie provides the scientific vision and architecture for its patient-centered medical platform, allowing patients to share in-depth information on treatments, symptoms and outcomes. In 1999, he founded the ALS Therapy Development Institute, the world's first non-profit biotechnology company and largest ALS research program. Jamie's work has been profiled by the *New Yorker, New York Times*, 60 Minutes, NPR, *Science*, and *Nature*. He and Stephen were the subjects of Pulitzer Prize winner Jonathan Wiener's biography, *His Brothers Keeper* and the Sundance award-winning documentary, "So Much So Fast."

Ralph I. Horwitz, MD, MACP is Senior Vice President for Clinical Evaluation Sciences and Senior Advisor to the Chairman of Research and Development at GlaxoSmithKline, and Harold H. Hines, Jr. Professor Emeritus of Medicine and Epidemiology at Yale University. Dr. Horwitz trained in internal medicine at institutions (Royal Victoria Hospital of McGill University and the Massachusetts General Hospital) where science and clinical medicine were connected effortlessly. These experiences as a resident unleashed a deep interest in clinical research training which he pursued as a fellow in the Robert Wood Johnson Clinical Scholars Program at Yale under the direction of Alvan R.Feinstein. He joined the Yale faculty in 1978 and remained there for 25 years as Co-Director of the Clinical Scholars Program and later as Chair of the Department of Medicine. Before joining GSK, Dr. Horwitz was Chair of Medicine at Stanford and Dean of Case Western Reserve Medical School. He is an elected member of the Institute of Medicine of the National Academy of Sciences; the American Society for Clinical Investigation; the American Epidemiological Society; and the Association of American Physicians (he was President in 2010). He was a member of the Advisory Committee to the NIH Director (under both Elias Zerhouni and Francis Collins). Dr. Horwitz served on the American Board of Internal Medicine and was Chairman in 2003. He is a Master of the American College of Physicians.

Brent C. James, MD, MStat is known internationally for his work in clinical quality improvement, patient safety, and the infrastructure that underlies successful improvement efforts, such as culture change, data systems, payment methods, and management roles. He is a member of the National Academy of Science's Institute of Medicine (and participated in many of that organization's seminal works on quality and patient safety). He holds faculty appointments at the University of Utah School of Medicine (Family Medicine and Biomedical Informatics), Harvard School of Public Health (Health Policy and Management), and the University of Sydney, Australia, School of Public Health. He is the Chief Quality Officer, and Executive Director, Institute for Health Care Delivery Research at Intermountain Healthcare, based in Salt Lake City, Utah. (Intermountain is an integrated system of 23 hospitals, almost 150 clinics, a 700+ member physician group, and an HMO/PPO insurance plan jointly responsible for more than 500,000 covered lives serving patients in Utah, Idaho, and, at a tertiary level, seven surrounding States). Through the Intermountain Advanced Training Program in Clinical Practice Improvement (ATP), he has trained more than 3500 senior physician, nursing, and administrative executives, drawn from around the world, in clinical management methods, with proven improvement results (and more than 30 "daughter" training programs in 6 countries) Before coming to Intermountain, he was an Assistant Professor in the Department of Biostatistics at the Harvard School of Public Health, providing statistical support for the Eastern Cooperative Oncology Group (ECOG); and staffed the American College of Surgeons' Commission on Cancer. He holds Bachelor of Science degrees in Computer Science (Electrical Engineering) and Medical Biology; an M.D. degree (with residency training in general surgery and oncology); and a Master of Statistics degree. He serves on several non-profit boards of trustees, dedicated to clinical improvement.

Michael M.E. Johns, MD assumed the post of chancellor for Emory University in October 2007. Prior to that, beginning in 1996, he served as executive vice president for health affairs and CEO of the Robert W. Woodruff Health Sciences Center and chair of Emory Healthcare. As leader of the health sciences and Emory Healthcare for 11 years, Dr. Johns engineered the transformation of the Health Sciences Center into

one of the nation's preeminent centers in education, research, and patient care. He previously served as dean of the Johns Hopkins School of Medicine and vice president for medicine at Johns Hopkins University from 1990 to 1996. In addition to leading complex administrative and academic organizations to new levels of excellence and service, Dr. Johns is widely renowned as a catalyst of new thinking in many areas of health policy and health professions education. He has been a significant contributor to many of the leading organizations and policy groups in health care, including the Institute of Medicine (IOM), the Association of American Medical Colleges (AAMC), The Commonwealth Fund Task Force on Academic Health Centers, the Association of Academic Health Centers, and many others. He frequently lectures, publishes, and works with state and federal policy makers, on topics ranging from the future of health professions education to national health system reform. Dr. Johns was elected to the Institute of Medicine in 1993 and has served on many IOM committees. Dr. Johns received his bachelor's degree from Wayne State University and his medical degree with distinction at the University of Michigan Medical School.

Craig A. Jones, MD is the Director of the Vermont Blueprint for Health, a program established by the State of Vermont, under the leadership of its Governor, Legislature and the bi-partisan Health Care Reform Commission. The Blueprint is intended to guide a statewide transformation resulting in seamless and well coordinated health services for all citizens, with an emphasis on prevention. The program is intended to improve healthcare for individuals, improve the health of the population, and result in more affordable healthcare costs. Prior to this he was an Assistant Professor in the Department of Pediatrics at the Keck School of Medicine at the University of Southern California, and Director of the Division of Allergy/Immunology and Director of the Allergy/Immunology Residency Training Program in the Department of Pediatrics at the Los Angeles County + University of Southern California (LAC+USC) Medical Center. He was Director, in charge of the design, implementation, and management, of the Breathmobile Program, a program using mobile clinics, team based care, and health information technology to deliver ongoing preventive care to inner city children with asthma at their schools and at County clinics. The program evolved from community outreach to a more fully integrated Pediatric Asthma Disease Management for the Los Angeles County Department of Health Services, and spread to several other communities across the country. He has published papers, abstracts, and textbook chapters, on topics related to health services, health outcomes, and allergy and immunology in Pediatric Research, Pediatrics, J Pediatrics, Pediatrics in Review, Journal of Clinical Immunology, Journal of Allergy and Clinical Immunology, Annals of Allergy, Asthma and Immunology, CHEST, and Disease Management. Dr. Jones was an Executive Committee and Board Member for the Southern California Chapter of the Asthma and Allergy Foundation of America, as well the chapter President. He is a past president of the Los Angeles Society of Allergy Asthma & Immunology, and a past President and a member of the Board of Directors for the California Society of Allergy Asthma & Immunology. Dr. Jones received his undergraduate degree at the University of California at San Diego and his MD at the University of Texas Health Science Center in San Antonio, Texas. He completed his internship and residency in pediatrics at LAC/USC Medical Center, where he also completed his fellowship in allergy and clinical immunology.

James L. Madara, MD, serves as executive vice president and chief executive officer of the American Medical Association (AMA), the nation's largest physician organization. An accomplished academic medical center physician, medical scientist and administrator, Dr. Madara, prior to joining the AMA, served as Timmie Professor and chair of pathology and laboratory medicine at the Emory University School of Medicine before assuming the Thompson Distinguished Service Professorship and deanship at the University of Chicago Pritzker School of Medicine. During his deanship at Chicago, which also extended to the university's renowned Biological Sciences Division, Dr. Madara also served as CEO of the University of Chicago Medical Center, bringing together the university's biomedical research, teaching and clinical activities. As CEO, he engineered significant new affiliations with community hospitals, teaching hospital systems, community Federally Qualified Health Centers on Chicago's South Side, as well as with national research organizations. While at the University of Chicago from 2002 to 2009, Dr. Madara oversaw a significant renewal of the institution's biomedical campus, including the opening of the Comer Children's Hospital, the New Hospital Pavilion for adults, the Gordon Center for Integrative Science and the Knapp Center for

Biomedical Discovery. Dr. Madara is a noted academic pathologist and an authority on epithelial cell biology and on gastrointestinal disease. He has published more than 200 original papers and chapters, making important contributions to understanding the biology of the cells that line the digestive tract. His work has garnered both national and international awards. Dr. Madara has served as president of the American Board of Pathology and as editor-in-chief of the *American Journal of Pathology*. A past recipient of a prestigious MERIT Award from the National Institute of Health, he recently received the Davenport Award for lifetime achievement in gastrointestinal disease from the American Physiological Society. Most recently, Dr. Madara served as senior advisor with Leavitt Partners, a highly innovative health care consulting firm started by former Secretary of Health and Human Services Mike Leavitt. Dr. Madara earned his medical degree from Hahnemann Medical College in Philadelphia. He completed his internship and residency at New England Deaconess Hospital in Boston. He subsequently completed a fellowship in anatomy and cell biology at Peter Bent Brigham Hospital in Boston (now Brigham and Women's Hospital). Following his fellowship, Dr. Madara joined the faculty of Harvard Medical School where he rose to a full tenured professor and served as director of the Harvard Digestive Diseases Center. Dr. Madara and his wife Vicki have two children: Max and Alexis.

Farzad Mostashari, MD, ScM, serves as National Coordinator for Health Information Technology within the Office of the National Coordinator for Health Information Technology at the U.S. Department of Health and Human Services. Farzad joined ONC in July 2009. Previously, he served at the New York City Department of Health and Mental Hygiene as Assistant Commissioner for the Primary Care Information Project, where he facilitated the adoption of prevention-oriented health information technology by over 1,500 providers in underserved communities. Dr. Mostashari also led the Centers for Disease Control and Prevention (CDC) funded NYC Center of Excellence in Public Health Informatics and an Agency for Healthcare Research and Quality funded project focused on quality measurement at the point of care. Prior to this he established the Bureau of Epidemiology Services at the NYC Department of Health, charged with providing epidemiologic and statistical expertise and data for decision making to the health department. He did his graduate training at the Harvard School of Public Health and Yale Medical School, internal medicine residency at Massachusetts General Hospital, and completed the CDC's Epidemic Intelligence Service. He was one of the lead investigators in the outbreaks of West Nile Virus and anthrax in New York City, and among the first developers of real-time electronic disease surveillance systems nationwide.

Mary D. Naylor, PhD, RN, FAAN is the Marian S. Ware Professor in Gerontology and Director of the NewCourtland Center for Transitions and Health at the University of Pennsylvania School of Nursing. Since 1989, Dr. Naylor has led an interdisciplinary program of research designed to improve the quality of care, decrease unnecessary hospitalizations, and reduce health care costs for vulnerable community-based elders. Dr. Naylor is also the National Program Director for the Robert Wood Johnson Foundation program, Interdisciplinary Nursing Quality Research Initiative, aimed at generating, disseminating, and translating research to understand how nurses contribute to quality patient care. She was elected to the National Academy of Sciences, Institute of Medicine in 2005. She also is a member of the RAND Health Board, the National Quality Forum Board of Directors and the immediate past-chair of the Board of the Long-Term Quality Alliance. She was appointed to the Medicare Payment Advisory Commission in 2010.

William D. Novelli, MA is a professor in the McDonough School of Business at Georgetown University. In addition to teaching in the MBA program, he is working to establish a center for social enterprise at the School. From 2001 to 2009, he was CEO of AARP, a membership organization of over 40 million people 50 and older. Prior to joining AARP, Mr. Novelli was President of the Campaign for Tobacco-Free Kids, whose mandate is to change public policies and the social environment, limit tobacco companies' marketing and sales practices to children and serve as a counterforce to the tobacco industry and its special interests. He now serves as chairman of the board. Previously, he was Executive Vice President of CARE, the world's largest private relief and development organization. He was responsible for all operations in the U.S. and abroad. CARE helps impoverished people in Africa, Asia and Latin America through programs in health, agriculture, environmental protection and small business support. CARE also provides emergency relief to people in need. Earlier, Mr. Novelli co-founded and was President of Porter Novelli, now one of the world's

largest public relations agencies and part of the Omnicom Group, an international marketing communications corporation. He directed numerous corporate accounts as well as the management and development of the firm. He retired from the firm in 1990 to pursue a second career in public service. He was named one of the 100 most influential public relations professionals of the 20th century by the industry's leading publication. Mr. Novelli is a recognized leader in social marketing and social change, and has managed programs in cancer control, diet and nutrition, cardiovascular health, reproductive health, infant survival, pay increases for educators, charitable giving and other programs in the U.S. and the developing world. He began his career at Unilever, a worldwide-packaged goods marketing company, moved to a major ad agency, and then served as Director of Advertising and Creative Services for the Peace Corps. In this role, Mr. Novelli helped direct recruitment efforts for the Peace Corps, VISTA, and social involvement programs for older Americans. He holds a B.A. from the University of Pennsylvania and an M.A. from Penn's Annenberg School for Communication, and pursued doctoral studies at New York University. He taught marketing management for 10 years in the University of Maryland's M.B.A. program and also taught health communications there. He has lectured at many other institutions. He has written numerous articles and chapters on marketing management, marketing communications, and social marketing in journals, periodicals and textbooks. His book, 50+: Give Meaning and Purpose to the Best Time of Your Life, was updated in 2008. His newest book, Managing the Older Worker: How to Prepare for the New Organizational Order (with Peter Cappelli) was published in 2010. Mr. Novelli serves on a number of boards and advisory committees. He and his wife, Fran, live in Bethesda, Maryland. They have three adult children and seven grandchildren.

Samuel R. Nussbaum, MD is Executive Vice President, Clinical Health Policy, and Chief Medical Officer for WellPoint, Inc. He is the key spokesperson and policy advocate for WellPoint. He oversees corporate medical and pharmacy policy to ensure the provision of clinically proven effective care. Dr. Nussbaum collaborates with industry leaders, physicians, hospitals and national policy and health care organizations to shape an agenda for quality, safety and clinical outcomes and to improve patient care for WellPoint's 34 million medical members nationwide. In addition, Dr. Nussbaum works closely with WellPoint business units to advance international and innovative health care services strategy and development. In the decade that Dr. Nussbaum has served as Chief Medical Officer at WellPoint, he has led business units focused on care and disease management and health improvement, clinical pharmacy programs, and provider networks and contracting with accountability for over \$100B in health care expenditures. He has been the architect of models that improve quality, safety and affordability, and was instrumental in developing an innovative contracting approach linking hospital reimbursement to quality, safety and clinical performance. In addition, he guided an extensive set of public and private sector partnerships which have improved community health. Under his leadership, WellPoint's HealthCore subsidiary has built partnerships with Federal agencies, including CDC and FDA, and with academic institutions to advance drug safety, comparative effectiveness and outcomes research. Dr. Nussbaum currently serves on the Boards of the National Quality Forum (NQF), the OASIS Institute, and BioCrossroads, an Indiana-based public-private collaboration that advances and invests in the life sciences. Dr. Nussbaum is a Professor of Clinical Medicine at Washington University School of Medicine and serves as adjunct professor at the Olin School of Business, Washington University. Dr. Nussbaum has served as President of the Disease Management Association of America, Chairman of the National Committee for Quality Health Care, as Chair of America's Health Insurance Plan's (AHIP) Chief Medical Officer Leadership Council, as a member of the AHIP Board, and on the Secretary of Health and Human Services Advisory Committee on Genetics, Health, and Society. Dr. Nussbaum received the 2004 Physician Executive Award of Excellence from the American College of Physician Executives and Modern Physician magazine and has been recognized by Modern Healthcare as one of the "50 Most Influential Physician Executives in Healthcare" in 2010 and 2011. Prior to joining WellPoint, Dr. Nussbaum served as executive vice president, Medical Affairs and System Integration, of BJC Health Care, where he led integrated clinical services across the health system and served as President of its medical group. He earned his medical degree from Mount Sinai School of Medicine. He trained in internal medicine at Stanford University Medical Center and Massachusetts General Hospital and in endocrinology and metabolism at Harvard Medical School and Massachusetts General Hospital, where he directed the Endocrine Clinical Group. As a professor at Harvard Medical School, Dr. Nussbaum's research led to new therapies to treat skeletal disorders and new technologies to measure hormones in blood.

Jonathan B. Perlin, MD, PhD, MSHA, FACP, FACMI is President, Clinical and Physician Services and Chief Medical Officer of Nashville, Tennessee-based HCA (Hospital Corporation of America). He provides leadership for clinical services and improving performance at HCA's 163 hospitals and more than 600 outpatient centers and physician practices. Current activities include implementing electronic health records throughout HCA, improving clinical "core measures" to benchmark levels, and leading patient safety programs to eliminate preventable complications and healthcare-associated infections. Before joining HCA in 2006, "the Honorable Jonathan B. Perlin" was Under Secretary for Health in the U.S. Department of Veterans Affairs. Nominated by the President and confirmed by the Senate, as the senior-most physician in the Federal Government and Chief Executive Officer of the Veterans Health Administration (VHA), Dr. Perlin led the nation's largest integrated health system. At VHA, Dr. Perlin directed care to over 5.4 million patients annually by more than 200,000 healthcare professionals at 1,400 sites, including hospitals, clinics, nursing homes, counseling centers and other facilities, with an operating and capital budget of over \$34 billion. A champion for implementation of electronic health records, Dr. Perlin led VHA quality performance to international recognition as reported in academic literature and lay press and as evaluated by RAND, Institute of Medicine, and others. Dr. Perlin has served on numerous Boards and Commissions including the National Quality Forum, the Joint Commission, Meharry Medical College, and he chairs the HHS Health IT Standards Committee. Broadly published in healthcare quality and transformation, he is a Fellow of the American College of Physicians and the American College of Medical Informatics. Dr. Perlin has a Master's of Science in Health Administration and received his Ph.D. in pharmacology (molecular neurobiology) with his M.D. as part of the Physician Scientist Training Program at the Medical College of Virginia of Virginia Commonwealth University (VCU). Perennially recognized as one of the most influential physician executives in the United States by Modern Healthcare, Dr. Perlin has received numerous awards including Distinguished Alumnus in Medicine and Health Administration from his alma mater, Chairman's Medal from the National Patient Safety Foundation, the Founders Medal from the Association of Military Surgeons of the United States, and is one of nine honorary members of the Special Forces Association and Green Berets. Dr. Perlin has faculty appointments at Vanderbilt University as Adjunct Professor of Medicine and

Dr. Perlin has faculty appointments at Vanderbilt University as Adjunct Professor of Medicine and Biomedical Informatics and at VCU as Adjunct Professor of Health Administration. He resides in Nashville, Tennessee, with his wife, Donna, an Emergency Pediatrics Physician, and children, Ben and Sarah.

Robert A. Petzel, MD was appointed Under Secretary for Health in the Department of Veterans Affairs (VA) on Feb. 18, 2010. Prior to this appointment, Dr. Petzel had served as VA's Acting Principal Deputy Under Secretary for Health since May 2009. As Under Secretary for Health, Dr. Petzel oversees the health care needs of millions of veterans enrolled in the Veterans Health Administration (VHA), the nation's largest integrated health care system. With a medical care appropriation of more than \$48 billion, VHA employs more than 262,000 staff at over 1,400 sites, including hospitals, clinics, nursing homes, domiciliaries, and Readjustment Counseling Centers. In addition, VHA is the nation's largest provider of graduate medical education and a major contributor to medical research. More than eight million veterans are enrolled in the VA's health care system, which is growing in the wake of its eligibility expansion. This year, VA expects to treat nearly six million patients during 78 million outpatient visits and 906,000 inpatient admissions. Previously, Dr. Petzel served as Network Director of the VA Midwest Health Care Network (VISN 23) based in Minneapolis, Minn. In that position, Dr. Petzel was responsible for the executive leadership, strategic planning and budget for eight medical centers and 42 community-based outpatient clinics, serving veterans in Iowa, Minnesota, Nebraska, North Dakota, South Dakota, western Illinois and western Wisconsin. Dr. Petzel was appointed Director of Network 23 (the merger of Networks 13 and 14) in October 2002. From October 1995 to September 2002, he served as the Director of Network 13. Prior to that position, he served as Chief of Staff at the Minneapolis VA Medical Center. Dr. Petzel is particularly interested in data-based performance management, organization by care lines, and empowering employees to continuously improve the way we serve our veterans. He is involved in a collaborative partnership with the British National Health Services Strategic Health Authority. In addition, he co-chairs the National VHA Strategic Planning Committee and the VHA System Redesign Steering Committee. Dr. Petzel graduated from St. Olaf College, Northfield, Minn., in 1965 and from Northwestern University Medical School in 1969. He is Board Certified in Internal Medicine and on the faculty of the University of Minnesota Medical School.

Richard Platt, MD, MSc is a professor and chair of the Department of Population Medicine at Harvard Medical School and the Harvard Pilgrim Health Care Institute. He is principal investigator of the FDA's Mini-Sentinel program, of contracts with FDA's Center for Drugs Evaluation and Research (CDER) and Center for Biologics Evaluation and Research (CBER) to conduct post-marketing studies of drugs' and biologics' safety and effectiveness. He chaired the FDA's Drug Safety and Risk Management Advisory Committee, is a member of the Association of American Medical Colleges' Advisory Panel on Research and the Institute of Medicine Roundtable on Value & Science-Driven Health Care. Dr. Platt was co-chair of the Board of Scientific Counselors of the Centers for Disease Control and Prevention's (CDC) Center for Infectious Diseases. Additionally, he has chaired the National Institutes of Health study section, Epidemiology and Disease Control 2, and the CDC Office of Health Care Partnerships steering committee. Dr. Platt is also principal investigator of a CDC Center of Excellence in Public Health Informatics, the Agency for Healthcare Research and Quality (AHRQ) HMO Research Network Center for Education and Research in Therapeutics, the AHRQ HMO Research Network DEcIDE Center, the CDC Eastern Massachusetts Prevention Epicenter, and FDA contracts to conduct post-marketing studies of drugs' and biologics' safety and effectiveness.

John W. Rowe, MD is a Professor in the Department of Health Policy and Management at the Columbia University Mailman School of Public Health. Previously, from 2000 until his retirement in late 2006, Dr. Rowe served as Chairman and CEO of Aetna, Inc. Before his tenure at Aetna, from 1998 to 2000, Dr. Rowe served as President and Chief Executive Officer of Mount Sinai NYU Health, one of the nation's largest academic health care organizations. From 1988 to 1998, prior to the Mount Sinai-NYU Health merger, Dr. Rowe was President of the Mount Sinai Hospital and the Mount Sinai School of Medicine in New York City. Before joining Mount Sinai, Dr. Rowe was a Professor of Medicine and the founding Director of the Division on Aging at the Harvard Medical School, as well as Chief of Gerontology at Boston's Beth Israel Hospital. He has authored over 200 scientific publications, mostly on the physiology of the aging process, including a leading textbook of geriatric medicine, in addition to more recent publications on health care policy. Dr. Rowe was Director of the MacArthur Foundation Research Network on Successful Aging and is co-author, with Robert Kahn, Ph.D., of Successful Aging (Pantheon, 1998). Currently, Dr. Rowe leads the MacArthur Foundation's Network on An Aging Society and chairs the Institute of Medicine's Committee on the Future Health Care Workforce for Older Americans. He has served as president of the Gerontological Society of America and recently chaired the Committee of the Institute of Medicine of the National Academy of Sciences on The Future Health Care Workforce Needs of An Aging Population. Dr. Rowe was elected a Fellow of the American Academy of Arts and Sciences and a member of the Institute of Medicine of the National Academy of Sciences where he is involved in the Evidence Based Roundtable. Dr. Rowe serves on the Board of Trustees of the Rockefeller Foundation and is Chairman of the Board of Trustees at the Marine Biological Laboratory in Woods Hole, Massachusetts. Dr Rowe is a former member of the Medicare Payment Advisory Commission (MedPAC).

Susan B. Shurin, MD is the Acting Director, National Heart, Lung, and Blood Institute (NHLBI). She joined NHLBI in 2006 as the Deputy Director, and has been Acting Director since December 2009. She is responsible for the scientific and administrative management of the intramural and extramural activities of the NHLBI, and oversight of the Institute's clinical research portfolio. Dr. Shurin represents the NHLBI in activities across the National Institutes of Health (NIH) and the Department of Health and Human Services. The NHLBI, third largest of the 27 Institutes and Centers at NIH, has an annual budget of over \$3.1 billion, and manages a complex portfolio of basic, clinical, translational and epidemiologic research. The bulk of the Institute's resources are allocated to support extramural research across the US and across the globe. Dr. Shurin is engaged in multiple trans-NIH research and administrative activities, and in global health research on non-communicable diseases. Before joining the NHLBI, Dr. Shurin was professor of Pediatrics and Oncology at Case Western Reserve University; director of Pediatric Hematology-Oncology at Rainbow Babies and Children's Hospital; director of Pediatric Oncology at the Case Comprehensive Cancer Center; and vice president and secretary of the Corporation at Case Western Reserve University in Cleveland, Ohio. Dr. Shurin received her education and medical training at Harvard University and the Johns Hopkins University School of Medicine. Her laboratory research focused on the physiology of phagocyte function,

recognition and killing of pathogens; mechanisms of hemolysis; and iron overload. She has been active in clinical research in many aspects of pediatric hematology-oncology, including participation in the Children's Cancer Group, Children's Oncology Group, multiple studies in sickle cell disease and hemostasis.

Mark D. Smith, MD, MBA has been President and Chief Executive Officer of the California HealthCare Foundation since its formation in 1996. The Foundation is an independent philanthropy with assets of more than \$700 million, headquartered in Oakland, California and dedicated to improving the health of the people of California through its program areas: Better Chronic Disease Care, Innovations for the Underserved, Market and Policy Monitor, and Health Reform and Public Programs Initiative. A board-certified internist, Smith is a member of the clinical faculty at the University of California, San Francisco and an attending physician at the Positive Health Program (for AIDS care) at San Francisco General Hospital. He has been elected to the Institute of Medicine and serves on the board of the National Business Group on Health. Prior to joining the California HealthCare Foundation, Smith was Executive Vice President at the Henry J. Kaiser Family Foundation. He previously served as Associate Director of AIDS Services and Assistant Professor of Medicine and of Health Policy and Management at Johns Hopkins University. He has served on the Performance Measurement Committee of the National Committee for Quality Assurance and the editorial board of the Annals of Internal Medicine. Smith received a Bachelor's degree in Afro-American studies from Harvard College, a Medical Doctorate from the University of North Carolina at Chapel Hill, and a Master's of Business Administration, with a concentration in Health Care Administration, from the Wharton School at the University of Pennsylvania.

Stephen Spielberg, MD, PhD is Deputy Commissioner for Medical Products and Tobacco of the U.S. Food and Drug Administration. A pediatrician and pharmacologist, Spielberg was most recently the Marion Merrell Dow Chair in Pediatric Pharmacogenomics, and Director of the Center for Personalized Medicine and Therapeutic Innovation at Children's Mercy Hospital in Kansas City. Previously, he served as Dean of Dartmouth Medical School and Vice President for Health Affairs at Dartmouth College in Hanover, NH. From 1997 to 2003, Dr. Spielberg was Johnson & Johnson's Vice President for Pediatric Drug Development and, prior to that, was Executive Director at Merck & Co.'s Research Laboratories. During that time, he was Chairman of the Pediatric Task Force of PhRMA, the drug industry's trade association. He received his bachelor's degree in biology from Princeton University, and an M.D. and Ph.D. (Pharmacology) from the University of Chicago.

Glenn D. Steele Jr, MD, PHD is President and Chief Executive Officer of Geisinger Health System. Dr. Steele previously served as the dean of the Biological Sciences Division and the Pritzker School of Medicine and as vice president for medical affairs at the University of Chicago, as well as the Richard T. Crane Professor in the Department of Surgery. Prior to that, he was the William V. McDermott Professor of Surgery at Harvard Medical School, president and chief executive officer of Deaconess Professional Practice Group, Boston, MA, and chairman of the department of surgery at New England Deaconess Hospital (Boston, MA). Widely recognized for his investigations into the treatment of primary and metastatic liver cancer and colorectal cancer surgery, Dr. Steele is past Chairman of the American Board of Surgery. He serves on the editorial board of numerous prominent medical journals. His investigations have focused on the cell biology of gastrointestinal cancer and pre-cancer and most recently on innovations in healthcare delivery and financing. A prolific writer, he is the author or co-author of more than 476 scientific and professional articles. Dr. Steele received his bachelor's degree in history and literature from Harvard University and his medical degree from New York University School of Medicine. He completed his internship and residency in surgery at the University of Colorado, where he was also a fellow of the American Cancer Society. He earned his PhD in microbiology at Lund University in Sweden. He is a member of the Institute of Medicine of the National Academy of Sciences and served on their Committee on Reviewing Evidence to Identify Highly Effective Clinical Services (HECS), the New England Surgical Society, a fellow of the American College of Surgeons, the American Surgical Association, the American Society of Clinical Oncology, and past president of the Society of Surgical Oncology. He was a member of the National Advisory Committee for Rural Health, the Pennsylvania Cancer Control Consortium and is presently a member of the Healthcare Executives Network, the Commonwealth Fund's Commission on a High

Performance Health System, and served as a member of the National Committee for Quality Assurance's (NCQA) Committee on Performance Measurement. Dr. Steele serves on several boards including Bucknell University's Board of Trustees, Temple University School of Medicine's Board of Visitors, Premier, Inc (Vice Chair), Weis Markets, Inc., and Wellcare Health Plans, Inc. Dr. Steele was recently appointed to serve on The Hospital & Healthsystem Association of Pennsylvania (HAP) Board of Directors, the Harvard Medical Faculty Physicians Board at Beth Israel Deaconess Medical Center and Cepheid's Board of Directors. Dr. Steele previously served on the American Hospital Association's Board of Trustees, Executive Committee, the AHA Systems Governing Council (Chair), and the AHA Long-Range Policy Committee. He will serve as a member on the AHA Committee on Research. Dr. Steele is currently Honorary Chair of the Pennsylvania March of Dimes Prematurity Campaign, served on the Healthcare Financial Management Association's Healthcare Leadership Council, the Northeast Regional Cancer Institute, the Global Conference Institute, and previously served on the Simon School of Business Advisory Board (University of Rochester) 2002 -2007. In 2006 Dr. Steele received the CEO IT Achievement Award, given by Modern Healthcare and the Healthcare Information and Management Systems Society (HIMSS) for promoting health information technology. In 2007, Dr. Steele received AHA's Grassroots Champion Award and was named to Modern Healthcare's 50 Most Powerful Physician Executives in Healthcare. He was recognized by "Modern Healthcare's 100 Most Powerful People in Healthcare" in 2009 and 2010. Dr. Steele received the 8th Annual 2010 AHA Health Research & Education Trust Award. The HRET award honors individuals who exhibit visionary leadership in healthcare and who symbolize HRET's mission of leveraging research and education to make a dramatic impact in policy and practice. Dr. Steele was awarded the HFMA Board of Directors' Award in 2011.

Marilyn Tavenner is currently the Acting Administrator for the Centers for Medicare & Medicaid Services. Previously, Ms. Tavenner was Principal Deputy Administrator for the Centers for Medicare & Medicaid Services (CMS). As the Principal Deputy Administrator, Ms. Tavenner served as the agency's second-ranking official overseeing policy development and implementation as well as management and operations.

Ms. Tavenner, a life-long public health advocate, manages the \$820 billion federal agency, which ensures health care coverage for 100 million Americans, with 10 regional offices and more than 4,000 employees nationwide. CMS administers Medicare, and it provides funds and guidance to all states for their Medicaid and Children's Health Insurance (CHIP) programs. With the passage of the Affordable Care Act in March of 2010, Ms. Tavenner is also responsible for overseeing CMS as it implements the insurance reforms and Affordable Insurance Exchanges included in the health reform law. Prior to assuming her CMS leadership role, Ms. Tavenner served for four years as the Commonwealth of Virginia's Secretary of Health and Human Resources in the administration of former Governor Tim Kaine. In this top cabinet position, she was charged with overseeing 18,000 employees and a \$9 billion annual budget to administer Medicaid, mental health, social services, public health, aging, disabilities agencies, and children's services. Before entering government service, Ms. Tavenner spent 25 years working for the Hospital Corporation of American (HCA). She began working as a nurse at the Johnson-Willis Hospital in Richmond, Va., in 1981 and steadily rose through the company. By 1993, she began working as the hospital's Chief Executive Officer and, by 2001, had assumed responsibility for 20 hospitals as President of the company's Central Atlantic Division. She finished her service to HCA in 2005 as Group President of Outpatient Services, where she spearheaded the development of a national strategy for freestanding outpatient services, including physician recruitment and real estate development. Ms. Tavenner holds a bachelor's of science degree in nursing and a master's degree in health administration, both from the Virginia Commonwealth University. She has worked with many community and professional organizations, serving as a board member of the American Hospital Association, as president of the Virginia Hospital Association, as chairperson of the Chesterfield Business Council, and as a life-long member of the Rotary Club. Her contributions also include providing leadership in such public service organizations as the March of Dimes, the United Way and the Juvenile Diabetes Research Foundation. In addition to numerous business awards, Ms. Tavenner has been recognized for her volunteer activities, including the 2007 recipient of the March of Dimes Citizen of the Year Award.

Reed V. Tuckson, MD, FACP is a graduate of Howard University, Georgetown University School of Medicine, and the Hospital of the University of Pennsylvania's General Internal Medicine Residency and Fellowship Programs. He is currently the Executive Vice President and Chief of Medical Affairs at UnitedHealth Group, a Fortune 25 diversified health and well-being company. As the most senior clinician, Dr. Tuckson is responsible for working with all the company's diverse and comprehensive business units to improve the quality and efficiency of the health services provided to the 75 million members that UnitedHealth Group is privileged to serve worldwide. Formerly, Dr. Tuckson served as Senior Vice President, Professional Standards, for the American Medical Association (AMA); is former President of the Charles R. Drew University of Medicine and Science in Los Angeles; and he is a former Commissioner of Public Health for the District of Columbia. He is an active member of the prestigious Institute of Medicine of the National Academy of Sciences. Recently, he was appointed to the National Institute of Health's Advisory Committee to the Director and the Department of Health and Human Services' Health Information Technology (HIT) Policy Committee - Enrollment Workgroup. He is immediate past Chair of the Secretary of Health and Human Services' Advisory Committee on Genetics, Health and Society. Dr. Tuckson has also held other federal appointments, including cabinet level advisory committees on health reform, infant mortality, children's health, violence, and radiation testing. Dr. Tuckson currently serves on the Board of Directors for several national organizations including the National Hispanic Medical Association; the Alliance for Health Reform; the American Telemedicine Association; the National Patient Advocate Foundation; the Macy Foundation; the Arnold P. Gold Foundation; Project Sunshine and Howard University.

Mary Wakefield, PhD, RN was named administrator of the Health Resources and Services Administration (HRSA) by President Barack Obama on February 20, 2009. Dr. Wakefield joins HRSA from the University of North Dakota (UND), where she was associate dean for rural health at the School of Medicine and Health Sciences, a tenured professor, and director of the university's Center for Rural Health. Dr. Wakefield brings experience on Capitol Hill to her post at HRSA. In the 1990s, she served as chief of staff to two North Dakota senators: Kent Conrad (D) and Quentin Burdick (D). She also has served as director of the Center for Health Policy, Research and Ethics at George Mason University in Fairfax, Va., and worked on site as a consultant to the World Health Organization's Global Programme on AIDS in Geneva, Switzerland. Dr. Wakefield is a fellow in the American Academy of Nursing and was elected to the Institute of Medicine (IOM) of the National Academies in 2004. She served on the IOM committee that produced the landmark reports To Err is Human and Crossing the Quality Chasm. She also co-chaired the IOM committee that produced the report Health Professions Education, and chaired the committee that produced the report Quality through Collaboration: Health Care in Rural America. In addition, she has served on the Medicare Payment Advisory Commission, as chair of the National Advisory Council for the Agency for Healthcare Research and Quality, as a member of President Clinton's Advisory Commission on Consumer Protection and Quality in the Health Care Industry, and as a member of the National Advisory Committee to HRSA's Office of Rural Health Policy. At UND, Dr. Wakefield also was director of the Rural Assistance Center, a HRSA-funded source of information on rural health and social services for researchers, policymakers, program managers, project officers and the general public. In addition, the Center for Rural Health administered a \$1.6 million award from HRSA under the Critical Access Hospital Health Information Technology Implementation program. Dr. Wakefield is a native of Devils Lake, N.D. She has a bachelor of science degree in nursing from the University of Mary in Bismarck and master's and doctoral degrees in nursing from the University of Texas at Austin.

Jonathan Woodson, MD is the Assistant Secretary of Defense for Health Affairs and director, TRICARE Management Activity. In this role, he administers the more than \$50 billion Military Health System (MHS) budget and serves as principal advisor to the Secretary of Defense for health issues. The MHS comprises over 133,000 military and civilian doctors, nurses, medical educators, researchers, healthcare providers, allied health professionals, and health administration personnel worldwide, providing our nation with an unequalled integrated healthcare delivery, expeditionary medical, educational, and research capability. Dr. Woodson ensures the effective execution of the Department of Defense (DoD) medical mission. He oversees the development of medical policies, analyses, and recommendations to the Secretary of Defense and the Undersecretary for Personnel and Readiness, and issues guidance to DoD components on medical matters.

He also serves as the principal advisor to the Undersecretary for Personnel and Readiness on matters of chemical, biological, radiological, and nuclear (CBRN) medical defense programs and deployment matters pertaining to force health. Dr. Woodson co-chairs the Armed Services Biomedical Research Evaluation and Management Committee, which facilitates oversight of DoD biomedical research. In addition, Dr. Woodson exercises authority, direction, and control over the Uniformed Services University of the Health Sciences (USUHS); the Defense Center of Excellence for Psychological Health and Traumatic Brain Injury (DCoE); and the Armed Services Blood Program Office. As Director, TRICARE Management Activity, Dr. Woodson is responsible for managing all TRICARE health and medical resources, and supervising and administering TRICARE medical and dental programs, which serve more than 9.6 million beneficiaries. Dr. Woodson also oversees the TRICARE budget; information technology systems; contracting process; and directs TRICARE Regional Offices (TRO). In addition, he manages the Defense Health Program (DHP) and the DoD Unified Medical Program as TRICARE director. Prior to his appointment by President Obama, Dr. Woodson served as Associate Dean for Diversity and Multicultural Affairs and Professor of Surgery at the Boston University School of Medicine (BUSM), and senior attending vascular surgeon at Boston Medical Center (BMC). Dr. Woodson holds the rank of brigadier general in the U.S. Army Reserve, and served as Assistant Surgeon General for Reserve Affairs, Force Structure and Mobilization in the Office of the Surgeon General, and as Deputy Commander of the Army Reserve Medical Command. Dr. Woodson is a graduate of the City College of New York and the New York University School of Medicine. He received his postgraduate medical education at the Massachusetts General Hospital, Harvard Medical School and completed residency training in internal medicine, and general and vascular surgery. He is board certified in internal medicine, general surgery, vascular surgery and critical care surgery. He also holds a Master's Degree in Strategic Studies (concentration in strategic leadership) from the U.S. Army War College. In 1992, he was awarded a research fellowship at the Association of American Medical Colleges Health Services Research Institute. He has authored/coauthored a number of publications and book chapters on vascular trauma and outcomes in vascular limb salvage surgery. His prior military assignments include deployments to Saudi Arabia (Operation Desert Storm), Kosovo, Operation Enduring Freedom and Operation Iraqi Freedom. He has also served as a Senior Medical Officer with the National Disaster Management System, where he responded to the September 11th attack in New York City. Dr. Woodson's military awards and decorations include the Legion of Merit, the Bronze Star Medal, and the Meritorious Service Medal (with oak leaf cluster). In 2007, he was named one of the top Vascular Surgeons in Boston and in 2008 was listed as one of the Top Surgeons in the U.S. He is the recipient of the 2009 Gold Humanism in Medicine Award from the Association of American Medical Colleges.



ROUNDTABLE ON VALUE & SCIENCE-DRIVEN HEALTH CARE

Other Participant Biographies

Rosemarie Filart, MD, MPH, MBA is a National Institutes of Health Medical Officer and Program Officer of the new National Center for Advancing Translational Sciences, Division for Clinical Innovation. Dr. Filart coordinates the NIH CTSA Comparative Effectiveness Key Function Committee (CER KFC). She is active in trans-NIH and Interagency CER Committees and manages CER/patient centered outcomes research grants. She has co-written initiatives to advance the field of CER/patient centered outcomes research and co-authored papers in CER Core Competencies and informatics in CER. She is a member of the IOM Value & Science-Driven Health Care (formerly EBM) Clinical Effectiveness Research- Innovative Collaborative (CER-IC) Subgroup and co-authored IOM CER-IC White Paper, 2010. She manages Clinical and Translational Science Award (CTSA) awards and coordinates activities for the CTSA Program since the Program was launched in 2006. She coordinates also four NIH CTSA Thematic Special Interest Groups (TSIG)/Networks: Telemedicine/Telehealth/mHealth, Sleep Research, Emergency Care Research, and Neuroscience/Neuro-related Research in collaboration with NHLBI, NINDS, and NLM. Dr. Filart is a representative to trans-NIH and trans-HHS Agency groups such as mHealth, National Robotics Initiative, NIH Office on Emergency Care Research, NIH Neuroscience Blueprint Working Groups, Trans-NIH Rehabilitation Research Committee and Federal Working Group on Bone Diseases. She has received NIH meritorious recognition: four NIH Director Awards for her work in teams to advance clinical and translational research, emergency medical research, and neurotherapeutics and an NIH Neuroscience Blueprint Director Award. Dr. Filart is a physician boarded in the field of Physical Medicine and Rehabilitation and Spinal Cord Medicine. She trained in Physical Medicine and Rehabilitation at Baylor College of Medicine in Houston, TX, Primary Care Medicine at Yale University School of Medicine in New Haven, CT, and Spinal Cord Medicine at University of Medical and Dentistry of New Jersey/Kessler Research Institute. She directed outpatient clinics and an inpatient unit and as the Director of Spinal Cord Medicine at JHMI before joining NIH and co-authored book chapters and articles in peer-reviewed journals on medical rehabilitation topics. She graduated from the Johns Hopkins Carey Business School with a Master's in Business of Medicine and earned a Lean Six Sigma Green Belt.

Veronica V. Goff, MS is vice president of the National Business Group on Health, a national non-profit membership organization devoted exclusively to providing practical solutions to its employer members' most important health care problems and representing large employers' perspective on national health policy issues. She leads the Institute on Health Care Costs and Solutions. The Cost Institute identifies and disseminates best practices and promising solutions to cost, quality, patient safety, and employee engagement challenges with a focus on implementation and actionable information for employers. Goff represents the Business Group on the IOM Value Incentives Learning Collaborative and the Advisory Board of the Patient Centered Primary Care Collaborative. She recently served on NCQA's Re-Evaluating PPC-PCMH Standards Advisory Committee and the BCBS Evidence-based Practice Center stakeholder panel on cancer and infectious disease. She has more than 25 years experience working with employers on health benefits and programs. Most recently, she was a senior consultant to the Business Group. Previously, she served as vice president for the Washington Business Group on Health, held a faculty position at the University of Virginia Health Sciences Center, and managed an on-site health promotion/fitness facility serving 8,000 AT&T employees. Goff is an American College of Sports Medicine- certified Health Fitness Specialist. She earned a M.S. degree in physical education with specialization in exercise physiology and a B.S. degree in physical education with a minor in athletic training from Southern Illinois University.

A. Seiji Hayashi, MD, MPH, FAAFP is the Chief Medical Officer for the Bureau of Primary Health Care (BPHC) at the Health Resources and Services Administration (HRSA). As Chief Medical Officer, Dr. Hayashi oversees BPHC's clinical quality strategy for the nation's 1,200 health center organizations that operate 8,500 sites. These community health centers, migrant health centers, health care for the homeless centers, and public housing primary care centers provide comprehensive, culturally competent, quality primary health care to over 20 million people. Health centers are health homes for more than one in three people living in poverty. Dr. Hayashi is a board-certified family physician and continues to cares for patients at a federally qualified health center in the District of Columbia. Dr. Hayashi graduated from Vassar College with a degree in Studio Art. He received his medical degree from the Albert Einstein College of Medicine in 1997. In 2000, he completed the Family and Community Medicine Residency Program at the University of California San Francisco. He received his Masters of Public Health from the Harvard School of Public Health in 2001 while serving as a fellow for the Commonwealth Fund/Harvard University Fellowship in Minority Health Policy.

Peter M. Loupos has been responsible for providing the vision, strategy, and leadership for innovative largescale technology initiatives in the pharmaceutical and healthcare industries. Peter began his career in the field of Health Information Technology where he led the development of clinical, financial, and physician services in the US, Europe, and Japan. He joined Rorer Pharmaceutical to lead the R&D Information Technology organization, growing in responsibility through successive mergers until the creation of Sanofi-Aventis. During this time he was recognized for his achievements in the design and delivery of industry leading solutions to support the life sciences. He then joined the Strategic Initiatives group focusing on the assessment and response to trends impacting the Pharmaceutical industry. He was a co-author of a PhRMA white paper documenting the potential impact of eHealth for the industry and has contributed to numerous initiatives such as the Observational Medical Outcomes Partnership, IMI Electronic Healthcare Records for Clinical Research, and Coalition Against Major Diseases. Peter is currently a member of the Advocacy team where his focus is to develop strategies and relations with patient groups to accelerate science and innovation in support of key platforms such as patient centered research, translational and personalized medicine, new approaches in clinical development, and open innovation collaboration models. He also is a member of the corporate Digital Steering Committee chartered to develop the social media strategy and policies for the company and leads the eHealth subgroup of this committee.

Gary Loveman is the Chairman and Chief Executive Officer and President of Caesars Entertainment Corporation. Loveman joined Caesars as Chief Operating Officer in 1998, after serving as an associate professor at the Harvard University Graduate School of Business Administration. He drew on his background in service-management to develop the gaming industry's most successful loyalty and analytics program, Total Rewards, which boasts more than 40 million members. At Caesars, he has promoted a culture of experimentation, which encourages a data-driven approach to continuously improving their operations and the customer experience. Additionally, Loveman became Chair of Business Roundtable's (BRT) Health and Retirement Committee in 2012. As providers of health insurance coverage to nearly 40 million beneficiaries, BRT CEOs seek to leverage learnings from the private sector to promote efficient, high quality healthcare that delivers greater value to American families. Under Loveman's leadership, the BRT's committee supports healthcare innovation and incentives to enhance wellness and make employees better healthcare consumers. It also supports reform in our nation's growing entitlement obligations to ensure fiscally sustainable Medicare and Social Security programs and viable healthcare coverage for the uninsured. Loveman also serves as a director of Coach, Inc. and FedEx Corporation and sits on the Board of Trustees at Children's Hospital Boston and the Visiting Committee of the Department of Economics at M.I.T. He holds a Ph.D. in economics from M.I.T., where he was an Alfred Sloan Doctoral Dissertation Fellow, and a B.A. in economics from Wesleyan University.

Richard McNaney is the Deputy Director of the Quality Improvement Group (QIG) in the Center for Clinical Standards and Quality (CCSQ) at the Centers for Medicare & Medi-caid Services (CMS).

Mr. McNaney is responsible for management and operations for the Quality Improvement Organization and End Stage Renal Disease (ESRD) programs, Inpatient and Outpatient Quality Reporting Programs, and for imple-mentation of numerous legislative mandates including Hospital Value-Based Purchasing under the Affordable Care Act and the ESRD Quality Incentive Program under the Medi-care Improvements for Patients and Providers Act. Prior to joining QIG, Mr. McNaney was Acting Director for the Infor-mation Systems Group and a senior communications specialist for the Office of Clinical Standards and Quality. Mr. McNaney joined CMS in 2000 as a Director of Promotion and Publicity for the Medi-care & You campaigns. He has a Masters degree from Johns Hop-kins University and a Bachelor of Arts degree from the University of Maryland Baltimore County.

Nancy E. Miller, PhD serves as Senior Science Policy Analyst in the Office of Science Policy, Office of the Director, NIH, where she serves as principal staff advisor to the Director, NIH, on health care reform policy issues, and programmatic activities related to the agency's Comparative Effectiveness Research (CER) portfolio. She coordinates NIH Institute and Center (IC) efforts for the purpose of organizing meetings to address major programmatic and science policy research issues, conceptualizes the needs of ICs in crosscutting health care reform activities; prepares reports on ARRA-supported CER advances, and coordinates and provides senior level expert policy advice on development of complex collaborative CER activities with multiple organizations, senior NIH staff, and sister federal agencies. Dr. Miller serves as principal staff advisor to the Director, NIH on activities related to the Patient-Centered Outcomes Research Institute, (PCORI) a private, non-profit corporation, established by the Patient Protection and Affordable Care Act, to develop and fund CER. She supports the Director, NIH, in his role as a member on the Board of Governors (BOG) and on the Program Development Committee (PDC), and tracks PCORI Methodology Committee Subcommittee activities. She provides advice regarding research policy issues affecting both NIH and the national biomedical research community, coordinates with OD offices, and makes recommendations for establishing precedents and/or resolving technical and procedural problems. Dr. Miller directs activities of the Trans-NIH Comparative Effectiveness Coordinating Committee (CER CC) where she serves as the Committee's Executive Secretary. A high-level committee established by the Director, NIH, and co-chaired by the Director, National Institute on Aging, and NHLBI, the CER CC is tasked with reviewing and prioritizing CER spending decisions for the NIH Director, shaping and supporting the next generation of CER studies, integrating the promise of personalized medicine with CER, and advancing research methods and science to benefit health care reform. In addition to coordinating trans-NIH initiatives, Dr. Miller advises OD offices regarding the development of agency and DHHS-wide collaborative policy related to CER and health-care reform related research; provides monthly IC briefings; oversees policy development pertaining to ethical, legal, societal and health implications raised by CER, and facilitates collaboration on CER and health reform research activities with DHHS, and among sister federal agencies. She oversees requests for information on CER from Congress, DHHS, OMB, GAO, PCORI, federal contractors and from IC Directors. Dr. Miller has served as Executive Secretary of the Common Fund initiative on the "Science of Behavior Change," helped initiate the NIH Common Fund program on the "Patient-Reported Outcome Measurement Information System (PROMIS)", and contributes to the Common Fund "Health Economics Initiative to Advance Healthcare Reform."

Jean D. Moody-Williams, RN, MPP, is the cur-rent Director for the Centers for Medicare and Medicaid Services' Quality Improvement Group (QIG) in the Center for Clinical Standards and Quality. She has responsibility for the operation of the Quality Improvement Program and the End Stage Renal Disease Networks. Jean also leads many of the agency's Value Based Purchasing programs in hospitals and End Stage Renal Dis-ease facilities. The mission is to promote efficient, effective, timely, equitable, person-centered and safe care for Medicare beneficiaries. Prior to serving as the QIG Director, she served as the Director of the Division of Quality, Evaluation and Health Outcomes (DQEHO) for the Center for Medicaid and State Operations (CMSO) at CMS and was responsible for leading quality improvement efforts for the Medicaid Program. Ms. Moody-Williams served as the Division Chief for Facility Quality and Perform-ance at the Maryland Health Care Commission (MHCC) prior to joining CMS, where she was responsible for developing and maintaining a system to evaluate and publicly report the quality of care and performance of Nursing

Homes, Hospi-tals, Ambulatory Surgical Facilities, and other health care facilities. She has held several management and health policy positions including serving as the Associ-ate Executive Director of the National Resource Center for Health Policy and Strategies, developing and implementing programs at both the Michigan and Pennsylvania Quality Improvement Organizations and serving as the Director of Quality Improvement for a Health Care System in Dallas. She has published a series of articles and technical papers in the area of quality improvement. She received her Bachelor's of Science in Nursing from Hampton University and a Masters of Public Policy and Management from the University of Maryland, College Park.

Lyn Paget, MPH is the Managing Partner of Health Policy Partners, an independent organization dedicated to connecting patient priorities with policy and innovation. For over 25 years, Ms. Paget has worked to enhance the quality of the patient experience in health care. With a focus on information, engagement, and partnership, she has established strategic alliances with government agencies, medical professional societies, consumer advocacy groups, health care quality organizations and policy leaders to create unity around principles for successful innovation and change. As Director of Policy and Outreach at the Informed Medical Decisions Foundation, she directed efforts in advocacy, communications and policy development to support sustainable models of patient centered care and shared decision-making. In this role, she built awareness and fostered collaboration among key stakeholder groups, advocated for new models of reimbursement, promoted quality standards for patient experience measures, and disseminated research results and knowledge to enhance the understanding of the patient's role in medical decision-making. Ms. Paget was instrumental in the development and launch of HealthNewsReview.org - a public access web site designed to evaluate the accuracy and balance of health and medical news stories. She has participated in and led national, state and local initiatives to expand policy and legislative opportunity for sustainable models of patient engagement. She helped established and served as Vice President of the Medical Outcomes Trust, an organization created to promote the routine use of patient-based outcome measures including the SF-36 and other instruments designed to systematically assess health-related quality of life. For several years, she focused in HIV/AIDS prevention working at the AIDS Project Los Angeles and in Washington State where she led a combined city county HIV/AIDS department. Her work in Tacoma received national recognition for innovative approaches to street outreach and education programs. Ms. Paget serves on a number of national and state committees and workgroups to advance the patient's role and involvement in health care. She has a BS in Health Education from the University of Massachusetts and a Masters in Public Health from the University of California, Los Angeles.

Modena Wilson, MD joined the American Medical Association as Senior Vice President for Professional Standards in September 2004. Her responsibilities at the AMA include four large groups-Medical Education; Ethics Standards; Performance Improvement, and Science, Medicine, and Public Health. Dr. Wilson came to the AMA from the American Academy of Pediatrics. She joined the executive staff of the Academy in January 2000 as Director of the Department of Committees and Sections. Dr. Wilson was a full time faculty member of the Johns Hopkins University School of Medicine for more than twenty years where she attained the academic rank of Professor of Pediatrics. At Johns Hopkins, Dr. Wilson directed the Division of General Pediatrics and Adolescent Medicine and General Academic Pediatrics Fellowship Program, Co-directed the Robert Wood Johnson Clinical Scholars Program, and held a joint appointment in the School of Public Health's Department of Health Policy and Management. In her research activities, Dr. Wilson was affiliated both with the Center for Injury Research and Policy and with the Center for Immunization Research at Johns Hopkins. She is the first author of a book on childhood injury control. Dr. Wilson graduated summa cum laude from McPherson College. She holds a Master's Degree in Biology from Wichita State University. She studied medicine at the University of Kansas. Her pediatric residency training took place at the University of Wisconsin Hospitals in Madison. She received both a Masters of Public Health degree and a certificate in the Business of Medicine from Johns Hopkins University. She was a member of the inaugural class of the US Public Health Service's Primary Care Policy Fellowship. Dr. Wilson's national activities have included service on the Council on Graduate Medical Education, the US Preventive Services Task Force, the Advisory Council of the National Injury Prevention Center, and the Board of Directors of the American Board of Pediatrics. Before joining the Academy staff, she served an Associate

Editor of the Archives of Pediatrics and Adolescent Medicine. With colleagues from general internal medicine and family medicine, Dr. Wilson Co-directed the Interdisciplinary Generalist Clerkship Project and the Genetics in Primary Care Project. She was also one of the directors of the Ambulatory Pediatric Association's national Faculty Development Scholars Program. Dr. Wilson is a Past-President of the Academic (Ambulatory) Pediatric Association.

John Yee, MD, MPH serves as Vice President, and U.S. Head Medical Officer at AstraZeneca Pharmaceuticals. In this role, he is responsible for leading all medical affairs and strategic development activities in the U.S. Prior to joining AstraZeneca, John served as Vice President and Global Head, Evidence-Based Medicine at Genzyme as well as the head of Global, US, and European medical affairs for Genzyme's rare genetic disease business. John has also served in leadership roles at a major academic medical center, at health care technology start-up companies, and as a clinical research consultant to pharmaceutical, biotechnology, and medical device companies. Prior to joining industry, John was a member of the faculty at Harvard Medical School and Children's Hospital Boston. He is a graduate of Harvard College, and earned his medical degree from Harvard Medical School in addition to a master's degree in public health from the Harvard School of Public Health. He completed a residency in pediatrics and fellowships in immunology/rheumatology and health services research at Children's Hospital Boston.



ROUNDTABLE ON VALUE & SCIENCE -DRIVEN HEALTH CARE

Roundtable on Value & Science-Driven Health Care Meeting Logistics

The National Academy of Sciences 2100 C Street, NW | Washington, DC Lecture Room September 27, 2012

We are looking forward to your participation in the September 27 meeting of the IOM Roundtable on Value & Science-Driven Health Care. If you have any questions regarding meeting logistics, please contact our office at <u>jcsanders@nas.edu</u> or 202-334-3889.

MEETING LOCATION

The meeting will take place from 8:30am to 4:00pm on September 27, 2012 in the Lecture Room at the National Academy of Sciences Building at 2100 C Street, NW in Washington, DC 20037. While **the agenda for this meeting has not been finalized**, these times provide an accurate estimation for travel planning purposes. Breakfast will be served starting at 8:30am, with the meeting's official agenda commencing at 9:00am.

HOTEL ACCOMODATIONS

Should you require lodging, previous guests have enjoyed their stays at the hotels listed below. Depending upon availability and the date of booking, Julia may be able to assist with obtaining the government per diem room rate of \$224. Please contact her by September 15 at jcsanders@nas.edu if you would like assistance.

State Plaza Hotel / 2117 E Street, NW / 202-861-8200 (7 minute walk) Hotel Lombardy / 2019 Pennsylvania Avenue, NW / 202-828-2600 (12 minute walk) One Washington Circle Hotel / 1 Washington Circle, NW / 800-424-9671 (16 minute walk) The River Inn / 924 25th Street, NW / 202-337-7600 (16 minute walk)

DIRECTIONS AND TRANSPORTATION

Airports: The meeting site is approximately 5 miles from Washington National Airport (a 20-minute cab ride depending on the time of day) and approximately 25 miles from Dulles International Airport (a 45-minute cab ride).

Metro: The Foggy Bottom metro stop (Orange/Blue Line) is located at 23rd and I Streets NW. Walking from the metro to the NAS building takes approximately 12 minutes. A map is on page 2 of this memo.

Parking: The parking garage for the National Academy of Sciences is located on 21st Street NW, between Constitution Avenue and C Street. However, space is very limited, so you may want to use an alternate mode of transportation.

Detailed driving and Metro directions to the National Academy of Sciences may be found at: <u>http://www.nationalacademies.org/about/contact/nas.html</u>



MAP OF FOGGY BOTTOM METRO TO NAS BUILDING