TRANSFORMING MEDICAL EDUCATION

Preparing Physicians to Lead Reform

ROOTS

The Jewish Healthcare Foundation (JHF) is a public charity that offers a unique blend of research, education, grantmaking, and program management to advance the quality of clinical care and the health of populations. Its current focus is promoting safety, best practice and efficiency at the front line of care, and building a workforce to sustain this. To accomplish its goals, JHF created the Pittsburgh Regional Health Initiative (PRHI) in 1997, and Health Careers Futures (HCF) in 2003. JHF is also a founding member of the Network for Regional Healthcare Improvement (NRHI). For more information, visit www.jhf.org.

The Pittsburgh Regional Health Initiative (PRHI) is an independent catalyst for improving healthcare safety and quality in Southwestern Pennsylvania. It operates on the premise that dramatic quality improvement is the best cost-containment strategy for health care. PRHI is one of the first regional consortia of medical, business, and civic leaders to address healthcare safety and quality improvement as a social and business imperative. Turning its own community into a demonstration lab, PRHI strives to accelerate improvement and set the pace for the nation. Its premise rests on three principles: (1) Health care is local; federal policy changes alone cannot achieve needed reform. (2) Those who work at the point of care discover quality and safety improvement. (3) Continuous improvement in quality and safety requires the highest possible standard, namely perfection. To settle for less limits achievement. For more information, visit www.prhi.org.

ROOTS publications explore issues central to the advancement of healthcare quality and value. Underlying our goal in preparing this issue of ROOTS is the conviction that policy reform and workforce development are both critical to the creation of a high-value healthcare system; neither can do the job alone. The roll-out of elements of the ACA has already increased physicians responsibility not only for developing new skills in themselves, but also for leading other members of their care team. It's time to give them the educational support they increasingly need. This ROOTS publication is therefore intended to not only compile physician education efforts, but also to inspire conversation, to stimulate thinking and, ultimately, to encourage action.

ACKNOWLEDGEMENTS

Contributing Writers: *Marian Block, MD; Kay Brewer; Kyle Crawford; Karen Wolk Feinstein, PhD; Robert Ferguson; Trish Melvin; Ebony Montgomery; Emily Stahl*

Contributing Editors: *Carla Barricella; Susan Elster, PhD*

Table of Contents

Preface

As a fitting tribute to 15 years devoted to reforming health care, the Pittsburgh Regional Health Initiative (PRHI) publishes this issue of ROOTS on "Reforming Medical Education." At the heart is our conviction that reforms to health professions education are "the next wave of reform" or "the reform that can no longer be postponed."

Here is how we came to that conclusion. PRHI traces its own roots to 1997, before the Institute of Medicine (IOM) published either *To Err is Human* or *Crossing the Quality Chasm*. At the time, PRHI served as a somewhat unwelcome Jeremiah, the prophet that preached a disturbing message: the U.S. did not have the best healthcare system in the world. In measures of safety, reliability, efficiency and outcomes of care, the U.S. healthcare system was seriously flawed.

There was great relief in 2002 when the prestigious IOM, not a hotbed of radicalism, confirmed these pronouncements. Our assumption at PRHI was that things would change rapidly after the problems and the solutions were exposed. Our own quality improvement (QI) method, Perfecting Patient Care℠, had been tested across all settings of care and for a multitude of problems. We knew that Lean quality improvement techniques worked and we knew how to teach them. We anticipated dramatic improvements.

Ten years after the twin IOM reports, study after study reveals that the needle still hasn't moved. Even where new quality improvement methods are being used, they are vastly underused, thinly applied, and focused on "spot removal" or repair work – lone units addressing limited problems. Our healthcare system continues to be the most costly in the world and performs poorly relative to most advanced economies on important population health measures.

At PRHI, we began to talk about a cycle of despair. In the past 15 years, we have witnessed stunning QI results from a small number of health system leaders applying Lean widely. More metrics on comparative performance became transparent and accessible. Widespread and bipartisan agreement that our healthcare system is flawed crossed all boundaries of health professional and hospital associations, federal funding agencies, and all socioeconomic groups. Congress passed the Affordable Care Act, with its plethora of provisions addressing quality improvement. But progress in delivering reliable high performance continues to be painfully slow.

Thinking that aligning incentives with quality would solve the problem, many were quick to jump on a new magic bullet — payment reform. True, the incentive to provide safe, reliable, and highly efficient care runs counter to the volume-rewarding, fee-for-service payment system. But when PRHI staff visited countries where the "managed care" payment system aligned the incentives for quality and cost containment, they still observed many of the same quality, safety, and efficiency deficits.

We were compelled, therefore, to ask ourselves what was missing.

Our conclusion: we are not preparing our health professionals to lead or practice in high performing organizations. Undergraduate business majors get basic instruction in safety science, organizational behavior, systems theory, and economics. They are exposed to management techniques that guarantee reliably high performance. But in healthcare education, particularly medical education, these subjects are optional or mostly nonexistent. It is hard to imagine that anyone would buy an automobile, ride an airplane, or live within 100 miles of a nuclear power plant if the management and frontline workers were not grounded in quality. Would you book a flight if the destination and cost were not clear, if you were assigned a pilot for whom safety precautions and checklists were optional, or if you knew that you had a 20% likelihood of being harmed during the flight?

Not only do consumers take such risks in health care every day, but even healthcare professionals who know that the system can be improved don't have the skills to correct the course. Knowing *what* care to deliver is only part of medicine; knowing *how* to deliver it and *with whom*, is also central.

The good news is that more accreditation bodies, curriculum developers, educators, and policy makers are beginning to call for education reform in the health professions. These are stirrings on which to build. This issue of ROTS is intended to suggest some useful content and curriculum and to highlight best practices. Equally, we aim to pinpoint opportunities and raise expectations about what is possible. While a particular focus of this issue is graduate medical education, many of the examples apply widely to other health professions.

Karen Wolk Feinstein, PhD
President and Chief Executive Officer
Jewish Healthcare Foundation
Pittsburgh Regional Health Initiative

BACKGROUND

The nation's healthcare system is at a crossroads of both extraordinary risk and unprecedented opportunity. With unsustainable growth in spending for medical care on one hand and the momentum to improve the health of the population on the other, Americans can no longer afford to endure a system that woefully underperforms in containing costs and ensuring quality. With a soaring national deficit, an aging population, and health outcomes that rank unfavorably among other advanced economies, every dollar spent in the U.S. on health care must buy services and outcomes appropriate for the money invested. That the current volume-based, fee-for-service system is unsustainable and provides for misaligned incentives has been noted for some time. The need for change was reinforced by the passage of the Patient Protection and Affordable Care Act (ACA) in 2010, fully launching the first widespread health reform since the 1960s.

Essential to the national conversation on reform, however, is the discussion of the need for redesigning medical education to align with the new changes. Patient safety, quality improvement, systems thinking, and work redesign must be universal principles of the new healthcare system. This will require that physicians and other healthcare workers be able to incorporate important new skills into their daily practice: continuous quality improvement, prevention and analysis of medical errors, seamless care transitions, teamwork, evidence-based outcomes, and performance measures related to value and cost.

As natural leaders in health care, physicians have to be prepared to not only participate in the movement for healthcare quality, but to lead it. Physician leaders with these skills can ignite and sustain the widespread, transformational reform required to address and rectify unreliable, unsafe, and inefficient care; and put the healthcare system on the trajectory of financial sustainability and improved population health for years to come. Unfortunately, the current medical education system is not yet deliberate in ensuring that physicians – or other health professionals – have these abilities.

The medical education enterprise is just beginning to venture beyond its traditional emphasis on conveying diagnosis and treatment skills, to meaningfully integrating these new elements into clinical curricula. A select number of undergraduate programs, medical schools, and residency programs have begun to emphasize

Accreditation Council for Graduate Medical Education's (ACGME) sixth core competency outlines the six expectations of physicians for learning systems-based practice. The other competencies can be found on pages 18-19.

Systems-based Practice:
Residents must demonstrate an awareness of and responsiveness to the larger context and system of health care, as well as the ability to call effectively on other resources in the system to provide optimal health care. Residents are expected to:

- Work effectively in various healthcare delivery settings and systems relevant to their clinical specialty;
- Coordinate patient care within the healthcare system relevant to their clinical specialty;
- Incorporate considerations of cost awareness and risk-benefit analysis in patient and/or population-based care as appropriate;
- Advocate for quality patient care and optimal patient care systems;
- Work in inter-professional teams to enhance patient safety and improve patient care quality; and
- Participate in identifying system errors and implementing potential systems solutions.

the importance of quality improvement methods and interdisciplinary teamwork. These pioneering programs are leading the way, proactively developing a foundation for the dramatic change needed in medical education. In addition to notable schools and residency programs, the Accreditation Council for Graduate Medical Education (ACGME), responsible for the accreditation of residency programs in the United States, has begun to outline detailed expectations for systematic change through its Next Accreditation System (NAS), which emphasizes the achievement of concrete milestones for each of six core competencies. Indeed, systems-based practice (competency six) and practice-based learning and improvement (competency three) requirements are both included in NAS as necessary components to residency programs. As these changes indicate, the time has come to align the goals and outcomes of medical education with the needs and direction of the nation's healthcare system and workforce.

The Pittsburgh Regional Health Initiative (PRHI) has long led change in health care by educating physicians, nurses, and other healthcare workers in quality improvement methods. As an independent catalyst for quality improvement and one of the first regional consortiums of medical, business, and civic leaders, PRHI's core mission focuses on meeting patient needs and achieving the optimal outcomes that define value in health care. Toward this end, PRHI has trained thousands of health professionals in process improvement with its Lean-based QI methodology — Perfecting Patient Care[SM]. The method has been applied unit by unit and process by process, resulting in dramatic improvements in an array of indicators, from hospital acquired infections to emergency department throughput to inpatient readmission rates. Lean improvement methods have become a key component of improvement strategies for hospitals and care providers in this country and around the world, leading healthcare leaders to seek expertise training for their workers. Organizations, like PRHI, which work to improve the healthcare environment and develop relevant curriculum to prepare workers to focus on value, represent resources for embedding new skills training in medical education.

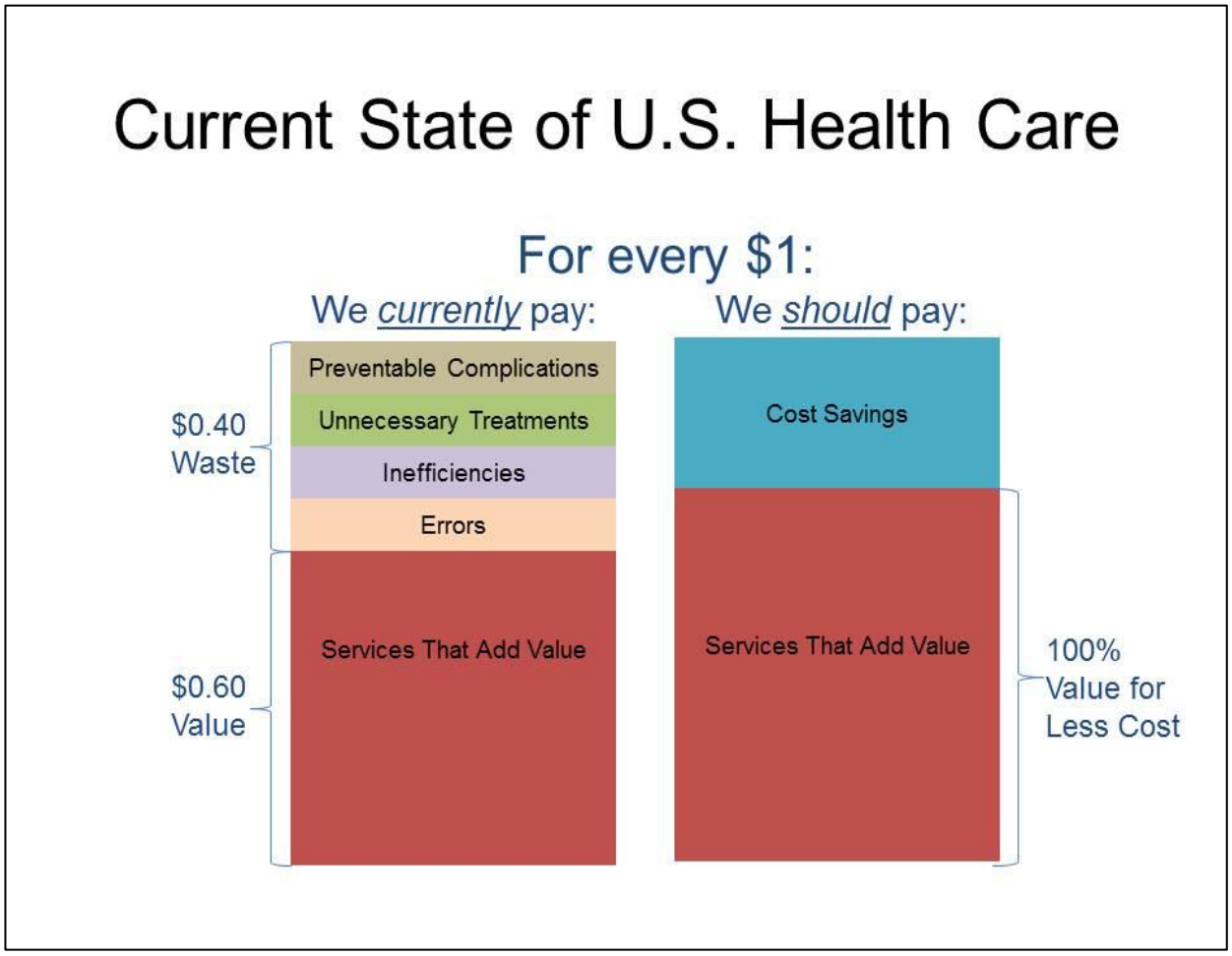
> *"Going to a competency based framework will flip the instructional paradigm on its head."*
>
> Carol A. Aschenbrener, MD
> Chief Medical Education Officer
> Association of American Medical Colleges

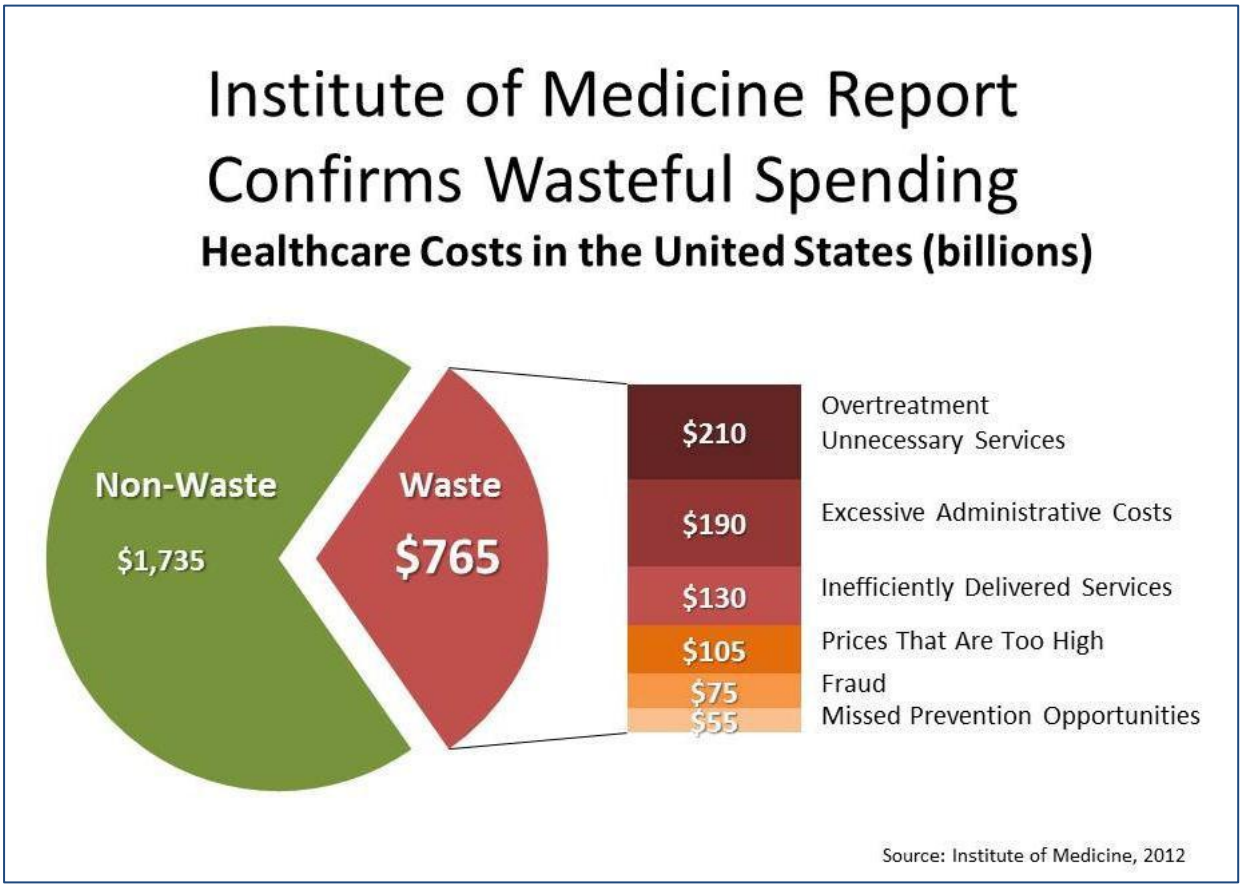
THE CURRENT STATE OF THE SYSTEM

More than ten years ago, the Institute of Medicine (IOM), in its seminal reports *To Err is Human* and *Crossing the Quality Chasm*: *A New Health System for the 21st Century,* exposed the quality and cost concerns that permeate the U.S. healthcare system. Major flaws of the system, noted by the IOM, included its focus on volume as opposed to value, discontinuity of care, lack of transparency and reporting, and unnecessary utilization of tests and procedures (often driven by fear of malpractice liability).

Substantial waste; increasing and unsustainable costs, even as many remained uninsured; low-quality and — in too many cases — unsafe care; were all indications that major healthcare reform was long overdue.

There is enormous opportunity to reduce waste and increase the safety and efficiency of the U.S. healthcare system. In order to see effective change in the amount of waste, physicians will need to acknowledge their role in the problem and be a part of the solution. They must learn early in their education of the importance of engagement in quality improvement and patient safety, addressing the problems of over and under treatment of patients and other forms of waste.

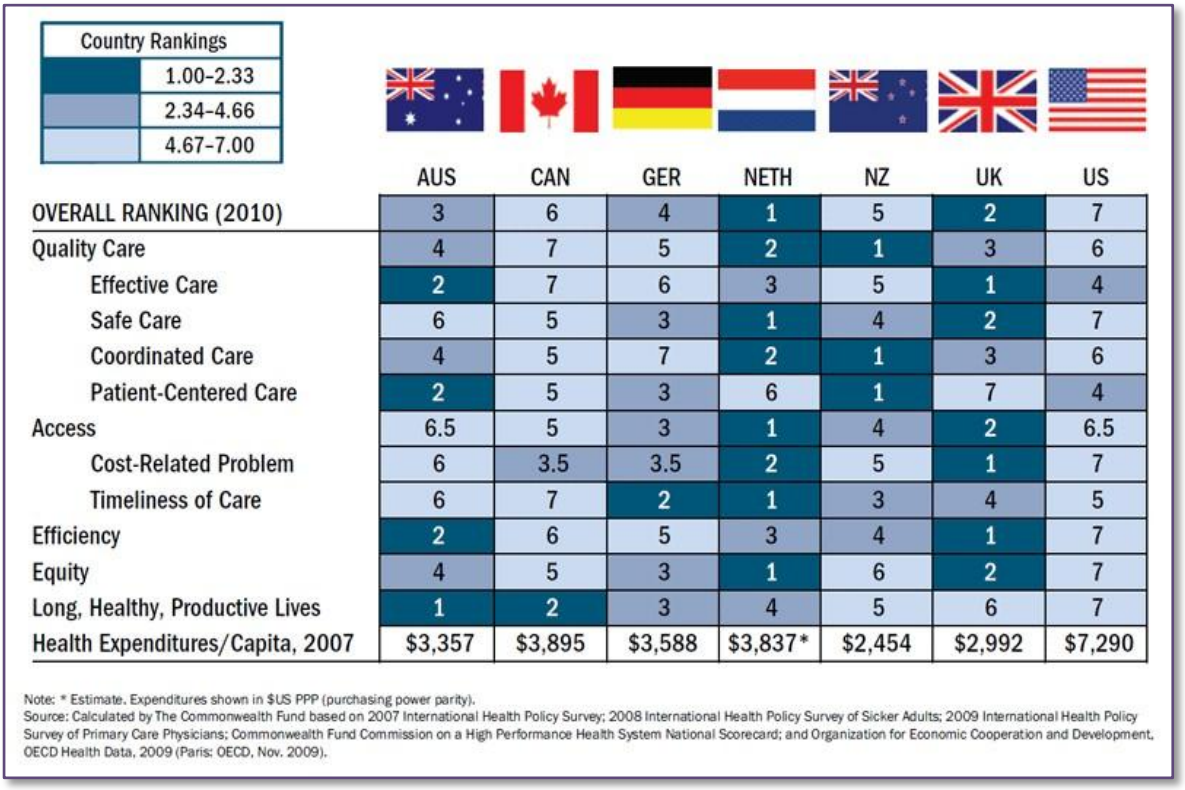




Notwithstanding the dozen years since the publication of the IOM reports, it is well known that the U.S. still lags behind other industrialized nations in terms of quality care and health outcomes. As can be seen in the table on the following page, compared to six other developed countries, the U.S. continues to spend more per capita on health care while ranking below its peers along key quality, access, and efficiency dimensions. Recent projections estimate that between 2009 and 2019, average annual health spending growth is anticipated to exceed the growth in the overall economy (6.1% to 4.4%),[i] yet we have little evidence that better outcomes will result from that increase. With current healthcare spending equaling 18% of GDP and rising, this level of spending growth is unsustainable.[ii] Despite this huge expense, services remain siloed, providers are not given access to information that would allow for more coordinated care, and payments continue to be rendered for services resulting from potentially avoidable medical errors.

In fact, the level of waste in the system is extraordinary. According to the latest IOM report (September 2012), estimates of waste approach $750 billion.[iii] At this level of spending, healthcare waste exceeds the 2009 budget for the Department of Defense by more than $100 billion. While there are methodological issues to consider among the different estimates from credible sources, figures are remarkably consistent and signal the potential for increasing quality as a form of reducing cost.

Ranking of seven nations' healthcare systems on quality of care and outcomes.[iv]



Country Rankings	
	1.00–2.33
	2.34–4.66
	4.67–7.00

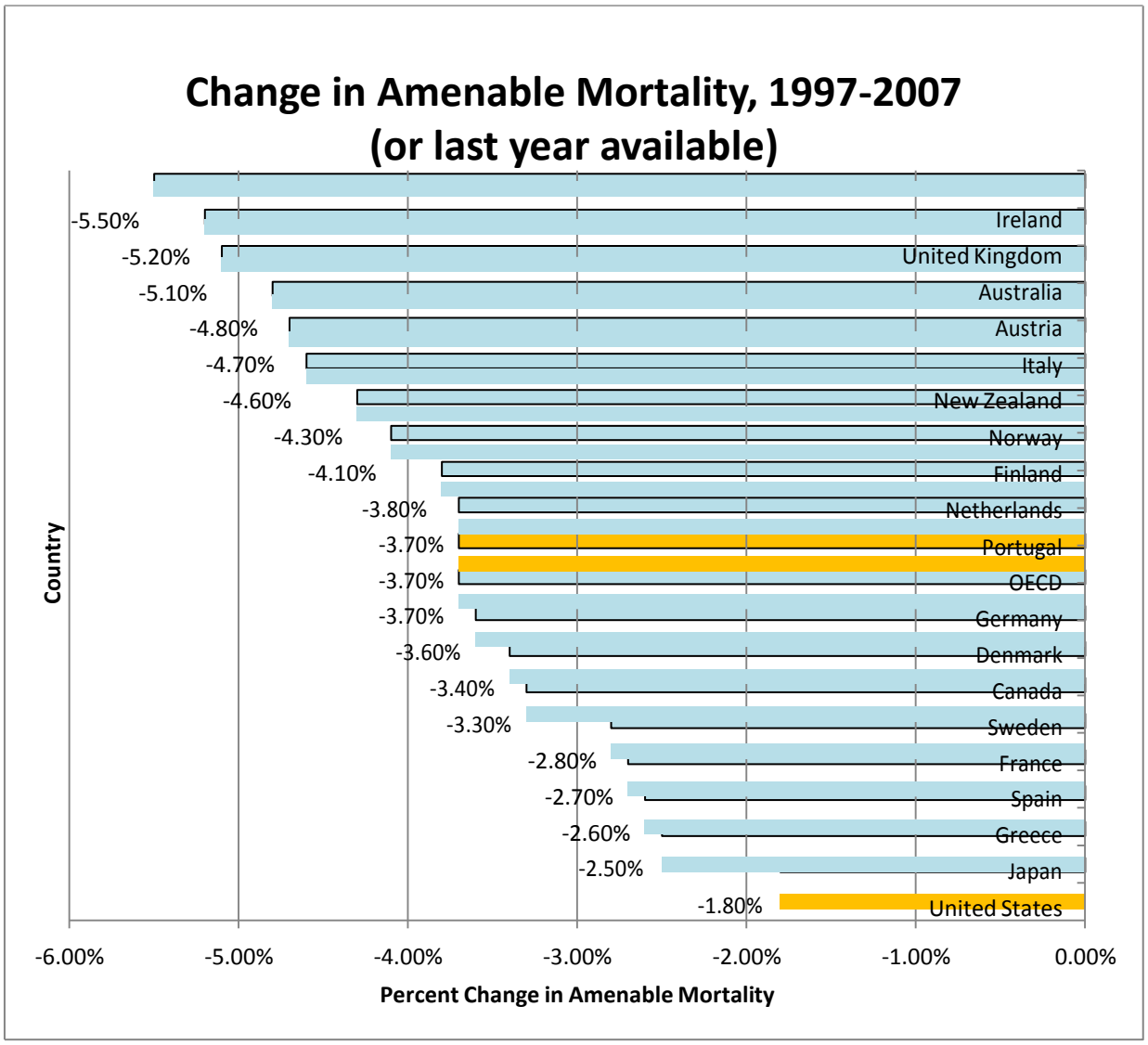
	AUS	CAN	GER	NETH	NZ	UK	US
OVERALL RANKING (2010)	3	6	4	1	5	2	7
Quality Care	4	7	5	2	1	3	6
Effective Care	2	7	6	3	5	1	4
Safe Care	6	5	3	1	4	2	7
Coordinated Care	4	5	7	2	1	3	6
Patient-Centered Care	2	5	3	6	1	7	4
Access	6.5	5	3	1	4	2	6.5
Cost-Related Problem	6	3.5	3.5	2	5	1	7
Timeliness of Care	6	7	2	1	3	4	5
Efficiency	2	6	5	3	4	1	7
Equity	4	5	3	1	6	2	7
Long, Healthy, Productive Lives	1	2	3	4	5	6	7
Health Expenditures/Capita, 2007	$3,357	$3,895	$3,588	$3,837*	$2,454	$2,992	$7,290

Note: * Estimate. Expenditures shown in $US PPP (purchasing power parity).
Source: Calculated by The Commonwealth Fund based on 2007 International Health Policy Survey; 2008 International Health Policy Survey of Sicker Adults; 2009 International Health Policy Survey of Primary Care Physicians; Commonwealth Fund Commission on a High Performance Health System National Scorecard; and Organization for Economic Cooperation and Development, OECD Health Data, 2009 (Paris: OECD, Nov. 2009).

For decades, health care in the United States has followed the implicit notion that more medical care — in the form of tests, prescriptions, or otherwise — is better. This philosophy is underscored by the fee-for-service reimbursement structure that pays separate providers for each service, regardless of its quality or outcome. In addition to its impact on costs, such a structure can compromise patient well-being as well. For patients with multiple chronic conditions who typically rely on multiple providers for care, several deleterious outcomes may result, including the development of separate treatment plans, the provision of contradictory treatment advice, unnecessary tests and procedures, duplicate or contraindicated medications, and disconnected and fragmented disease management.

In addition to the excessive waste and unsafe conditions that these issues can cause, because the fee-for-service reimbursement incentivizes volume of care rather than value, there is enormous pressure for physicians to demonstrate productivity by seeing more patients, shortening visits, restricting time for comprehensive reviews of their patients' health, and ordering more tests to compensate for shorter patient visits.[v] The U.S. continues to fall well below its peers in measures of population health;[vi] and, amenable mortality (one measure of preventable death) has historically not only lagged behind most other developed countries, but has improved much more slowly than others as well (see graph on page 6). By rewarding volume, the system incentivizes physicians to work faster, but not necessarily better. Providing more time-consuming, comprehensive, and preventive care is, therefore, not prioritized. Moreover, methods that would help physicians deliver care more efficiently have not been part of physicians' professional tool kit.

Comparison of the Decrease in Preventable Deaths (amenable mortality) Over Time in OECD Countries.[vii]



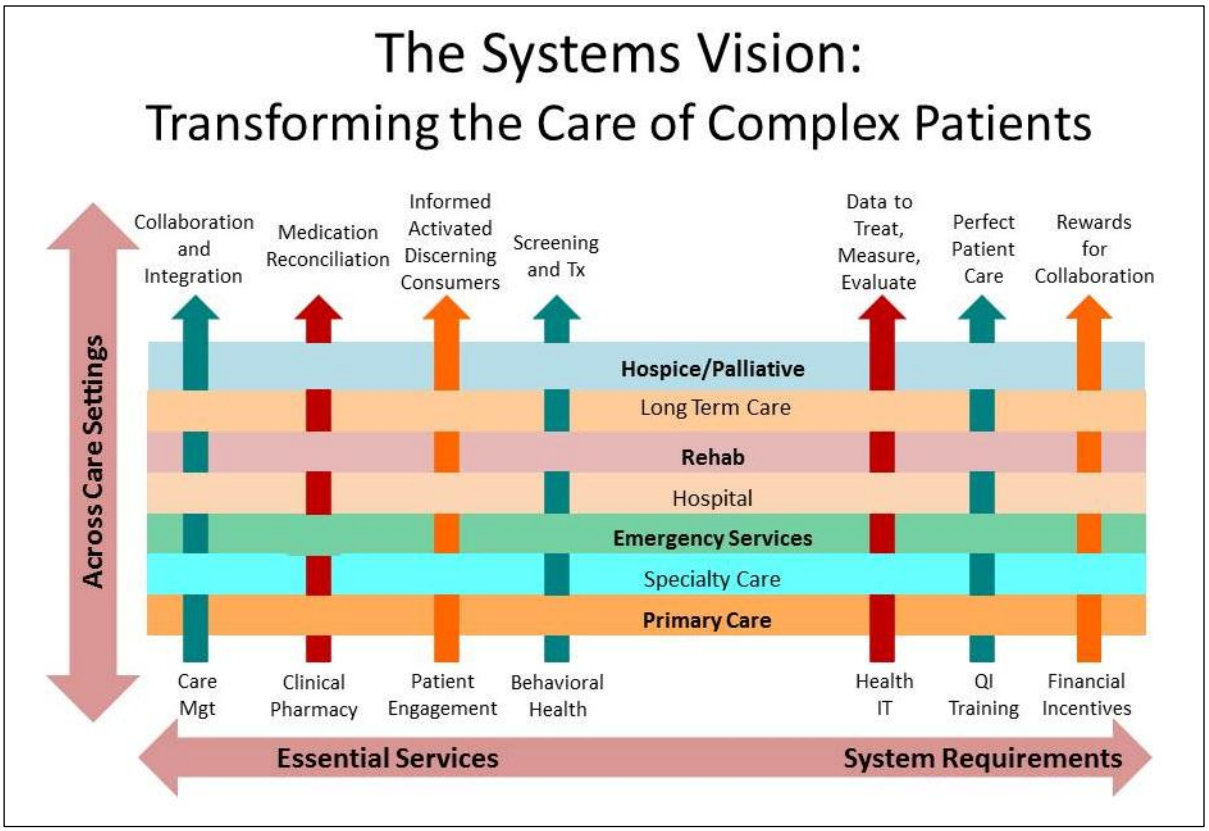
HEALTHCARE REFORMS and THE CHANGING ROLE OF PHYSICIANS

In recent years, the poor performance of the U.S. healthcare system has risen to the top of the political agenda, with recognition that its current state is not sustainable and that growing healthcare costs are affecting all other public priorities and overall economic growth. The 2010 Affordable Care Act (ACA) begins to address some of the systematic, long-standing problems identified years ago by the IOM. As a large scale, federal health reform effort, the ACA implemented immediate fixes to some inefficiencies and perverse incentives, and initiated pilot testing of potential long-term solutions. Importantly, it also helped to clarify national healthcare aims and standards for providers, physicians, insurers, and consumers. The ACA has been a catalyst, giving needed momentum to the development and implementation of new care delivery models. Practicing medicine within the environment that the ACA is creating will require that physicians possess new skills for working in environments that promote both cost and quality transparency, for working across care settings, monitoring and incentivizing performance, and emphasizing the importance of systems-based practice and practice-based learning and improvement (two of the core ACGME competencies being implemented in residencies across the country that would allow physicians to prepare for practicing in and leading the development of a reformed system).

PRHI has a long history of working with physician leaders in organizations to facilitate change and improvement. The Jewish Healthcare Foundation, in collaboration with the Allegheny County Medical Society and Pennsylvania Medical Society, launched the Physician Champions program in 2005. The program gave physicians who aspired to transform care in their organization the tools and support they needed to do so. In those instances where we do see great performance in health care, change is often driven by physician leaders who love and embrace quality, safety, and transparency; who respect the work of their teams; and who understand the importance of data and measurement in tracking improvement and making the business case for quality and safety.

Transforming the Care of Complex Patients

PRHI has developed a vision of care for complex patients that serves as a valuable model for conceptualizing the interconnected, coordinated system to which health care needs to move. The model identifies essential services and system requirements that should exist across care settings. Medical education has not yet evolved to comprehensively integrate these driving forces and physician leadership will be essential for this vision to become reality.



Many healthcare organizations, perhaps anticipating changing incentives triggered by the ACA, have taken it upon themselves to enhance the safety, reliability, and value of the care they provide. More practices are adopting models like the Patient-Centered Medical Home (PCMH), which emphasizes continuity of care and proactive medicine, and insurers are beginning to attach financial rewards to such innovations (see the section on ACA – page 38). The incentives will be a striking contrast from past system principles with a shift away from patient volume and fee-for-service payments toward patient-centered, high-value, high-quality care at a reasonable cost.

Despite apparent interest in new models of care delivery, many provider organizations encounter barriers in their improvement efforts because skills necessary for achieving high performance are not widely present in the workforce. Although the new models are structured to encourage improved outcomes and cost containment, their execution will be difficult to achieve if physicians and healthcare workers are not given the skills to operationalize them. In fact, without systematic focus on the development of new workforce skills, the ACA may fall short of expectations. Many promising models and reforms have emerged in the past, yet failed to succeed in part due to physicians' inability to manage and adapt to the changes. As PRHI has learned from 15 years of improvement work in health care, in order to drive improvement and systems change, strong leaders must be fully engaged in the change process. While all healthcare workers are needed for continuous improvement, clinical leaders, especially physicians, are integral drivers of change. Their respect, buy-in, and efforts are needed to catalyze improvements by the whole team, especially because the resistance of a few physicians can derail all efforts.

Physician Champions, January 2008

At issue is whether physicians have the skills necessary to spearhead the comprehensive changes required and encouraged by the ACA (more detail on ACA-driven changes can be found on page 38). A review of physician education programs suggests, in fact, that they do not. In order to rectify this situation, doctors will need additional training. ***Without a skilled physician workforce trained to lead and implement these reforms, the potential for quality and safety to improve — and for cost reductions to be realized — will be limited***.

By working closely with physicians in quality improvement and transformation work, PRHI has developed a clear understanding of the physician's role in leading and managing successful organizational change in health care. In order to actualize the reforms' potential, physicians must understand the socio-cultural dynamics of healthcare organizations and know how to deploy their valued human capital in the most beneficial ways. Although high-value care is the result of a combination of factors, including teamwork and system structure, physicians are often the most effective agents for establishing and reinforcing a culture of quality — making it crucial that they are prepared to lead the transformation.

THE SKILLS GAP

The world in which physicians practice is rapidly changing. In order to ensure that future physicians can maximally function in this new world, medical education will need to adapt at an equal pace. Indeed, a recent study by The Commonwealth Fund found that 20% of Accountable Care Organizations (ACO) or planned ACOs will be physician-led and 51% will be a joint venture between physicians and hospitals,[viii] underscoring the emerging need to prepare physicians for the changing environment. In this section, we provide detail on some of the skills emerging as critical to physician performance, and ultimately to healthcare safety, efficiency, and effectiveness.

Technology changes, often accompanied by regulatory changes, have meant that physicians need a broader set of skills to complement their clinical expertise. The changes taking place will impact those who are already in their professional careers, as well as those preparing to enter the field. For example, many practicing physicians have had to transition their practices from paper files to electronic health records (EHRs). Emerging technologies will only continue to play an increasing role in the healthcare system.

Team work and patient engagement skills have also become increasingly important. While physicians represent a core component of health care, and often are default leaders, they must not be thought of as autonomous actors. They practice within organizations and communities with particular resources, and provide care to patients with varying levels of insurance, language skills, access, and more. It is not solely clinical knowledge that is needed to best care for patients; it is also a physician's ability to guide patients toward improved health by ensuring their comfort and safety during the provision and coordination of services. Core medical knowledge is put to its best use not only by explicitly integrating an interdisciplinary team in care provision, but also by leveraging complementary provider skills, such as cultural competence, that encourage positive outcomes for patients by respecting their history, unique situation, and potential.

"Having classes in QI to fix other people's work doesn't work. Students must be immersed in real-world problem solving in their own context."

Bruce Block, MD
Chief Medical Informatics Officer
Pittsburgh Regional Health Initiative

One example of how a broader set of skills can potentially improve patient outcomes — which will come with financial incentives under new reforms — can be seen by reviewing a notoriously frustrating aspect of the physician experience: low levels of patient engagement in improving health. In the past, reimbursement was not linked to whether or not patients were engaged in their care or improved their health. As new reimbursement structures are instituted, physicians and the entire healthcare team will be held more responsible for producing positive patient outcomes. Stern exercise of physician authority is not likely to produce the results that are needed. Rather, improved patient engagement and outcomes will likely be the product of enhanced communication skills, such as motivational interviewing, which can recognize the needs and desires of patients in the pursuit of

improvements in health. Without ensuring that physicians possess a skill for overcoming low levels of patient engagement, new reimbursement models may reduce payment to providers, but not produce the intended patient outcomes. In order to prevent the visionary reforms from breaking down at the point of care, physicians will need to be taught to employ new skills.

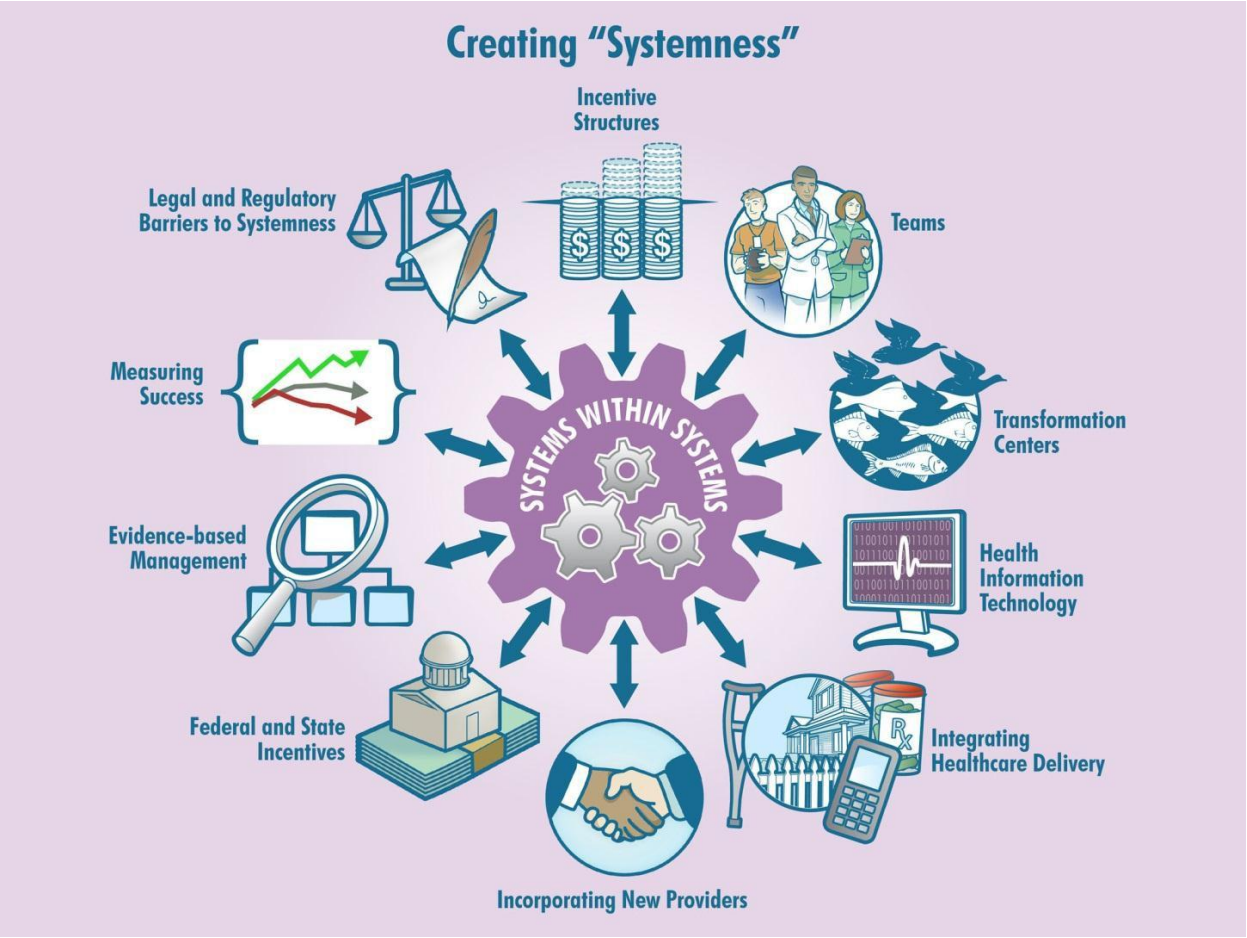
Leading quality improvement efforts in health care require a unique type of expertise, one that is not traditionally a component of physician education programs. Change processes must be carefully managed, designed to produce short-term and long-term "wins," and reinforced regularly. They also must be supported by organizational or team leaders. PRHI has found that physician buy-in is critical to the development, implementation, and success of quality improvement efforts. Supportive physicians can garner additional resources and foster a culture of learning. However, when physician buy-in is absent, quality improvement efforts can be stopped in their tracks.

> "Americans would be better served by a more nimble health care system that is consistently reliable and that constantly, systematically, and seamlessly improves."
>
> IOM Report, Sept. 2012

To achieve reform in care delivery, physician education must accommodate a set of realities:

- Though interdisciplinary teams are vital to high-value care, physicians will likely continue to function as the leaders of care teams and must utilize strong facilitation and leadership skills.
- Processes must be redesigned and continually refined to improve patient care and experience.
- Strategies for improving outcomes for specific patient populations require an enhanced ability to utilize and analyze data from EHRs.
- The complexity of diseases (their diagnoses and treatments) will benefit from decision-making technology that identifies the most appropriate evidence-based care for a given patient.
- The separate assessment and care of behavioral and physical needs will shift to more coordinated, team-based, interdisciplinary health services.
- Coordinated care extends beyond the walls of a practice to include transitions of care between separate facilities — hospital and nursing home, for example — and across settings.
- Healthcare teams, including physicians, will develop more comprehensive understanding of the human service network in their area, as well as closer relationships with those providers, to tackle the social determinants of high utilization.
- Health information technology (HIT) will strengthen a more networked care environment for patients; health professionals will use the technology for more meaningful quality improvement.
- Practices will be pressured by new value-based reimbursement practices to increase coordination to improve patient outcomes.

Physicians have been instrumental in leading transformative demonstrations sponsored by the Pittsburgh Regional Health Initiative. Physician leaders have successfully tackled such problems as eliminating healthcare-acquired infections (from central line to MRSA to C diff to ventriculostomy) and reducing frequent hospital readmissions for patients with COPD and HIV/AIDS. Efforts to bring meaningful conversations about options at the end-of-life to patients and families were also physician-led. Working Hearts, a JHF and PRHI initiative to improve the care of women with heart problems — as well as to prevent such problems in the first place, benefitted greatly from the physician champions who supported the effort. Chief Medical Officers (CMOs) at ten local Federally Qualified Health Centers provided oversight to their teams to achieve recognition as Patient Centered Medical Homes. And hospital CMOs are working with PRHI to explore a new Primary Care Resource Center concept at area hospitals.



(Source: www.ecri.org/2012 ECRI Institute Conference Graphic)

THE NEED FOR THE OVERHAUL OF MEDICAL EDUCATION

The passage of the ACA demonstrated a national recognition that in order to ensure health care is safe and affordable, dramatic improvements to the payment structure, application of medical data, level of collaboration, and more, are necessary. The one glaring oversight in the national discussion around these new reforms, however, has been the relative lack of emphasis on redesigning medical education in step with changes to the field. Though dynamic and complex, the effective functioning of a health delivery system is, to an important extent, defined by physician behavior. Medical education dedicated to producing generations of physicians operating as solo entities misses the mark of meaningful healthcare reform.[ix] We cannot have a safe and cost-effective system if the pieces of the system are disconnected.

The existing literature identifies a number of specific drivers of medical education reform:

- Emphasis on transparently high-quality, high-value, and affordable care will require physicians to approach their role and apply their skills in new ways[x].
- Knowledge, skills, and values needed for improving population health and for continuous delivery system improvement will need to be taught throughout medical education in order to provide care that fits within a broader context of health and health care[xi].
- New payment models offer providers support to improve care if they accept accountability for overall cost and quality[xii].
- Interdependence of primary care, public health, and specialty care will require closer collaboration across medical facilities and require stronger inter-professional understanding[xiii].
- Evidence- and outcomes-based medicine demands physicians understand health information technology so they are able to attain rapid feedback to monitor the care provided to their patient population[xiv].
- The roles of non-MD frontline providers are expanding to allow them to operate at the top of their licenses in team-based primary care[xv]. This will change the MD role.

A 2007 study by the Council on Graduate Medical Education stated that "programs are not uniformly educating residents/fellows with all of the required skills to enable them to meet the array of future healthcare needs of their patients, nor the future needs of the population."[xvi] And, although efforts are being made by several medical schools and residency programs to integrate interdisciplinary education and research into medical education for the purpose of improving healthcare quality and patient safety (see "Making Strides in Reforming Medical Education" starting on page 18), change has been slow.

A history of the calls for changing medical education by various stakeholders is instructive (see Timelines starting on page 38).

Today, more organizations have been raising concern about the need for medical education to adapt its approach. Beginning at the application level, changes to the Medical College Admissions Test (MCAT) approved by the Association of American Medical Colleges (AAMC) will build on the test's emphasis on natural sciences to include "a new section on the psychological, social, and biological foundations of behavior" which expands the type of knowledge aspiring physicians will need to understand from an early stage.[xvii] The Accreditation Council for Graduate Medical Education's (ACGME) systems-based core competencies and their Next Accreditation System (NAS) have moved from standards which were noted as being vague to standards with clearly outlined tasks necessary to accomplish in order to achieve competency.

At the funding level, the Medicare Payment Advisory Commission's (MedPAC's) proposal that Medicare's financing of graduate medical education be contingent upon the achievement of certain educational objectives and quality standards demonstrates a shift towards outcomes-based funding, to which future physicians will, of necessity, adapt.[xviii] Each of these demonstrations of major medical education institutions actualizing their commitment to preparing future physicians to best operate in this new environment are notable efforts to incorporate quality and safety into undergraduate medical education and residency training.

The Fellowship Programs

PRHI and JHF offer fellowship programs that are designed to engage future physicians and other health professionals in the work and conversation of improving health care. Through discussion and teamwork with their peers in other professions, fellows are able to broaden their understanding of, and expand their skill sets in, patient safety and quality improvement.

Preparing for Team-based Care

The current model of medical education, which does not incorporate many of the changes discussed above, prioritizes biological science while limiting exposure to complementary healthcare issues, such as health policy, patient safety, social determinants of health, interdisciplinary learning, and quality improvement. Consequently, physicians may enter the workforce with only a limited understanding of the other health professionals with whom they will be working. Further, they may undervalue external factors affecting health outcomes, such as patient engagement, costs, and cultural respect.

In developing new curricula, multiple absent components could be addressed simultaneously. Interdisciplinary education with schools of social work or public health, for example, could provide valuable exposure to health policy and socio-economic factors. Similarly, conducting QI projects with other professions during residency could strengthen collaboration, while simultaneously improving care processes. Patient safety techniques usually require a team approach to be effective.

Since widespread integration of these opportunities has not yet occurred, organizations operating outside of academia, such as PRHI, have developed a number of extra-curricular fellowships to provide small, but comprehensive experiences in patient safety, quality improvement, and teamwork. The impact of these programs is restricted by the limited number of future health professionals involved in them, as well as by such programs' short time period. However, the fellowship programs offered by JHF and PRHI have seen remarkable growth in popularity, with the Jonas Salk Fellowship doubling in size, indicating an increased interest in health reform and advocacy by young healthcare professionals. Clearly, medical students and residents are interested in leading reform and are seeking opportunities to enhance their education.

The Patient Safety Fellowship *was created with the goal of growing the healthcare leaders of tomorrow who can lead rapid change and discovery; leaders who will apply an interdisciplinary approach to practicing and continually improving health care and patient safety. At the core of the program is teaching hands-on Lean healthcare process improvement methodology. Throughout the fellowship students are taught to understand systemic problems through observation at the point of patient care, refine team-based approaches to solving problems, redesign work based on a systems perspective, and analyze errors for informative value. The Fellowship provides graduate level students with hands-on experience in applying Lean methods to real-world problems in healthcare organizations.*

The Jonas Salk Fellowship *is a unique educational program that brings together students from a diverse array of health-related graduate programs, ranging from medical residents to MD, RN, OT, PT, PharmD, MPP, MPH and health law students, to discuss paramount issues confronting health care. Additionally, this seminar series delves into the leadership traits and change processes that allow for significant improvement. Presentations from regional and national leaders complement discussions, and a set of challenging readings spurs critical analysis. The Jonas Salk Fellowship permits a high-level analysis of health system problems and offers a more comprehensive perspective than "single degree" graduate programs.*

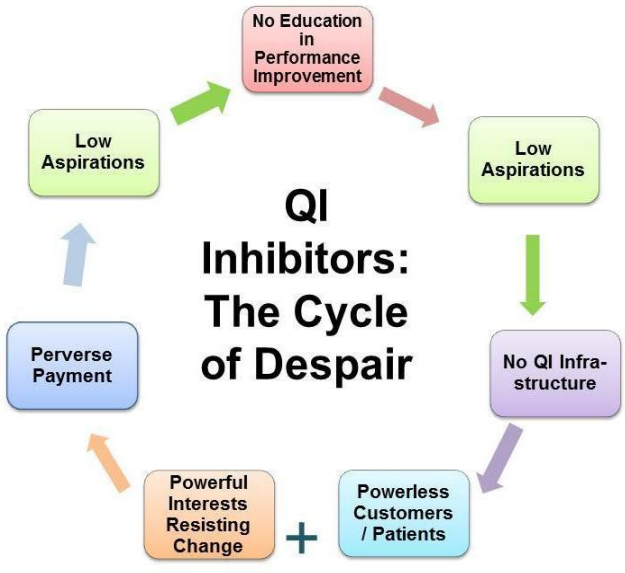
The Quality Improvement Meets Information Technology Health Innovators Fellowship *is a new fellowship designed to foster healthcare quality improvement through innovation and entrepreneurship by developing health professionals skilled in applying data analysis and information technology to real-world healthcare problems. Fellows work in small teams, and with subject matter experts over five sessions, develop novel solutions to pressing issues in health care. Each session also includes guest speakers from the health industry who have successfully translated data into large-scale solutions. This learning is complemented by hands-on, rapid results exercises designed to challenge groups to assess problems and develop actionable resolutions within a challenging timeframe. In order to encourage diverse and challenging perspectives to solving problems, each cohort consists of an inter-disciplinary training group, including clinicians, entrepreneurs, researchers, techies, designers, and more.*

Improving the Capacity to Measure and Improve Quality and Patient Safety

One of the major barriers to instituting necessary changes stems from a lack of faculty experienced in quality improvement and patient safety. The limited spread of these topics means that no systematic approach exists for instilling these skills into medical practitioners. In fact, pressures related to gaining tenure may actually increase the prioritization of clinical research, which develops a culture that perpetuates a clinical emphasis. It has been reported that trainees' exposure to role models related to the disclosure of medical errors has a large impact on their attitudes towards patient safety, and that reducing their exposure to negative role models may improve the likelihood they will report errors in the future.[xix] If medical education is to prepare future physicians for new requirements, it will have to strengthen existing faculties' familiarity with the tools and concepts of patient safety and quality improvement. [xx]

Impeding progress in developing QI competencies is an issue for faculty concerned that time is already limited for teaching future physicians a wealth of information related to the hard sciences.[xxi] In order to augment the existing curriculum with patient safety and quality improvement techniques, medical students and residents participate in extracurricular fellowship programs.[xxii] For these concepts to be internalized, however, they will need to be integrated throughout existing coursework, using a variety of methods, and conveyed by faculty as important to the practice of medicine.[xxiii] For instance, programs could emphasize quality improvement by highlighting noteworthy examples in health care, developing aptitude in the methodologies, and creating opportunities for designing improvement projects at participating clinics.

Despite the numerous barriers to meaningful reform of the medical education curriculum and methodologies outlined above, a number of undergraduate and residency programs have instituted notable changes to the traditional model in order to prepare physicians to practice in new ways. These models will be explored further in this publication.



MAKING STRIDES IN REFORMING MEDICAL EDUCATION

In 1999, the ACGME, which approves all residency programs in the United States, in conjunction with the American Board of Medical Specialties, established six core competencies that all residents must have before practicing medicine independently. For many years, these competencies were left up to interpretation by individual programs and were loosely enforced. Recognizing the weakness of this design, in 2009 the ACGME began the process of restructuring that tied these competencies to clearly defined training outcomes. This more exacting approach is called the Next Accreditation System (NAS) and emphasizes milestones to be achieved at different levels of education, from the novice physician (graduating medical student) to the advanced (specialist resident or practicing physician). [xxiv] The goals of the NAS are to prepare physicians to practice in the 21st century by enhancing their abilities in the peer-review system, facilitate the ACGME's progress toward educational-outcome based accreditation, and alleviate the burden of the current structure and process-based approach in health care.

Business schools and industry have long expected students to learn organizational theory and have introduced QI methods in the classroom. The Practice-based Learning and Improvement milestone and the Systems-based Practice milestone will emphasize this concept in the medical education continuum, recognizing that physician leaders must be both clinically prepared and able to drive improvement and work within the system.

The six ACGME core competencies are as follows:

1. ***Patient Care:***
   Residents must be able to provide patient care that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health.
2. ***Medical Knowledge:***
   Residents must demonstrate knowledge of established and evolving biomedical, clinical, epidemiological, and social-behavioral sciences, as well as the application of this knowledge to patient care.
3. ***Practice-based Learning and Improvement:***
   Residents must demonstrate the ability to investigate and evaluate their care of patients, to appraise and assimilate scientific evidence, and to continuously improve patient care based on constant self-evaluation and lifelong learning. Residents are expected to develop skills and habits to be able to meet the many goals.
4. ***Interpersonal and Communication Skills:***
   Residents must demonstrate interpersonal and communication skills that result in the effective exchange of information and collaboration with patients, their families, and health professionals.
5. ***Professionalism:***
   Residents must demonstrate a commitment to carrying out professional responsibilities and an adherence to ethical principles.

6. ***Systems-based Practice:***
   Residents must demonstrate an awareness of and responsiveness to the larger context and system of health care, as well as the ability to call effectively on other resources in the system to provide optimal health care. Residents are expected to:
   - *work effectively in various healthcare delivery settings and systems relevant to their clinical specialty;*
   - *coordinate patient care within the healthcare system relevant to their clinical specialty;*
   - *incorporate considerations of cost awareness and risk-benefit analysis in patient and/or population-based care as appropriate;*
   - *advocate for quality patient care and optimal patient care systems;*
   - *work in inter-professional teams to enhance patient safety and improve patient care quality; and*
   - *participate in identifying system errors and implementing potential systems solutions.*[xxv]

NAS will be officially implemented in selected residency specialties by July 2013, and in the remaining residency programs the following year. By achieving the milestones associated with each competency, residents integrate the tools they have learned in the classroom in their work environments so they can safely and effectively practice without supervision. Specifically, achievement of the Systems-based Practice (SBP) competency is measured by working effectively with other care providers and within different settings, improving healthcare delivery, and providing cost-effective care for patients and populations. SBP is regarded as one of the most important, yet most complex, of the ACGME competencies because it incorporates classroom medical education into practice in the hospital or outpatient setting. The SBP competency complements the Practice-based Learning and Improvement (PBLI) competency, which requires the resident to evaluate their care of patients, audit scientific evidence, and find ways to continuously improve patient care in partnership with other healthcare professionals. Incorporating aspects of both of these competencies into well-defined milestones will provide a path for developing a workforce that can facilitate and lead to a more efficient and safe healthcare system.[xxvi] The milestones for both the SBP and PBLI competencies can be found in the table on the following page.

There is already evidence of the adoption of the competencies, namely SBP and PBLI, into graduate medical education, undergraduate medical education, and even pre-medical undergraduate education. Over time, programs such as these will contribute to a more seamless transition across the medical education continuum and lead to the development of physicians who are ready to practice and lead in the changing environment. Though programs vary among universities in format and timing, many have found success in their approaches to incorporate PBLI and SBP into their curriculums, several of which are detailed here. Furthermore, other healthcare organizations — like healthcare systems pioneering QI programs, regional health improvement collaboratives (RHICs) and foundations — are also actively engaging physicians in quality improvement and can offer valuable experience, support, and partnership in advancing the conversation on integrating these principles into medical education.

PBLI and SBP Competency Milestones[xxvii]

	PBLI	SBP
Level 1 (typical graduating medical student)	• Describes basic concepts in clinical epidemiology, biostatistics, and clinical reasoning • Categorizes the study design of a research study	• Can describe systems theory and the characteristics of high-reliability organizations • Understands the epidemiology of medical errors and the differences between medical errors, near misses, and sentinel events • Can define human-factors engineering
Level 2 (resident during the program)	• Ranks study designs according to their ability to minimize threats to validity and to generalize to larger populations • Identifies critical threats to study validity when reading a research paper or study synopsis • Distinguishes research outcomes that directly affect patient care from other outcomes • Formulates a searchable question from a clinical question	• Reports problematic devices, architecture, and processes to supervisor, institution, or program as appropriate • Illustrates with examples how human-factors engineering promotes patient safety
Level 3 (resident during the program)	• Applies a set of critical appraisal criteria to different types of research, including synopses of original research findings, systematic reviews and meta analyses, and clinical practice guidelines • Critically evaluates information from others; colleagues, experts, pharmaceutical representatives, and patient-delivered information	• Analyzes the cause of adverse events through root-cause analysis • Demonstrates basic usability testing and critique design of devices, architecture, and processes on the basis of principles of human-factors engineering
Level 4 (graduating resident)	• Demonstrates a clinical practice that incorporates principles and basic practices of evidence-based practice and information mastery	• Can compare and contrast failure modes and effects analysis with root-cause analysis as a patient safety tool in health care • Develops content for and facilitates a morbidity and mortality presentation or conference focusing on systems-based errors in patient care
Level 5 (advanced, specialist resident or practicing physician)	• Independently teaches and assesses evidence-based medicine and information-mastery techniques • Can cite evidence supporting several common practices	• Recommends and justifies characteristics of high-reliability organizations to organizational leadership to promote patient safety • Develops and works with multidisciplinary teams to find solutions to patient safety problems

Undergraduate Pre-Medical Education

Implementation of the new NAS milestones and upcoming changes to the MCAT provide an opportunity for undergraduate pre-medical programs to offer competitive, comprehensive training. Well-rounded, dynamic undergraduate programs exist, and exploring the methods these progressive universities have employed could provide a foundation upon which quality pre-medical education can be further developed.

Brandeis University

Brandeis University offers undergraduate students a program called Health: Science, Society and Policy (HSSP), an interdisciplinary program that allows students to study biological, psychosocial, and policy-related aspects of health and health care. [xxviii] Though not specifically a pre-medical program, the BS track fulfills medical school prerequisites, and students of any major may complete an HSSP minor.

This progressive course of study has several components. A set of four core courses is required, covering the diverse but heavily interconnected fields of biology, epidemiology, healthcare law, and sociology. Students also select from an impressive variety of electives spread across three focal areas: Biological Dimensions of Health and Illness, Social and Behavioral Dimensions of Health and Illness, and Health Care Policy and Practice. An experiential learning requirement ensures each student gets real-life experience in practicing PBLI and SBP before graduating. The major is one of the fastest growing on campus.

As medical education moves towards a more comprehensive curriculum to develop physicians with the ability to think holistically about health and healthcare systems, pre-medical programs have an opportunity to provide meaningful training to future physicians. Brandeis is setting the stage for developing undergraduate programs that provide the foundation for development of well-rounded medical students.

The Progression of Physician Education

Undergraduate Pre-Medical Education:
At the undergraduate level, preparation for medical school revolves around fulfilling educational requirements in math, English, and science, while preparing students for the MCAT. Some schools offer specialized pre-medical programs, but students of any major may be accepted into medical school. Undergraduate programs in biology and neuroscience often meet these goals, and many students bound for medical school choose to major in these areas.

Medical School Education:
Medical school lasts four years and traditionally consists of two years of pre-clinical work in the classroom and two years doing clinical rotations in various medical specialties. Schools are increasingly introducing students to working with patients earlier in their programs. Dual-degree programs, like MD/PhD or MD/JD, can also be found at many universities.

Graduate Medical Education:
After graduating from medical school, physicians must complete a residency, during which they train in a medical specialty under the supervision of an attending physician. Residents are matched to programs during the Main Residency Match, a process that takes into consideration the preferences of both residents and residency programs. Residencies vary in length from three to seven or more years, depending upon the specialization of medicine being practiced.

Medical School Education

Much of the current focus of medical school (undergraduate) education is on building the clinical and scientific knowledge of students and placing them into residency programs. The Liaison Committee on Medical Education (LCME) requires no training in safety or quality improvement. Some medical schools, however, recognized the need for change long before the announcement of ACGME's shifting of the residency expectations and are becoming a model for education reform, showing others what is possible.

University of Connecticut School of Medicine

In 2001, the University of Connecticut (UCONN) School of Medicine addressed PBLI and SBP competencies by implementing a continuous quality improvement (CQI) curriculum for second- and third-year medical students. Following extensive training in CQI methods, including courses in QI and seminars around clinical process change and quality measurement, each student was placed into a small group and sent out into one of 24 community-based primary care clinics to complete a real-life diabetes care QI project. Students worked directly with clinic physicians. A study on the pioneer CQI curriculum showed that not only did diabetes care measurably improve, but that both students and mentors gained valuable experience in quality measurement and improvement. [xxix]

> *"Our system's overall goal is to improve care with value defined by the patient. This is our sole overriding strategy. And we measure progress daily, because we are focused on outcomes. The status quo is unacceptable."*
>
> Thomas H. Lee, MD, MSc
> Network President
> Partners Healthcare System
> New England Journal of Medicine
> August 2, 2012

The students in the program not only learned about medical systems, but became active participants in amending medical processes to ensure better care delivery. Ten years later, UCONN's medical school remains devoted to creating physicians literate in QI. The Practice-based Learning and Improvement competency is a one of six key goals in their current curriculum.[xxx]

Dartmouth Medical School

Geisel School of Medicine at Dartmouth is another medical school with a lengthy history of educating their students in principles of QI and the SBP and PBLI competencies. In 2006, the school intensified these efforts, incorporating more robust healthcare systems and improvement coursework into the first two years of training, with the goal of familiarizing students with basic concepts of patient-centered care, QI, and clinical outcomes. [xxxi] An elective practicum program was also created — the Health Leadership Practicum (HeLP) — which allowed students to work in small teams with a site coach and an improvement faculty coach to apply QI measures in local healthcare settings. The practicum resulted in distinct care improvements and gave students a new lens through which to view the care they would provide.[xxxii]

With the introduction of Sciences of the Healthcare Delivery initiative (August 2011), improvement became even more ensconced into the curriculum, spanning all four years of

medical education. First-year students are introduced to fundamentals in safety and QI during case seminars, and examples of positive systems change are incorporated into second-year courses.[xxxiii] Training doesn't stop when students step out of the classroom and into the hospital: hands-on experience and working in multi-disciplinary teams is woven into third-year rotations. More extreme changes are on the horizon. Recognizing the need for a major overhaul in medical education, school leadership has initiated a complete redesign of their educational programs.[xxxiv] Calling on faculty, former and current students, and subject matter experts, this collaborative process can be expected to yield some exciting results. Dartmouth is an example of the direction that medical schools can take to empower physicians for a changing healthcare environment.

Graduate Medical Education

With the ACGME's release of the NAS, graduate medical education is at the forefront of meeting physician workforce needs for the changing environment. As programs rapidly work to adapt to meet the new milestones, several residency programs have already begun to experiment with new methods for teaching the SBP and PBLI competencies. While these changes provide a pathway for others, they are far from comprehensive, and continued transformation will be required to meet new ACGME requirements.

"Medical education is about building a framework for future learning. Post-graduates must prepare for a world where medicine changes rapidly — from technological advances to evolving standards of care. Learning never stops."

Keith Kanel, MD, MHCM, FACP
Chief Medical Officer
Jewish Healthcare Foundation and
Pittsburgh Regional Health Initiative

Dartmouth Medical School Residency

Dartmouth's residency program built the foundation of SBP and PBLI education throughout graduate medical education. In conjunction with MetroHealth Medical Center in Cleveland, Dartmouth-Hitchcock Medical Center invites combined program residents (e.g., medicine-pediatrics or medicine-psychiatry) to participate in a PBLI elective. The PBLI elective requires between four and eight half days per week for a month, which is designed to coordinate with the busy workload of the residents. The aim of the elective is for participants to gain hands-on experience in PBLI by understanding their workplace, collecting and presenting data, and proposing QI interventions. The curriculum combines didactic and experiential learning. Didactic sessions provide the foundations of PBLI and SBP and cover topics including the model for improvement, components of the Plan-Do-Study-Act cycle, methods for identifying areas to change within a process, and approaches to recognizing whether the proposed process changes are successful. The sessions combine pre-reading with interactive discussions to advance the work on the resident's QI project (e.g., reducing needlestick injuries for medical students and residents). An evaluation of the first elective class showed that residents were able to undertake an improvement project, describe their results in a presentation to colleagues, and apply the knowledge in a standardized

evaluation tool — all with a reasonable time commitment from residents, faculty, and sponsors.[xxxv] Programs like this could serve as a model for how to begin to integrate these concepts into residency.

University of Minnesota School of Medicine Residency

Recognizing the potential value of involving residents in their hospital's patient safety and QI efforts, the Graduate Medical Education Committee at the University of Minnesota developed the Systems-based Medical Practice and Learning (SYMPAL) project. SYMPAL consists of several interrelated parts. First, problems in patient care are identified, described, and recorded using a Residents' Survey Instrument. These problems are then posted on the SYMPAL project's website, which other residents can view and offer solutions. Hospital administrators then have 14 days to respond and flesh out steps toward resolving the issue.

Collaboration is further fostered by allowing associated physicians and nurses to comment on and be involved in the problem solving and in providing educational materials about how to teach patient safety concepts and the SBP and PBLI competencies. This program empowers residents to identify and seek solutions to issues, as well as provide an accountability structure and material for faculty; all of which are crucial lessons for other change efforts.The end result is a win-win situation: residents gain SBP experience, patient safety is improved, and the medical center leverages a valuable new resource in the mission to improve quality.[xxxvi]

School of Medicine at the University of Virginia Residency

Through the Institute for Quality and Patient Safety (IQPS) of the University of Virginia, residents and students have access to quality improvement and patient safety programs in different fields of medicine. The residency program exposes internal medicine residents to systems-based practice, practice-based learning, communication, and professionalism in a three-year program using faculty from IQPS.

The program teaches concepts and skills of patient safety and QI through courses such as systems thinking and human factors analysis, root cause analysis, and process mapping.[xxxvii] Residents participate in a series of interactive seminars and projects that are designed to give them the opportunity to practice these new skills with the direction of faculty. The enhancement of the QI curriculum has led to changes in the clinic workflow and the personal development of each resident’s practice to reflect the patient-centered values of the field.[xxxviii]

Alternatively, the IQPS provides a course open to faculty, staff, fellows, and graduates in a program called Quality & Safety Leadership in Academic Medicine (QSLAM). This is an advanced elective course covering topics like Introduction to Quality, Safety & Medical Error; Art & Science: Systems Thinking, Human Factors, Variation & Measurement; Use of Root Cause Analysis; Run and Control Charts; Data Analysis; Managing the QI Process: Leadership, Effective Teams, Business Case for Quality; and Practical Use of QI Tools. The course prepares students to lead his or her own QI and patient safety project and provides the opportunity to do just that in the program.[xxxix]

Stanford University School of Medicine Residency

Stanford's School of Medicine, Department of Medicine, is working with residents, faculty, and staff to incorporate QI and patient safety in practice and in education. In 2009, The Department of Medicine started a project called Stanford 2020: Quality Improvement Team Challenge. The mission was to instruct and encourage residents, house staff, and faculty on systematic approaches to identifying areas of quality improvement at Stanford Medical Center, and designing ways to improve efficiency, clinical outcomes, and patient satisfaction in hopes of breaking the top ten ranking in these areas by the year 2020. The program aims to communicate quality improvement techniques to residents through several didactic sessions and empower them to carry out their own quality improvement projects.

Outside of the Quality Improvement Team Challenge, Stanford also offers internal medicine residents an elective training course called Quality Improvement, Patient Safety and Organizational Change (QI/PS). Throughout this course, the residents engage in directed readings on relevant topics, attend sessions with experienced "QI Champions," and learn about quality improvement projects and processes at Stanford. Residents also have the opportunity to participate in ongoing quality and patient safety activities within the Department of Medicine and Stanford Hospital & Clinics, and offer valuable feedback for the continuation of the projects.[xl]

College of Physicians and Surgeons – Columbia University Residency

Another educational innovator for quality improvement and patient safety is Columbia University Medical Center (CUMC). In 2008, when medical center administrators realized that conveying an understanding of health systems was missing in the training of their internal medicine residents, CUMC pioneered the Health Systems and Public Health curriculum. This program consists of a weeklong didactic curriculum for senior residents, including ten half-day seminars on topics such as health policy and health insurance reform, population health, public health, and preventive health. The course has been rated as "highly valuable to professional development" by the majority of participants.[xli]

Emerging Quality Improvement Leaders

Many prominent healthcare facilities have found ways to incorporate successful and lasting quality improvement measures which can serve as a model for others. These organizations have invested time and resources into making healthcare delivery safer and more efficient. By providing healthcare professionals an environment that is conducive to employee-led QI projects, they become crucial to lowering healthcare costs, ensuring delivery of adequate care and eliminating medical errors. A renowned method of driving sustained improvement is the Lean process improvement methodology known as the Toyota Production System (TPS). Closely related to many quality improvement methods widely used in health care, such as Six Sigma, continuous quality improvement (CQI), and PRHI's own Perfecting Patient Care[SM], Lean is emerging as a gold standard for the industry.

PRHI was one of the first organizations to adopt and apply Lean within the healthcare sector. Lean principles deliver and sustain improvement in many organizations and industries throughout the world. Its aim is to minimize waste to maximize value for the customer. Since the early adoption of Lean into health care, systems such as ThedaCare, Denver Health, and Virginia Mason have also fostered the SBP and PBLI competencies within their organizations through their use of Lean methods. Additionally, all of these systems have strong physician leadership that drove much of their improvement — a notable component of their transformation. With organizations like these putting the core competencies into practice, it is easy to see how partnerships and innovative reforms can be reached in medical education.

As the healthcare education system strives to reform the way it prepares physicians to practice, it is helpful to keep a vision for what reforms are striving to do. The xylophone above illustrates a vision for how to transform healthcare organizations, like those in the following pages, to reach goals identified by the ACGME sixth competency of SBP. According to the ACGME, "systems-based practice is the least understood and possibly most potent of the six competencies. SBP addresses the skills residents need to acquire to navigate their complex and multi-disciplinary environment."[xlii]

ThedaCare and ThedaCare Center for Healthcare Value

ThedaCare, a community health system in northeast Wisconsin, was founded in 2003 and strives to create a healthcare marketplace that rewards providers for delivering value. ThedaCare employs the Lean improvement method to build the framework by which healthcare leaders and staff become daily problem solvers. ThedaCare exponentially reduced defects, improved patient outcomes, eliminated waste, and removed tens of millions in costs without layoffs. This first-hand experience drives the ThedaCare Center to share these findings with other hospitals and health providers. In 2010 alone, two hospitals in the ThedaCare system saw 88% of safety and quality indicators improve, 85% of customer satisfaction indicators improve, 83% of staff engagement indicators improve, and 50% of financial indicators improve.[xliii] ThedaCare notably achieved zero medication reconciliation errors for four consecutive years, and reduced readmission rates to less than 12%. Seattle Children's Hospital, an affiliate of ThedaCare, reduced overall patient costs by 3.7% and supply expenses by $2.5 million. Testimonies such as these show that Lean thinking can improve healthcare settings and the quality of care delivered.[xliv]

ThedaCare's success in providing high-quality, efficient care can largely be attributed to the leadership and contributions of John Toussaint, a physician and CEO emeritus of ThedaCare. He established the ThedaCare Center for Healthcare Value, which aims to redesign components of health care to create more value for the patient. These components are deeply rooted in Lean methods. Dr. Toussaint's healthcare improvement work using Lean has been well documented in articles published in *Health Affairs* and other prestigious journals.[xlv]

"The medical problem solving turns out to be the easy part. I could have used more training on real-world problem solving: figuring out whether someone is disabled, trying to get care for someone without insurance or income, and scheduling appointments and procedures for single parents who work two jobs."

Jonathan Weinkle, MD
Squirrel Hill Health Center
Consultant
Jewish Healthcare Foundation

Virginia Mason Medical Center

In 2000, Virginia Mason Medical Center (VMMC) adopted the Toyota Production System, or Lean, to emphasize quality and safety as the highest of priorities. They have become a national leader in the implementation of these methods to health care, which can be largely attributed to their Chairman and CEO, and practicing physician, Gary Kaplan.[xlvi] Since the incorporation of the Virginia Mason Production System, a customized adaption of TPS, Virginia Mason Medical Center has seen noteworthy improvements that have resulted in more than $11 million saved in planned capital investments, 85% reduction in waiting time for lab test results, increased productivity by approximately 93% in many targeted areas, and reduced premiums for professional liability insurance by approximately 56%. These results came from a system-wide investment of time, improving patient safety, and dissecting processes to identify improvement opportunities.[xlvii]

Virginia Mason developed a Patient Safety Alert (PSA) system in 2002 which requires all staff who encounter a potentially dangerous situation to cease activity and file a report immediately. Since implementating the system, 20,000 PSAs have been reported and addressed in a timely manner. As a result, medical claims fell drastically while overall patient safety rose. The Emergency Department of VM used a "team sort" process which uses standard clinical assessment tools to quickly sort and identify incoming patients to create capacity for patients who require more extensive treatment. This adjustment alone decreased VM's ED divert hours and the number of hours the ED was unable to treat new patients by over 90%. These are a few of the many successful examples of quality improvement and patient safety that VM has undertaken in the past few years.

Denver Health

In 2005, Denver Health began to work with Lean improvement methods, led and driven by their physician chief executive officer, Patty Gabow. The goal was to identify waste and improve efficiency in their large, 525-bed safety net hospital. They sought a cultural change that would allow them to remain financially stable while providing high-quality patient care in a declining reimbursement environment. Since implementing Lean, Denver Health has experienced astounding success through its efforts. Accomplishments include generating $135M in financial benefit (as of early 2012) with no staff layoffs, and achieving the number one ranking in the country among academic medical centers in patient survival. They were the first healthcare organization to receive the Shingo Bronze Medallion for Operational Excellence and involving more than 1,300 employees in improvement opportunities.[xlviii]

Non-Clinical Healthcare Organizations

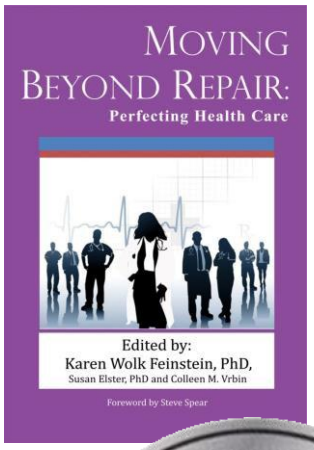
The weight of reforming medical education does not need to fall solely on the medical education institutions or those in clinical practice. Improvement and healthcare organizations like PRHI, Regional Health Improvement Collaboratives (RHICs), and foundations can bring valuable content and support to the table. These organizations can provide materials, resources, ideas, and curriculum adapted from best practices, and can serve as catalysts for moving medical education reform forward.

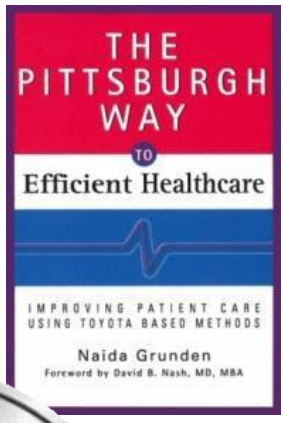
Pittsburgh Regional Health Initiative

The Pittsburgh Regional Health Initiative (PRHI) was one of the nation's first regional collaboratives of medical, business, and civic leaders organized to address healthcare safety and quality improvements. Since its founding in 1997, PRHI has approached quality improvement as both a social and a business imperative. Its core mission is to show that an unwavering focus on meeting patient needs and on achieving optimal care outcomes, along with simultaneous dedication to efficiency and zero defects, will create maximum value for the patient and for society.

To achieve its mission, PRHI developed its own lean-based process improvement methodology called Perfecting Patient Care[SM] (PPC) based on industrial engineering principles in Lean manufacturing.

Much of PRHI's recent work is detailed in the book, *Moving Beyond Repair: Perfecting Health Care* (2012). *Moving Beyond Repair* is a call for applying lean-based tools to full functionality in hospitals, physician practices, and nursing homes in order to move beyond targeted problem-solving to transforming the way both organizations and healthcare systems achieve, spread, and sustain value. The goal of the book is to show what is possible and to excite health providers to design their own transformations in the combined interest of quality, safety, and efficiency.





Two books have documented PRHI's experience in the healthcare improvement space. *The Pittsburgh Way* was recently awarded the "Shingo Research and Professional Publication Award" for 2012. Named after Japanese industrial engineer Shigeo Shingo, one of the world's thought leaders in the Toyota Business System, the award recognizes and promotes research and writing regarding new knowledge and understanding of lean and operational excellence. Both *The Pittsburgh Way* and *Moving Beyond Repair* capture and discuss the work of leaders and frontline workers who established a place for Lean in health care through their successful applications of Perfecting Patient Care[SM].

PPC is delivered in a number of ways to cater to the varying needs of different organizations. *Moving Beyond Repair* builds upon a previous publication — *The Pittsburgh Way to Efficient Healthcare* (2008) — which described the various improvements seen in the first decade since PRHI's inception, including an 86% reduction in medication errors at an institution, a 68% drop in CLABs in 32 regional hospitals, a 40% reduction in readmissions for COPD patients, and a 100% increase in a pathology lab's efficiency. Additionally, PRHI has developed numerous fellowship programs targeted at engaging students in the health professions to think differently about their environment and to practice quality improvement. Through the fellowship programs, PRHI is experimenting with filling the gaps in medical education (see pages 14-16).

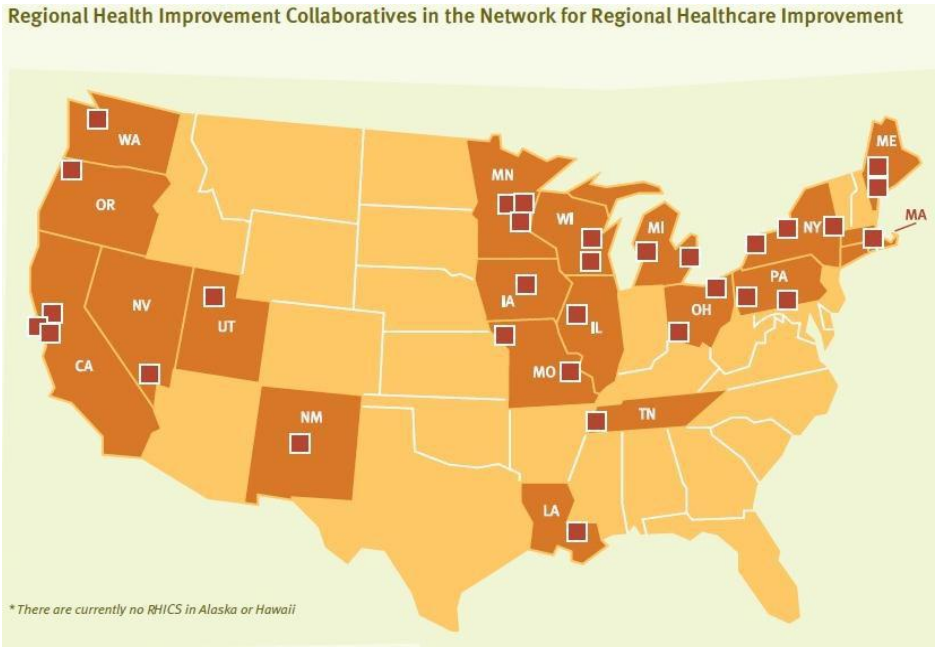
In an era of value-based purchasing, when organizations are reimbursed according to the quality, safety, and efficiency of clinical care, the challenge of moving an organization and industry to meet quality targets is immense. Recognizing the need to spread the education and application of Lean, PRHI developed an online portal called Tomorrow's HealthCare™ (THC) that brings together QI management tools and training, with opportunities for entire healthcare teams to lead and sustain change and rapidly respond to problems.

THC is designed to engage frontline staff and leaders in building their quality improvement skill set and experimenting within improvements in the course of conducting their work. In the complex world of health care, THC allows frontline staff to learn and practice when time allows, providing flexibility and the easy spread of information through an organization. THC also serves as a management tool with multiple functionalities including an online curriculum, networking communities, QI collaboration opportunities, and individual portfolios. The curriculum currently consists of multiple courses in Lean QI methods, as well as access to many continuing education courses for health professionals. THC is being used in various organizations across the United States to enhance communication and access to QI resources. THC serves as a clear example of an approach to making QI curriculum available on a large scale to all healthcare workers, which could easily be extended to students in medical school or residency programs.

Regional Health Improvement Collaboratives

Regional Health Improvement Collaboratives (RHICs) – non-profit, multi-stakeholder organizations – help their communities to deliver higher quality, more affordable health care in various ways. Five of the most important roles they are playing across the country are measuring health system performance, facilitating payment and delivery system reform, providing training and assistance to providers, educating consumers, and helping to plan and coordinate the many different health improvement activities in the community. A growing number of communities are recognizing that RHICs are ideal organizations for developing coordinated, multi-stakeholder solutions to their healthcare cost and quality problems. A RHIC does not deliver healthcare services directly or pay for such services; rather, it provides a neutral, trusted mechanism through which the community can plan, facilitate, and coordinate the many different activities required for successful transformation of its healthcare system.[xlix]

Different RHICs are expert in data collection, extraction, and analysis; consumer engagement; public reporting; and quality improvement. Their value in the efforts to change medical education has not been tapped. As familiar players in facilitating change, they can offer support and expertise to medical education institutions in their pursuit of meeting the new ACGME milestones and reforming their methods.



RHICs are found in communities across the country;
many are members of the Network for Regional Healthcare Improvement.

Institute for Healthcare Improvement

Other opportunities for collaboration between existing QI organizations and medical education providers to meet the need for reforms also exist. In fact, a relationship like this is being tested with the Institute for Healthcare Improvement's (IHI) Open School curriculum. IHI is a renowned player in the healthcare quality improvement space. Their online series of courses in QI and patient safety — Open School — is interdisciplinary and open to health professions students of all levels. It is designed to develop skills that will create change agents in healthcare improvement. In March of 2012, Eastern Virginia Medical School became the first medical school to require the completion of IHI's curriculum for graduation, ensuring that all of their students are exposed to and understand issues in QI and patient safety.[I] Making QI curriculum a mandatory component of education is a solid step in the direction of educating and empowering young physicians. Organizations like IHI and PRHI have the expertise, resources, and ability to expand their expertise into medical education.

Foundations

Foundations and grantmakers are influential in the advancement of healthcare systems when they seed innovative new approaches to better population health. They serve as an important bridge between policy, research, and practice; helping to translate groundbreaking changes and discoveries into demonstrations. Foundations can work with diverse healthcare stakeholders to spur new medical education reforms.

In the medical education space, foundations could play a critical role in funding extracurricular programs and experiments in curriculum redesign. Foundations can fund online and experiential

learning experiments, as well as credible evaluations. Foundations can accelerate the sharing of best practices nationally and internationally. They also have the opportunity to convene thought leaders and early adopters to accelerate the spread of new medical education content. They can help engage medical faculty and interdisciplinary faculty in the conversation to ensure buy-in, creativity, and sustainability. The extensive network of healthcare funders[li] provides an ideal path for widespread dissemination of best practices in quality improvement education.

Medical Societies/Other Organizations

Medical Societies and other organizations are also involved in efforts to improve quality of care and could have much to offer in medical education reform. A few examples of these programs are listed here:

- ***The Accreditation Council on Graduate Medical Education's Clinical Learning Environment Review (CLER)*** *is a program designed to assess the graduate medical education learning environment of each sponsoring institution. The program is designed "to generate national data on program and institutional attributes that have a salutary effect on quality and safety in settings where residents learn and on the quality of care rendered after graduation." CLER assesses sponsoring institutions in six focus areas, including both patient safety and quality improvement. More information can be found on their website: http://www.acgme-nas.org/cler.html.*

- ***The Alliance of Independent Academic Medical Centers (AIAMC)*** *is a national membership organization consisting of major academic medical centers and health systems dedicated to high-quality patient care, medical education, and research. In addition to helping its members improve the quality of their operations, the Alliance strives to become a national resource for best practices in medical education and research. Since its inception in 1989, the AIAMC has been open to any independent academic medical center that sponsors four or more accredited residency programs, supports an institutional research program, and serves as an affiliate for medical school clerkships. More information can be found on their website: http://www.aiamc.org.*

- ***The American Board of Medical Specialties' Maintenance of Certificate (ABMS MOC)*** *process is the means by which certified physicians retain their respective specialty and subspecialty certification(s) over time. With a focus on continuous professional development, the ABMS MOC process requires the ongoing assessment of each specialist along six core competencies adopted by ABMS and ACGME (one of which is "patient care and procedural skills"). Each of ABMS's twenty-four Member Boards is responsible for carrying out these evaluations via a standardized four-part process. Created in 2000, the ABMS MOC is scheduled to be fully implemented by all Member Boards by 2016. More information can be found on their website: http://www.abms.org/maintenance_of_certification.*

- ***British Medical Journal (BMJ) Learning*** *offers high-quality CME/CPD and postgraduate training for doctors and other healthcare professionals. With hundreds of accredited, peer-reviewed learning modules, they cover clinical subjects as well as quality improvement issues. With content like this already developed, medical education institutions have resources to which they can turn. More information on BMJ Learning can be found on their website: http://learning.bmj.com/learning/home.html*

- ***The Choosing Wisely Campaign by the American Board of Internal Medicine*** *helps physicians become better stewards of finite healthcare resources. Nine medical specialty organizations, along with Consumer Reports, have identified five commonly prescribed tests and procedures whose necessity should be questioned and discussed. More information can be found on their website: http://www.abimfoundation.org/Initiatives/Choosing-Wisely.aspx*

- ***The Coalition for Physician Accountability*** *is a multi-organization initiative designed to improve the quality and safety of patient care by enhancing physician accountability. Among other things, the Coalition seeks to provide a forum for dialogue among members concerning ways to increase physician accountability through changes to physician education, training, and practice. The Coalition includes numerous national organizations that are responsible for physician evaluation, accreditation, licensure, and credentialing. More information can be found on the website of the Accreditation Council for Continuing Medical Education, one of the Coalition members: www.accme.org.*

- ***Doctors for America*** *is a national movement of physicians and medical students working together to improve the health of the nation, and to ensure that everyone has access to affordable, high-quality health care. They recognize the role that physicians can play in changing the healthcare system and have already engaged medical students; they want to be part of the solution. More information can be found on their website: http://www.drsforamerica.org/about*

- ***The Foundation for Advancement of International Medical Education and Research (FAIMER)*** *is a non-profit foundation that is dedicated to improving world health through promoting excellence in international health professions education. Founded in 2000 by the Educational Commission for Foreign Medical Graduates, FAIMER concentrates its efforts on three strategies: faculty development, targeted research that informs health workforce policy and practice, and development of data that advances educational quality improvement decisions. The Foundation focuses its efforts in developing regions in Latin America, Africa, and Asia. More information can be found on their website: http://www.faimer.org.*

- ***The Medical Education Futures Study (MEFS)*** *is a George Washington University-based initiative that is dedicated to studying the "social mission" of medical schools. Funded by the Josiah Macy, Jr. Foundation and directed by Dr. Fitzhugh Mullan, the Study addresses the need for medical schools to increase their focus on training more ethnically- and racially-diverse physicians, training more primary care doctors, and ensuring a more appropriate geographic distribution of the physician workforce. The MEFS will conclude by publishing a report with findings and recommendations for new or expanding medical education programs. More information can be found on their website: http://www.medicaleducationfutures.org.*

- ***The National Physician Alliance*** *creates research and education programs that promote health and foster active engagement of physicians with their communities to achieve high quality, affordable health care for all. One of their areas of focus is patient safety and system improvement. More information can be found on their website: http://npalliance.org*

CONCLUSION

So where does all of this leave the nation and medical education? The groundwork has been laid to make substantial changes to the way physicians are prepared to practice in the United States. From the momentum for action generated over the last several years by reform efforts, and the substantial data which confirm gaps in the quality of the current healthcare system, it is clear that the time is ripe for transformation. The ACA "quality and value" provisions for new payment models, care coordination, use of technology, and patient safety establish a mandate for greatly enhanced health professions curriculum. The challenge that remains is how to move the current health system — rooted in decades of volume-based and error-prone practices — toward newly-defined goals that reward and encourage patient-centered, high-quality care. A solution can be found in the education and development of the workforce, especially the highly-skilled, natural leaders of the clinical setting — physicians.

PRHI and others have long recognized the power that a physician leader can have in the transformation of care. Their approval and buy-in is necessary for almost all change efforts in the healthcare system, with other members of the care team looking to them for assurance and empowerment. But there are many barriers that prevent physicians from leveraging that ability. As noted in an article from the Agency for Healthcare Research and Quality, "recognizing that one works within a system and understanding how that system functions are only the beginning. Physicians and other healthcare providers must be empowered to change aspects of the system they recognize as failed. Often, well-meaning providers are not sure how to effectively design and test cycles of change; they lack the authority or power, and they lack the time."[lii] Putting the skills of quality improvement, systems-based thinking, teamwork, and leadership into the hands of physicians will create a workforce that is able to drive care to reach goals beyond what the ACA has defined and accelerate transformation.

As evidenced by the innovative work being done at several medical schools and residency programs, there is already an early and sporadic shift in medical education toward teaching the concepts described in this publication. Arguably there is a long way to go, with most programs still experimenting, limiting them to electives or as standalone projects. The ACGME has taken initial steps in moving the medical education field forward (200 medical schools and 9,000^{+} residencies[liii]) by clarifying and identifying specific milestones associated with systems-based practice and their other core competencies, and programs are beginning work to meet these new standards.

There is, encouragingly, another benefit to investing in the redesign of medical education. Physicians will be prepared not only to lead in the system as it is defined in the ACA, but will be trained to adapt and improve upon models of care that continue to emerge with the development of new technologies, methods, and models of care. For many years, physicians have had to respond to external efforts at reforming health care. With meaningful grounding in health policy, economics, organizational behavior, and safety science — systems thinking — physicians could design their own future.

POSTSCRIPT

The authors circulated this publication to a number of distinguished physicians and medical students — Barbara Barnes, MD, MS; Ateev Mehrotra, MD, MPH; Jason Sanders, PhD; Daniel Bishop, MD/PhD candidate; Fred Sherman, MD; Joanne Narduzzi, MD; Joanne Conroy, MD; Eric Rodriguez, MD; Tamara Sacks, MD. We received so many good comments that we wanted to capture some of the feedback.

In general, there was much support for our focus on Systems-based Practice (SBP) as defined by the ACGME's Next Accreditation System. One reviewer called it the "least understood and possibly the most potent of all the competencies, exposing the fundamental deficiencies in the education of physicians today." Another noted that SBP has the fewest and least validated metrics, although it could be seen as a "modifier of all the other competencies, integral to whatever work a physician is doing." The same person bemoaned that SBP could be regarded as "a kind of umbrella or wastebasket for almost everything (policy, culture, economics, demographics, ethics, and safety) that hasn't been part of traditional medical education." The concern is that a potpourri effect will send a message that "this stuff isn't actually that important, not like pure medical knowledge." Overall, there was sentiment that SBP encompasses the totality of what physicians do every day with every patient. It recognizes, in fact, the critical role of the MD and how his or her actions set in motion a chain of consequences critical to the outcomes of care.

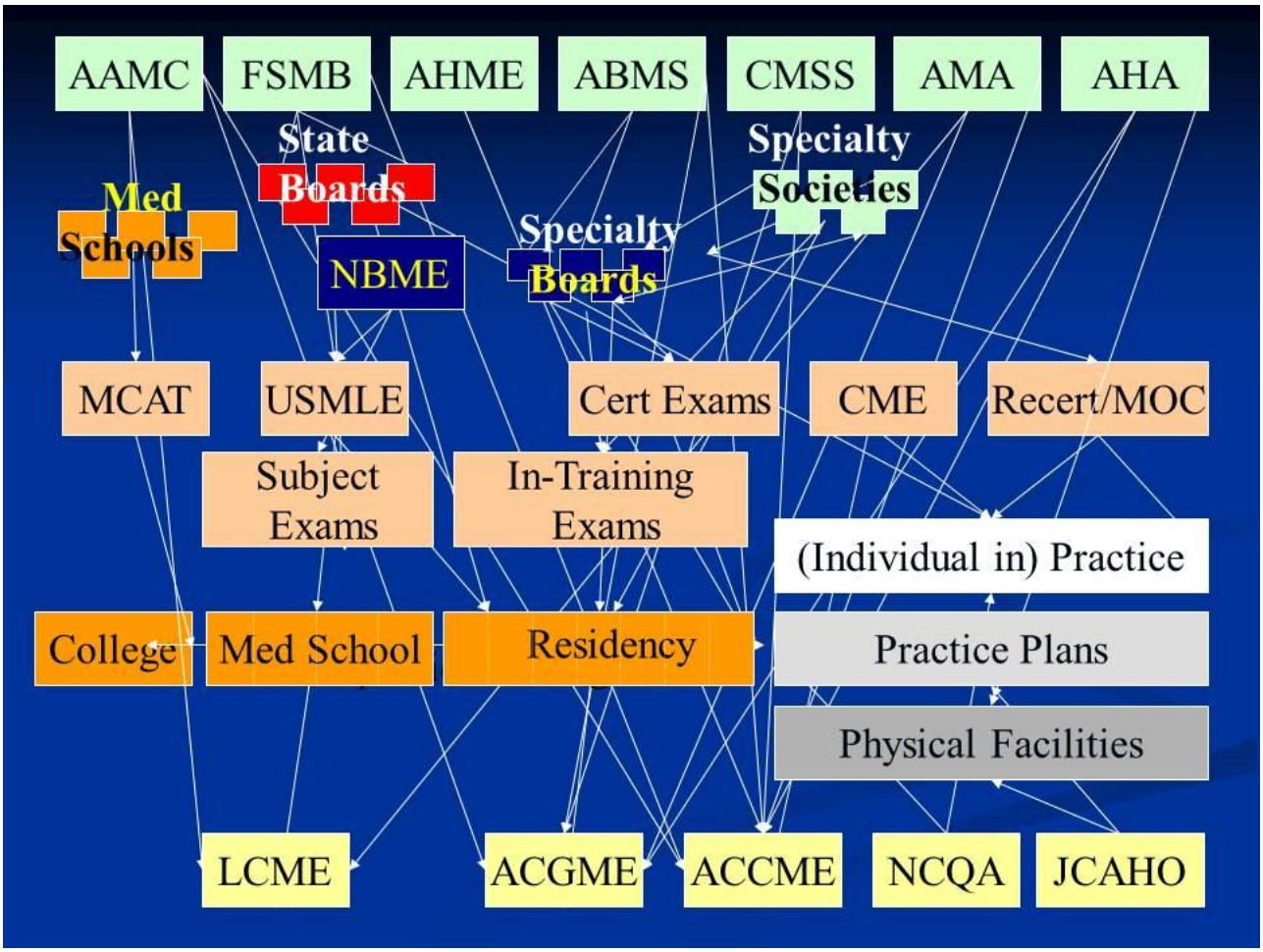
If SBP is effected, one review argues, it will achieve an expanded research and inquiry function for physicians, bringing experimentation, rapid feedback, and constant improvement into daily practice. By itself, it acknowledges that "high performance, resulting from a newly structured knowledge base, can be taught!" Although medicine will always be fraught with ambiguity and misinterpretation — it will remain somewhat inexact as a science — variability can be reduced and reliability advanced. It acknowledges, in fact, that environments for patients aren't stable and controlled; "trainees should follow patients through the continuum of care rather than sitting in one site and having the patient come to the doctor." When SBP is translated into operational terms, classroom curriculum will naturally be enhanced with experiential learning. Students need to understand the full patient experience. One reviewer, in fact, eschewing the typical organ-based curriculum, suggested "when it comes time to study the heart, lectures could include discussions of the economic impact of heart disease, disparities in care, the socioeconomic determinants of cardiac risk, the failings of health care to safely; and efficiently apply the best scientific evidence."

Several physicians noted the lack of faculty to teach SBP among traditional medical instructors, but favored the inclusion of educators from other schools such as business, engineering, public policy, ethics, etc. One graduate student noted that "many attendings feel that SBP is something trainees absorb through their training rather than something one learns specifically." This could be an obvious reflection of a faculty person's own lack of training in SBP. The cry for some standardized curriculum was widespread. One attending acknowledged that he is "at a loss as to how to evaluate what his residents should have been taught or experienced in SBP, what the student should have learned and how to demonstrate that this learning was incorporated into practice."

Most interesting was the suggestion that students need to learn how to use observation, how to extract meaning from their practice and patient encounters, much in the manner of Dr. Atul Gawande, author of many articles and books on the practice of medicine. The belief is that finding meaning in everyday work enhances satisfaction. A wise caveat was that introducing "new thinking" younger physicians into "older thinking" workplaces could be demoralizing. New doctors need to be prepared for a potential clash of cultures. Also invoked was a warning that some supposed "QI reforms" are not without downsides and risks, in particular Computerized Prescription Order Entry, health information databases, decision support systems, and even teaching hospitals themselves. All can and should be regarded with open minds and unfiltered inquiry when patient safety is endangered.

Overall, there is enthusiasm for the sixth competency, a general belief that young physicians are ready and eager to participate in redesigning delivery systems and that examiners are currently examining all aspects of medical education and certification, and that the scientific method with which doctors are imbued produces the kind of critical thinking that will make a broader curriculum stimulating and meaningful.

The Medical Oversight Landscape



Source: National Board of Medical Examiners

GLOSSARY

AAMC	Association of American Medical Colleges
ABMS	American Board of Medical Specialties
ACCME	Accreditation Council for Continuing Medical Education
ACGME	Accreditation Council for Graduate Medical Education
AHA	American Hospital Association
AHME	Association for Hospital Medical Education
AMA	American Medical Association
CME	Continuing Medical Education
CMSS	Council of Medical Specialty Societies
FSMB	Federation of State Medical Boards
JCAHO	Joint Commission on the Accreditation of Healthcare Organizations
LCME	Liaison Committee on Medical Education
MCAT	Medical College Admissions Test
NBME	National Board of Medical Examiners
NCQA	National Committee for Quality Assurance
Recert/MOC	Recertification/Maintenance of Certification
USMLE	United States Medical Licensing Examination

TIMELINES

Graduate Medical Education Reform

Year	Event	Description
1910	Flexner Report	Called for reforms needed in the medical education curriculum and clinical teaching. Much of the current form of medical education is based on this report.
1940	Report of the Commission on Graduate Medical Education	Defines and describes residency to the American public, distinguishes residency from internship and continuing medical education, and argues that residency should become the sole recognized path to specialty practice in the United States.
1965	Milestones in Raising the Standards of Medical Education	Report on the improvements made to medical education in the twentieth century, but also the fragmentation of residency programs (Association of American Medical Colleges).
1966	The Report of the Citizens Commission on Graduate Medical Education	Verified the need for more primary care physicians and a mechanism for enhancing residency programs and defining roles of institutions (American Medical Association).
1980	Graduate Medical Education Present and Prospective; a Call for Action	Identified problems of rising cost of care and national needs not being satisfied by GME programs (Josiah Macy Jr. Foundation).
1981	General Professional Education of the Physician and College Preparation for Medicine Panel	Designed to enhance the general education of future physicians and calls out healthcare cost as a concern for medical education (Association of American Medical Colleges).
	Establishment of the Accreditation Council on Graduate Medical Education	Preceded by the Liaison Committee for Graduate Medical Education formed in 1972, the ACGME is the accrediting body for medical residency programs.
1993	Taking Charge of Graduate Medical Education: To Meet the Nation's Needs in the 21st Century	Publication on the relative scarcity of primary care physicians and the strong tendency of doctors to aggregate in affluent large communities, but not in rural areas or inner cities (Josiah Macy Jr. Foundation).
1999	ACGME New Curriculum Models	Introduced competencies, such as professionalism and systems-based practice, to the curriculum for medical residents (Accreditation Council for Graduate Medical Education).
2003	Health Professions Education: A Bridge to Quality	Recognizes the importance of patient safety to the advancement of healthcare delivery. Their recommendations for creating patient safety programs in healthcare organizations are suspected to have the greatest impact on health care (Institute of Medicine).
	Reforming Medical Education: Urgent Priority for the Academic Health Center in the New Century	Recommendations to amend support faculty, resident, and volunteer educators in health professional schools (Blue Ridge Academic Health Group).
2010	Site Visits to Selected Institutions with Innovations In Residency Training	Acknowledges that residency programs are teaching the competencies necessary, but not to the level needed to significantly improve quality of care (RAND Health).
	A Summary of Educating Physicians: A Call for Reform of Medical School and Residency	Reevaluation of the needs in the healthcare community since the release of the Flexner Report to address the future's demands (Carnegie Foundation for Advancement of Teaching).

Health Policy, Legislation and Finances

Year	Event	Description
1965	Medicare Established	Government-issued health insurance program for Americans 65 years old or older. Hospitals with residency programs receive both direct and indirect government funds for medical education.
2000	Beginning of Healthy People Initiative	Sets goals for people to live healthier and monitors progress in ten-year increments (Centers for Disease Control and Prevention).
2009	Medicare Payment Advisory Commission	Provided Congress with reasons and recommendations for healthcare delivery system reform and to increase funding for education programs which will meet the needs of the country.
	ARRA (HITECH)	American Recovery and Reinvestment Act & Health Information Technology for Economic and Clinical Health: Federal funding for hospitals and physicians who utilize electronic health records and incentivizes the widespread implementation of EHRs in primary care.
2010	Patient Protection and Affordable Care Act (ACA)	Strives to alleviate rising healthcare costs while improving quality of care.
2012	Supreme Court decision on the ACA	In a close 5-4 vote, the Supreme Court upholds key provisions in the ACA, such as the individual mandate for all Americans to get health insurance.

Patterns, Changes in Medicine and Demographics

Year	Event	Description
1989	Institute for Healthcare Improvement Founded	Established to improve the lives of patients focused on six progress aims for the healthcare system: Safety, Effectiveness, Patient-Centeredness, Timeliness, Efficiency, and Equity.
1992	Evidence-based Medicine Guidelines Established	Principles for applying medical research findings to decisions made in a clinical setting are developed.
1999	*To Err is Human: Building a Safer Health System* Published	Raises awareness of the widespread preventable medical errors that are in the system (Institute of Medicine).
2001	*Crossing the Quality Chasm: A New Health System for the 21st Century* Published	Urging practitioners to raise levels of healthcare quality while offering suggestions to streamline system processes (Institute of Medicine).
2006	5 Million Lives Campaign	Designed to support the improvement of medical care in the U.S., significantly reducing levels of morbidity (illness or medical harm such as adverse drug events or surgical complications) and mortality over the course of two years (IHI).
2011	Baby Boomers Retire	Rising numbers of aging Americans begin to take a toll on the healthcare system of today and tomorrow.

Jewish Healthcare Foundation and Pittsburgh Regional Health Initiative

Year	Event	Description
1990	Jewish Healthcare Foundation (JHF) established	Founded from the sale of Montefiore Hospital in Pittsburgh, the foundation offers a unique blend of research, education, grantmaking, and program management to advance the quality of clinical care and the health of populations.
1997	Pittsburgh Regional Health Initiative (PRHI) established	Established as an operating arm of JHF, PRHI is an independent catalyst for improving healthcare safety and quality in Southwestern Pennsylvania. It operates on the premise that dramatic quality improvement is the best cost-containment strategy for health care.
	Perfecting Patient Care[SM]	PRHI's flagship process improvement methodology, based on Lean concepts and principles of the Toyota Production System, is created and adapted to the healthcare setting.
2003	Health Careers Futures (HCF) established	Created as an operating arm of JHF to provide the health sector with research, data, and products on health careers; to increase regional recruitment and retention capacity, and to provide support for training in health careers.
2005	Building a Better Delivery System	This report encourages the healthcare industry to widely adopt quality engineering disciplines similar to those PRHI has been pursuing since its formation (IOM & National Academy of Engineering).
2008	Fine Awards	The Fine Foundation and the Jewish Healthcare Foundation create the Fine Awards to draw attention to the critical role that teamwork plays in health care by recognizing local healthcare teams that have achieved breakthroughs in safe, effective patient care.
	The Pittsburgh Way to Efficient Healthcare is published	PRHI's work on the various improvements seen in the first decade of its inception, including: an 86% reduction in medication errors, a 68% drop in CLABs in 34 regional hospitals, a 44% reduction in readmissions for COPD patients, and a 100% increase in a pathology lab's efficiency.
2012	*Moving Beyond Repair: Perfecting Health Care* is published	PRHI's second book serves as a call for applying Lean-based tools to full functionality in hospitals, physician practices, and nursing homes, in order to move beyond targeted problem solving to transforming the way both organizations and healthcare systems achieve, spread, and sustain value.
	The Pittsburgh Way to Efficient Healthcare receives Shingo Award	The book published in 2008 receives the Shingo Research and Professional Publication Award for 2012. Named after Japanese industrial engineer Shigeo Shingo, one of the world's thought leaders in the Toyota Business System, the award recognizes and promotes research and writing regarding new knowledge and understanding of lean and operational excellence.
	QIT Center opens at JHF	A new training center, operated by JHF and PRHI, opens to bring education around quality improvement and information technology: merging two of the hot topics in health care.

AFFORDABLE CARE ACT
KEY PROVISIONS

To help show how the ACA and other recent healthcare policies are changing the healthcare system and the practice of medicine, some of the major aspects of the law are reviewed below.

Title III of the ACA, *Improving Quality and Efficiency of Health Care,* is entirely focused on improving the quality of care, increasing efficiency, and making healthcare costs more reasonable. The changes outlined in the Act, while intended to bring the United States closer to a sustainable system based on quality and value, will need to be developed further as gaps are revealed in the regulations. This will rely heavily on the industry itself and its workers – not just regulators – to complete transformation. The key pieces of Title III are highlighted here: payment reform, care coordination and disease management, safe practices, and technology.

Value-based Purchasing: Achieving Multiple Performance Targets

New links between the quality of patient outcomes and financial incentives are being implemented to stimulate cost savings and improve care. Although other models, such as the Health Maintenance Organizations (HMO) of the 1990s, have used financial incentives to influence the actions of providers, the accountability models set forth in the ACA directly link quality and cost outcomes with payment to emphasize value-based purchasing, either through the realignment of incentives, as with payment "bundling," or through the use of payment rewards like "pay-for-performance."[liv,lv] A bundled payment is a single payment for an episode of care, which is divided among the care providers (e.g., hospital, physician, etc.). It is hoped that creating a single payment will incentivize all providers to work together to provide the lowest cost and most effective care, maximizing the reimbursement to all. Traditional pay-for-performance programs reward providers with enhanced payments for meeting certain cost and quality performance targets. More recently, shared savings plans – a variation on traditional pay-for-performance models – allow providers to collect the savings generated from providing care that is more efficient than average.

In the Medicare Hospital Value-based Purchasing (HVBP) program, 1-2% of hospital revenue will be withheld pending a "grade" on a balanced scorecard of process, outcomes, satisfaction and efficiency measures.

These healthcare payment models encourage care coordination and better disease management to ensure accountability for, and management of, cost and quality outcomes. The most notable and, arguably, the most promising emerging model is the accountable care organization (ACO).[lvi] An ACO is an entity which manages the bundled payments to care providers in a defined community. Many ACOs have also proposed using shared savings for further incentives.

Another emerging model is the Patient-Centered Medical Home (PCMH) or health home. A medical home is a model of primary care that focuses on teamwork, quality improvement, coordinated care, using technology for care improvement, and the provision of patient-centered, comprehensive services. While the model has existed for many years, enhanced payment to practices which have been formally accredited could encourage widespread adoption throughout the country. Having a primary care system that can effectively organize care for patients as they leave the hospital, or that can prevent hospitalizations altogether, is a principle component of an ACO. Both of these models are currently being tested by PRHI and other organizations, with government and private philanthropic support. Experience with these pilot efforts has made it abundantly evident that many physicians need skills to organize their own practices before they can take maximum advantage of these emerging payment models.

Coordinating Care within the Healthcare System

A central aim of the ACA is improved care coordination by encouraging providers and payers to organize themselves in ways that allow management of cost and quality across multiple providers. Indeed, both ACOs and PCMHs emphasize the importance of care coordination. Some fundamental care coordination goals are to "improve the flow of information among providers, assist patients with transitions between care settings, and help patients access medical and social support services" in order to reduce the need for costly services. [lvii] For example, care coordination services can help patients follow a recommended diet and exercise program, recognize and respond to signs of worsening health, and obtain routine medical tests.[lviii] Another element of improved care coordination, known as disease management, focuses on facilitating the utilization of evidence-based best practices in chronic disease care to improve patient outcomes and prevent the need for costly, downstream services. Although care coordination and disease management models are already used by many private health providers and insurers, a number of new federal demonstration programs authorized by the ACA are currently being piloted throughout the nation. Because care coordination and disease management tend to result in reduced hospitalizations and emergency room visits – among the most costly of healthcare services – they are likely to gain in popularity.

In the coming years, physicians will need to provide care coordination and disease management programs – or work with existing programs to do so. Both will require an understanding of and respect for teamwork and the skills of other health professionals. This level of collaboration is not generally emphasized in medical education. A number of organizations nationally have made great efforts to improve the coordination of patient care by incorporating more entry level employees into the care process, most commonly community health workers (CHWs) and medical assistants (MAs). CHWs are often individuals from select communities who reach out to other residents with complex diseases to ensure they are following appropriate health regimens and that their health is improving. There are currently no standard qualifications or certifications for CHWs; they are valued, rather, for their role in the community and understanding of its cultural nuances. With regard to MAs, certifications exist, but are not always required. A number of health organizations have found,

however, that certifying and developing MAs can reduce MA turnover, give patients a more consistent care team over time, and provide physicians with a greater level of trust regarding the tasks for which MAs are responsible. In short, enhancing the skill sets of entry-level employees may ensure better care coordination and improved patient outcomes.

As part of the sixth competency for ACGME, physicians must learn how to coordinate care within the healthcare system. Breaking through the silos of health care is a difficult task. "*Care coordination is the deliberate organization of patient care activities between two or more participants (including the patient) involved in a patient's care to facilitate the appropriate delivery of healthcare services. Organizing care involves the marshaling of personnel and other resources needed to carry out all required patient care activities, and is often managed by the exchange of information among participants responsible for different aspects of care."* [lix]

Ensuring Patient Safety and Aligning Incentives

With the awareness that the Institute of Medicine brought to medical errors with *To Err is Human*, the federal government decided to look very seriously at patient safety problems. In particular, the Medicare program began to tie quality and safety to hospital reimbursement. In the past, providers could anticipate full payment for services even when a poor outcome, due to a medical error or poor discharge process, resulted in added cost to treat complications. Now, federal regulations limit these payments.[lx]

Since the Deficit Reduction Act of 2005, the Secretary of Health and Human Services has been required to "identify conditions that are: (a) high cost or high volume or both, (b) result in the assignment of a case to a Diagnosis-Related Group that has a higher payment when present as a secondary diagnosis, and (c) could reasonably have been prevented through the application of evidence-based guidelines."[lxi] As a consequence, since October 1, 2008, hospitals have not received additional payment to treat specific conditions that were not present on the initial admission (generally, hospital-acquired conditions or infections).[lxii]

The ACA takes this a step further by requiring the Secretary to incorporate similar changes into the Medicaid program, such as policies that prohibit payments for healthcare-acquired conditions. In addition, under the hospital readmissions reduction program, the federal government will reduce Medicare payments to hospitals when potentially avoidable readmissions occur. While a specific definition exists in the regulations, avoidable readmissions are generally identified as those within 30 days of discharge for a condition that could have been prevented with complete and proper follow up. These initiatives not only incentivize providers to deliver better quality care by improving care coordination and care transitions, but they also reduce the spending that is incurred with unnecessarily costly hospital stays. Additionally, these policies affect what reimbursement and payments hospitals and physicians receive, as outlined

earlier, which provide an incentive for providers to limit errors. With training in error causation, error mitigation, and safety practices, physicians will be better able to lead their practices and organizations to receive full reimbursement for all services provided and ensure the safest care for their patients.

Using Technology for Quality Improvement

Health information technology (HIT) will play a key role in transforming the current healthcare system into one focused on efficiency, quality, and affordability. Since the passage of the Health Information Technology for Economic and Clinical Health Act (HITECH) of the American Reinvestment and Recovery Act (ARRA) of 2009, many provider organizations have begun to implement computerized record systems to make "meaningful use" of such technology for prescribing, for exchanging health information with other providers to improve the care quality and coordination, and for tracking and improving adherence to clinical quality measures.[lxiii] HIT will be instrumental in reducing waste by allowing physicians timely access to health information, prevention of duplication of effort, reconciliation of medical treatment, and quality improvement. HIT also facilitates transparency by enabling the reporting of quality and outcomes data to healthcare consumers.

In order for physicians to practice effectively within the constructs of the aforementioned accountability models, they will be expected to possess a level of competency with HIT systems that is largely beyond the current level of most physicians. In particular, they will require data collection and analysis skills (to track their adherence to quality indicators, which in turn drive reimbursement and quality improvement), the ability to use shared data to improve the coordination of care, and an understanding of how data are used for public reporting of cost and quality outcomes. New models, such as shared savings and pay-for-performance reimbursements, will be realized only when the desired cost and performance outcomes are easily measured and monitored on a regular basis to provide the opportunity for ongoing improvement.

NOTES

[i] Office of the Actuary, Center for Medicare and Medicaid Services. National health expenditures projections 2009-2019 forecast summary. Washington, DC, 2009.

[ii] Congress of the United States. The long –term outlook for health care spending. Congressional Budget Office. 2007 Nov; [cited 2012 Aug 22]. Available from: http://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/87xx/doc8758/11-13-lt-health.pdf

[iii] Best Care at Lower Cost: The Path to Continuously Learning Health Care in America. Institute of Medicine. Washington, DC., 2012 Sept; [cited 2012 Oct 19]. Available from: http://www.iom.edu/~/media/Files/Report%20Files/2012/Best-Care/BestCareReportBrief.pdf

[iv] Davis K, Schoen C, Stremikis K. How the performance of the U.S. Health Care System Compares Internationally, 2010 update. The Commonwealth Fund: Mirror, Mirror on the Wall. 2010 June; [cited 2012 Aug 22]. Available from: http://www.commonwealthfund.org/~/media/Files/Publications/Fund%20Report/2010/Jun/1400_Davis_Mirror_Mirror_on_the_wall_2010.pdf

[v] Grieco P, McDevitt R. Productivity and Quality in Health Care: Evidence from the Dialysis Industry. Working paper, Penn State University. 2012 Aug; [cited 2012 Aug 22]. Available from: http://www.econ.psu.edu/~plg15/dialysis_Mar2012.pdf

[vi] Nolte E, McKee C. Measuring the health of nations: updating an earlier analysis. Health Aff. 2008 Jan; [cited 2012 Aug 22]; Available from: http://content.healthaffairs.org/content/27/1/58/T3.expansion.html

[vii] Gay J, Paris V, Devaux M, Looper M. Mortality Amenable to Health Care in 31 OECD Countries: Estimates and Methodological Issues. OECD Health Working Papers No. 55; OECD Publishing. 2011 Jan [cited 2012 Oct 26]. Available from: http://www.oecdilibrary.org/docserver/download/fulltext/5kgj35f9f8s2.pdf?expires=1351281686&id=id&accname=guest&checksum=FDBB1D751E0A4A342A9672C544561199

[viii] Audet A, Kenward K, Patel S, Joshi M. Hospitals on the path to accountable care: highlights from a 2011 national survey of hospital readiness to participate in an accountable care organization. The Commonwealth Fund. 2012 Aug; [cited 2012 Aug 22]. Available from: http://www.commonwealthfund.org/Publications/Issue-Briefs/2012/Aug/Hospitals-on-the-Path-to-Accountable-Care.aspx

[ix] Gawande A. Cowboys and pit crews. The New Yorker. 2011 May 26; [cited 2012 Aug 29]. Available from: http://www.newyorker.com/online/blogs/newsdesk/2011/05/atul-gawande-harvard-medical-school-commencement-address.html

[x] Medicare Payment Advisory Council (MedPAC). Graduate Medical Education Financing: Focusing on Educational Priorities. In: Report to the Congress: aligning incentives in Medicare. Washington, DC: MedPAC; 2010 June. p. 103-125.

[xi] Cooke, M., Irby DM, O'Brien BC. Educating Physicians: A Call for Reform of Medical School and Residency. San Francisco, CA: Jossey-Bass; 2010.

[xii] Fisher ES, McClellan MB, Safran DG. Building the Path to Accountable Care. N Engl J Med. 2011 Dec 29; 365(26): 2445-7.

[xiii] Green LA, Jones SM, Fetter G, Pugno PA. Preparing the personal physician for practice: changing family medicine residency training to enable new model practice. Acad Med. 2007 Dec; 82(12):1220–7.
[xiv] Mazzone M, Krasovich S, Fay D, Ginn P, Lopresti L, Nelson K, et al. Implementing radical curriculum change in a family medicine residency: the majors and masteries program. Fam Med. 2011 Jul-Aug; 43(7):514-21.
[xv] Iglehart JK. The uncertain future of Medicare and graduate medical education. N Engl J Med. 2011 Oct 6; 365:1340-45.
[xvi] Council on Graduate Medical Education (COGME). COGME 19th report: Enhancing flexibility in graduate medical education. Washington, DC: COGME; 2007 Sept.
[xvii] Association of American Medical Colleges (AAMC). New Medical College Admission Test Approved: Changes Add Emphasis on Behavioral and Social Sciences [page on the internet]. Washington, DC: AAMC; [updated 2012 Feb 16; cited 2012 Aug 29]. Available from: https://www.aamc.org/newsroom/newsreleases/273712/120216.html
[xviii] Medicare Payment Advisory Council (MedPAC). Graduate Medical Education Financing: Focusing on Educational Priorities. In: Report to the Congress: aligning incentives in Medicare. Washington, DC: MedPAC; 2010 June. p. 103-125.
[xix] Martinez W, Lehmann L. The hidden curriculum, patient safety and ethical erosion: exposure to role modeling and residents' disclosure of medical errors. Proceedings of the Society of General Internal Medicine New England Regional Meeting; 2012 Mar 9; [cited 2012 Aug 29]. Available from: http://www.sgim.org/userfiles/file/AM12presentations/ASD1AM12.pdf
[xx] O'Reilly KB. Safety on the syllabus: patient safety becoming part of medical education [homepage on the internet]. American Medical Association; [updated 2010 April 19; cited 2012 Aug 22]. Available from: http://www.ama-assn.org/amednews/2010/04/19/prsa0419.htm
[xxi] Lucian Leape Institute. Unmet needs: teaching physicians to provide safe patient care. Boston, MA: National Patient Safety Foundation; 2010.
[xxii] Nelson C. Evaluation of a patient safety training program [book on the internet]. Santa Monica, CA: RAND Health; 2005 [cited 2012 Aug 29]. Available from: http://www.rand.org/pubs/technical_reports/TR276.html
[xxiii] Weinstein D. Ensuring an effective physician workforce for the United States. Proceedings of a conference on the content and format of GME; 2011 May; New York, NY: Josiah Macy Jr. Foundation; 2011 Nov.
[xxiv] Thomas N, Philibert I, Bringham T, Flynn T. The next GME accreditation system — rationale and benefits. N Engl J Med. 2012 Feb 22; [cited 2012 Aug 22]. Available from: http://www.acgme-nas.org/assets/pdf/NEJMfinal.pdf
[xxv] Accreditation Council for Graduate Medical Education. Common Program Requirements. 2011, July 1; [cited 2012 Oct 9]. Available from: http://www.acgme.org/acgmeweb/Portals/0/dh_dutyhoursCommonPR07012007.pdf
[xxvi] Philibert I, editor. Systems-Based Practice: To Learn About and to Improve the System. ACGME Bulletin. 2004 Nov; [cited 2012 Aug 22]. Available from: http://www.acgme.org/acWebsite/bulletin/bulletin11_04.pdf

[xxvii] Thomas N, Philibert I, Bringham T, Flynn T. The next GME accreditation system — rationale and benefits. N Engl J Med. 2012 Feb 22; [cited 2012 Aug 22]. Available from: http://www.acgme-nas.org/assets/pdf/NEJMfinal.pdf

[xxviii] Brandeis University. Health: Science, Society and Policy [homepage on the internet]. Waltham, MA. [cited 2012 Aug 22]. Available from: http://www.brandeis.edu/programs/hssp/index.html

[xxix] Gould E, et al. Improving patient care outcomes by teaching quality improvement to medical students in community-based practices. Acad Med. 2002 Oct; 77 (10): 1011-018.

[xxx] University of Connecticut School of Medicine. Curriculum Goals, Objectives and Competencies [homepage on the internet]. Farmington, CT. [cited 2012 Oct 11]. Available from: http://medicine.uchc.edu/prospective/curriculum/goals/index.html

[xxxi] Ogrinc G, Nierenberg D, Batalden P. Building experiential learning about quality improvement into a medical school curriculum: the Dartmouth experience. Health Aff. 2011 Apr; 30(4): 716-22.

[xxxii] Ogrinc, G, Headrick L, Morrison L, Foster T. Teaching and Assessing Resident Competence in Practice-based Learning and Improvement. J Gen Intern Med. 2004 May; 19(5p2): 496-500.

[xxxiii] Geisel School of Medicine at Dartmouth. The MD Program Courses [homepage on the internet]. Hanover, NH. [cited 2012 Oct 11]. Available from: http://geiselmed.dartmouth.edu/ed_programs/mdprog/#2

[xxxiv] Geisel School of Medicine at Dartmouth. Curriculum Redesign [homepage on the internet]. Hanover, NH. [cited 2012 Oct 11]. Available from: http://geiselmed.dartmouth.edu/insider/curriculum-redesign/

[xxxv] Ogrinc G, Nierenberg D, Batalden P. Building experiential learning about quality improvement into a medical school curriculum: the Dartmouth experience. Health Aff. 2011 Apr; 30(4): 716-22.

[xxxvi] Watson K. SYMPAL (SYstems-based medical practice and learning): a pilot project. ACGME Bulletin 2004 Nov; [cited 2012 Aug 22]. Available from: http://www.acgme.org/acWebsite/bulletin/bulletin11_04.pdf

[xxxvii] Voss J, et al. Changing conversations: teaching safety and quality in residency training. Acad Med. 2008 Nov; 83(11): 1080-087.

[xxxviii] University of Virginia School of Medicine. Common Components [homepage on the internet]. Charlottesville, VA. [cited 2012 Oct 11]. Available from: http://www.medicine.virginia.edu/clinical/departments/medicine/grad-ed/im- residapp/curriculum/components

[xxxix] University of Virginia. Institute for Quality and Patient Safety [homepage on the internet]. Charleston, VA. [cited 2012 Aug 22]. Available from: https://iqps.med.virginia.edu/cms/first.php?pageid=10.

[xl] Hooper, Kambria. Quality Improvement & Patient Safety Programs for Residents [homepage on the internet]. Stanford School of Medicine. [cited 2012 Aug 22]. Available from: http://medicine.stanford.edu/education/quality_improvement.html

[xli] Fiebach N, Rao D, Hamm M. A curriculum in health systems and public health for internal medicine residents. Am J Prev Med. 2011 Oct; 41(4): S264-269.
[xlii] ACGME Bulletin 2004 Nov; [cited 2012 Aug 22]. Available from: http://www.acgme.org/acWebsite/bulletin/bulletin11_04.pdf
[xliii] ThedaCare. ThedaCare Center for Healthcare Value – Lean Management System [homepage on the internet]. Appleton, WI. [cited 2012 Aug 29]. Available from: http://www.createvalue.org/resources/case-studies/lean-management-system/
[xliv] ThedaCare. ThedaCare Center for Healthcare Value – Success Stories [homepage on the internet]. Appleton, WI. [cited 2012 Aug 13]. Available from: http://www.createvalue.org/delivery/success-stories/
[xlv] ThedaCare Center for Heatlhcare Value: John Toussaint [homepage on the internet]. ThedaCare Center for Healthcare Value. Appleton, WI [cited 2012 Sept 27]. Available from: http://www.createvalue.org/about/john-toussaint/
[xlvi] Team Medicine: Chairman and CEO Gary Kaplan [homepage on the internet]. Virginia Mason. [cited 2012 27]. Seattle, WA. Available from: https://www.virginiamason.org/ChairmanandCEOGaryKaplanMDFACPFACMPE
[xlvii] VMPS Facts. Virginia Mason Medical Center. 2010. Available from: https://www.virginiamason.org/workfiles/pdfdocs/press/vmps_fastfacts.pdf
[xlviii] Denver Health Lean Academy [homepage on the internet]. Denver Health & Hospital Authority. Denver, CO. [cited 2012 Sept 27]. Available from: http://www.denverhealth.org/LEANAcademy/AboutLEANAcademy.aspx
[xlix] Jewish Healthcare Foundation. Regional Health Improvement Collaboratives: Essential Elements for Successful Healthcare Reform. Roots. http://www.prhi.org/images/stories/docs/PRHI%20Roots%20RHICs%20Volume%202.pdf. 2012.
[l] IHI Open School. Medical School in Virginia First to Require IHI Open School Certificate for Graduation. Institute for Healthcare Improvement. Cambridge, MA. [cited 2012 Sept. 27]. Available from: http://www.ihi.org/offerings/ihiopenschool/resources/Pages/EVMSFirstToRequireIHIOpenSchoolCertificate.aspx
[li] See Grantmakers In Health, http://www.gih.org/.
[lii] Johnson J, Miller S, Horowitz S. Systems-based practice: improving the safety and quality of patient care by recognizing and improving the systems in which we work. Agency for Healthcare Research and Quality. [cited 2012 Aug 22]. Available from: http://www.ahrq.gov/downloads/pub/advances2/vol2/Advances-Johnson_90.pdf
[liii] Accreditation Council for Graduate Medical Education. List of ACGME Accredited Programs and Sponsoring Institutions. [cited 2012 Aug 22]. Available from: http://www.acgme.org/adspublic/default.asp
[liv] Social Security Act §1866, 42 U.S.C. §1395cc-4.
[lv] Social Security Act §1899, 42 U.S.C. §1395jjj.
[lvi] Social Security Act §1899, 42 U.S.C. §1395jjj.
[lvii] Nelson L. Lessons from Medicare's demonstration projects on disease management and care coordination. Working Paper, Congressional Budget Office. 2012 Jan; [cited 2012 Aug 22]. Available from: http://www.cbo.gov/sites/default/files/cbofiles/attachments/WP2012-01_Nelson_Medicare_DMCC_Demonstrations.pdf

[lviii] Nelson L. Lessons from Medicare's demonstration projects on disease management and care coordination. Working Paper, Congressional Budget Office. 2012 Jan; [cited 2012 Aug 22]. Available from: http://www.cbo.gov/sites/default/files/cbofiles/attachments/WP2012-01_Nelson_Medicare_DMCC_Demonstrations.pdf

[lix] McDonald KM, Sundaram V, Bravata DM, Lewis R, Lin N, Kraft S, et al. Care Coordination. Vol 7 of: Shojania KG, McDonald, KM, Wachter, RM, Owens, DK, editors. Closing the Quality Gap: A Critical Analysis of Quality Improvement Strategies. Technical Review 9 (Prepared by the Stanford University-UCSF Evidence-based Practice Center under contract 290-02-0017). AHRQ Publication No. 04(07)-0051-7. Rockville, MD: Agency for Healthcare Research and Quality. June 2007.

[lx] Centers for Medicare and Medicaid Services. Hospital-acquired conditions (present on admission indicator). 2012 May; [cited 2012 Apr 19]. Available from: http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HospitalAcqCond/index.html?redirect=/HospitalAcqCond/

[lxi] Centers for Medicare and Medicaid Services. Deficit Reduction Act of 2005, Sec 5001(b).

[lxii] Centers for Medicare and Medicaid Services. Hospital-acquired conditions (present on admission indicator). 2012 May; [cited 2012 Apr 19]. Available from: http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HospitalAcqCond/index.html?redirect=/HospitalAcqCond/

[lxiii] Payment for physicians' services. 42 U.S.C. 1395w–4 (2009). Available from: http://www.law.cornell.edu/uscode/text/42/1395w-4

Center City Tower, Suite 2400
650 Smithfield Street, Pittsburgh, PA 15222
Phone: 412-594-2550
Fax: 412-232-6240
Email: info@jhf.org
www.jhf.org

ROOTS is a special publication of the Jewish Healthcare Foundation and its operating arms.