

The Essential Role of Generalists in Health Care Systems

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Viewing primary care as merely one of the many niches in individual patient care fosters a narrow perspective that neither accounts for the full value of primary care nor offers proper guidance for reforming it. Instead, a systems view better articulates primary care's essential role in increasing the effectiveness and efficiency of other health care services. Primary care improves health care system functioning through such services as managing and triaging undifferentiated symptoms, matching patient needs to health care resources, and enhancing the system's ability to adapt to new circumstances. By acting as an appropriate filter for high-technology care, primary care helps ensure that it is appropriately applied, a major determinant of outcomes. Furthermore, because primary care is the most financially and geographically accessible arm of the health care system, it reduces socioeconomic and geographic

disparities across the population. Even in the de facto health system that exists in the United States, these functions are necessary for the efficient, equitable, and sustainable delivery of health care and the adaptability and resilience of the system as a whole. As primary care reforms proceed, it will be important to explicitly consider how to support and strengthen its system-level benefits. Needed reforms include enabling universal access to primary care and providing the leadership, training, and infrastructure support to improve its performance as a central hub in the network of patients, clinicians, and communities. It is important that health systems realize the essential integrative function of primary care.

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To manage a system effectively, you might focus on interaction of the parts rather than their behavior taken separately.

—Russell L. Ackoff, systems theorist (1)

Health care is an essential means for promoting human development. By expanding people's capability to pursue lives that they value—free from premature death or treatable illness—health care reduces deprivation and enhances freedom (2). But to achieve these social objectives, a society must be able to distribute the benefits of health care across its entire population. Because it delivers health care to populations with both equity and efficiency, primary care is an essential component of a rational health care system (3).

Given such broad aspirations, realizing the potential of primary care is universally challenging, but it has been especially difficult in the United States (4). Without an organized system of health care delivery, or even a financing mechanism that ensures universal access, the fragmented system that has evolved presents many obstacles to primary care (5–9).

Some recent assessments of primary care's future have become increasingly dystopian (8, 10, 11), standing in stark contrast to the thorough account of primary care's benefits published by the Institute of Medicine's Committee on the Future of Primary Care less than a decade ago (3). Many of the warnings about primary care's possible demise take a market perspective (10–12), arguing that if primary care is faltering because of consumer choice, then the "invisible hand" has performed its duty to regulate demand and supply. But the market is subject to well-known failings—the so-called externalities—in which decisions to produce or consume a good or service have consequences beyond the participants in the transaction (13). In such cases, the aggregate effect of many self-interested decisions causes public harm in domains such as social

well-being, public health, and environmental protection (14). A classic example is the polluter, who saves money by indiscriminately disposing of wastes, while others pay the costs in the form of a degraded environment (15). Certain population benefits of primary care are at risk for being eroded by externalities in the current U.S. health care marketplace. For example, free access to specialists may be an individual psychic good, but if it comes at the expense of a rational system of matching population needs with health care resources, and promoting generalist–specialist interdependence, then free access to specialists may endanger long-term health system sustainability.

It is easy to overlook many of the important benefits of primary care if one views it as merely another clinical services niche in the marketplace. Only a systems view illuminates the real value of primary care: First, primary care is best understood as an essential part of an effective, efficient, and equitable health care system, even in a de facto system such as exists in the United States (16). Second, within the broader "system"—the naturalistic ecology (17, 18) of patients nested within health care systems nested within communities—primary care provides essential services at each level of organization. Important aggregate effects of primary care—over and above its benefits for individual patients—arise at higher organizational levels, representing new system behaviors not necessarily predictable from lower-level effects (19, 20).

We describe these essential system functions that primary care performs for health care organizations and populations. We have attempted to build on previous systems

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thinking (16, 21, 22), by explicitly considering a set of “primary care functions” that contribute to the effectiveness and overall integrity of the health care system, including triage of undifferentiated symptoms, improving the efficiency and appropriateness of specialty care, and reducing socioeconomic and geographic disparities. We hope that a focus on these primary care functions will not only place the debate on primary care’s future in a sufficiently broad context but will also guide transformations that will enable primary care to fully realize its promise. Many of the transformations involve strengthening generalists’ role as key connections in the network of patients, clinicians, and communities.

SCALING UP FROM INDIVIDUALS TO SYSTEMS

In trying to understand complex systems like ecosystems, economies, or health care, a central issue is how large-scale system features and patterns emerge from small-scale interactions (23–25). For example, what driving forces across millions of doctor–patient interactions cause disparities by race and ethnicity in the use of preventive and therapeutic interventions (26)—even among insured populations (27)—to emerge independently in so many communities across the United States? To address such questions, 3 characteristics of complex systems must be understood (28): 1) the number and diversity of interacting components, 2) how the components interact to generate system behavior, and 3) the mechanisms that feed back to the components the outcomes of their interactions. Each characteristic can sway the performance of the overall system. Most intuitively, an increase in 1 type of component relative to the others will change system behavior. Thus, continuing with the health care disparities example, if physicians from minority groups provide less disparate care, then each incremental increase in the minority physician workforce would be expected to incrementally reduce health service disparities. Beyond a critical threshold of minority physician workforce, however, the larger medical culture may evolve so that patient interactions change across all providers, thus sharply reducing disparities. Such emergent effects often follow nonlinear paths, illustrating the principle that quantitative change of a sufficient magnitude becomes qualitative change. The feedback mechanism motivating physician behavior change could be very explicit (tracking measures of disparate care) or more implicit (heightened awareness of disparities prompts physicians to question their assumptions when they care for minorities).

PRIMARY CARE FUNCTIONS

Primary care provides essential functions for patients, health systems, and populations. Because patient-level services have been extensively discussed in the primary care literature, we discuss them here only to emphasize that they are the fundamental units of primary care activity and

the necessary prerequisites for the emergence of many higher-level functions (Table, top). For example, although not unique to primary care, a strong emphasis on person-focused care (29, 30) projects beyond the patient–physician dyad to support important system goals such as quality of care (31, 32) and efficient use of services (33, 34). Person-focused care also helps caregivers reach decisions that meet the needs of the patient rather than the health care system (35). This entails careful consideration of procedures that may be driven by availability rather than benefit (36); self-perpetuating cascades of diagnostic or therapeutic interventions (37); and interventions aimed at reducing clinician rather than patient uncertainty.

Functions for Health Care Systems

Primary care provides essential functions for health systems, whether the de facto system of care in the United States or the more centrally organized health systems elsewhere (Table, middle). As the point of entry into the health system, primary care enhances the efficiency of downstream providers in several ways. First, primary care is a mechanism to evaluate patients with undifferentiated symptoms, so that, for example, patients with chest pain from panic disorder do not end up in the angiography laboratory, while those with chest pain from angina do. This benefit accrues not only to patients; the aggregate effect of this triage function at the health system level is to match patients’ needs with system resources, thus minimizing potential overtreatment or undertreatment (38). Part of the triage effect emerges from the mathematics of clinical epidemiology. Specialist testing strategies for ruling in serious disease function well only when the prior probability of disease is reasonably high; primary care can ensure that this is so with appropriate screening of referrals (39, 40). Another part of the triage effect stems from the different severity of illness usually seen by generalists rather than specialists. Dealing with complex, high-risk cases, specialists often use “maximin” strategies (41) designed to make the best of the worst-case scenario, strategies that may be inappropriate for patients with less severe illness (42). On the other hand, patients with complex illnesses often require specialist care, and primary care triage helps to ensure that specialists spend most of their time applying their skills where they are critically needed. In the case of illnesses such as major depressive disorder, primary care also provides a major source of system capacity for a disorder that would otherwise overwhelm the supply of specialist mental health clinicians.

Some patients present with problems that the health care system cannot diagnose or solve (43). Often, after a string of specialty evaluations excludes various organ systems as the cause, the patient is left feeling confused, frightened, and forsaken. Because of its commitment to persons rather than problems, primary care does not dismiss these patients, but continues to hold them in the system and manage their problems. The continuing prev-

Table. Health Care Functions Provided by Primary Care

Primary Care Function	Function	Example
Patient Level		
Provide personal health care	Diagnose and treat illness	Care for diabetes mellitus in context of continuous relationship
Focus on person rather than disease	Understand patient's overarching goals	Balance treatment intensity and quality of life
Focus on decisions congruent with goals of patient rather than health care system	Elicit informed preferences	Discuss marginal benefit of additional testing, intervention
Develop continuous healing relationship	Enhance trust and understanding	Address fears about surgery stemming from experiences
Focus on trajectories of personal health	Anticipate future problems	Risk for family violence
Place patient in context of family/community	Understand contextual risks and perceptions	Address medical practices that conflict with culture
Integrate needs of patients with multiple conditions	Manage conflicts and burden of multiple recommendations	Discuss effect of steroid use for lupus on diabetes mellitus
Health care system level		
Point of entry for initial evaluation	Access and initial triage of symptoms	Differentiate coronary artery disease from panic disorder
Match patient needs with system resources	Avoid over- or undertreatment	Manage asthma in primary care vs. referral to pulmonologist
Increase mutual understanding of patient and health care system	Provide contextual information	Tell consultant that patient is very stoic and minimizes symptoms
Coordination of services	Coordinate care from multiple disciplines	Coordinate mental health and support group services for patients with cancer
Provide capacity for acute and chronic illness not requiring specialty care	Provide source of clinical care manpower	Care for major depression
Population level		
Link geographies of community and tertiary care	Supply decentralized source of local health care	Refer patients needing tertiary care intervention
Match population needs with health resources	Enhance efficiency and appropriateness of care	Buffer supply-side drivers of overuse
Promote equity and counter market dynamics	Provide access and understand sources of bias Distribution matches geographical distribution of U.S. population	
Locus of primary and secondary prevention	Augment public health	Provide recommended immunizations

alence of undiagnosable illness in medical practice (44) makes this holding function an important system service.

Another function of primary care is to enhance the mutual understanding of patient and health system. Using the knowledge gained from personal relationships, primary care clinicians can anticipate and address patients' concerns about diagnostic tests, procedures, and referrals. And patients' reciprocal trust will make them more likely to open up and ask difficult questions. Physicians' knowledge of specialty colleagues can also help patients understand consultants' professional approaches and personal styles, minimizing surprises for the patient. Conversely, primary care physicians can also assist specialty colleagues in understanding patients, for example, by pointing out that an especially stoic patient may minimize symptoms or functional limitations, or that a patient's relative had a serious complication from the same procedure for which the patient is being referred.

Primary care also increases health care systems' adaptive capacity, defined as system flexibility and the ability to change in response to opportunities or disturbances. For example, primary care can help absorb a spike in demand for care related to an important new test or treatment. Primary care can also buffer shifts in health care manpower, such as the current inadequate number of geriatricians.

And because these services can be provided across multiple organ systems and age groups, primary care is a multifunctional buffer for such situations.

Functions for Populations

As the most geographically and financially accessible form of health care, primary care helps to minimize inequities due to the geographic distribution and high costs of health resources (Table, *bottom*) (45–47). In this respect, primary care helps reduce the impact of the “inverse care law,” which states that health care is available to a population in inverse proportion to its need (48). Primary care physicians are more likely to be located in rural areas or economically disadvantaged urban areas than specialist physicians (47, 49). For patients who need specialty care but lack financial access to it, primary care clinicians often provide a level of care that can forestall severe illness. These reductions in health inequity due to primary care are measurable at the population level (50–52).

The decentralized geography of primary care is also an important mechanism to bridge communities and tertiary care. Primary care is a pathway to tertiary care for patients with rare or complex illnesses, providing the necessary linkages for case finding and referral.

As an aggregated effect of the health system service

noted above, primary care helps accomplish population-level matching of health needs and services, so that health resources within a society can be deployed most effectively. For example, patients in states with higher population ratios of generalist physicians spend less on Medicare while receiving higher quality of care, as measured by receipt of recommended services (53).

One of the population-level benefits of primary care may be to act as a filter between patients and high-technology care (54, 55). Although this created negative perceptions of primary care during the era of expanded gatekeeping, both theory and evidence suggest that the health care system functions better when primary care is the pathway to specialty care (16, 56). One of the most robust findings in health services research is that population rates of many procedures correlate very closely with supply-side variables such as per capita ratios of physicians, hospital beds, and technology, while showing very poor correlations with indicators of need such as illness rates (36, 57–59). For example, thresholds for coronary bypass grafting fall as the per capita ratio of cardiothoracic surgeons increases, leading to increasing probability that procedures will be applied to patients with less severe disease (60). More intensive diagnosis and therapy can lead to patient harm, through detection of “abnormalities” with little prognostic meaning, and increased risk for iatrogenesis from medications or surgery (61, 62). Although the literature on this question is small, there is evidence that patients who are referred for procedures by primary care physicians have better outcomes than do patients who have gone directly to specialists (56). Primary care can also function to direct patients toward higher-quality technical care for procedures with critical volume–outcome relationships, such as coronary bypass (63).

In addition, primary care is a locus for primary and secondary prevention, augmenting the public health system’s ability to meet prevention targets. Beyond its role as a source of clinical preventive services, primary care may provide other, more subtle, preventive benefits. Because most people make at least 1 visit to a primary care physician each year, primary care is in a position to serve as a “population strategy” for prevention. Population strategies have small effects on large numbers of persons at low risk for illness, yielding aggregate public health benefits that often exceed those from prevention programs that produce large effects on small numbers of people at high risk (64).

Health care system sustainability may be the ultimate population-level service of primary care. In an era when the intersection between affluent modern societies and rapidly expanding technology adds up to a seemingly limitless demand for health care (fueled further by profit motives [65])—while willingness to pay is bounded by business and public-sector economics—some rational control is necessary. Although primary care (as gatekeeper) has been recently stung by the forbidding politics of restraint, health system sustainability has not ceased to be an issue.

EVIDENCE OF PRIMARY CARE’S SYSTEM BENEFITS

Cross-national comparisons of primary care infrastructure and population health outcomes provide evidence of the systems benefits of primary care. In a series of studies over 20 years, replicated for both the 1980s and 1990s, Starfield and colleagues have demonstrated that nations with stronger primary care infrastructure have lower rates of premature deaths, deaths from treatable conditions, and neonatal and postneonatal mortality, even after accounting for differences in demographics and gross domestic product (66–68). In contrast, nations such as Belgium, Germany, and the United States, which rank lower in primary care organization and processes, have higher costs and lower health outcomes.

Case studies within specific countries further illustrate primary care’s benefits to health systems (69). In the 1950s and 1960s, Sweden invested heavily in hospitals and specialists, but subsequent overuse of services and high costs triggered increased emphasis on primary care clinicians and infrastructure. Utilization and costs decreased. Finland has witnessed a similar trajectory. Spain enacted tax-based financing in 1994 and moved to increase its supply of family physicians. Primary care delivery was linked to a geographically defined population base and was reorganized in health care centers that emphasized multidisciplinary teamwork. Eight years later, areas where reform was implemented had better continuity and patient satisfaction with care, although access and comprehensiveness achieved fewer gains (70).

The United Kingdom arguably has the most strongly institutionalized system of primary care, and its central role continues to expand. Working within 303 local “primary care trusts,” designed to make allocation decisions more responsive to community needs, general practitioners now share responsibility for purchasing medical and social services for their defined populations. Although there have been significant hurdles as general practitioners transitioned to their new role (71), primary care trusts have generated new approaches to providing clinical services, enhanced quality improvement, and established new collaborations with social services (72).

In the United States, the Veterans Administration (VA) is an example of a large delivery system that has reorganized to enhance primary care. In 1995, the VA began opening community-based outpatient clinics, sites intended to provide veterans with more geographically accessible services while emphasizing primary care. Total direct patient care costs are significantly lower in community-based outpatient clinics because these clinics less frequently use ancillary services and specialists (73). In addition, traditional VA medical centers have also reorganized themselves to improve their primary care components. Outcomes have included enhanced continuity of care, higher rates of preventive services, fewer hospitalizations, and lower death rates (74).

In contrast, Kaiser Permanente has long been organized to integrate generalist and specialist care. Although the proportion of specialist physicians in the Permanente Medical Group has increased to 60% in parallel with the overall trend in the United States, the Kaiser model emphasizes close integration of generalists and specialists working together in multispecialty groups that also include midlevel practitioners. These teams collaborate to develop guidelines and protocols that direct the patient to the most appropriate level of care. Collaboration between generalists and specialists has been one of the organizational features that have allowed Kaiser to deliver a high quality of care at relatively low cost (75).

TRANSFORMING PRIMARY CARE TO IMPROVE SERVICES

The skeptical reader will have identified instances where primary care's performance in providing the listed services has been suboptimal. Idealized visions of primary care have been difficult to convert into reliably executed reality (76). Some of the expertise relevant to primary care—integration, personalization, effective collaboration (77)—is difficult to program. Other deficiencies have been common to the broader medical care system, including the failure to reliably deliver beneficial clinical interventions (78). Although primary care has already busied itself addressing some of these deficiencies, with advances such as electronic medical records, same-day appointment access (79), team care (80), chronic care models (81), and quality improvement programs, further transformations will be necessary to improve the systems-level contribution of primary care to the health system.

Primary care transformation will rely partially on technology such as information systems, but the main task is organizational: enhancing primary care's performance as an essential hub in the network formed by patients, health care organizations, and communities. Modern understanding of systems ranging from metabolic pathways to corporations to the Internet has emphasized that robust networks are characterized by a small set of nodes with disproportionately high connectedness (82). These well-connected nodes greatly decrease the number of times that information must travel from node to node to traverse the network (83). Effective primary care provides the well-connected nodes in the health care network, and many of the needed design improvements in primary care relate to enhancing its network functions. A successful design should address the following key questions:

1. How should people be linked to primary care practices to promote the systems functions of primary care?
2. How should primary care be linked to other services within the health care system to optimize the functioning of the overall system?
3. How should primary care be linked to communities to best integrate community needs with health care system services?

How these connections are created is also important. Unlike regionalized tertiary care, primary care is a decentralized, bottom-up endeavor necessarily dispersed where its constituents reside; prescriptive, top-down formulations risk failure to successfully address local circumstances. Instead, the most effective strategies will outline the necessary linkages, allowing for adaptable local design and evolution of working interactions (25). Several general principles for reform follow from the discussion of complex systems' characteristics earlier in the paper:

First, the diversity of system components should be matched to the complexity of tasks. When the team is faced with high-complexity clinical tasks, adding people with varied skills to the team increases the number of possible solutions that will be generated. For example, routine early review of certain high-acuity patients with a specialist or pharmacotherapist may identify solutions that accelerate appropriate use of specialized medications or interventions. Conversely, many repetitive low-complexity clinical tasks should be handled by members of the primary care team other than the physician, reserving physician-level expertise for individualized care (84).

Second, changing interactions may be more important than changing people. Most primary care physicians probably have established relationships with all the different types of health care personnel that are required to deliver excellent care, but the interactions are not designed to optimize outcomes. For example, as will be discussed later, there may be one interaction mode (referral) for a set of problems that requires multiple possible responses.

Third, feedback mechanisms that inform system components about the outcomes of their behavior must be created. Without feedback, components or interactions cannot purposefully evolve. All primary care teams require feedback on their collective performance so that *the team* can learn (85). Finding metrics suitable for measuring the health effects of primary care has been difficult (86), but progress may require the generalist community to choose a few "good enough" measures that will be routinely collected, and to begin to track and compare outcomes.

Linkages with Persons

The most powerful boost to primary care's population-wide effectiveness would be achieved by assuring universal access to health care. Universal access would improve population-wide access to basic primary care functions such as initial assessments of health care needs, triage to necessary specialty care, and primary and secondary prevention.

Linking every person with a primary care clinician of choice should be a policy priority for both government and private delivery systems. Even persons with little need for health care, or those whose care is overwhelmingly supplied by subspecialists, should have an identified primary care clinician to enable the functions of primary care that require population management, such as delivery of preven-

tive services and implementation of chronic care models. Another advantage would be the ability to calculate population denominators for primary care research.

As argued by Bodenheimer and colleagues (87), primary care clinicians' role should be to coordinate care rather than act as gatekeepers. Setting primary care as a barrier to obtaining services was distasteful to both patients and clinicians, and was unfaithful to the dual responsibility of primary care to remedy undertreatment as well as restrain overtreatment. But perhaps the current shift toward patient cost-sharing as the preferred way to limit medical expenditures (88) may turn the gatekeeping dynamic on its head and provide incentives for patients to seek out trusted sources of advice on what care is truly of value. Data from the RAND Health Insurance Experiment and Medical Outcomes Study demonstrate that consumer cost-sharing reduces the use of both effective and ineffective medical interventions (89, 90). Thus, consumers subject to financial disincentives for seeking care need guidance to avoid underuse of beneficial services. The advising function of generalists could be promoted by reduced cost-sharing for primary care visits. Of course, to maintain credibility as care coordinators, primary care physicians must shun the financial conflicts of interest that sabotaged public confidence in their objectivity as gatekeepers.

Linkages with Other Health System Components

The 3 generalist disciplines (general pediatrics, general internal medicine, and family medicine) should establish a working association. From a systems perspective, without an institutionalized role in a national health system, primary care is severely constrained in its administrative relationships (91). Generalists would benefit from collective efforts to study, improve, negotiate, and advocate for their roles in the health care system—yet alliances remain the exception. We therefore propose the formation of a “Primary Care Partnership,” a collaborative association of the 3 disciplines whose role would be to provide national leadership on issues of common interest, such as improving the systems role of generalists, integrating health care, implementing life course models of care, working more effectively with communities, and selecting performance measures. (As does the European Union, the Primary Care Partnership could rotate leadership among its constituencies.)

The Primary Care Partnership would also increase representation of a generalist agenda at policy forums and funding agencies. For instance, to lobby Congress and the National Institutes of Health for increased funding for generalist issues such as reducing fragmentation of care, coordinated representation from the 3 primary care specialties would give generalism a bigger voice and the potential to exert more influence.

Another necessary step is improving primary care's performance in integrating care: ensuring that the health care team pulls together to best serve patient needs in the medical, behavioral, and social arenas. Extensive anecdotal

evidence suggests that care integration is often poor. Integration is complex, time-consuming work; improving primary care's performance in integrating care will involve an effort akin to that of improving safety. Effective integration must become part of the curriculum in primary care training. Systems of care will need to evolve so that integration is a built-in system property, with information systems, teams, and organizational linkages promoting integration. For example, a local group of clinicians or a larger delivery system could devise integration “templates” for common primary care scenarios, such as school failure, family violence, frail elderly persons, chronic or life-threatening illness, and end-of-life care. Depending on the locale and system of care in which the practice was embedded, these templates could span the range from alerting primary care clinicians to existing local resources to engaging previously specified teams that would work with the patient.

The division of care between generalists and specialists should be reconceptualized from a systems perspective. While referral usually focuses on the narrow question of which type of clinician should see the patient, it makes more sense to optimize the outcomes generated by the generalist–specialist system of care, given that outcomes are determined less by the quality of specialized intervention—although that too is essential—than by its appropriate application (92). As discussed above, the filtering function of generalists is critical, and care should be taken that the filter be neither too permissive nor too restrictive. Generalists should work with specialists to address the following questions: What are the volume–outcome relationships for a specific condition in both primary and specialty care and how can they be optimized? When is referral too early, and when is it too late? They should create communication patterns that support the proper selection of steps along the referral continuum of advice, formal consultation, co-management, or referral (93, 94). Over time, it will be important to take into account the co-evolution of primary care clinicians and specialists because change in what either does has implications for the other. For instance, as primary care practitioners became more comfortable prescribing antidepressant medications, there were implications for psychiatric practitioners in referral case mix and changes in the consultative relationship. Unfortunately, the co-evolution of roles and responsibilities is often left to play out haphazardly, although this is changing in integrated delivery systems such as Kaiser Permanente, which has recently designed a program for integration of primary and specialized mental health services early in the course of treatment (95).

Linkages with Communities

Response to community needs remains one of the most challenging tasks of primary care. As the arm of clinical medicine with the broadest reach into the community, primary care clinicians are well-positioned to help the health care system to understand local needs and design

programs that address community health (96), yet there is often little coordination between public health and primary care (97). Well-developed models of community engagement, such as community-oriented primary care (COPC) (98), remain the ideal, but they have met with limited success in the United States because of limitations in clinician time, poorly defined relationships between communities and practices, and the lack of reimbursement for community health activities. Despite the obstacles, however, addressing community needs in an anticipatory rather than reactive manner requires perseverance.

Every primary care practice should forge 3 types of community linkages. First are linkages with community agencies that can augment, or obtain funding for indigent patients to receive, the clinical or social services that the practice offers. Because the network function of primary care is often hindered by lack of information about these agencies and their services, social workers or other appropriately trained personnel should be closely linked to primary care. Communities can also create Internet-based information systems that would assist network connections.

Second, primary care needs to have ongoing connections with local public health departments that can share data on local patterns of morbidity and mortality that can help shape clinical interventions. Given that most practices in the United States are not explicitly linked with populations, a useful heuristic to create connections among primary care, public health, and communities is the concept of a “practice footprint.” Most practices serve a panel of patients drawn from nearby neighborhoods; although usually corresponding poorly with any traditionally defined community, the panel nevertheless reflects the practice’s coverage—its footprint—in a set of one or more neighborhoods. Thus, in an era when many local public health departments track risk factors, diseases, and preventive services with sophisticated geographic information systems (specifying, for example, which dwellings contain nonimmunized children), such information can be used to define the intersection of a practice’s community footprint with a set of epidemiologic risks, thereby guiding action. For instance, a practice with many patients from a ZIP code with a high incidence of cervical cancer could be prompted to review its performance in screening women from those ZIP codes and to contact women who had not been screened. To define its footprint, a practice would provide the health department with a set of addresses from administrative data, and the health department would produce a report of the most urgent morbidity in the areas reached by the practice.

Third, public health services often target the same prevention goals as primary care, offering programs that address behavioral risk factors. There are many lost opportunities for information to flow in both directions, with practice patients who remain unaware about available programs, and public health staff who remain uninformed

about pockets of need identified in primary care practice. Active collaboration can strengthen these networks.

PAYMENT REFORM AS A SYSTEM INTERVENTION

Although a detailed discussion of reimbursement reform is beyond the scope of this paper, it is clear that payment mechanisms affect systems by enabling or constraining the adoption of new models of delivering services. Reimbursement mechanisms must be aligned with important system functions. For example, innovations such as e-mail communication with patients, group visits for chronic illness care, shared generalist–specialist care, and community-oriented primary care have been hindered by reimbursement issues.

CONCLUSION

Primary care provides essential functions within health systems and populations that go beyond its treatment of individual patients. These functions advance the interests of stakeholders throughout the health care system and help address 2 of the urgent questions facing health care globally: First, how can we make the benefits of basic health care widely accessible to all people within a society? Second, how can needs and services best be matched so that we neither neglect necessary care nor deliver unnecessary care? Explicitly recognizing and supporting its system functions must be an important part of current efforts to reform primary care. Concerted effort is needed to develop the organizational characteristics that enable primary care to function well at the center of an integrated network weaving together health systems and communities, allowing patients to access appropriate high-quality services along the spectrum of care. The demands of a fragmented nonsystem can no longer be the dominant forces in practice organization; the design must now address itself to the needs of patients and populations.

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References

- Ackoff RL. *Ackoff's Best: His Classic Writings on Management*. New York: J Wiley; 1999.
- Sen A. *Development as Freedom*. New York: Alfred A. Knopf; 1999.
- Donaldson MS, Yordy KD, Lohr KN, Vanselow NA, eds. *Primary Care: America's Health in a New Era*. Washington, DC: National Academy Pr; 1996.
- Schoen C, Osborn R, Huynh PT, et al. Primary care and health system performance: adults' experiences in five countries. *Health Affairs*. 2004;W4:487-503. [PMID: 15513956]
- Moore G, Showstack J. Primary care medicine in crisis: toward reconstruction and renewal. *Ann Intern Med*. 2003;138:244-7. [PMID: 12558374]
- Schroeder SA. Primary care at a crossroads. *Acad Med*. 2002;77:767-73. [PMID: 12176687]
- Showstack J, Lurie N, Larson EB, Rothman AA, Hassmiller S. Primary care: the next renaissance. *Ann Intern Med*. 2003;138:268-72. [PMID: 12558378]
- Sandy LG, Schroeder SA. Primary care in a new era: disillusion and dissolution? *Ann Intern Med*. 2003;138:262-7. [PMID: 12558377]
- Moore GT. The case of the disappearing generalist: does it need to be solved? *Milbank Q*. 1992;70:361-79. [PMID: 1614384]
- Kleinke JD. *Bleeding Edge: The Business of Health Care in the New Century*. Gaithersburg, MD: Aspen Publishers; 1998.
- Philibert I. An Interview with Carl Getto, MD. *ACGME Bulletin*. 2004; June, 2004:10-1.
- Hueston WJ. Myth-information about family medicine: is fiction better than truth? [Editorial] *Fam Med*. 2004;36:359-62. [PMID: 15129385]
- Madden CW. Excess capacity: markets regulation, and values. *Health Serv Res*. 1999;33:1651-68. [PMID: 10029502]
- McMichael T. *Human Frontiers, Environments and Disease: Past Patterns, Uncertain Futures*. Cambridge, United Kingdom: Cambridge Univ Pr; 2001.
- Fullerton D, Stavins R. How economists see the environment. *Nature*. 1998; 395:433-4.
- Starfield B. *Primary Care: Balancing Health Needs, Services, and Technology*. New York: Oxford Univ Pr; 1998.
- White KL, Williams TF, Greenberg BG. The ecology of medical care. *N Engl J Med*. 1961;265:885-92. [PMID: 14006536]
- Green LA, Fryer GE Jr, Yawn BP, Lanier D, Dovey SM. The ecology of medical care revisited. *N Engl J Med*. 2001;344:2021-5. [PMID: 11430334]
- Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, DC: National Academies Pr; 2001.
- Plsek PE, Wilson T. Complexity, leadership, and management in health care organisations. *BMJ*. 2001;323:746-9. [PMID: 11576986].
- Grumbach K, Fry J. Managing primary care in the United States and in the United Kingdom. *N Engl J Med*. 1993;328:940-5. [PMID: 8446142]
- Grumbach K, Bodenheimer T. A primary care home for Americans: putting the house in order. *JAMA*. 2002;288:889-93. [PMID: 12186609]
- Levin SA. The problem of pattern and scale in ecology. *Ecology*. 1992;73: 1943-67.
- Arthur WB. Complexity and the economy. *Science*. 1999;284:107-9. [PMID: 0010103172]
- Plsek PE. Redesigning health care with insights from the science of complex adaptive systems. In: *Institute of Medicine. Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, DC: National Academies Pr; 2001.
- Carlisle DM, Leake BD, Shapiro MF. Racial and ethnic differences in the use of invasive cardiac procedures among cardiac patients in Los Angeles County, 1986 through 1988. *Am J Public Health*. 1995;85:352-6. [PMID: 7892918]
- Fiscella K, Franks P, Doescher MP, Saver BG. Disparities in health care by race, ethnicity, and language among the insured: findings from a national sample. *Med Care*. 2002;40:52-9. [PMID: 11748426]
- Levin SA. *Fragile Dominion: Complexity and the Commons*. Reading, MA: Perseus Books; 1999.
- McWhinney IR. *A Textbook of Family Medicine*. 2nd ed. New York: Oxford Univ Pr; 1997.
- Cassel EJ. The nature of suffering and the goals of medicine. *N Engl J Med*. 1982;306:639-45. [PMID: 7057823]
- Parchman ML, Burge SK. The patient-physician relationship, primary care attributes, and preventive services. *Fam Med*. 2004;36:22-7. [PMID: 14710325]
- Meredith LS, Orlando M, Humphrey N, Camp P, Sherbourne CD. Are better ratings of the patient-provider relationship associated with higher quality of care for depression? *Medical Care*. 2001;39:359-60.
- Weiss LJ, Blustein J. Faithful patients: the effect of long-term physician-patient relationships on the costs and use of health care by older Americans. *Am J Public Health*. 1996;86:1742-7. [PMID: 9003131]
- Mainous AG 3rd, Gill JM. The importance of continuity of care in the likelihood of future hospitalization: is site of care equivalent to a primary clinician? *Am J Public Health*. 1998;88:1539-41. [PMID: 9772859]
- Culpepper L, Gilbert TT. Evidence and ethics. *Lancet*. 1999;353:829-31. [PMID: 10459978]
- Wennberg JE. Unwarranted variations in health care delivery: implications for academic medical centres. *BMJ*. 2002;325:961-4. [PMID: 12399352]
- Mold JW, Stein HF. The cascade effect in the clinical care of patients. *N Engl J Med*. 1986;314:512-4. [PMID: 3945278]
- Becker LA, Green LA, Beaufair D, Kirk J, Fromm J, Freeman WL. Use of CT scans for the investigation of headache: a report from ASPN. Part I. *J Fam Pract*. 1993;37:139-44.
- Sox HC. Decision-making: a comparison of referral practice and primary care. *J Fam Pract*. 1996;42:155-60. [PMID: 8606305]
- Rosser WW. Approach to diagnosis by primary care clinicians and specialists: is there a difference? *J Fam Pract*. 1996;42:139-44. [PMID: 8606303]
- Brody H, Thompson JR. The maximin strategy in modern obstetrics. *J Fam Pract*. 1981;12:977-86. [PMID: 7014759]
- Reich JM. Mortality of intrathoracic sarcoidosis in referral vs population-based settings: influence of stage, ethnicity, and corticosteroid therapy. *Chest*. 2002;121:32-9. [PMID: 11796429]
- Kroenke K, Mangelsdorff AD. Common symptoms in ambulatory care: incidence, evaluation, therapy, and outcome. *Am J Med*. 1989;86:262-6. [PMID: 2919607]
- Okkes IM, Oskam SK, Lamberts H. The probability of specific diagnoses for patients presenting with common symptoms to Dutch family physicians. *J Fam Pract*. 2002;51:31-6. [PMID: 11927060]
- Blumenthal D, Mort E, Edwards J. The efficacy of primary care for vulnerable population groups. *Health Serv Res*. 1995;30:253-73. [PMID: 7721596]
- Grumbach K, Hart LG, Mertz E, Coffman J, Palazzo L. Who is caring for the underserved? A comparison of primary care physicians and nonphysician clinicians in California and Washington. *Ann Fam Med*. 2003;1:97-104. [PMID: 15040439]
- Council on Graduate Medical Education. *Physician Distribution and Health Care Challenges in Rural and Inner-City Areas. Tenth Report*. Rockville, MD: Health Resources and Services Administration, 1998.
- Hart JT. The inverse care law. *Lancet*. 1971;1:405-12. [PMID: 4100731]
- Fryer GE, Green LA, Dovey SM, Phillips RI Jr. The United States relies on family physicians unlike any other specialty. *Am Fam Physician*. 2001;63:1669. [PMID: 11352277]
- Shi L. Primary care, specialty care, and life chances. *Int J Health Serv*. 1994; 24:431-58. [PMID: 7928012]
- Shi L, Starfield B, Politzer R, Regan J. Primary care, self-rated health, and reductions in social disparities in health. *Health Serv Res*. 2002;37:529-50. [PMID: 12132594]
- Shi L, Macinko J, Starfield B, Xu J, Regan J, Politzer R, et al. Primary care, infant mortality, and low birthweight in the states of the USA. *J Epidemiol Community Health*. 2004;58:374-80. [PMID: 15082734]
- Baicker K, Chandra A. Medicare spending, the physician workforce, and beneficiaries' quality of care. *Health Aff (Milwood)*. 2004;W4:184-97. [PMID: 15451981]
- Jones R. The impact of molecular medicine on health services. *Nat Med*. 1996;2:959-60. [PMID: 8782443]
- Starfield B, Holtzman NA, Roland MO, Sibbald B, Harris R, Harris H. Primary care and genetic services. Health care in evolution. *Eur J Public Health*.

- 2002;12:51-6. [PMID: 11968521]
56. **Roos NP.** Who should do the surgery? Tonsillectomy-adenoidectomy in one Canadian province. *Inquiry.* 1979;16:73-83. [PMID: 155042]
57. **Welch WP, Miller ME, Welch HG, Fisher ES, Wennberg JE.** Geographic variation in expenditures for physicians' services in the United States. *N Engl J Med.* 1993;328:621-7. [PMID: 8429854]
58. **Fisher ES, Wennberg DE, Stukel TA, Gottlieb DJ, Lucas FL, Pinder EL.** The implications of regional variations in Medicare spending. Part 1: the content, quality, and accessibility of care. *Ann Intern Med.* 2003;138:273-87. [PMID: 12585825]
59. **Fisher ES, Wennberg DE, Stukel TA, Gottlieb DJ, Lucas FL, Pinder EL.** The implications of regional variations in Medicare spending. Part 2: health outcomes and satisfaction with care. *Ann Intern Med.* 2003;138:288-98. [PMID: 12585826]
60. **Tu JV, Naylor CD, Kumar D, DeBuono BA, McNeil BJ, Hannan EL.** Coronary artery bypass graft surgery in Ontario and New York State: which rate is right? Steering Committee of the Cardiac Care Network of Ontario. *Ann Intern Med.* 1997;126:13-9. [PMID: 8992918]
61. **Fisher ES, Welch HG.** Avoiding the unintended consequences of growth in medical care: how might more be worse? *JAMA.* 1999;281:446-53. [PMID: 9952205]
62. **Franks P, Clancy CM, Nutting PA.** Gatekeeping revisited—protecting patients from overtreatment. *N Engl J Med.* 1992;327:424-9. [PMID: 1625720]
63. **Hannan EL, Kilburn H Jr, Bernard H, O'Donnell JF, Lukacik G, Shields EP.** Coronary artery bypass surgery: the relationship between in-hospital mortality rate and surgical volume after controlling for clinical risk factors. *Med Care.* 1991;29:1094-107. [PMID: 1943270]
64. **Rose G.** *The Strategy of Preventive Medicine.* Oxford: Oxford Univ Pr; 1992.
65. **Abelson R.** An M.R.I. machine for every doctor? Someone has to pay. *The New York Times.* 13 March 2004:A1.
66. **Starfield B.** *Primary Care: Concept, Evaluation, and Policy.* New York: Oxford Univ Pr; 1992.
67. **Starfield B, Shi L.** Policy relevant determinants of health: an international perspective. *Health Policy.* 2002;60:201-18. [PMID: 11965331]
68. **Macinko J, Starfield B, Shi L.** The contribution of primary care systems to health outcomes within Organization for Economic Cooperation and Development (OECD) countries, 1970-1998. *Health Serv Res.* 2003;38:831-65. [PMID: 12822915]
69. **Fry J, Horder J.** *Primary Health Care in an International Context.* London: Nuffield Provincial Hospitals Trust; 1994.
70. **Larizgoitia I, Starfield B.** Reform of primary health care: the case of Spain. *Health Policy.* 1997;41:121-37. [PMID: 10169298]
71. **Walshe K, Smith J, Dixon J, Edwards N, Hunter DJ, Mays N, et al.** Primary care trusts [Editorial]. *BMJ.* 2004;329:871-2. [PMID: 15485941]
72. **Smith J, Mays N, Dixon J, Goodwin N, Lewis R, McClelland S, et al.** A review of the effectiveness of primary care-led commissioning and its place in the NHS. London: The Health Foundation; 2004.
73. **Maciejewski ML, Chapko MK, Hedeem AN, Fortney JC.** VA community-based outpatient clinics: cost performance measures. *Med Care.* 2002;40:587-95. [PMID: 12142774]
74. **Rubenstein LV, Yano EM, Fink A, Lanto AB, Simon B, Graham M, et al.** Evaluation of the VA's Pilot Program in Institutional Reorganization toward Primary and Ambulatory Care: Part I, Changes in process and outcomes of care. *Acad Med.* 1996;71:772-83. [PMID: 9158345]
75. **Feachem RG, Sekhri NK, White KL.** Getting more for their dollar: a comparison of the NHS with California's Kaiser Permanente. *BMJ.* 2002;324:135-41. [PMID: 11799029]
76. **Safran DG.** Defining the future of primary care: what can we learn from patients? *Ann Intern Med.* 2003;138:248-55. [PMID: 12558375]
77. **Cassell EJ.** Teaching the fundamentals of primary care: a point of view. *Milbank Q.* 1995;73:373-405. [PMID: 7659045]
78. **McGlynn EA, Asch SM, Adams J, Keesey J, Hicks J, DeCristofaro A, et al.** The quality of health care delivered to adults in the United States. *N Engl J Med.* 2003;348:2635-45. [PMID: 12826639]
79. **Murray M, Bodenheimer T, Rittenhouse D, Grumbach K.** Improving timely access to primary care: case studies of the advanced access model. *JAMA.* 2003;289:1042-6. [PMID: 12597761]
80. **van Weel C.** Teamwork. *Lancet.* 1994;344:1276-9. [PMID: 7967991]
81. **Bodenheimer T, Wagner EH, Grumbach K.** Improving primary care for patients with chronic illness. *JAMA.* 2002;288:1775-9. [PMID: 12365965]
82. **Watts DJ, Strogatz SH.** Collective dynamics of 'small-world' networks. *Nature.* 1998;393:440-2. [PMID: 9623998]
83. **Strogatz SH.** Exploring complex networks. *Nature.* 2001;410:268-76. [PMID: 11258382]
84. **Bar-Yam Y.** Multiscale variety in complex systems. *Complexity.* 2004;9:37-45.
85. **Bar-Yam Y.** *Making Things Work: Solving Complex Problems in a Complex World.* Brookline, MA: Knowledge Pr; 2005.
86. **Ware JE.** Measuring patients' views: the optimum outcome measure [Editorial]. *BMJ.* 1993;306:1429-30. [PMID: 8518638]
87. **Bodenheimer T, Lo B, Casalino L.** Primary care physicians should be coordinators, not gatekeepers. *JAMA.* 1999;281:2045-9. [PMID: 10359396]
88. **Gabel J, Claxton G, Holve E, Pickreign J, Whitmore H, Dhont K, et al.** Health benefits in 2003: premiums reach thirteen-year high as employers adopt new forms of cost sharing. *Health Aff (Millwood).* 2003;22:117-26. [PMID: 14515887]
89. **Newhouse J, Group tE.** *Free for all? Lessons from the Rand Health Insurance Experiment.* Cambridge, MA: Harvard Univ Pr; 1993.
90. **Wong MD, Andersen R, Sherbourne CD, Hays RD, Shapiro MF.** Effects of cost sharing on care seeking and health status: results from the Medical Outcomes Study. *Am J Public Health.* 2001;91:1889-94. [PMID: 11684621]
91. **Stevens RA.** The Americanization of family medicine: contradictions, challenges, and change, 1969-2000. *Fam Med.* 2001;33:232-43. [PMID: 11322514]
92. **van Weel C.** Primary care: political favourite or scientific discipline? *Lancet.* 1996;348:1431-2. [PMID: 8937286]
93. **Orton P.** Shared care. *Lancet.* 1994;344:1413-5. [PMID: 7695704]
94. **Pincus HA, Pechura CM, Elinson L, Pettit AR.** Depression in primary care: linking clinical and systems strategies. *Gen Hosp Psychiatry.* 2001;23:311-8. [PMID: 11738461]
95. **Dea RA.** The integration of primary care and behavioral health care in northern California Kaiser-Permanente. *Psychiatr Q.* 2000;71:17-29. [PMID: 10736814]
96. **Lee PR.** Models of excellence. *Lancet.* 1994;344:1484-6. [PMID: 7968125]
97. **Starfield B.** Public health and primary care: a framework for proposed linkages. *Am J Public Health.* 1996;86:1365-9. [PMID: 8876503]
98. **Nutting PA.** *Community-oriented Primary Care: From Principle to Practice.* Albuquerque, NM: Univ of New Mexico Pr; 1990.

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