

# Inefficiencies in Health Care Provision

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## Abstract

This essay seeks to elucidate salient issues on the topic of inefficiency in the provision of health care. We begin with a discussion on the definition of efficiency, and the particular forms it can take in health care. From there, we define a useful framework for thinking about ways in which efficiency in the health care system can be improved. We describe cutting edge research being conducted in the field, and the major challenges to furthering the research agenda in this area, not the least of which is the unique nature of health care itself. We conclude with a discussion about key issues for future research, including the importance of incorporating multidisciplinary perspectives into this research.

## INTRODUCTION

Our evolving understanding of what constitutes *inefficiency* in health care is challenged by two fundamental questions. The first of these has to do with the definition of *efficiency*, a necessary starting point for a discussion of what represents a lack of efficiency. The second and closely related issue has to do with the level of efficiency that is feasible and/or desirable in the health care market (Burgess, 2012).

In the United States, which spent \$2.8 trillion on health care in 2012 (Martin, Hartman, Whittle, & Catlin, 2014), any detectable amount of inefficiency in the health care system represents an opportunity to reallocate resources in ways that might return sizable benefits to society. However, changes to the system are unlikely to yield these large societal benefits unless they are based on research that inherently incorporates the complex, multifactorial nature of health care delivery. In this sense, moving the health care system toward better outcomes is likely to require new perceptions and interdisciplinary approaches that accept and take advantage of these inherent system complexities. Furthermore, these interdisciplinary approaches account for

certain characteristics that are peculiar to the health care industry. These characteristics, which we discuss later, can have a magnifying effect on small changes to the system, a mitigating effect on large changes, or even pose fixed, immutable barriers to change. Thus, we will discuss how decoupling those elements of health care that we want to hold fixed from those that we want to modify is essential to making progress.

The starting point for this investigation is a brief discussion of how we can conceptualize *efficiency*, a term that is often associated with the notion of *value*. The value equation can be thought of as quality divided by cost. Cost is typically expressed in monetary terms, making it relatively easy to measure. As any health economist will attest, however, making broad changes to health care costs remains a difficult task. Quality, on the other hand, is a rather amorphous construct, making it more difficult to measure, but also potentially easier to alter. We will discuss, then, that a reasonable framework for thinking about the rest of this essay is to set costs as fixed and measure inefficiency first as “failed” quality for given effort. At the system level, this can be thought of as holding the spending on health care relatively fixed while trying to improve the quality of what we receive for those expenditures.

One particular difficulty in analyzing any aspect of the health care system is its inflexibility, stemming from, among other things, the presence in the market of sunk costs (i.e., resources spent that cannot be recovered) and asset specificity (i.e., once clinical providers specialize in a field, they tend to continue practicing in that field). The health care system protects itself by making this inflexibility mostly opaque to outside evaluation and fundamental change. This essay illuminates the emerging trends that illustrate how challenging these problems are to conceptualize and attack, and points toward the most promising avenues of further investigation and research.

## FOUNDATIONAL RESEARCH

In light of the considerable discord that exists between both early and recent definitions of efficiency found in the literature (Burgess, 2012), a comprehensive review of them here would be counterproductive (see the Further Reading section for more resources on this topic). Instead, we ground our discussion in a recently developed, person-centered efficiency framework developed by Palmer and Torgerson (1999).

First, consider that the inefficiency we seek to address is wrapped up in the relationship between resource inputs (i.e., costs, in the form of labor, capital, equipment, and supplies) and either intermediate outputs (e.g., numbers of patients treated, measures of access to care) or final person-level health outcomes [e.g., QALYs (quality adjusted life years), as noted by Palmer and

Torgerson]. As we described above, this approach permits one to alter efficiency by improving quality while holding these costs and input/output relationships (in a cost sense) fixed. With this framework in mind, and following Palmer and Torgerson, we can define three foundational economic measures of inefficiency.

Technical inefficiency is seen as occurring when we fail to use productive inputs and/or resources to their greatest potential as we maximize health outcomes. One can attempt to identify which particular resources are at fault in this type of inefficiency, and, as a result, target a particular resource for intervention or improvement. This is the most basic and straightforward definition of inefficiency.

Productive inefficiency occurs when we fail to choose the right combinations of productive resources that achieve the maximum quality-adjusted health benefits for a given cost. This conceptual approach specifically fixes cost, but quickly becomes complicated, given the multifactorial causes that could underlie a particular type of productive inefficiency.

Allocative inefficiency results when we fail to seek the right mixture of health care programs, social programs, and health systems that maximize the health of society as a whole. This is the loftiest of efficiency goals, and is also the most complex, not least because many aspects of allocative efficiency rely on factors that lie outside of the health care system.

### CUTTING-EDGE RESEARCH

We have described elsewhere some of the main challenges involved in defining health care inefficiency, both in general (Burgess, 2012) and with respect to hospital readmissions specifically (Burgess & Hockenberry, 2014). However, additional challenges exist. First, health economists are not alone in raising questions about how provider actions can influence health care services; providers themselves are often concerned with how their actions compare to those of their peers (Huesch, 2014). In many cases, providers might be better equipped to handle these questions, as there are some unique aspects of defining health care expenditures (Aaron, 2013) that might elude economists, who often are underexposed to nuances of the health care industry (Baumol, 2012). While official Bureau of Labor Statistics figures tend to suggest dramatic health care price increases over time, prices in many key areas (e.g., cardiovascular care) have actually fallen, and effectiveness of treatments has increased (Cutler, 2014).

Second, there are an almost innumerable set of extremely different areas in which one might focus a research agenda on the topic of health care efficiency. As we note above in the definition of allocative inefficiency, perhaps our largest problem is in allocating too much of total social spending on

health care, and not enough on social services (Bradley & Taylor, 2013). Perhaps our health care organizations, burdened by institutionalism, are not built to “learn” and incorporate evidence-based strategies to decrease inefficiency (Smith *et al.*, 2013). Further, there exist wide geographic differences in nearly any measure of the health care system (Newhouse & Garber, 2013). In our view, some of the most path-breaking recent empirical papers addressing these challenges are by Gutacker *et al.* (2013), Mutter *et al.* (2013), and Wildman and McMeekin (2014). Another challenge has to do with the availability and form of data to be used in this type of research; a particularly salient question at the moment is what the role of “Big Data” is going to be in research in the future (Murdoch & Detsky, 2013).

A third challenge characterizes any study of social science, but especially important to the science of health care delivery: the question of *causality* in relationships. Different approaches for addressing questions of causal inference are frequently debated (Pearl, 2009), but a useful framework for high-level thinking about causality in health care efficiency comes from Gelman and Imbens (2013). Their model distinguishes between the “effects of causes” and the “causes of effects.” The former is concerned with isolating a single factor (or variable), then estimating its contribution to a given outcome of interest. The latter is a broader construct, emphasizing the relative contribution of multiple factors to a particular outcome of interest. Our discussion centers on this second construct, taking the “effect” in question to be inefficiency in the health care system.

Much of the contemporary literature in medicine is concerned with the delivery of an intervention to a patient, with a focus on the effectiveness of “treatment” A versus that of “treatment” B in changing outcomes. Many research design and statistical methods, whether prospective or observational, are focused on this sort of one-versus-the-other causal reasoning, which might not be the optimal approach in a field as complex as health care. Few studies examine the relative contribution of the multitude of factors that contribute to an outcome, or how these factors might mediate or moderate the treatment effect.

This approach to causal reasoning has made its way, in varying degrees, to other disciplines, including health services research, health systems research, and to health economics. In these fields, the “treatment” being studied is rarely an actual medical treatment, but rather is often an organizational feature of the provision system, or how it is financed. At the most macro level, research in these fields seeks to explain a seemingly paradoxical phenomenon: the growth in health care spending in the United States far outpaces that found in other developed nations, but US life expectancy outcomes are poorer than in those countries. Many reasons for this phenomenon

have been proposed over the years. On the supply side, these include differences in the financing system, the resultant impact on prices (Anderson *et al.*, 2003), and the American tastes for high technology (Newhouse, 1992). On the demand side, some have argued that systematic differences in risky behaviors drive the quality gap, and once this is accounted for, some of the cost-quality disparity evaporates (Ohsfeldt & Schneider, 2006). Still others point to structural social inequities that translate into poorer health (Marmot *et al.*, 2008). In general, each of these contributions to the health care inefficiency literature focuses on the “effects of causes,” while acknowledging the existence of many “causes of *the* effect.”

### KEY ISSUES FOR FUTURE RESEARCH

One might assume such broad, high-level considerations of what causes health care inefficiency at the macro level would translate into clearer thinking among those addressing more granular, ground-level questions of specific health care inefficiencies. However, this is not always the case. Consider the illustrative case of hospital readmissions. If one simply looks at aggregate statistics, expenditures on hospital care, particularly for individuals who are discharged from the hospitals but are readmitted within a short time frame, are staggering (Jencks, Williams, & Coleman, 2009): about 30% of total US national health care expenditures are on hospital care, and approximately 1 in 5 patients are rehospitalized within 30 days. Clearly, hospital readmission is a ground-level issue that has implications for the broader question of system-wide health care efficiency.

In response to these statistics, the US Medicare program, as specified in the Affordable Care Act, has implemented payment reductions for hospitals with higher-than-expected readmission rates among its beneficiaries. The implicit assumption in such a policy is that *hospital* quality (in the form of either inpatient care or coordination of care at discharge) is the chief “cause of the effect” in this context. As such, a multitude of hospital-based interventions that were developed to improve the quality of hospital care and subsequent care coordination also are now touted as effective “treatments” for the “disease” of high readmission rates (Axon & Williams, 2011; Coleman, Parry, Chalmers, & Min, 2006; Kocher & Adashi, 2011). However, there are important questions remaining regarding the efficiency of these approaches.

For example, one emerging consideration is that even in systems with lower overall spending than the United States and only recently increasing growth rates (e.g., NHS in England, or Medicare in Australia), the proportion of spending on readmissions is just as staggering as that found in the United States. If some dimension of hospital-based quality is at the root of this perceived readmission inefficiency, then it permeates hospital organizations

across borders. If one steps back and considers the “causes of effects” in this context, he or she might reach a different conclusion regarding which policies would be effective at addressing this inefficiency, or whether high rates of readmission represent inefficiency at all (Burgess & Hockenberry, 2014).

First, one must consider whether readmission itself even represents a “cause of the effect,” or whether it is simply one component of a complex, multifaceted pathway from multiple causes to the effect. If readmission is a cause of inefficiency, then tackling it can reduce resource use, and assuming patients do not prefer to be in the hospital, improve quality as defined by patient satisfaction. On the other hand, if excess readmission is a symptom of a wider set of causes, such as social inequality, low health literacy, then targeting strong incentives may reap short-term cost savings with regard to hospital care, but could exacerbate inefficiency across the system, including increasing inefficiency in hospital care in the long run.

Even if readmission itself is a cause, there exist other considerations for anyone seeking to measure the efficiency of the approaches intended to address the problem. First, targeted treatments for readmission rely on whether the system can identify and “treat” only those patients most likely to be readmitted. If this proves unfeasible, the intervention has to be applied to everyone (like a vaccine) to gain reductions in readmission. Thus, the cost-effectiveness (and therefore, the efficiency) of a particular readmissions intervention relies on whether the *sum* cost of delivering the intervention to every patient is satisfactorily offset by the cost reduction gained by avoided readmissions. Second, this thinking relies on the somewhat unlikely assumption that hospitals, in response to loss of revenue from readmissions, will not simply replace that revenue by raising prices on other services provided to patients from other payment sources. Third, from a social welfare perspective, a more desirable target for reducing readmission might be items of broader social concern: health literacy, self-efficacy, and social inequality, all of which might be thought of as “causes of the effect.”

Readmission policy is, of course, just one of many granular issues related to macro-level health care inefficiency, but we use it here as a rich example to demonstrate the importance of thinking deeply about causal questions when addressing inefficiency, writ large, in these social policy contexts.

Modern health care delivery also suffers from all three forms of inefficiency related to both the nature of demand for health care and industrial engineering issues characterizing its manufacture. Medical systems in developed nations are laden with complex technology, not unlike modern manufacturing in other industries. However, unlike other manufacturing industries, much of the demand in the health care sector is unpredictable in its timing. Furthermore, technology in other industries is often designed to reduce costs,

whereas technology in the health care sector is often associated with greater costs (Cutler & Huckman, 2003; Weisbrod, 1991).

To understand the timing issue, contrast health care with automobile manufacturing. An auto manufacturer can organize a production line, staff the production line, and time the delivery of inputs with supply chain management, all of which can be controlled or anticipated through contracting. Once the automobiles are manufactured, output can be stored to meet customer demand when necessary, albeit with some financing and storage costs. Similarly, a health care administrator can organize a production line and staff, but in the case of many illnesses, he or she cannot control the timing of the arrival of the key input to production: the patient. Furthermore, medical care providers cannot produce health and simply store it in a warehouse for ready purchase by the customer. As such, health care has to build out capital capacity and staff it with labor that will often sit partially, or completely, idle for long periods. This creates the somewhat perverse observation that the least costly and most general provider types (such as floor nurses and primary care providers) are most pressed to high effort, whereas the most costly and most specialized resources often sit idle and do not have to work as hard to generate high rents.

Further compounding this inefficiency are agency issues inherent in health care delivery and finance systems that align incentives in a way that promotes induced demand. Physicians, who control much of the utilization of care either directly or indirectly, act as agents for patients and hospitals. The payment system is designed in such a manner that providing more care is personally beneficial to physicians. Absent an altruistic motive to conserve social resources, there is a strong incentive to physicians, possibly mitigated by altruism, to provide more care, even when the incremental value of care in terms of increased health is smaller than its benefit. In the context of the queuing problems noted above, this is compounded by physician agency on behalf of hospitals. Indeed, evidence of short-term excess capacity (as opposed to medical necessity) driving utilization is found in such high cost health care services as neonatal intensive care units (Freedman, 2012) and cardiac surgery (Hockenberry *et al.*, 2011).

Given these characteristics of the health care system, it may be tempting to address inefficiency by simply reducing capacity through regulation. However, in this regard also, health care poses some unique challenges. Unlike customers of auto manufacturers, patients have the potential to die if immediate access to health care is reduced. Restated another way, while short-term excess capacity in health care leads to demand inducement, reducing quality of and/or access to health can lead to (in extreme cases) socially undesirable loss of life, an arguably inefficient outcome. Indeed, an emerging body of literature (Almond & Doyle, 2011; Almond, Doyle,

Kowalski, & Williams, 2010; Chandra & Staiger, 2007; Cutler & Huckman, 2003; Doyle, 2011; Doyle, Graves, Gruber, & Kleiner, 2012; Hockenberry & Helmchen, 2014) suggests that increases in medical treatment intensity on the margin lead to the cost-effective preservation of life and/or reduction of severe symptoms. From this perspective, reducing capacity could itself prove socially inefficient.

In light of the issues described thus far, it is clear that more research is warranted in the area of inefficiency in health care delivery. Here, key considerations for prioritizing this research agenda are outlined.

One vital area of research that remains underdeveloped is the body of work addressing how we measure trade-offs within and among different types of resources within the health care system. Recall from earlier in the essay that most commonly-accepted definitions of efficiency rely on the construct of quality, yet an agreed-upon definition of quality remains elusive. Thus, it has been difficult to conduct studies that uncover the degree to which different health care inputs affect health care quality, making this field a potentially fruitful research area.

For example, under the “right patient, right time, right intensity of care” quality definition, questions remain about what constitutes “right intensity of care.” If two inputs, A and B, produce the same patient outcome, but input B is less resource-intensive, most would agree that input B represents the “right” care intensity. Although this thinking originally developed around medical interventions, the framework can easily be extended to questions regarding the mix of labor inputs to health care. The case of nurse practitioners (NPs) and physician’s assistants (PAs) provides one illustrative example. Studies have suggested that these nonphysician practitioners can reduce labor costs (Roblin, Howard, Becker, Kathleen Adams, & Roberts, 2004; Venning, Durie, Roland, Roberts, & Leese, 2000), whereas other studies have shown the quality of care they can provide is on par with that provided by physicians (Horrocks, Anderson, & Salisbury, 2002; Sox, 1979). Taken together, these results suggest that nonphysician practitioners might offer a cost-effective alternative to medical doctors in at least some areas of care delivery. However, the respective contribution of such providers to quality outcomes depends to some extent on scope of practice regulations. These regulations, which vary by state, dictate the degree to which NPs and PAs may practice independently, without physician supervision. At least one study has offered evidence that allowing NPs to practice and prescribe medications independently offers cost savings over models that require physician oversight (Spetz, Parente, Town, & Bazarko, 2013), but questions still remain about the optimal scope of practice for these providers. Furthermore, as an accepted definition of quality evolves in the literature,



the relative importance of nonphysician providers in achieving that quality will become an important area for research.

The debate surrounding what constitutes an optimal health care labor mix is not limited to medical providers. Nurses have long been considered an integral input to health care outcomes, yet few studies exist examining whether some nurses are “better” than others at improving care quality, and what might constitute an appropriate nursing-type balance in the clinical setting. One recent study has found that hospitals with higher proportions of care delivered by contract nurses (as opposed to nurses employed full-time by the hospital) have lower patient satisfaction scores (Becker & Hockenberry, submitted). Given the growing role of patient satisfaction as an indicator of quality, this issue should warrant considerable attention in the literature in the near future.

#### AREAS OF RESEARCH IN OTHER FIELDS

Our approach in discussing these emerging trends has been drawn primarily from the field of health economics. However, similar important insights are emerging from other fields, such as sociology, anthropology (e.g., Hoff, 2013), medicine (e.g., Srinivasan & Schwartz, 2014), and organization [issues of teamwork (Pullon, McKinlay, & Dew, 2009), power of staff such as nurses (Sabiston & Lascbinger, 1995), and identity and control (Doolin, 2002)]. The overriding theme of these efforts in other fields is synchronous with our approach, in that they emphasize the complexity of the health care systems and the resulting difficulties in defining successful interventions for improvement. For example, Doolin (2002) emphasizes the challenges in trying to control, curtail, or influence professional autonomy of clinicians which is a likely outcome of any system-level interventions. Hoff (2013) identifies a difference between hard implementation practices that represent structural interventions as distinct from soft relational practices that play out in day-to-day interactions. Srinivasan and Schwartz outline the approaches that medicine, in particular the Society for General Internal Medicine, is recommending attacking these issues. Successful efforts in the future are likely to employ multidisciplinary methods which account for these complexities that are resistant to standard modeling.

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