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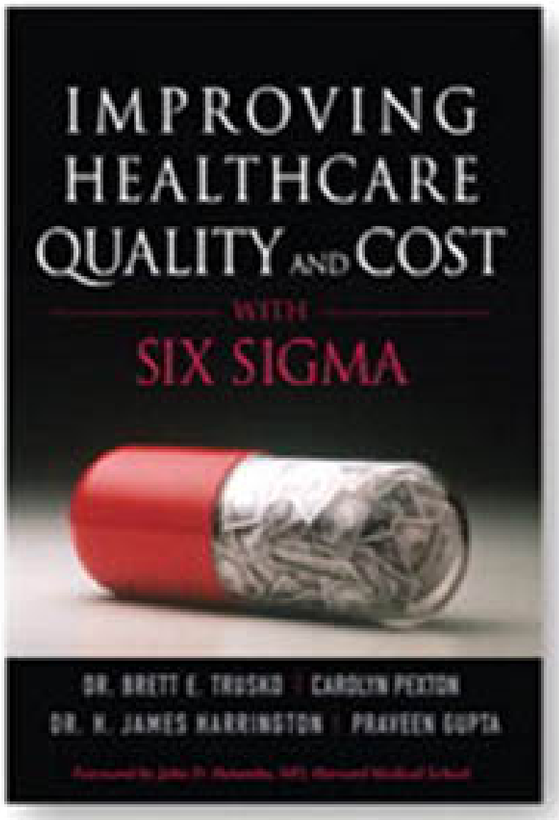
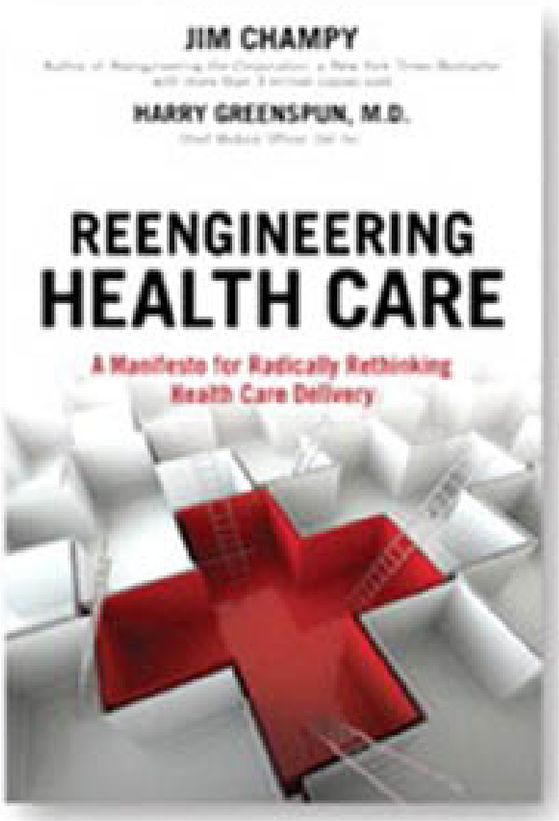
PRACTICAL SOLUTIONS FOR HEALTHCARE MANAGEMENT AND POLICY





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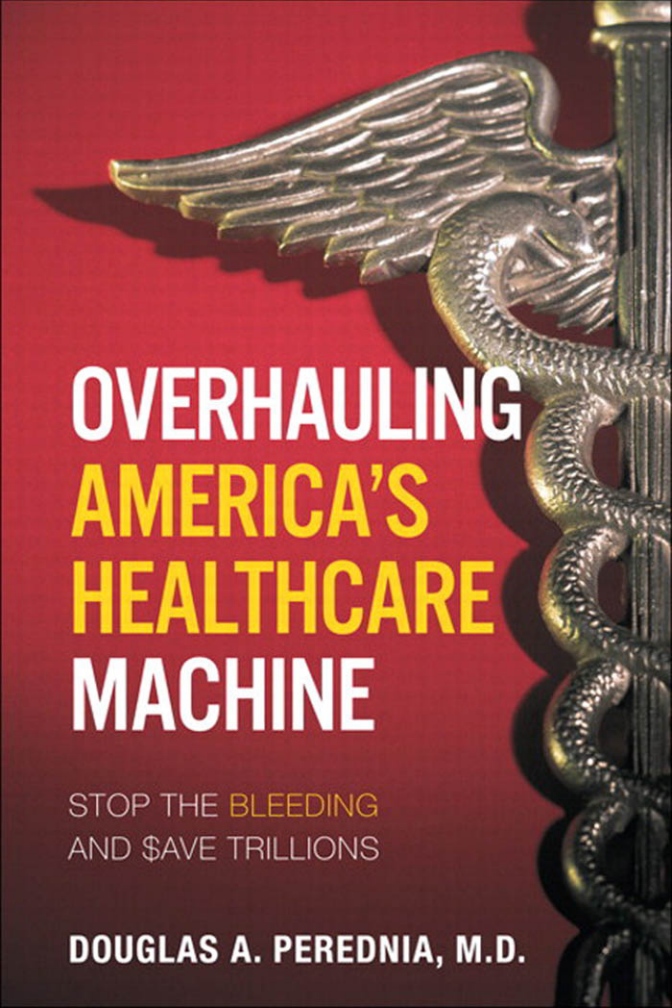
OVERHAULING
AMERICA'S
HEALTHCARE
MACHINE
STOP THE BLEEDING
AND $AVE TRILLIONS
DOUGLAS A. PEREDNIA, M.D.

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Overhauling America's Healthcare Machine

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Overhauling America's Healthcare Machine

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Overhauling America's Healthcare Machine

Stop the Bleeding and Save Trillions

Douglas A. Perednia, M.D.

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Printed in the United States of America

First Printing February 2011

ISBN-10: 0-13-217325-5
ISBN-13: 978-0-13-217325-4

Pearson Education LTD.
Pearson Education Australia PTY, Limited.
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Library of Congress Cataloging-in-Publication Data

Perednia, Douglas A.
Overhauling America's healthcare machine : stop the bleeding and save trillions / Douglas Perednia.
p. cm.
Includes bibliographical references.
ISBN-13: 978-0-13-217325-4 (hardback : alk. paper)
ISBN-10: 0-13-217325-5
1. Medical care—Finance. I. Title.
RA412.3.P47 2011
338.4'33621—dc22

2010040123

For Nancy and Teddy

Contents

Acknowledgments

This book is a distillation of what we now know about fixing American healthcare. It describes the collective experience and thinking of millions of Americans, channeled through personal accounts and conversations, written reports, statistics, economic data and healthcare research. I wish that there were some way to individually thank each of the patients, clinicians, executives, economists, researchers and others who directly and indirectly contributed their time, insights and expertise, but there are far too many. Nevertheless, this book could never have been written without you.

Distilling healthcare is one thing, but surviving the process of getting into print is another. There are some individuals who need to be singled out for special thanks on this score.

First and foremost is my editor, Jeanne Glasser, who took an interest in this book when many others had written off healthcare reform as too complicated, boring, or passé to tackle. The fact that it became even more relevant after the passage of the 2010 Affordable Care Act speaks volumes about her foresight, persuasiveness, and determination. Thanks, Jeanne, and thanks to Alex Johnson and Dr. Bill Bernstein for referring me to you. Drs. Jim Grigsby and Phoebe Barton provided invaluable support and counsel while I was still looking for publisher brave enough to take the plunge. Many thanks are also due to some very smart, busy people who contributed their valuable time to review and comment on the manuscript. These include Drs. Margaret Lancefield, Donald Lindberg, Richard Fogoros and Richard Armstrong, Randy Kasten, Kevin Coltin, David Perednia, and Will Engle. Jovana San Nicolas-Shirley and her colleagues did an excellent job of shepherding me through the production process. Finally, I owe a special debt of gratitude to my family and especially my remarkable spouse. Without your endless patience, encouragement and support, none of this would have ever happened.

About the Author

Douglas A. Perednia, M.D., graduated from Swarthmore College with a degree in Economics, and obtained his medical degree at Washington University in St. Louis, Missouri. A medical internist and dermatologist, he has spent many years in clinical medicine, in academia as a principal investigator for the National Institutes of Health, with non-profit healthcare organizations, and as a business executive in private industry. A popular speaker and writer, Dr. Perednia periodically works as a consultant to government, business, and non-profit organizations. In his spare time, he writes for *The Road to Hellth* blog (www.roadtohellth.com), which deals with the interactions between doctors, patients, insurers, government, and the business of medicine.

3

Where Does All Our Money Go?

> "I was walking down Fifth Avenue today and I found a wallet, and I was gonna keep it, rather than return it, but I thought: Well, if I lost a hundred and fifty dollars, how would I feel? And I realized I would want to be taught a lesson."
>
> —*Emo Philips*

Given that we spend more than twice what other developed countries spend on healthcare without achieving substantially better results, what is sucking up all that cash? There are only four possibilities:

1. We're buying far more healthcare goods and services than our friends in other developed countries.
2. The healthcare goods and services that we're buying cost more here than they do elsewhere.
3. Much of the money spent on "healthcare" is actually being spent on things that don't actually improve health, such as administration, overhead, and inefficient business practices—and at a much higher rate than elsewhere.
4. Some combination of the above.

Determining which of these is the case is crucial if we're going to be able to reduce spending and/or improve the type and level of care provided. Identifying the source of excess spending will also show whose monetary ox is likely to be gored by attempts to improve the system. Our ability to eliminate waste in the system and improve the

value received for our healthcare dollar is going to be directly proportional to the wastefulness of the expenditure and its political vulnerability. Of these two, the level of political protection has the bigger impact on whether the problem will be solved.

When we follow the money, the golden rule that governs healthcare behavior is a simple one:

> In a regulated free-market system, whatever healthcare activities and strategies are most profitable and are not prohibited or discouraged by laws or regulation are the activities that will occur. This will happen regardless of the overall impact of these activities on the actual health and welfare of patients and their families. Moreover, this rule applies to all participants within the healthcare system, including patients, families, and government itself, as well as vendors and providers of healthcare goods and services.

In other words, whether you're talking about insurers, the government, drug makers or other vendors, healthcare providers, or even patients, people are most highly motivated by their own bottom lines.

Ignoring this rule is the most serious mistake that any of us can possibly make in the course of evaluating and setting healthcare policy. Unfortunately it happens all the time—most frequently to academics, think tanks, public interest groups, and pundits. Because they are typically unfamiliar with (or even philosophically opposed to) the business of healthcare, these groups universally attempt to dictate methods and behaviors instead of creating an environment that will inherently produce the desired results through economic self-interest. The usual result is that their efforts are often wasted or even backfire. (We'll see a number of examples of this in later chapters.)

Perhaps the best gauge of the importance of money in healthcare is the amount that is spent on political lobbying. In the year 2000, healthcare officially became the largest lobby in Washington, spending more than any other industry to influence government policy and legislation. Healthcare lobbyists and contributors spent nearly $400 million in 2010, more than lobbying for traditional powerhouses such as agriculture, communications, and defense. It's estimated that more than 7,000 registered Washington lobbyists were actively promoting

various healthcare-related agendas. That's 13 lobbyists for each one of the 535 members of Congress.[1]

That kind of spending means that the stakes are high. Where is all the money going, and how can the efficiency of the system be improved?

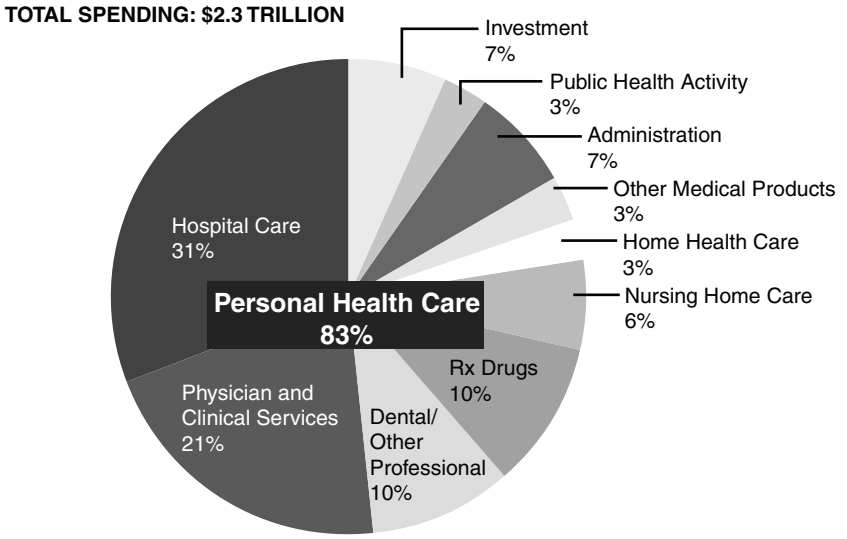
Exactly What Are We Buying?

It's not strange that we spend a lot of money on healthcare. To a great extent, healthcare services are a luxury item. (This might seem odd, but humans survived for hundreds of thousands of years without effective hospitals, doctors, or drugs. In fact, many people on Earth still do. Most medical problems will get better over time regardless of whether they're treated.) On the other hand, everyone who can *afford* to buy more healthcare, does. The more you make as a country, the more you spend. In fact, about 90% of healthcare spending can be predicted based upon the level of national income.

Even so, the United States is an outlier. We spend almost twice as much per capita than average for a developed country, and 50% more than the next highest spender. Something that we're doing or buying is setting us apart. What are we spending all that money on? Figure 3.1 shows the "official" view of the way our healthcare dollars are spent, based upon U.S. government statistics. Let's take a closer look at the quantities and prices of each of the larger and more important components.

Hospital Care

Although hospital care accounts for the largest single use of our healthcare dollars, we actually use hospitals considerably less than most other developed countries. Not only do we have fewer admissions, but we're excellent at getting people out of the hospital once they've been admitted. The average length of U.S. hospital stays is the same as the OECD average, although for some conditions such as heart attacks and childbirth, we have some of the shortest stays in the developed world. A hospital stay for a heart attack is just about half as long as in the United States as in the top ten developed countries. We discharge our mothers in less than two hospital days after they give birth, compared with the OECD average of 3.6 days.



From: California Healthcare Foundation. "Health Care Costs 101." April 2010. (http://www.chcf.org/~/media/Files/PDF/H/HealthCareCosts10.pdf)[2]

Figure 3.1 U.S. Healthcare Spending Distribution by Category, 2008

The bizarre thing about this is that while our hospital utilization is low, our total hospital costs per capita are actually the *fourth highest* in the entire OECD.[3] This suggests that the average U.S. hospital visit is either far more "intense" than is usually the case in other countries, (that is, each hospitalization uses far more goods and services), or that the price we're paying for hospital services is much higher in the United States.

The data regarding intensity seems to be mixed. It's certainly true that the trend in America has been to do everything possible on an outpatient basis—ranging from plastic surgery to removing gallbladders. As a result, most of us need to be pretty sick to make it into the hospital and stay there for any length of time. We're first in the world with respect to performing hospital-based heart surgery, and well above the average for organ transplants and Caesarean section childbirth. But in certain other hospital operations, such as hip replacement, the United States tends to be below the OECD average. And there is at least as much variability in the intensity of hospitalization

between different parts of the United States as there is between the United States and the world. At least one study looking at hospitals in the United States and Canada suggests that, at least as of 1987, there did not appear to be much difference in the level of *clinical* services and resources used by Canadian and U.S. hospitals for their respective admissions.[4] A different study from 1993 estimated that resource use in the United States was actually about 24% higher in the United States when compared with Canada.[5]

The circumstances surrounding hospital prices seem to be far clearer. While direct cost comparisons between countries are notoriously tough to make, several studies of selected procedures are pretty consistent. The same hospital visit costs a *lot* more in the United States than in Canada—the only developed country for which direct comparisons are readily available. Let's look at two specific examples: hip surgery and the repair of abdominal aortic aneurysms.

The nice thing about formal comparison studies is that they tend to control for factors such as the procedure, age and physical condition of the patients, complications, outcomes, and so on. This lets us more directly compare costs and prices. Table 3.1 summarizes the results of these two studies.

These differences are quite extraordinary, especially when you consider that each group received essentially the same procedures with the same results. The difference in overhead costs is particularly astonishing. Americans are often paying almost as much for administration costs *alone* as Canadians are paying for *all* their hospital expenses.

But perhaps hospitals are a special case? We've seen that America has fewer hospital beds, acute care bed days, and shorter hospital stays per capita on average than other developed countries. Perhaps our higher hospital costs are part of a strategy that does a great job of delivering more, less expensive services on an outpatient basis? The past 20 years have seen a massive nationwide effort to minimize hospital days in an effort to reduce costs. The average length of stay decreased 24%, from 7.35 days per admission in 1980, to 5.6 days in 2004. Perhaps the savings are realized elsewhere in the system?

TABLE 3.1 Canada Versus U.S. Hospital Procedure Cost Comparison

	Canada	United States	% Difference (United States vs. Canada)	Notes
Total Hip Replacement Surgery (2004)[6]				There was no significant difference in Canadian versus U.S. post-operative mortality or complications.
Average Length of Stay	7.2 ± 4.7 days	4.2 ± 2.0 days	–41.7%	
Average Hospital "Direct" Costs (in U.S. $)	$4,552	$8,221	+80.6%	Costs derived from departments actually providing goods and services to the patients (does *not* include physician fees).
Average Hospital "Overhead" Costs (in U.S. $)	$2,214	$5,118	+131.2%	Costs incurred by hospital "overhead" departments, such as administration and housekeeping.
Average Total Cost	**$6,766**	**$13,339**	**+97.1%**	

continues

TABLE 3.1 Continued

	Canada	United States	% Difference (United States vs. Canada)	Notes
Repair of Abdominal Aortic Aneurysm (2003)[7]				There was no significant difference in Canadian versus U.S. post-operative mortality.
Average Length of Stay	9.0 days	7.0 days	–22.2%	
Average Hospital "Direct" Costs (in U.S. $)	$11,334	$13,327	+17.6%	Costs derived from departments actually providing goods and services to the patients (does *not* include physician fees).
Average Hospital "Overhead" Costs (in U.S. $)	$4,518	$9,972	+120.7%	Costs incurred by hospital "overhead" departments, such as administration and housekeeping.
Average Total Cost	**$15,852**	**$23,299**	**+47.0%**	More than 90% of Canadian patients were discharged to self-care versus <67% of U.S. patients.

Pharmaceuticals

Making good use of pharmaceuticals is one way of getting people out of hospitals and keeping them out. Medications can relieve pain, increase mobility, shorten the course of infections, improve the control of severe chronic diseases, and even turn certain deadly cancers into chronic outpatient conditions. It's interesting to note that, unlike other forms of healthcare consumption in developed countries, access to medicine actually has a measurable impact on overall life expectancy in later life.* Statistically speaking, doubling pharmaceutical expenditures in developed countries would increase life expectancy at age 40 by about 2 percent, and life expectancy at 60 by roughly 4 percent.[8] And while pharmaceuticals make up only about 10% of U.S. healthcare spending, their ubiquity, importance, and high cost gives them a high profile.

For our purposes, the question is what role demand and/or price of drugs might play in driving U.S. healthcare costs unsustainably higher. First, let's take a look at how much we spend for drugs compared with everyone else. Our first point of reference is Figure 3.2.

By now it should be no surprise that the United States leads the way when it comes to spending. Americans spend more on drugs than anyone else, and about twice the OECD average. But why? Do we use twice as much?

To tell the truth, it's hard to say. It's extremely difficult to compare the true consumption of pharmaceuticals between countries for a

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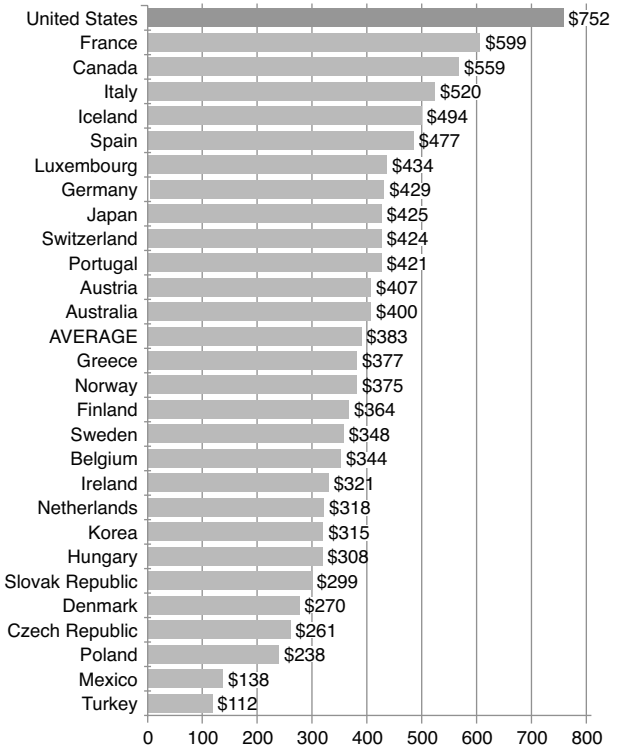
* Beyond a certain point, adding more healthcare services such as hospitalization and physician visits produces diminishing returns. In less-developed countries, the greatest determinant of health and well-being is the availability of sanitation and clean water. Only after these needs are met does investment in other healthcare services become economically worthwhile. In most of the OECD countries (and the U.S. in particular), hospitalization and other healthcare services have already had their greatest impact on overall mortality—adding more has relatively little effect. Demographics are one reason: The elderly use far more hospital and physician services, but they have fewer years of life left to save. On average, people older than 65 spend about four times more than those under 65, and much of that is spent right at the end. In 2006, about 25% of Medicare's budget went to patients in their last year of life.



Notes: Amounts are adjusted using U.S. dollar purchasing power parities, and are based on estimates and/or earlier years for 16 countries for Canada, Denmark, France, Iceland, Luxembourg, Portugal, Spain, Sweden, and Switzerland, amounts are 2004 estimates; for Belgium (estimate), Japan (estimate), and the Slovak Republic, the numbers are from 2003; for the Czech Republic, Hungary, and the Netherlands, amounts are from 2002; and for Turkey, amounts are 2000. Recent data are available only for 28 of the 30 OECD countries.

From: Peterson CL, Burton R. "U.S. Healthcare Spending: Comparison with Other OECD Countries." *CRS Report for Congress*, September 17, 2007.

Figure 3.2 Pharmaceutical Spending per Capita, 2004

variety of reasons. For one thing, many of the medications sold worldwide are simply not the same. Different products might share active ingredients, but the dosages, packaging, routes of administration, and combinations can and do vary enormously from country to country. And in addition to prescription medications, there is the over-the-counter market. While it might seem strange to equate Bengay and Ex-Lax with heart medication and cancer drugs, a substantial number of drugs that start out as prescription-only eventually end up being sold over-the-counter. Nonsteroidal anti-inflammatory drugs such as

Advil and Aleve, antihistamines such as Claritin, and antifungals such as Lotrimin have all taken this route. Another important consideration is the high degree of variation in practice patterns and prescribing preferences. Physicians in some countries rely heavily on older drugs that may be less effective, but are more familiar and less expensive.

Despite these limitations, we *can* compare consumption of a limited number of medications that share active ingredients. Figure 3.3 does this for a broad set of drugs used to treat cardiovascular disease and stroke in 12 OECD countries.[9,†] This is a good starting place because cardiovascular disease (especially heart attacks and strokes) happens to be the leading cause of death in most developed countries. In this graph, "DDD" stands for "defined daily dose," which is a way of comparing formulations of the same drug that might not be exactly equivalent. Measuring the DDD per 1,000 people is an indication of what percentage of the population is using a given drug (or in this case, class of drugs). This particular chart classifies all the cardiovascular drugs measured by the study by whether they are "older" drugs that have been around for many years, and thus many have large numbers of generics available, and "newer" drugs—many of which may still be under patent protection.

What we see here is that the United States seems to be an average consumer with respect to older generic medications, but a relatively early adopter with respect to newer drugs. On a per capita basis, we're not the highest user of drugs in either category.

The trendline shows that countries that spend more of their GDP on healthcare seem to consume more new drugs compared to their peers. In contrast, per capita consumption of generic drugs is relatively unaffected by the level of healthcare spending. In economic terms, older drugs are treated like necessities, such as basic food or shelter. Beyond a certain point their consumption by rich people and poor people simply isn't that different. In contrast, new drugs behave

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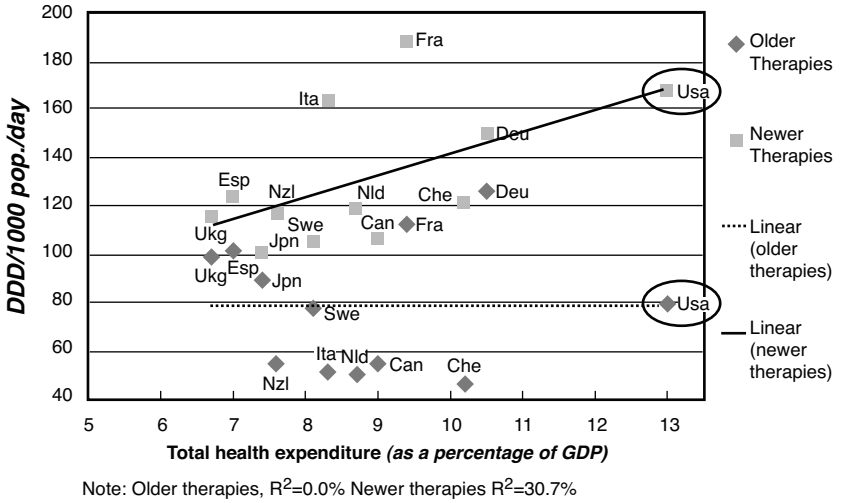
† The 12 OECD countries included in the study were Canada, France, Germany, Italy, Japan, The Netherlands, New Zealand, Spain, Sweden, Switzerland, the United Kingdom, and the United States. Study data was available for the years 1989, 1991, 1993, 1995, 1997, and 1999.



Note: Older therapies, R^2=0.0% Newer therapies R^2=30.7%

From: Dickson M, Jacobzone S. "Pharmaceutical Use and Expenditures for Cardiovascular Disease and Stroke: A Study of 12 OECD Countries." *OECD Health Working Papers* No. 1 (2003).[10]

Figure 3.3 Cardiovascular Drug Consumption As a Function of Total Health Spending, 1997

like luxury goods. Those with higher healthcare budgets tend to buy more of them—presumably to take advantage of the additional benefits they offer.

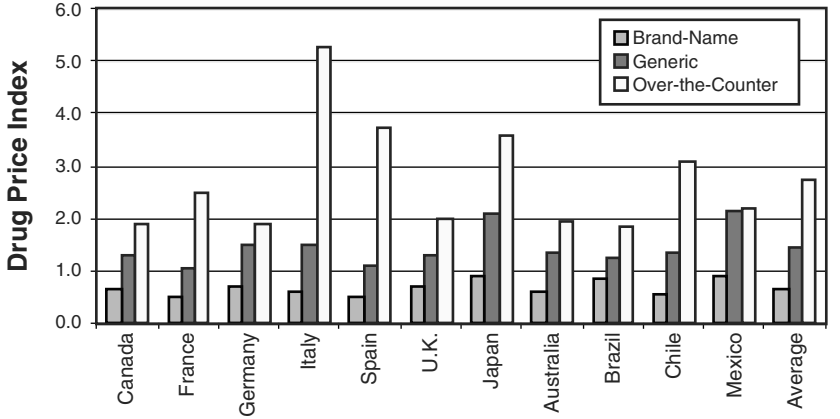
However, the United States does stand out when you look at very new drugs—those less than two years old. U.S. consumption of recent entrants into the healthcare marketplace (defined as drugs sold for less than two years) is at least double than that of any country except Germany, even if our total per capita consumption of all drugs is not appreciably higher.

The bottom line is that the United States buys more brand-name drugs sooner than other countries, even though its total consumption of medication is not unusually high.

So are we paying more or less for our pharmaceuticals than everyone else?

Logic dictates that if U.S. drug consumption is not excessive and yet we're paying more per capita for drugs than anyone else in the world, our drug prices are higher. As it turns out, that's only partly true. Except for Japan, the United States does indeed pay more for

wholesale, single-manufacturer, on-patent drugs than a sample of eight other developed countries. However, the flip side is that we actually pay substantially *less* than most of the other countries for generic and nonprescription drugs, as shown in Figure 3.4.‡ Patients in all the eight countries listed pay more for OTC medications than the United States, with most paying over twice as much.[11]



Data from: Danzon PM, Furukawa MF. "International Prices and Availability of Pharmaceuticals in 2005." *Health Affairs* (2008); 27(1): 221-233.[12]

Figure 3.4 Price Indexes: Brand Name, Generic, and Over-The-Counter Drugs. Manufacturer Prices Relative to U.S. Prices, Adjusted for U.S. Market Discounts, 2005 (U.S. Prices Index Equals 1.00)

Given that new medications are expensive and generics are cheap (at least in the United States), the relevant question for healthcare spending then becomes, what do we use most of? If the majority of our medications are generic and over-the-counter, then on average the current healthcare system is producing good value for the money. In fact, the system might be expected to provide better value over time as more and more drugs go off patent. On the other hand, if the

‡ The distinction between wholesale and retail prices here is an important one, because it does not take into account any administrative or overhead costs that could dramatically increase the cost of a drug to consumers before they get they hands on it. In fact, it's perfectly possible that a drug that is inexpensive at the wholesale level could become very costly at the retail level after the costs of distribution, profit, and overhead are taken into account.

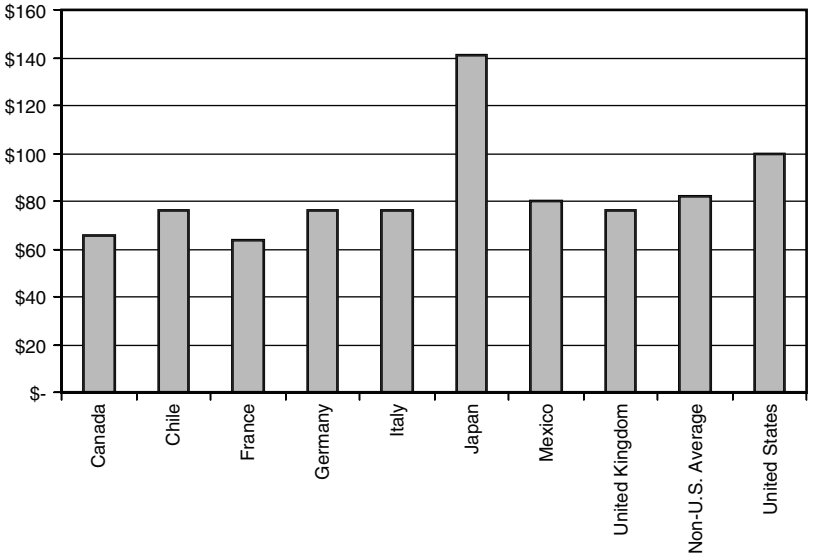
majority of our consumption is in brand-name, patented medications, we are paying a high near-term price for our comparative lack of drug price regulation.[§] One way to determine where American consumers stand in the balance is to look at the relative proportions of brand-name and generic medications sold versus the relative share of costs that they incur. Newer patented medications make up a little less than half of all the doses taken in the United States, but account for more than 80% of spending on the medications surveyed.[13] In contrast, generics make up nearly 60% of the total volume, but represent less than 20% of the money spent. It's easy to see why insurers try to force the use of generic drugs wherever they can, but the real question is, are we getting good value for our healthcare dollars spent on pharmaceuticals? To a large extent, our abundant use of new drugs is a matter of societal preference rather than a matter of medical "right" or "wrong." Other countries have other preferences and pricing structures. How do we compare apples to apples?

The answer is to try to determine what a typical basket of medicine (based on the U.S. proportions of new and generic drugs) would cost in other developed countries. This is shown in Figure 3.5.

What we see is that, on average, Americans pay about $18 more for a $100 basket of drugs than our OECD counterparts, and about $35 more than the average Canadian. This is quite a bit of money, but to put things in perspective, we should compare this excess to the

---

[§] Exactly why new medications are comparatively expensive and generics are cheap in the United States (and vice versa elsewhere) is an interesting question. Danzon et al. point out that this a market response to price regulation. Countries that heavily regulate the price of new medications (such as France, Italy, and Japan) might be successful at keeping the initial price relatively low, but these same low prices discourage others from coming into the market with competing products when patent protection expires. In contrast, the high initial prices in the U.S. market give potential makers of generic substitutes a powerful financial incentive to enter the market. After a number of generics are available, the price of the drug tends to decrease rapidly as a result of competition between multiple manufacturers. The data support this theory. Countries that heavily regulate drug prices do have far fewer makers of generic drugs in their marketplaces for any particular medication, and pay substantially higher prices for the generics that are available. Thus, the initial pain of high prices in the near-term paves the way for lower prices over the long-term.



Data from: Danzon PM, Furukawa MF. "Prices and Availability of Pharmaceuticals: Evidence from Nine Countries." *Health Affairs* (2003); Web Exclusive W3, 29 October 2003: 521-536, and Peterson CL, Burton R. "U.S. Healthcare Spending: Comparison with Other OECD Countries." *CRS Report for Congress*, September 17, 2007.[14]

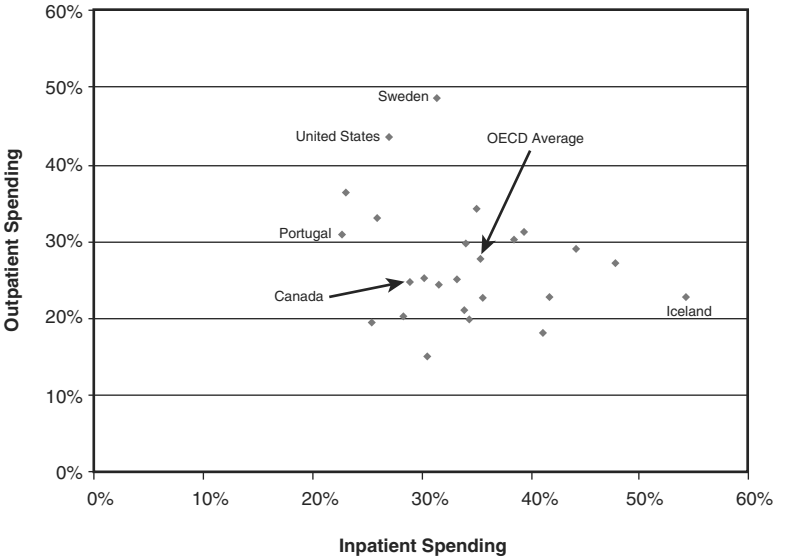
Figure 3.5 Comparative Wholesale Cost of a Proportional Basket of 249 New and Generic Drugs Costing $100 in the United States

total that we spend on healthcare each year. Pharmaceuticals make up about 10% of U.S. healthcare spending, or about $200 billion annually. An 18% reduction in price would save $36 billion per year, or $118 per American per year. This is quite a bit of money in hard economic times, but only 1.8% of the total healthcare budget. To put it in perspective, total U.S. healthcare spending is expected to increase by $146 billion between 2010 and 2011. Bringing drug spending down to the non-U.S. average would reduce that increase by just 25%. While helpful, it's hardly enough to make a huge difference in the big picture. We can certainly work on more efficient pricing for pharmaceuticals, but the real savings will have to be found elsewhere. Perhaps in outpatient care?

Outpatient Care

It's fair to say that the United States does indeed have an outpatient-oriented approach to healthcare. As shown in Figure 3.6, a full

44% of our healthcare dollars are spent on outpatient services, compared with just 27% for inpatient services. Only Sweden does more on an outpatient basis. This is largely a result of moving procedures out of the hospital and into outpatient facilities such as imaging centers, surgery centers, dialysis centers, and even cardiology catheterization labs. Between 1986 and 2006, the percentage of U.S. healthcare spending devoted to hospital care fell from 37% to 31%. The percentage devoted to outpatient care rose slightly, while prescription drug spending rose from 5% to 10% of the total.



Data from: Anderson GF, Frogner BK, Reinhardt UE. "Health Spending in OECD Countries in 2004: An Update." *Health Affairs* (2007); 26(5): 1481-1489.[15]

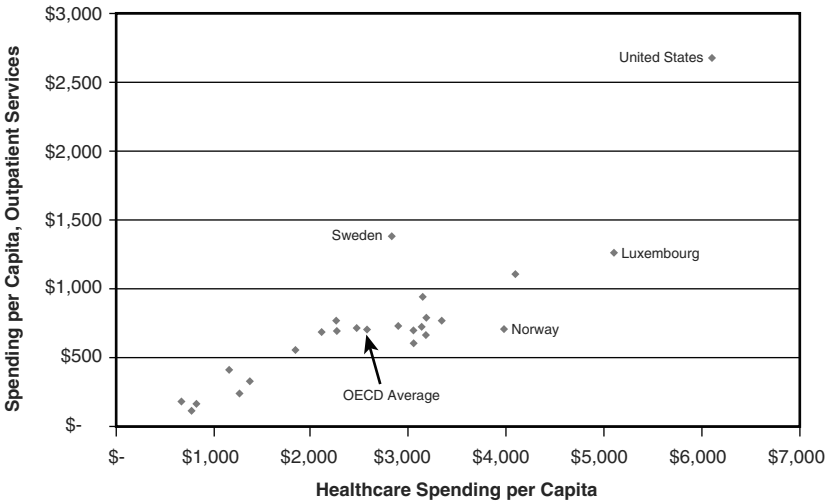
Figure 3.6 Inpatient Versus Outpatient Services as a Percentage of Total Healthcare Spending

It's widely assumed that this trend has greatly improved the safety, efficiency, and cost-effectiveness of the healthcare services we receive. In many respects, this makes good sense. Hospitals are full of sick people and drug-resistant bacteria, and they're just about the last place that you'd want to send patients with problems that could be diagnosed and treated elsewhere. And, as we've seen, hospitals also have high fixed overhead expenses. We'd like to see an American

outpatient healthcare industry that is lean, efficient, and low-cost, with a high capacity for handling large numbers of patients.

But the actual situation is a bit different than one might expect. Oddly enough, the United States seems to use fewer actual *resources* to manage its outpatients than the average country. We have fewer physicians, and fewer doctor visits per capita than all but 6 of 30 OECD members. In fact, at only 3.9 doctor visits per person per year, the United States actually has one of the *lowest* rates of physician utilization within the developed world.[16] The average number of annual doctor visits per person in Canada, Germany, and Japan are 6.1, 7.3, and 13.8, respectively.

Despite this comparatively low rate of visitation, the United States still managed to spend well over twice as much per capita on outpatient care as its next nearest OECD member (Figure 3.7). How is this possible?



Data from: Anderson GF, Frogner BK, Reinhardt UE. "Health Spending in OECD Countries in 2004: An Update." *Health Affairs* (2007); 26(5): 1481-1489.[17]

Figure 3.7 Annual Per Capita Spending on Healthcare and Outpatient Services in Developed Countries

That's easy. As it happens, we pay higher prices for services in this area of healthcare as well. In 1985, physician fee schedules in the

United States were anywhere from 150% to more than 300% of those charged in Canada (Table 3.2).

TABLE 3.2 U.S. Versus Canada Physicians' Fees, 1985**

Service	Ratio of United States to Canada
Surgery	3.21x
Anesthesiology	3.73x
Radiology	3.59x
Procedures (Weighted Average)	3.34x
Moderate Office Visit	1.56x
Extensive Office Visit	1.55x
Moderate Hospital Visit	4.77x
Extensive Hospital Visit	2.57x
Consultation	1.60x
Evaluation and Management (Weighted Average)	1.82x
All Services	**2.39x**
Actual Average Physician Net Income (As Opposed to Clinic Charges)	**1.35x**

Notes: Values are in 1985 U.S. dollars; value for "All Services" is the weighted average of procedures and evaluation-and-management ratios.

Data from: Fuchs VR and Hahn JS. "How Does Canada Do It? A Comparison of Expenditures for Physicians' Services in the United States and Canada." *New England Journal of Medicine* (1990); 323: 884-890. Tables 3 and 5.

One might expect that this meant that U.S. doctors were making a killing. But the peculiar thing is that the actual net income of U.S. doctors in the study was only 35% higher than that of their Canadian counterparts. The remainder of the money mysteriously "disappeared."

More recent data comparing charges with income across countries is scarce, but show an even more pronounced result. Take a look

** Along with consultations, evaluation and management (or "E & M" procedures, as they are known in medical jargon) are the bread and butter of what we think of as the average doctor visit. E&M procedures consist of visits in which the patient presents to the clinic and the healthcare provider takes a history, does a physical exam, and then evaluates all the information and formulates an action plan. Consultations are similar in nature, but are usually one-time events requested by another doctor.

at the selective and unweighted list of procedure costs from 1992-93 in Table 3.3. This particular list is flawed by not including the generally lower-paying and more common evaluation and management procedures. Nevertheless, the common procedures that are listed are far more expensive in the United States. In fact, in 1993 the overall ratio of U.S. to Canadian fees in the list is almost *triple* the ratio seen in 1985. Does this mean that American doctors became fabulously rich within that same period of time?

TABLE 3.3 Comparison of Procedure Charges in the United States and Canada—Early 1990s

Specialty	Procedure	Ratio of United States to Canada
Internal Medicine	Electrocardiogram	3.81x
	Flexible sigmoidoscopy	1.45x
	Liver biopsy	5.30x
Pediatrics	Circumcision of newborn	3.91x
General Surgery	Appendectomy	5.14x
	Cholecystectomy	4.61x
	Inguinal hernia	4.79x
	Partial gastrectomy w/o vagotomy	4.61x
	Radical mastectomy	5.31x
	Excision of breast tumor	6.45x
Orthopedic Surgery	Colles' fracture	5.96x
	Hip arthroplasty	8.28x
	Knee arthroplasty	9.21x
Thoracic/Cardiovascular Surgery	Valve replacement	5.26x
	Coronary bypass (multiple)	4.35x
Plastic Surgery	Rhinoplasty	9.58x
	Mammoplasty (unilateral reduction)	9.13x
	Mammoplasty (unilateral augmentation)	22.76x
	Blepharoplasty	10.13x

continues

TABLE 3.3 Continued

Specialty	Procedure	Ratio of United States to Canada
Neurosurgery	Craniotomy for evacuation of hematoma	6.41x
	Laminectomy	7.81x
Obstetrics and Gynecology	Complete care, normal delivery	5.90x
	Complete care, Caesarean delivery	6.11x
	Dilation and currettage	9.11x
	Abdominal hysterectomy	7.10x
Overall	**Ratio Average**	6.90x

Note: Median fees, converted to Canadian dollars.

Data from: Buske L. "MD Fees Much Higher in U.S." *Canadian Medical Association Journal* (1997); 156(6): 960.)[18]

It's a serious question, but to any healthcare provider living through this period, the thought is laughable. The early 1990s marked the end of a golden age in medicine for physicians—financially, politically, socially, and psychologically. It was a time marked by the growth of HMOs, managed care, "capitation," a loss of practice independence, and the perceived loss of financial control over their futures. These years marked the first time that many American doctors began to question their decision to go into medicine. Most doctors and nurses in America are not poor by any means, but their salaries are not unusually high by the standards of developed countries. Adjusted for inflation, the real income of U.S. physicians has actually been declining over the past fifteen years. Table 3.4 describes the trend in real income for U.S. physicians between 1995 and 2003, and compares it with corresponding changes in the income of other professionals and technical workers. As you can see, doctors have done far worse in that interval than their nonmedical counterparts, while the number of hours spent seeing patients actually increased during that same period.

TABLE 3.4 Physicians' Net Income from Practice of Medicine and Percent Change, 1995-2003

	Average Reported Net Income (Dollars)			Average Net Income, Inflation Adjusted(1995 Dollars)			Percent Change in Inflation-Adjusted Income		
	1995	1999	2003	1995	1999	2003	1995-1999	1999-2003	1995-2003
All Patient Care Physicians	180,930	186,768	202,982	180,930	170,850	168,122	-5.6*	-1.6	-7.1*
Primary Care Physicians	135,036	138,018	146,405	135,036	126,255	121,262	-6.5*	-4.0*	-10.2*
Specialists	210,225	218,819	235,820	210,225	200,169	195,320	-4.8*	-2.4	-7.1*
Medical Specialists	178,840	193,161	211,299	178,840	176,698	175,011	-1.2	-1.0	-2.1
Surgical Specialists	245,162	255,011	271,652	245,162	255,276	224,998	-4.9	-3.6	-8.2*
Private Sector Professional, Technical, Specialty Occupations	N/A	N/A	N/A	N/A	N/A	N/A	4.3	2.5	6.9

Notes: The Bureau of Labor Statistics (BLS) Employment Cost Index of wages and salaries for private sector "professional, technical and speciality" workers was used to calculate estimates for these workers. Significance tests are not available for these estimates. All inflation-adjusted estimates were calculated using the BLS online inflation calculator (http://146.142.4.24/cgi-bin/cpicalc.pl). The composition of the physician population changed between 1995-2003—a fact that makes some estimates of percentage changes in real income appear inconsistent (for example, estimates of income changes for all patient care physicians not falling between estimates for primary care physicians and specialists.) These data patterns occur because the proportion of medical specialists steadily increased from 1995 to 2003 (32% to 38%) while proportions of primary care physicians and surgical specialists both declined by about 3 percentage points.

* Rate of change is statistically significant at $p < .05$.
Source: Community Tracking Study Physician Survey

From: Tu HT, Ginsburg PB. Center for Studying Health System Change Tracking Report. Results from the Community Tracking Study, No. 15. June 2006.[19]

Table 3.5 shows how U.S. professional salaries compared with those in the rest of the world as of 2004. Skilled healthcare professionals often represent some of the most energetic and best educated workers in any country. As a result, they typically command a premium in the overall labor market. Expressing the premium as a multiple of per capita gross domestic product (GDP) provides a way of comparing the value that societies place upon physicians across countries.

As you can see, U.S. physician specialists, general practitioners, and nurses are all in the top tier with respect to GDP ratio. However, with respect to Canada (which was our initial point of net salary compensation for 1985), the physician salary ratio 20 years later is only slightly higher—1.43 for specialists and 1.51 for general practice physicians. But if physician *charges* in the United States were roughly six times higher than the equivalent fees in Canada for the same period, *what happened to the rest of that money*?

This seemingly simple question holds the key to what is wrong with American healthcare today.

TABLE 3.5 Average Compensation of Certain Healthcare Professionals, 2004 (Dollars in U.S. Purchasing Power Parities)‡‡

	Specialists		General Practitioners		Nurses	
	in $1,000s	Ratio to per captia GDP	in $1,000s	Ratio to per captia GDP	in $1,000s	Ratio to per captia GDP
Netherlands	$253	6.0	$117	3.6		
Australia	$247	7.6	$91	2.8	$48	1.5
United States	$230	5.7	$161	4.1	$56	1.4
Belgium	$188	6.0	$61	2.0		
Canada	$161	5.1	$107	3.4		
United Kingdom	$150	4.9	$118	3.9	$42	1.4
France	$149	5.0	$92	3.1		
Ireland	$143	4.0			$41	1.1
Switzerland	$130	3.8	$116	3.4		
Denmark	$91	2.9	$109	3.4	$42	1.3
New Zealand	$89	3.6			$34	1.4
Germany	$77	2.7				
Norway	$77	1.9			$35	0.9
Sweden	$76	2.5	$66	2.2		
Finland	$74	2.5	$68	2.3	$29	1.0
Greece	$67	3.1			$33	1.5
Portugal	$64	3.5	$64	3.5	$34	1.9
Czech Republic	$35	1.7	$32	1.7	$14	0.8
Hungary	$27	1.7	$26	1.6	$14	0.9
Mexico	$25	2.4	$21	2.1	$13	1.3
Poland	$20	1.6				
AVERAGE	$113	3.7	$83	2.9	$33	1.3
excluding U.S.	$107	3.6	$78	2.8	$32	1.3
Median	$83	3.3	$80	3.0	$34	1.3

From: Peterson CL and Burton R. "U.S. Health Care Spending: Comparison with Other OECD Countries." *Congressional Research Service Report to Congress*, September 17, 2007. Table 2.[20]

‡‡ **Notes:** Sorted by specialists' compensation. Amounts are adjusted using U.S. dollar purchasing power parities. Amounts from previous years are trended up to 2004 dollars using the annualized Bureau of Labor Statistics Employment Cost Index for wages and salaries of health services workers in private industry. It is not known whether wage growth in health professions in other countries was similar to that in the United States. Amounts are from previous years for 10 countries: data for Australia, Canada, Denmark (for specialists and nurses), Finland (for nurses), and the Netherlands are from 2003; data for Belgium (for specialists), Denmark (for general practitioners), New Zealand (for nurses), and Sweden are from 2002; data for Switzerland and the United States (for specialists and general practitioners) are from 2001; and data for Belgium (for general practitioners) and the United States (for nurses) are from 2000. Ratios of salaries to GDP per capita reflect the year the data was collected and are not adjusted for inflation. For countries that have both self-employed and salaried professionals in a given field, the amount presented here is the higher of the two salaries. Four countries have both salaried and self-employed specialists: the Czech Republic (where compensation is $29,484 for salaried and $34,852 for self-employed specialists), Greece ($67,119 and $64,782), the Netherlands ($130,911 and $252,727), and the United States ($170,300 and $229,500). One country has both salaried and self-employed general practitioners: in the United States, salaried general practitioners earn $134,600, compared with $154,200 if self-employed. All nurses are salaried among this data. Recent data are available only for 21 of the 30 OECD countries.

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PRAVEEN GUPTA

FT Press
FINANCIAL TIMES

An Imprint of PEARSON EDUCATION

Upper Saddle River, NJ • New York • London
San Francisco • Toronto • Sydney • Tokyo • Singapore
Hong Kong • Cape Town • Madrid • Paris • Milan
Munich • Amsterdam

Vice President, Publisher: Tim Moore
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Proofreader: Linda K. Seifert
Manufacturing Buyer: Dan Uhrig

Publishing as FT Press
Upper Saddle River, New Jersey 07458

Printed in the United States of America

First Printing, April 2007

ISBN 0-13-174171-3

Pearson Education LTD.
Pearson Education Australia PTY, Limited.
Pearson Education Singapore, Pte. Ltd.
Pearson Education North Asia, Ltd.
Pearson Education Canada, Ltd.
Pearson Educatio[ac]n de Mexico, S.A. de C.V.
Pearson Education—Japan
Pearson Education Malaysia, Pte. Ltd.

Library of Congress Cataloging-in-Publication Data

Improving healthcare quality and cost with six sigma / Brett E. Trusko ... [et al.].
p. ; cm.
Includes bibliographical references.
ISBN-13: 978-0-13-174171-3 (hardback : alk. paper)
ISBN-10: 0-13-174171-3 (hardback : alk. paper) 1. Medical care—Quality control—United States—Statistical methods. 2. Medical care—United States—Cost control—Statistical methods. 3. Medical care—United States—Cost effectiveness. I. Trusko, Brett E.
[DNLM: 1. Delivery of Health Care—organization & administration. 2. Quality Assurance, Health Care—methods. 3. Cost Control—methods. 4. Efficiency, Organizational. 5. Quality Control. W 84.1 I345 2007]
RA399.A3I47 2007
362.1068'1—dc22

2006036533

Dedication

To my incredibly encouraging wife, Kirsten; my children, Nikolas, Dominick, and Treyton; my parents, Jerry and Faye Truskowski, for the obvious reasons; and my wife's parents, Jack and Bonnie Barthel, who have never suggested (that I know of) that their daughter find a "non-writing" husband. All of whom prove that even to a Six Sigma practitioner, a special cause once in a while isn't always bad.

—Brett Trusko

To my family for their love, support, and patience. Special thanks and appreciation to my husband Craig, my son Kenny and daughter Laurie, and to my parents, Allen and Muriel Gove.

—Carolyn Pexton

To the many people who have and will die because their healthcare provider did not use the Six Sigma approaches.

—Dr. H. James Harrington

To my friends and family doctors, including Dr. Robert Weber, Vinod Motiyani, John Saran, Michael Koehne, Diane Metrick, John Saniat, Nandini Upadhayay, and Bob Manam.

—Praveen Gupta

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ACKNOWLEDGMENTS

Dr. Brett E. Trusko: I would like to acknowledge all my clients and professional contacts—too numerous to mention, but each and every one critically important.

Carolyn Pexton: While we cannot possibly list everyone who has played a role in bringing Six Sigma to healthcare, the authors would like to gratefully acknowledge some of the many practitioners and pioneers who have generously offered their expertise, leadership, and commitment to excellence along the way:

Frank Alvarez, Heather Anderson, Jay Anderson, Sandra Bacon, Elaine Banzhaf, Kathleen Bradley, Jason Broad, Jean Cherry, Alan Cooper, Mary Reich Cooper, Mary Cramer, Edward Craven, Glenn Crotty, Chuck DeBusk, Tom Decker, Chris Desmarais, John Desmarais, John DeVries, Maureen Donahue, Adrienne Elberfeld, Shari Eschete, Barbara Feldman, Glenn Fosdick, Kathleen Gallo, Andy Ganti, Cindy Garza, Tomas Gonzalez, Bonnie Gorges, Dave Green, Ben Hahlen, Roger Hoerl, Blake Hubbard, David Ingraham, John Kalb, David Keefe, Joe Kent, Eleanor Killam, Tracy Kirkconnell, Janice Kishner, Matthew Krathwohl, Beth Lanham, Jason Lebsack, Lisa Lopez, Karen Matijak, Jack McDaniel, Susan McGann, Mara Migliazza, Ben Miles, Donald Miller, Rich Miller, Bev Moncy, Charlie Morris, Robert Morrow, Carol Mullin, Nan Nelson, Gary Norman, Nick Nauman, Monte Parker, Shauna Pearce, Frank Pietrantoni, Nancy Pratt, Darcy Prejeant, Irma Pye, Art Rangel, Lou Rhodes, Nancy Riebling, Nancy Roberts, Heath Rushing, Deborah L. Smith, Sondra Smith, Todd Sperl, Jim Springfield, Rich Stahl, Greg Stock, Hylton Surrett, Carolyn Sweetapple, Jim Swindler, Michael Toomey, Barbara Truskoski, James Tucci, Kevin Tuttle, Mary Ellen Uphoff, Mark Van Kooy, Matiana Vela, Jennifer Volland, Lory Wallach, Scott Ward, Marie Weissman, David Yarbro, Lois Yingling, Deborah P. Young, Michael Zia, Robert Zisman.

Special thanks to Chuck DeBusk for taking his valuable time to review and provide feedback during the content development process. Thanks also to Mike Cyger, president of iSixSigma, for establishing a special networking and education portal for Six Sigma and Lean practitioners in healthcare (www.healthcare.isixsigma.com).

Dr. H. James Harrington: I would like thank Dr. Tom McNellis for his insight into the use of Six Sigma in the healthcare operations and thank Candy Rogers for typing the manuscript and proofreading the many drafts.

Praveen Gupta: Thanks to my coauthors for memorable teamwork, family members for support, and colleagues and friends for ideas. I would like to especially acknowledge my in-laws—Mummy, Papa, Alka, Seema, Navita, and Arun—for their unquestionable support that encourages me to pursue my interests in writing, including this one. My heartfelt thanks go to my wife, Archana, for instilling healthy habits in our family. The best healthcare begins at home.

Thanks also to the team at Pearson for their guidance and support throughout the project: Jim Boyd, Amy Neidlinger, Amy Fandrei, Alan Clements, Lori Lyons, Lisa Thibault, Nonie Ratcliff, and Linda Seifert.

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FOREWORD

Through all of human history, health caregivers have been respected individuals in society. Now with the Internet, consumerism, the Baby Boomers aging, risk adjustment, outcomes measurement, and quality metrics, blind trust in clinicians has begun to erode.

The "Crossing the Quality Chasm" reports (Committee on Quality of Healthcare in America, 2001) by the Institute of Medicine over the past decade have identified the stark reality of errors in the healthcare system—more than 98,000 preventable deaths each year. Although the exact number is disputed, one life lost to error is one too many.

Many in academia, clinical practice, and government have suggested that use of information technology in healthcare is the answer to error reduction. However, information technology by itself can have only a limited impact, unless the information is used for deliberate improvement in healthcare practices. Despite the evidence that IT improves care, basic electronic information about patients remains out of reach for most clinicians.

The rising cost of healthcare and sustained poor quality mandates deployment of better practices and continual improvement in healthcare operations at a much faster rate than historically achieved. There have been many attempts to improve quality in healthcare, but most have been based on management fads and have been unsustainable. Six Sigma methodologies have been deployed successfully in the industrial sector. I believe the healthcare industry can realize similar benefits using Six Sigma. Many healthcare organizations have already benefited from Six Sigma deployment.

The *Improving Healthcare Quality* book offers help. The four coauthors of the book, experts in the excellence, process quality. and healthcare fields, have collaborated nicely to offer a customized approach to implementing Six Sigma in the healthcare industry. The book is very well organized and contains actual cases for ease of learning and application.

I believe *Improving Healthcare Quality* is the most comprehensive book for applying an improvement methodology in healthcare to improve both quality and cost. It is time healthcare professionals—administrators, physicians, and support staff—learn about reputed improvement methodologies and commit to improve healthcare services to clients. We have committed our lives to serve people; we must recommit our abilities to do our best. *Improving Healthcare Quality* will be a vital tool that will enable us to do our best.

I have enjoyed reading the book, and expect the same for you, the reader. I am confident that trust in clinicians and confidence in the healthcare system will markedly increase.

John D. Halamka, MD
Harvard Medical School

INTRODUCTION

This book is an introduction to quality methods, Six Sigma, and healthcare. No doubt, if you purchase this book you are concerned about the quality issue and the future of healthcare. You have probably tried TQM (Total Quality Management), CQI (Continuous/Clinical Quality Improvement), and a number of other approaches to improving quality in your organization. We too have thought about this long and hard throughout the years as consultants, speakers, and writers in the healthcare field. You might be familiar with Dr. Brett Trusko's work as a futurist who collaborated with the late Russell Coile Jr. Little did he know some 20 years ago that most of our work in healthcare would boil down to quality issues. We have spoken and written about quality, organizational development, motivation, teamwork, information technology, and finance in healthcare with a Pollyanna perspective that with enough caring and hard work we can solve the problems of healthcare. Only recently did we really begin to understand that all these issues were reflective of a dysfunctional system that works against excellence in healthcare.

For example, our healthcare system in the U.S. systematically rewards heroics and intervention while penalizing planning, quality, management, and effectiveness. For years we have reimbursed providers based upon costs while efficiency has generally resulted in lower reimbursements. In our capitalist economy, we usually find that the best provider of a good or service is the one that is the most efficient, not the least. But this is precisely how we handle healthcare in the U.S. The more healthcare resources we consume as providers of healthcare, the more reimbursements we receive. How would we feel about paying a mechanic more for replacing parts that our car doesn't even need? How about rewarding grocery stores for finding the most expensive method of shipping groceries to the store?

Of course, healthcare providers aren't mechanics, and hospitals aren't grocery stores. Hospitals are hospitals and physicians are physicians. Healthcare is generally an imprecise science. However, using the excuse of an imprecise science as a reason not to improve healthcare is irresponsible. In fact, healthcare is an imprecise science, but at the same time there is much in healthcare that can and should be improved.

The authors have worked in healthcare for more than 60 years. We have been unit secretaries, surgical scrub technicians, and administrators. We have seen healthcare finances from the

inside out and worked in the clinical setting. Healthcare is not an easy business. Healthcare professionals are some of the most dedicated and caring people on earth. When publications such as the May 1, 2006, edition of *Time* magazine (Gibbs, 2006) and morning news shows like *The Today Show* and others prominently feature stories about how to protect yourself from medical errors in a hospital, we would expect to see more healthcare professionals expressing outrage against the system. Dedicated, caring professionals are and should be outraged at the shallow investigative reporting. But the fact is that healthcare professionals usually don't have a very good defense against attacks, because in most cases, they don't really know what happened. They don't know what happened because they don't understand their processes, and they don't understand their processes because the processes tend to be complicated and fluid.

As professionals who have worked in healthcare for so many years, we the authors can personally vouch for the fact that most healthcare providers strive for delivery excellence. These providers have witnessed miracles, such as the snaking of wires from the leg to the brain to clear a clot and save a life. They have seen two-pound premature babies live, and people on the verge of death brought back to living. Miracles of excellence happen constantly in the healthcare provider's world. And when errors occur, healthcare professionals grieve. There may be no other profession or industry that is more driven by a desire for excellence in the world. Unfortunately, processes and systems created by misaligned incentives sometimes make it difficult to provide excellence. This is where discussion of Six Sigma really begins.

Six Sigma is an approach to quality that should appeal to healthcare professionals intrinsically. It is based on improving processes and procedures, based on evidence. One of our authors has a bachelor's degree in biology, two have degrees in engineering, and others have diplomas in business. Dr. Trusko stated in one of our early writers meetings that when he first heard of Six Sigma years ago, it was like coming home. Of course, running a business requires making decisions based upon facts and not just intuition or politics. Unfortunately, this is exactly the way most healthcare provider institutions are run. Now throw into the mix the politics of government funding and insurance companies, and it's no wonder we accomplish anything with healthcare. Not that governments and insurance companies are not trying to do the right thing; in fact, the motivation is based on doing the most good for the most people. Healthcare providers, in a relatively weak bargaining position due to the cottage nature of the industry, generally have to work within the system that the government and the insurance industry have created. But there are things that healthcare providers can do to increase efficiency, reduce malpractice costs, and increase profits. Even in a system that rewards resource utilization, having an intimate understanding of your business, your processes, and the influence you have on outcomes allows the healthcare provider to maximize its revenue while minimizing the anguish of medical mistakes.

CHAPTER 3

APPLICABILITY OF SIX SIGMA IN HEALTHCARE ORGANIZATIONS

SECTIONS

We hope by now we have presented you with enough information about healthcare systems around the world that you will agree that they need to be reformed. We need to start measuring our healthcare failures in deaths per million, not deaths per "hundreds or even deaths per thousands." Even deaths per million is not good enough in the healthcare system. The required standard should be measured in the deaths per billion and errors per million. This is where proven, preventative approaches—such as Total Improvement Management, Six Sigma, and Lean—can provide real benefit to the healthcare system. Both of these two approaches have been refined as they were used in other industries, and they are now ready to advance the healthcare industry into a new, higher level of customer satisfaction and performance.

Studies indicate that the services industries have an average sigma level of between 2.0 to 2.5; that's an error rate of 159,000 to 208,000 per million opportunities. But many of the healthcare activities perform much worse. For example, the process for treating depression is estimated to be running at the 2 sigma level or 308,538 errors per million opportunities.

Although process capability techniques have been used extensively in manufacturing for more than 50 years, a major breakthrough occurred when Motorola applied them to its business support functions as a logical extension of its manufacturing quality initiatives. The results were improvements of ten times to a hundred times in Motorola's business processes in as short a period as two years. When Motorola won the Malcolm Baldrige Award in 1988, it credited the Six Sigma program as the primary driver of its improvement. During the first part of the 1990s, the Six Sigma program continued in Motorola and spread slowly into other organizations. But in the mid-1990s, GE latched onto the concepts and committed millions of dollars to implementing the program throughout the entire organization. GE's program expanded from 200 projects in 1995 to 6,000 projects in 1997, which resulted in more than $320 million in savings, all directly attributed to this Six Sigma program. In 1998, GE estimated that its savings were about $750 million.

Notable healthcare Six Sigma projects include North Shore-Long Island Jewish Health System, Memorial Hospital and Health, of Marlton NJ, McLeod Regional Medical Center, Froedtert Memorial, New York Presbyterian, Vytra Health Plans, several Blue Cross and Blue Shield Plans, MD Anderson Cancer Center, Thibodaux Regional Hospital, University of New Hampshire, Commonwealth Health Corporation, Charleston Area Medical Center, Mount Carmel Health System and Bon Secours National Health System, just to name a few (see case studies chapters).

Six Sigma projects are defined as projects designed to reduce error rates to a maximum of 3.44 errors per million exposures (or "opportunities") through the use of statistical analysis techniques, problem solving, and quality principles. The typical healthcare organization has error rates in excess of between 2,700 and 45,500 (3 and 2 sigma) errors per million opportunities. Individuals, departments, projects, functions, plants, or entire organizations can use the Six Sigma approach.

More important than the specific measurement of error rates (because healthcare is about people as well as process) is the methodology behind Six Sigma. The Six Sigma process forces hospitals to measure those things that are important to the business of healthcare, things like quality, mortality, customer satisfaction, and employee satisfaction. If a hospital says that it is a patient-focused organization, what does that mean? And if the organization claims to be patient-centered (or focused), then how does it measure "patient focused?" If the hospital says it can't measure that, then it is it really important to them? Most organizations limit their measurement mechanisms to traditional accounting measurements, such as income and expenses, but medical mistakes are typically not measured and are generally underreported due to malpractice and the tendency to penalize and terminate individuals who report errors. (After all, one critical error can lead to the revocation of a practitioner's license.) Under a Six Sigma methodology, the hospital will find ways to measure what is important to them by tracing and analyzing the things they value the most as they relate to the internal or external customer's needs. Organizations that can't measure what they say they value don't really value what they profess to value. And if they can't measure it, they can't improve it!

While many healthcare organizations have attempted process improvement throughout the last 20 years, most have ended in disappointment. The discipline of the Six Sigma approach to quality through process improvement (as apposed to isolated quality attempts—such as inspection and post-mortem review of errors) is potentially the industry's best opportunity to address

lingering issues of quality and the resultant real costs that are added to any system when poor quality is the rule, rather than the exception.

> "When you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you can not express it in numbers, your knowledge is of a meager and unsatisfactory kind. It may be the beginning of knowledge, but you have scarcely, in your thoughts, advanced to the stage of science."
>
> —William Thomson, Lord Kelvin (1824–1907)

A Brief Explanation of Six Sigma

An ever-growing number of healthcare organizations are using Six Sigma to improve processes, from admitting to discharge and all the administrative and clinical processes in between. This adoption is driven by several factors including the need to improve the organization's bottom line, eliminate medical errors, and position themselves for an imminent global consumer-centered healthcare revolution. Healthcare providers once enjoyed a respect by their customers that few institutions in the world enjoy. Then came continuous years of double-digit cost increases capped off by the Institute of Health report indicating that medical errors kill approximately 98,000 people per year in the United States. These mistakes can range from prescription errors to a failure to wash hands. Many healthcare consumers began to question why increasing costs did not equate to improved quality. Accordingly, the healthcare industry finds itself at a crossroads—to continue on the current path, which would lead to disaster, and or the other road, leading to potential redemption. Many organizations thankfully have chosen a path of redemption: Six Sigma.

A brief history of Six Sigma is helpful to a healthcare entity considering a Six Sigma initiative. The earliest quality initiatives were based on 100 percent inspection, a concept that would be impossible in a service-oriented environment such as healthcare. Because this was expensive and time-consuming, sampling plans were developed to define acceptable defect levels. Then in the 1970s, quality guru Phil Crosby established a program called *zero defects*. This program was an inspirational way of explaining to employees the notion that everything should be done right the first time, that there should be no failures or defects in the work output. In the healthcare world, a defect can be as benign as an unpaid bill or as serious as a medication error causing the death of a patient. Probably more critical than in any other industry, zero defects should be the order of the day in a patient encounter.

The zero defects concept was somewhat controversial because some quality experts felt it mainly focused on meeting internal design specifications. It did not focus on customer requirements or on continuous improvement. Many quality professionals disagreed with the concept because they believed that it was impossible to have zero defects all the time. These process-oriented professionals felt that process capability requirements were a better way of defining acceptable performance. But the U.S. government quickly embraced this concept, and it became the "in" thing to do for a number of years.

In the 1970s and early 1980s, organizations such as IBM released requirements that their process capabilities (C_{pk}) must reach a 1.40 level, or an acceptable corrective action plan needed to be in place before products could be shipped to their customers. IBM's technical report entitled "Process Qualification—Manufacturing Insurance Policy"[1] required that a process "plus or minus 4 sigma limit" must fall within the specification limit when the following are considered:

- Accuracy
- Precision
- Repeatability/reproducibility
- Variation/stability
- Linearity, or resolution
- Sensitivity
- Variation between similar pieces of equipment used for the same purpose

In the mid 1980s, Motorola's president directed that all processes should have a tenfold improvement within a five-year period. This called for radical changes in the way processes within Motorola functioned, thus the creation of Six Sigma. This program set an objective for all processes to statistically perform at an error rate no greater than 3.4 errors per million opportunities. The real breakthrough in Motorola's Six Sigma approach was that the Six Sigma concept was applied to all processes, not just the manufacturing processes. (Obviously, in hindsight, was the fact that general systems theory creates a relationship between nearly all the processes in an organization.)

To calculate the process performance, samples of the output were plotted on a histogram, and the standard deviation was calculated. Once the standard deviation and mean were calculated, it was easy to compare the Six Sigma calculated performance limit to the specifications and/or requirements, if the organization has defined its requirements for each process and each activity within the process. Of course, this was not the case for most non-production activities. As a result, organizations that undertake a Six Sigma program are forced into a major upgrading of their internal requirements and measurement system.

Once the process variation and mean performance are compared to the requirements, most processes fail to meet the Six Sigma requirements. Many non-production processes fail to even meet a ±3 sigma performance level (3 defects per 1,000, or 3,000 per million). To place this in context, a routine appendectomy might consist of 200 to 300 opportunities for error (hand and room washing, instrument sterilization, scheduling, pharmaceuticals, skills of surgeon, and so on), most non-critical, but many fatal. The non-critical are the most common and result in "nickel and diming" up the cost of care, while the well-publicized critical errors might result in malpractice or expensive corrective action, such as repeat procedures or infection, or death of the patient, each of which is extremely expensive to organizations in reputation and in dollars. In a fast-paced and variable environment, such as a hospital emergency room, one might expect dramatic fluctuations in the sigma performance level, but typically the deviations from the mean are not much greater than that found in an accounting office. This is true because the defects built into the system are generally consistent across time.

Six Sigma quality became popular immediately following Motorola winning the Baldrige Award in 1988. The information package that Motorola distributed to explain their winning stated:

> "To accomplish its quality and total customer satisfaction goals, Motorola concentrates on several key operational initiatives. At the top of the list is Six Sigma Quality, a statistical measure of variation from a desired result. In concrete terms, Six Sigma translates into a target of no more than 3.4 defects per million products, customer services included. At the manufacturing end, this requires designs that accommodate reasonable variation in component parts but production processes that yield consistently uniform final products. Motorola employees record the defects found in every function of the business, and statistical technologies are increasingly made part of each and every employee's job."

Although Motorola called its program Six Sigma, Motorola only required that Six Sigma be applied to one point in time ($C_p = 2$) and allowed the process to perform at lower levels when the process drift is considered (C_{pk}). Table 3.1 relates the various levels of sigma to defects per thousand and per million.

TABLE 3.1 Quality Levels and Corresponding Number of Defects

Quality Level	Defects Per 1,000 Opportunities	Defects Per Million Opportunities
1 sigma	317	317,310
2 sigma	45	45,500
3 sigma	2.7	2,700
3.5 sigma	0.465	465
4 sigma	0.063	63
4.5 sigma	0.0068	6.8
5 sigma	0.00057	0.57
6 sigma	0.000002	0.002

Note that our calculation differs from the 3.4 per million as defined by Motorola because we take into account the shift of process average.

Regardless of the specific measurement methodology used, a low sigma can result in consequences not traditionally identified in the normal course of business. For example, utilizing our Six Sigma measurement in the context of power company outages or misspelled words in a library, we see the data shown in Table 3.2.

TABLE 3.2 Defect Rate Versus Sigma Level for Power Outages and Misspelled Words

Sigma Level	Defect Rate (ppm)	Duration of Power Outages Per Month	Number of Misspelled Words
1	317,400	228.5 hours	159 per page
2	45,600	32.8 hours	23 per page
3	2,700	1.94 hours	1.35 per page
4	63	2.72 minutes	1 per 31 page
5	0.57	1.48 seconds	1 per several books
6	0.002	0.005 seconds	1 per small library
7	0.000003	0.00001 seconds	1 per large library

Although .002 errors per million fuses, bolts, screws, nuts, garden hoses, or brooms may not be an aggressive target, when you start to apply the same requirements to management decisions, drawings, books, letters, sales contracts, meals served, auto repairs, medical operations, sales calls, or lines of codes, it turns out to be a very aggressive target. This is particularly true in any type of service activity in which quality cannot be inspected or tested.

The Six Sigma program is not just a new performance standard because the new performance standard cannot be met if the organization does the same old thing the same old way. It is for this reason that Motorola calls its program the "Six Sigma Quality Program." It drove a major improvement effort that radiated through the organization. Motorola's Six Sigma quality program is shown in Figure 3.1.

You will note that the Six Sigma quality program is divided into four major quadrants:

- Improvement process
- Quality initiatives
- Quality measurements
- Improvement tools

To help with the implementation of the Six Sigma quality program, Motorola formed the Six Sigma Research Center to develop a set of reference books known as the Encyclopedia of Six Sigma. This encyclopedia consists of three main parts:

- A collection of statistical tools
- Application case studies
- Descriptive, specific optimization methods

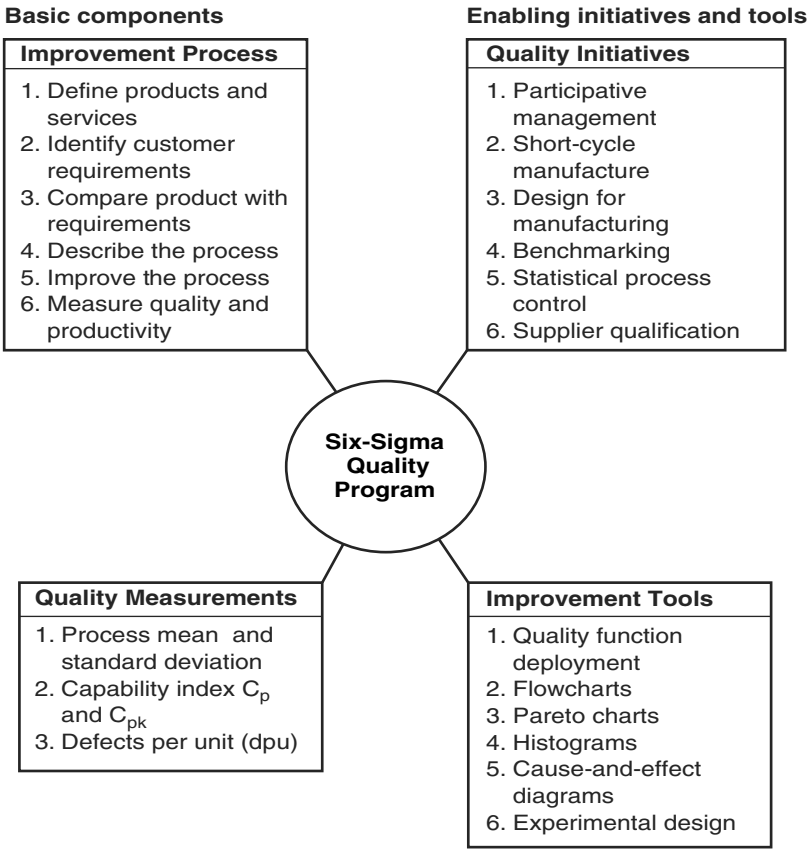

FIGURE 3.1 Six Sigma quality program

Motorola established an innovative recognition system, called the *Black Belt program*, to support the Six Sigma quality program. Individuals progress through various levels that were designated as:

- **Green Belts**. Individuals who have completed the training.
- **Black Belts**. Individuals highly competent to serve as the on-site consultants for applications of Six Sigma methodologies.
- **Master Black Belts**. Individuals who have mastered the Six Sigma process and are capable of teaching the process to others.

The following is a ten-step process to achieve Six Sigma in a clinically intensive process:

1. **Identify Your Products**. What is the service or product that you are producing? In the case of an operating suite, it might be technically superior procedures.
2. **Identify Customer Requirements**. What is the customer's perception of error-free products or service? The response might be any adverse condition that would be deemed a medical mistake.
3. **Diagnose the Frequency and Source of Errors**. What is the source of errors? In an emergency department, errors could come from any number of places including supply carts or ineffective ambulance routing leading to overcrowded waiting rooms.
4. **Design the Process**. How can the process enablers be put together to provide a best-value solution? In said emergency room, perhaps some mechanisms can avoid the overcrowding.
5. **Develop a Simulation Model**. This model is used to project the process'' performance characteristics and determine if the process will meet the customer's error-free needs. Try a new scheduling system.
6. **Error-Proof the Process**. How can the process be changed to eliminate potential errors? In the operating suite, this might include new flow of personnel or redesigned procedure packs. In a billing department, this might include correction of mistakes by the admitting department.
7. **Install Internal and External Control Points and Measurements**. How can you detect trends before they become errors? In the case of the billing department, one might institute reporting of missing information or unsigned discharge orders before they reach final billing. In the case of the emergency room, correctly stocked supply carts might eliminate trips to and from Central Supply.
8. **Install New Process**es. How do you get the users to embrace the new process? (A pilot installation often is required. In any case, an early change management intervention is advised as is input by those affected.)
   - Certify each step or activity in the process
   - Qualify the total process as a single item
9. **Measure Performance**. Does the process meet the Six Sigma requirements? If not, how does the process need to be adjusted to do so?
10. **Continuously Improve**. How can the process'' effectiveness, efficiency, and adaptability be improved?

To meet the very challenging quality requirements associated with Six Sigma, an organization has only three options: Reduce the process variability, center the mean of the population, or open the acceptable performance limit.

The first approach should always be to focus on centering the process mean and reducing the process breadth. Motorola's research institute recommends the following six steps [2]:

1. Identify the product characteristics that are critical to satisfying both the physical and functional requirements of the customer and the requirements of relevant regulatory agencies. This might mean that patients who come into your facility for a series of tests will have all of them performed on a single day rather than over an extended period.
2. Determine the specific product elements that contribute to achieving these critical characteristics. What does your organization do to streamline the process for the patient or coordinate appointments?
3. According to product elements, determine the process step or process choice that controls each critical characteristic. Is your organization designed to serve the staff, the equipment, the patient, or none of the above?
4. Determine a nominal design value and the maximum (real) allowable tolerance for each critical characteristic, which still guarantees successful required performance. How would you have to change the scheduling process to achieve the Six Sigma goals?
5. Determine the capability for parts and process elements that control critical characteristics. In the example of scheduling appointments in the same visit, is the limitation in IT systems, in physical layout of the plant, or is it rooted in outmoded processes?
6. If C_p is not = 2 (C_{pk} = 1.5), then change the design of the process to achieve C_p = 2 (or institute process control measures which will narrow process capability sufficiently to achieve C_p = 2). Note: C_{pk} is the process capability index and is referenced later in the book.

To make Six Sigma more personal, consider the case of a physician who performs more than 1,000 surgical procedures (1,000 opportunities for error per case) with no more than 1 mistake. Certainly, this is very challenging based upon normal performance levels. It requires a radical new design to the way the operating room functions.

A number of points need to be considered when you are using the Six Sigma process:

- Six Sigma works well where there are high production rates of the same or very similar parts. In other words, many organizations have tackled CABG (Coronary Artery Bypass Graft) since it fits the above requirement well.
- Six Sigma is very difficult to obtain in areas like administration, sales, personnel, and so on where results are difficult to measure and are unique from one incident to another.
- It is extremely difficult for management to perform at the Six Sigma level due to the high degree of variation in the "process" of managing.
- Six Sigma works well when variables data can be collected, but not so well when attributes data are used.
- It is based upon the use of normal distribution, not abnormal or skewed distributions.

Motorola defined a list of tools required to support the Six Sigma program. They are grouped into three categories: design, process, and material. These tools are easily adaptable to healthcare if you consider them from a slightly different perspective:

- **Design Tools (or "Design of Care")**
  - Design to standard parts/materials
  - Design to standard processes
  - Design to known capabilities
  - Design for assembly
  - Design for simplicity
  - Design for robustness
- **Process Tools (or "Process in Healthcare")**
  - Short cycle manufacturing
  - Process characterization
  - Process standardization
  - Process optimization
  - Statistical process control
- **Material Tools (or "Central/Sterile Supply Optimization")**
  - Parts standardization
  - Supplier SPC (Statistical Process Control)
  - Supplier certification
  - Material requirements planning

Why Do You Need Six Sigma?

Assume that a typical surgical procedure contains 1,200 processing steps (not unusual because the typical healthcare organization has approximately 20,000 individual processes). If each step has a short-term 4 sigma capability, the throughput yield would be (RT is rolled throughput yield):

$$Y_{RT} = 0.999968^{(1200)} = 96.24\%$$

If you consider over a period of time, the process drifts away from the nominal as much as 1.5 sigma, the yield at each step would be degraded to .9938 and the throughput yield would be:

$$Y_{RT} = 0.9938^{(1200)} = 0.05\%$$

In other words, you have near zero possibility of completing a surgical procedure without committing an error. This is assuming that all the steps are in series with each other. Table 3.3 provides you with a breakdown of this concept based upon the number of steps in the process, and various sigma limits, assuming a 1.5 sigma shift.

TABLE 3.3 Throughput Yield Versus the Number of Process Steps and Processes

Number of Process Steps	3	4	5	6
1	93.32%	99.379%	99.9767%	99.9996%
2	87.09	98.76	99.95	99.99932
5	70.77	96.93	99.88	99.9983
10	50.09	93.96	99.77	99.9966
50	3.15	73.24	98.84	99.98
100	0.10	53.64	97.70	99.966
500	0	4.44	89.02	99.83
1000	0	0.2	79.24	99.66
2000	0	0	62.75	99.32

Quality

By applying Six Sigma principles, it is relatively easy to reduce current error rates, and a 50 percent reduction in errors in a 3 sigma healthcare organization cannot only lead to greater customer satisfaction, but large reductions in claims related to medical mistakes. The following sections describe some examples.

GE

Jack Welch launched the Six Sigma program at GE with 200 projects in 1995. In 1996, it increased to 3,000 projects. It expanded to 6,000 projects in 1997. The target for the Six Sigma program was to save $150 million in productivity gains and profits. The actual 1997 savings was $320 million, more than double the goal. In 1998, net savings were estimated to be about $750 million.

Some people within GE were concerned because they believed Six Sigma will cause bureaucracy to increase. Welch's reply to this concern was, "I don't give a damn if we get a little bureaucracy as long as we get the results."

William Woodburn, head of GE's industrial diamonds business, reports that in four years the operation's returns on investment increased fourfold and, at the same time, the cost structure was cut in half. He gives the Six Sigma program credit for much of the improvement. To get the improvements, he had to cut more than a third of the workforce, which included more than 50 percent of the salaried staff.[3]

Allied Signal

Lawrence A. Bossidy, former GE Vice Chairman, started the Six Sigma program at Allied Signal Inc. when he was CEO in 1991. The increased productivity and profit got Jack Welch's attention. At this time, GE was running at a 3 to 4 sigma level. The gap between 4 sigma and Six Sigma at GE was costing GE between $8 and $12 billion a year.

> "There is one rule for Industrialists and that is: Make the best quality of goods possible at the lowest cost possible, paying the highest wages possible."
>
> —Henry Ford (1863–1947)

> "I'm surprised we didn't come up with this a few decades ago. For a hospital like ours, questioning and second-guessing is common."
>
> —Dr. George Kerlakean, Good Samaritan Hospital

Six Sigma Applied to Healthcare

The Six Sigma approach is in its infancy in the healthcare industry. It has been applied to some extent to refine some hospitals' business processes using reengineering or process redesign methodologies. Monica Berry, president of the American Society for Healthcare Risk Management, stated, "If we look at quality as it has been implemented in the past, we won't be successful in reducing patient errors."

Most healthcare providers have put in place some type of Total Quality Management (TQM) or Continuous Quality Improvement (CQI) program. A Six Sigma project does not endanger these programs. In fact, it will enhance them as it builds on their strengths and puts additional focus on the measurement system.

The TQM programs focuses on defining the voice of both internal and external customers, Process Control, Process Redesign, Problem Solving (PDCA), teams and the need for objective data, total organizational involvement, and reporting in order to improve the processes.

The Continuous Quality Improvement model was defined in 1987 in the American Society for Quality book, *The Improvement Process*.[4] It defines the continuous improvement process in the following 10 building blocks.

1. Obtain top management's commitment.
2. Establish an improvement steering council.
3. Obtain total management participation.
4. Secure team participation.
5. Obtain individual involvement.

6. Establish system improvement teams (process control teams).
7. Develop supplier involvement activities.
8. Establish a systems assurance audit activity.
9. Develop and implement short-range and long-range improvement plans, and implement short-range strategy that will eliminate and prevent errors.
10. Establish recognition and reward systems that reinforce desired behaviors.

The system approach required cross-functional teams to be formed to work on process problems. For example, to reduce medication errors in a hospital required a team made up of delivering nurses, ordering physicians, dispensing pharmacists, and medication suppliers, all working together. At Stanford Hospital, they formed 11 cross-departmental teams. For example, the Cardiac Surgery team was made up of the following members:

- Physician champion/Co-Leader
- Department manager/Co-Leader
- Clinical specialists
- Pharmacists
- Social workers
- Case managers
- Respiratory therapists
- Managers from all the process departments
- Clinical financial analysts
- A consultant

The measurement system for the CQI approach was called "Poor Quality Cost," as defined in ASQC's improvement in reduction in the cost of the following:

- Prevention cost
- Appraisal cost
- Internal error cost
- External error cost
- Test Equipment cost
- Customer-incurred cost (resulting from errors)
- Customer-dissatisfaction cost
- Loss-of-reputation cost
- Last opportunity cost

Note that in the 1980s, the CQI approach was directed at reducing cost caused by errors. This changed in the 1990s as cycle time became as important in many cases, sometimes more important than cost.

The problem-analysis cycle was called "The Opportunity Cycle" and consisted of five phases:

- Phase 1 - Problem Selection
- Phase 2 - Root cause Analysis
- Phase 3 - Correction
- Phase 4 - Measurement
- Phase 5 - Prevention

Many organizations just stayed with the old, proven Shewhart (or Deming) cycle because it was simpler. It consists of the following:

- **Plan**. What to identify or accomplish.
- **Do**. Initiate the strategy or plan.
- **Check**. Evaluate the outcome of the strategy or plan.
- **Act**. What have we ascertained?

Shewhart worked for the Western Electric Company, a manufacturer of telephone hardware for Bell Telephone, from 1918 until 1924. Bell Telephone's engineers had a need to reduce the frequency of failures and repairs. In 1924, Shewhart framed the problem in terms of "assignable-cause" and "chance-cause" variation and introduced the use of the "control chart" as a tool for distinguishing between the two. Bringing a production process into a state of "statistical control," where the only variation is chance-cause, was necessary to manage the process economically.

Shewhart worked to advance this thinking for Bell Telephone Laboratories and their foundation in 1925, until his retirement in 1956.

Shewhart's charts were adopted by the American Society for Testing and Materials (ASTM) in 1933. The charts were used to improve production during World War II in the form of American war standards Z1.1, Z1.2, and Z1.3. W. Edwards Deming championed Shewhart's methods, working as a consultant to Japanese industries from 1950 to 1990.[5]

Another quality model sometimes used in healthcare was developed by a well-known physician, Dr. Avedis Donabedian.

Dr. Avedis Donabedian was widely recognized for his structure-process-outcome formulation for quality assessment activities. This model has set the framework for most contemporary quality measurement and improvement activities. His professional work focused on the systemization of knowledge throughout healthcare organizations, especially with respect to quality assessment and monitoring. His contributions include six books and many other publications.[6]

The Donabedian model developed in the 1980s focused on three domains:

- Structure
- Process
- Outcome

You will note that all three approaches have a focus on processes such as the following:

- Pharmaceutical care
- Diagnostic testing
- Accurate drug administration
- Registration
- Billing
- Appointment scheduling

It is easy to see that the Six Sigma approach should blend easily with your present quality system and improve upon it. It is a normal addition to your current system to help update it with the best and latest proven technology.

Six Sigma at Work in Healthcare

Some healthcare units are running pilot Six Sigma projects, and the results are very encouraging. Typical improvements are

- Reduced length of stay
- Improved customer satisfaction
- Reduced time to enter the healthcare unit
- Reduced inventory
- Increased efficiency in the billing system

Typical Six Sigma activities include the following:

- Charleston Area Medical Center applied Six Sigma to its supply chain management for surgical supplies saving $1 million.
- Virtual Health focused on its congestive heart failure patients and reduced variation leading to shorter length of time to recover.
- Scottsdale Healthcare applied Six Sigma approaches to the emergency room process and reduced the time required to transfer a patient to an in-patient hospital bed, increasing profits by $1.6 million per year.

"We do this project so that our staff learns and achieves results by proactively participating in the Six Sigma process. The result (decline) in registered nurse overtime alone was 65 percent over one year."

—Douglas Sears, Bon Secours Health Systems

"The results were a reduced average ventilators length of stay of 25 percent and reduction of defects per million opportunities by 12 percent for annualized savings of $450,000."

—Sarah Davis, Director of Nursing, Sentara

- One of the Stanford Hospital and Clinics' Six Sigma teams directed the Coronary Artery Bypass Graft (CABG) Surgery process. The results were outstanding:
  - Annual savings of $15 million (U.S.)
  - The mortality rate dropped from 7.1 percent to 3.7 percent for all CABG procedures
  - Costs were reduced by 40 percent
  - Intensive care time was reduced by 8 hours
  - Intubation time was reduced from 12–16 hours to 4–6 hours
- Theresa Garrison reports that at St. Louis Hospital, they were able to reduce infections by 65 percent.
- Hospital with good team spirit and nurses with authority to act on their own in case of sudden problems had 59 percent lower than average death rates.
- Stanford Hospital and Clinic saved $25 million per year from standardized purchasing and other process improvements.

Six Sigma will help in many ways. It is not just a problem-solving tool; it is also an information gathering and analysis tool. There is a huge information gap. The present data systems in

most hospitals are poor at best. Therefore, doing any Six Sigma project in the typical healthcare setting can prove to be difficult and time consuming.

Because the typical healthcare project requires more manual information gathering (observations, stop-watch exercises, walk-through) than the average manufacturing organization we often find that this is the true "moment of truth" for the healthcare organization. For example, if one wants to track the time it takes to go through the admissions process in the typical hospital, the Six Sigma practitioner will likely find that the information isn't available or is only available without the granularity that is necessary to create a sound hypothesis. Because data collection can be expensive and time consuming and there are so many information voids in the typical healthcare organization, many give up the Six Sigma effort at this point (or the effort languishes in a near-completion state).

At this point, the enlightened organization redoubles its efforts to capture valuable information for the current and future studies (as well as SPC). While we do not know the actual number of times Six Sigma efforts are abandoned at this critical state, we have seen it happen far too many times and, just as the road to the Ph.D. is strewn with unfinished dissertations, so is the road to the Black Belt. This is one of the most important reasons for following the implementation guidelines from later in this book to a tee, as well as finding a champion or MBB who has not only been a part of a Six Sigma program, but one who has actually started a program and has executive presence and strong leadership skills.

Vicky Gregg from Blue Cross Blue Shield of Tennessee, when he was discussing the quality and quality of outcome information that was available to the customers, stated, "If you think about it as the equivalent of a manufacturer not having the system and information flow to understand and measure quality, that's pretty scary." The Six Sigma approach to data collection analysis can help with this problem along with electronic record keeping.

Six Sigma also attacks the basic problem that all hospitals have: the variation in the way things are done. For example, a simple urinary tract infection without any complications can be treated in 135 different ways. Which process provides the best overall value? No one knows or everyone would be using it.

Training is a key part of preparing the organization for Six Sigma. The following is the minimum Six Sigma training required by job assignment based upon ASQ (American Society for Quality) recommendations:

- Executive: one day overview
- Upper Management Champions: 5 days
- Six Sigma Green Belt: 10 days on Six Sigma concepts
- Six Sigma Black Belt: 20 days during a 4-month period

Most organizations do all of the above in half the time and will heavily focus the training on field experience and improvement projects.

Different Views of Healthcare Quality

One of the problems that slow down quality in healthcare is the many different views of what quality is. For example,

- The paying organization views quality as a measure of the value associated with the delivered care.
- The physician/nurse views quality as making the right diagnosis, prescribing the right medicine, and employing the right procedure to make the patient better. It's doing the right job from a scientific point of view.
- The patients view quality as the perceived services, such as: Are the employees gracious? Do they appear to be competent? Are they receiving timely care? Is the hospital a good environment?
- The healthcare managers view quality as the appropriateness of care. Quality in healthcare is the evaluation of the appropriateness of treatment.

When we develop the healthcare system, all four views of quality must be designed into the system.

Conclusions

Many other non-healthcare organizations have embraced the Six Sigma concepts. Among them are IBM, Texas Instruments, Defense System Electronics Group (DSEG), and GE. While the implementation of Six Sigma in a healthcare-provider setting is in its early stages, some of the top healthcare organizations in the world are interested in the possibilities. Most quality-focused organizations performed at the 4 sigma level at the beginning of the 1990s. As of this date, we know of no organization that is performing all of its measurements to the Six Sigma requirements. Our experience indicates that Six Sigma and the related methodologies are not implemented without difficulties.

G. Don Taylor and John R. English, in their paper entitled "A Benchmarking Framework for Quality Improvement,"[7] point out the five following problems related to the Six Sigma methodology:

- Determining how to measure defects
- Applying Six Sigma in non-traditional settings
- Determining whether to relax specifications or to reduce the normal variability of the product
- The use of restrictive assumptions
- The determination of appropriate tools to use to achieve Six Sigma goals

Motorola, on the other hand, reports the following results (in a manufacturing environment):

- Improved yields and lower than expected fallout during manufacturing (this could equate to less use of supplies or less errors)
- Better productivity
- Higher performance
- Improved MTTF (Mean Time To Failure)
- Lower manufacturing cost (or lower costs per procedure, patient, and so on)
- Improved customer satisfaction

GE has embraced the Six Sigma concept in order to drive its future quality improvement activities. GE's Six Sigma program is the largest quality initiative ever mounted in the U.S. They call their design for Six Sigma *DMADV*, which stands for:

- **Define**. Define the process, product or service that will be improved. Define the customer's view of error-free performance.
- **Measure**. Evaluate the current item's performance.
- **Analyze**. Define best practices, benchmarks, and enablers.
- **Design**. Develop a best-value future-state solution.
- **Verify**. Measure the new item to ensure it meets the requirements documented in the define stage and the Six Sigma requirements.

As an example, the following are a few of the tools and techniques used by GE in support of Six Sigma:

Quality Function Deployment	Cost/Benefit Analysis	Pareto Charts
Organizational Change Management	Business Process Improvement	Process Capability
Value-Added Analysis	Shareholder Analysis	Scatter Diagrams
Charting (Pie, Bar, etc.)	Prioritization Matrix	Histogram
Root Cause Analysis	Problem Cycle	The 5 W's
Critical Source Factors	Surveys	Benchmarking
Classification of Solution Criteria	Focus Groups	Gap Analysis
Activity-Based Costing	Process Frame (boxing)	SPC
Regression Analysis	Visioning	Affinity Diagrams
Design of Experiments	Gantt Chart	Process Analysis
Cause-and-Effect Analysis	Project Management	Stratification

Force-Field Analysis	Common/Special Causes	Work-Out
Cycle Time/Work Flow analysis	Moments of Truth	Value Analysis
Quantifying Opportunities	Resistance Analysis	Brainstorming
"Should-Be" Process Maps	Behavior Conditioning	Mind Mapping
Work Breakdown Structure	Risk Assessment	Charters
Continuous Improvement	Standardization	Measurement Plan

It is very important to point out that one of the most used tools in Total Six Sigma is Business Process Improvement (BPI). The three major methodologies that are included in BPI include the following:

- Process redesign
- Process reengineering
- Process benchmarking

All three require that a very effective change management project is used in conjunction or the possibility of failure runs very high.

Hammer and Champy in their book, *Reengineering the Corporation*, reported, "Some 50 to 70 percent of reengineering attempts fail to deliver the intended dramatic results."[8]

Six Sigma Potential in Healthcare

So, where can a healthcare organization find Six Sigma opportunities? It's clear in manufacturing where opportunities lie, but in the healthcare space we are talking about service, we are talking about mass customization, and we are talking about customer/patient lives.

In fact, there are almost limitless opportunities in healthcare. Most Six Sigma practitioners find that services in general, and healthcare in particular, are some of the most fertile ground available. These opportunities generally come in from a wasteful and inefficient administrative process but can just as easily be found in the clinical space and, amazingly enough, in the hands of the patients. In no other business is the vested interest as great as in the healthcare space. Patients and families are more than happy to participate in any effort to reduce variation and potentially adverse outcomes.

Some examples of where Six Sigma might work in healthcare could be

- **Billing Department**. Imagine a billing department that reduced errors in processing patient bills to a 5 sigma process level. While the department might be producing claims at a very efficient and effective rate, it is common knowledge in the industry that many claims are rejected due to errors by personnel at the payer organization. As of Fall 2003, Cigna, Anthem, and many of the Blues are implementing Six Sigma in their organizations. Should a provider and payer agree to implement Six Sigma in

tandem, tremendous savings could be achieved solely on the potential to reduce or eliminate claims adjudication in favor of a "trusted" claims chain.

- **Emergency Department**. Imagine an emergency department with a phone-in triage function aimed at "pre-processing" patients for the appropriateness of care. Six Sigma could enable an Emergency Department to send potential ER department patients to more appropriate venues of care or sister facilities for load balancing—a not unheard-of application when most patients could use their cell phones to call on-route.
- **Floor Procedures.** Imagine a system where patients gain control of their stay via meal delivery as a "menu with room service." This psychological "control" leads to faster recovery times, increased patient satisfaction, and potential reduced costs by the food services department through better balancing food preparation throughout the day instead of centered on breakfast, lunch, and dinner.

What would work in one facility wouldn't necessarily work in another, and this is the beauty of the Six Sigma approach. Instead of following the cookie-cutter approach of the healthcare provider down the street, the hospital is able to evaluate its own opportunities and work to improve its unique opportunities. Just as facilities specialize, so too are they empowered by the Six Sigma process to individually identify and improve processes tailored to their individual patient population, payer mix, and staffing situation. Six Sigma truly offers an opportunity for a breakthrough in healthcare.

In the past, we have believed that the healthcare system was too complex with too many players—companies, insurers, medical device makers, pharmaceutical companies, doctors, nurses, hospitals, special interest groups, and others—to actually gain control over a process, never mind a system. These players all have different interests and objectives and, in fact, different motivations for correcting the problem. But if we, the business community, do not step up to the challenge, the government will have to and we believe we can find a better answer. Now, Six Sigma is not the total answer to the problems we are facing in our healthcare system, but it can be a key part. It is time to start making some major changes.

Healthcare organizations may be the type of service organization for the use of Six Sigma. If one considers the very nature of the business, one might notice that in fact healthcare is generally a highly repetitive environment, subject to variation in disease from patient to patient, yes, but generally uniform in the reaction to the variation by patient. While Patient A might require a different dose of a medicine than Patient B in response to an episode, the common factors would be method of ordering and delivering the medication, administering, and documenting the incident. The staff and physicians would be the same—the pharmacy, the crash carts, the floor layouts all generally the same. The only thing that might vary is the patient's reaction to the drug in question at the dose administered. In fact, one could argue that the "practice" of medicine is actually not what we do on the average patient, but what we do in the exception—the day-to-day treatment of our patients is the science of medicine, and science requires a scientific approach to the delivery of medicine. Six Sigma is as close to scientific management than anything that has come before.

Consider the scientific method. One definition we like is "principles and procedures for the systematic pursuit of knowledge involving the recognition and formulation of a problem, the collection of data through observation and experiment, and the formulation and testing of hypotheses."[9] In respect to the methodology of Six Sigma, which we will discuss in greater detail later in the book, Six Sigma allows for:

- Principles and procedures for the systematic pursuit of knowledge; knowledge being about critical to quality characteristics and the understanding and measurement of said characteristics.
- Involving the recognition and formulation of a problem, as formulated in the Six Sigma project charter specifically addressing the problem we will try to solve, the magnitude, and the risks involved.
- The collection of data through observation and experiment, and the formulation and testing of hypotheses, as manifested in the collection of data, development of hypothesis, testing of hypothesis, and development of tests of the hypothesis.

In addition, Six Sigma allows you to utilize the scientific method to actually apply the improvements for immediate benefits to your patients, their families, and the overall well being of the healthcare organization. Accordingly, Six Sigma fits so well with the culture and environment of healthcare that it is one of the most logical and effective extensions of healthcare to come along in the last 50 years.

Medicine, Measurement, and Science

The current healthcare error rate in the U.S. is about 6,210 errors per million opportunities (3.8 sigma) and for some treatment activities runs as high as 1 sigma. Compare this to the manufacturing Six Sigma standard of 3.4 errors per million opportunities for all processes.

According to Altman, at least 150 times since 1996, surgeons in hospitals in this country have operated on the wrong arm, leg, eye, kidney or other body part, or even on the wrong patient.[10] The figure does not include near misses, such as when doctors have started to operate on the wrong part of the patient or even the wrong patient, but stopped before the operation was completed because the error was detected. No one collects such information.

Complex Business

Thirty to forty percent of the cost waste is caused by errors made by specialists.

The U.S. government estimates that IT can save $140 billion per year through improved patient care and the elimination of redundant tests ordered.

In September, 2003, Tawnya Brown underwent surgery at Inova Fairfax Hospital in Falls Church, Virgina. Although the surgery went well, the patient ultimately died. Brown was given two pints of A-negative blood and her blood type was O-positive. To make the condition worse, her doctor called for more blood when he discovered that she was not doing well in recovery. In the following three hours, she received six more pints of the wrong type of blood. (A person her

size can hold a volume of about eight pints of blood only.) The day before the surgery, a technician drew a blood sample so that the correct type would be available if needed. The problem was that the technician took the sample from the wrong patient. This should have been discovered by the phlebotomist, but he failed to perform two required identification screens: checking the patient's hospital bracelet and asking the patient to state her name. The financial settlement for this error was about $1.7 million. But not even $1.7 million can make up the loss of a mother to an eight-year old girl.

Brian Bachman, two years of age, died after undergoing a liver transplant at the Fairview University Medical Center in Minnesota. The surgery was uncomplicated, and Brian was doing well initially. However, two days after the surgery, Brian's condition worsened. At 7 a.m., a nurse misread the table on a log of Heparin she was replacing. The new bag contained a much higher concentration of blood thinner than the one she was replacing, and the machine delivering the medication was not reprogrammed. Brian began receiving 10 times the amount ordered by the physician. The staff failed to notice the mistake throughout the day, even though the medication drip was checked every 15 minutes. The error was finally discovered by the evening nurse, but Brian had already experienced internal bleeding and a blood clot in the artery leading to his liver. A blood clot can trigger liver damage, which can cause swelling of the brain and brain death. Doctors determined that the little boy "will most likely remain in a vegetative state." As a result, Brian was taken off life support and died soon thereafter. Mike Sertz, Fairview's Vice President for Risk Management, stated, "It was more a system error than an individual error."

Fraud and Abuse

Healthcare costs run $1.7 trillion a year. Fraud and abuse run between $50 and $75 billion a year. In controlling variation, fraud and abuse can be more easily identified and dealt with.

Six Sigma can be a great tool in fighting healthcare fraud and abuse. For example, billing for services not furnished is arguably the single most common method of deceiving or misrepresenting services delivered. Because Six Sigma utilizes statistical process control as a core tool, variations in standard practice will always be noted. Too many treatments, too many supplies, or too many visits will, by definition, signal the system to investigate the reasons for the variation. This argument can also be made for unbundling or "exploding" charges, and "upcoding."

Another typical healthcare fraud and abuse practice is the misrepresentation of a diagnosis, which can be identified through controls when individual institutions or physicians seem to consistently have sicker patients than the population in general. This argument also works in the case of falsification of certificates of medical necessity, plans of treatment, and medical records.

Only by gaining a true understanding of your healthcare business can you begin to get a real handle on the indicators of fraud and abuse. Six Sigma enables you to spot outliers before they become a big problem for the provider.

Dedication to Perfection and Elimination of Errors

Each year an estimated 1,500 surgical patients have foreign objects (such as sponges) left in them during surgery, leaving many to face crippling health problems. However, there is no mandatory system for reporting errors, leaving the actual number of medical errors in question.

It is often only through malpractice lawsuits that these errors become public knowledge. The article goes on to report that 5 percent of doctors are found responsible for more than 50 percent of successful malpractice suits. One caution: Most malpractice cases don't make it to court. Only one in six victims even file, and about half of those abandon the effort before trial.[11]

Performance

Contrary to popular belief, effective performance metrics in healthcare are virtually non-existent.

Hospitals with an atmosphere and/or culture of distrust have a death rate that is 58 percent higher than average.

Ramon Cruz, 81, had not even been hospitalized when Good Samaritan Hospital Medical Center in Islip, NY, forwarded the incorrect information to government agencies that he had died. Apparently, a hospital worker called up the wrong "Ramon Cruz" in the database. Cruz's monthly Social Security checks were halted, his bank accounts emptied, and Medicare benefits terminated. A spokesman said all Cruz's lost money will be returned, adding that it would take a couple of months.[12]

Customer Focus

According to the Centers for Disease Control, two million patients per year acquire an infection in the U.S. when hospitalized for conditions not related to the infection, and 88,000 die as a direct or indirect result. This adds an additional healthcare cost of $5 billion.[13]

According to the CDC's William Jarvis, MD, and scientific chair of the healthcare-associated infections conference sponsored by CDC, "If you get an infection while you're in the hospital for an operation for heart disease, for example, your hospital stay may be extended by days, and sometimes weeks, before the infection is cured."

In general, the number of extra days a patient has to spend in the hospital varies depending on the type of infection he or she gets: an estimated 1 to 4 days for a urinary tract infection, 7 to 8 days for an infection at the site of a surgery procedure, 7 to 21 days for a bloodstream infection, and 7 to 30 days for pneumonia.

"The costs vary, too," Dr. Jarvis said. "Anywhere from $600 or so for a urinary tract infection to $5,000 or more for pneumonia. Prolonged bloodstream infections can top $50,000."

According to some experts, a patient improves faster at home by 10 to 60 percent than in a healthcare facility.

Complaints about hospital bills are as common as complaints about hospital food. *Consumer Reports* recently surveyed 21,000 readers on satisfaction with hospital stays. Of the 11,000 respondents who had reviewed their itemized hospital bills, 5 percent said they found major errors. Respondents with out-of-pocket expenses of $2,000 or more were twice as likely to have found billing errors.[14]

Consumerism in healthcare is another hot topic. Health Savings Accounts were introduced in 2005 to mixed reviews. Since then, they have been growing in popularity with employers and insurers. While some might be advocating a repeal of the law, the plan, which allows customers to opt into a high deductible health plan while investing their own money in healthcare expenses below the deductable, is proving to be popular.

What this means to the healthcare provider is that customers/patients now have a say in how, where, and with whom they will spend their money. It is doubtful that customers will spend their discretionary money at healthcare organizations that cannot or will not invest in quality and customer-focused care.

Staffing Shortages

There is a critical shortage of nurses. This is caused by several factors, including

- A growing demand as the baby boomers retire.
- The high cost of training a nurse. Because many universities find that tuition stratification is difficult (that is, charging different amounts based on the major), classes and majors that require labs, small classes, and highly skilled instructors are not as profitable as others.
- A nursing instructor with a Masters degree is paid less than half that of a hospital nurse. Given the pay differential, universities are finding it very difficult to recruit nursing professors.
- Finally, nursing can be difficult and sometimes hazardous. In general, the hours are long, the work is dirty, and the pay is less than a comparable position outside the hospital. Accordingly, many nursing professionals leave the field each year for easier work at software companies, pharmaceutical companies, and doctors' offices.

Patricia Ann Hottois, age 53 of Phoenix, died of septic shock after the abdominal pad was left in her surgical wound. She had her surgery on June 8, 2003, at Maricopa Medical Center. About two weeks after the surgery, she was still complaining about the pain when her doctors discovered that the pad was left inside her. She died on July 1, 2003. This medical malpractice case was settled for $320,000.[15] These types of errors should be eliminated by just doing a sponge count. According to a 2003 study in the *New England Journal of Medicine*, this type of surgical error occurs in about 1 out of every 1,000 to 1,500 abdominal operations, a lot more than the six sigma goal of 3.4 per million.

On March 19, 2004, two patients died at Foothill Medical Centre because they got an incorrect solution during dialysis treatment. They were given a potassium chloride solution instead of sodium chloride. The mix-up took place in the hospital's pharmacy. Dr. Bob Johnston, the CHR's Chief Medical Officer, stated "Despite our best efforts, errors do occur." Barry Cavanaugh, Chief Executive of the Pharmacists Association of Alberta, stated, "An adverse event could happen because they are overworked."[16]

Costs to Society

In the U.S., healthcare accounts for 15 percent of the GNP, and it will continue to rise to 18 percent. This compares to 8 percent and 10 percent in developing regions such as Japan, Europe, and Canada.

Two percent of hospital patients experience an adverse drug reaction, resulting in an increased length of stay and $4,700 added needless expenses. This accounts for 2.5 percent of the hospital's budget.[17]

One person in the U.S. dies every eight minutes as a result of nosocomial infection, and 95 percent are preventable.[18]

About 20 percent of U.S. "products and services" extra cost is caused by our legal system.[19]

"Survey: 40 percent of public experienced medical errors," which appeared in the *New England Journal of Medicine*, reports that more than one-third of practicing physicians and 40 percent of the public have experienced a medical error in the care that they or a family member received as patients. One of the findings of the survey is that "physicians disagree with national experts on the effectiveness of many of the proposed solutions to the problem of medical errors."[20]

ENDNOTES

1. Harrington, H James. "Process qualification manufacturing insurance policy." *IBM Technical Report*, September 15, 1980.
2. Coppola, Anthony. Six Sigma Programs. *DoD Reliability Analysis Center START Sheets,* 1990. Volume 6, Number 5.
3. Byrne, John A. "How Jack Welch Runs GE". *BusinessWeek,* June 9, 1998, p. 47.
4. Harrington, H. James. *The Improvement Process*. (McGraw-Hill, 1987).
5. Cutler, A.N. (2001, August 22). http://www.sigma-engineering.co.uk/, Sigma Engineering Partnership.
6. Trusko, Brett E. (2006, November 14). http://www.jointcommission.org/Codman/Avedis_Donabedian.htm, Ernest Emory Codman Award.
7. Taylor, G. Don and English, John. "A Benchmarking Framework for Quality Improvement." *Quality Engineering*, Vol. 6, No. 1, July 1993, pp. 57-69
8. Hammer, M and Champy, J. *Reengineering the Corporation: A Manifesto for Business Revolution* (New York: Harper Business, 1993).
9. tangents.home.att.net/data/rlgdef.htm.
10. Altman, L.K. "The wrong foot, and other tales of surgical error," *The New York Times*, December 11, 2001.
11. Burton, Susan. "The Biggest Mistake of Their Lives," *The New York Times,* March 16, 2003.
12. Associated Press. "Government Declares Man Very Much Alive, Dead." *Associated Press,* February 19, 2002.

13. Centers for Disease Control (United States). Hospital infections cost U.S. billions of dollars annually. *Media Relations.* Monday March 6, 2000. http://www.cdc.gov/od/oc/media/pressrel/r2k0306b.htm.
14. *Consumer Reports*, 2003. "Decoding your hospital bills. You can find and fix costly errors."http://www.consumerreports.org/cro/personal-finance/decoding-hospital-bills-103/overview/index.htm.
15. Leonard, Christina. "Surgery Mistake Is Costly," *The Arizona Republic*. June 25, 2004.
16. Trusko, B and Harrington, H.J., "The Prescription for Health Care Excellence - Take Six Sigma As Needed." *Quality Digest*. http://qualitydigest.com/IQedit/qdarticle_print.lasso?articleid=8889&-session=ACCESS:40A788221b3f61DA5DynTy16AE15. 2006.
17. Institute of Medicine. Preventing Medication Errors: Quality Chasm Series. July 20, 2006.
18. Centers for Disease Control (United States). Hospital infections cost U.S. billions of dollars annually. *Media Relations.* Monday March 6, 2000. http://www.cdc.gov/od/oc/media/pressrel/r2k0306b.htm.
19. Council of Economic Advisors. Who pays for tort liability claims? An economic analysis of the U.S. tort liability system. April 2002.
20. Davis, Robert. Survey: 40 percent of public experienced medical errors. *Asbury Park Press,* December 15, 2002.

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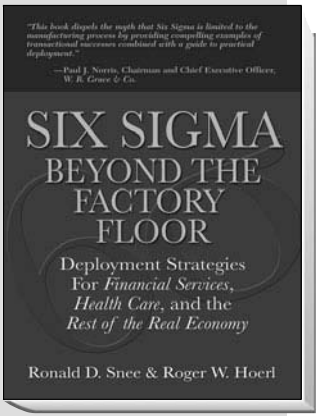

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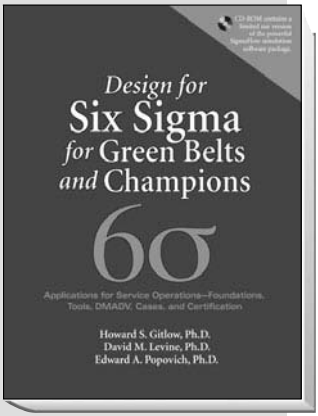

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REENGINEERING HEALTH CARE

A Manifesto for Radically Rethinking Health Care Delivery

JIM CHAMPY
HARRY GREENSPUN, M.D.

Pearson Education, Inc.
Publishing as FT Press
Upper Saddle River, New Jersey 07458

Printed in the United States of America

First Printing June 2010 with corrections May 2011

ISBN-10: 0-13-705265-0
ISBN-13: 978-0-13-705265-3

Pearson Education LTD.
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Library of Congress Cataloging-in-Publication Data is on file

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For my wife, Lois, from whom
I have learned so much;
for my son, Adam, who has now
become my teacher;
and for all those who provide
care to our family.

—JAC

For my family for their support,
my colleagues for their teaching,
and my patients for their inspiration.

—HGG

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ACKNOWLEDGMENTS

A book of this kind is only written with the collaboration of others. We are grateful to all who have helped and challenged us along the way. Our thanks go to the talented editors and researchers at Wordworks, Inc.: Donna Sammons Carpenter, Maurice Coyle, Ruth Hlavacek, Molly Jones, Larry Martz, Cindy Butler Sammons, and Robert Stock. We also thank Helen Rees and Joan Mazmanian of the Helen Rees Literary Agency for their sound advice and counsel, and Barbara Hendra and Danny Stern for their publishing wisdom.

We are deeply appreciative of the efforts of our publisher, Tim Moore, and all his colleagues at Pearson: Amy Neidlinger, Megan Colvin, Julie Phifer, Gary Adair, Lori Lyons, Nonie Ratcliff, and Cheryl Lenser. And our capable assistants, Dee Dee Haggerty, Judy Bennett, and Trina Wellendorf have once again helped to make us productive.

But we are most grateful to the real heroes of this book, the people who are changing health care and inspiring others to do the same. You will soon hear their names and voices, but we call them out

here because this book would not have been possible without their courage, vision, and actions:

Catherine Camenga, RN
Florence Chang
Matt Eisenberg, MD
Debra A. Geihsler
Nan L. Holland, RN
Thomas W. Knight, MD
Scharmaine Lawson Baker, RN
Maggie Lohnes, RN
Zeev E. Neuwirth, MD
Cheryl Pegus, MD

Finally, as always, we are grateful to our famlies who support us in our work and whose care and wellbeing further inspire us to write this book.

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Jim Champy is one of the leading management and business thinkers of our time. His first best seller, ***Reengineering the Corporation***, remains the bible for executing process change. His second book, ***Reengineering Management***, another best seller, was recognized by *Business Week* as one of the most important books of its time. Champy's latest books, ***OUTSMART!*** and ***INSPIRE!***, show how to achieve breakthrough growth and engage customers, in even the toughest marketplace.

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CHAPTER 3

HARNESS TECHNOLOGY

Anyone who still doubts the value of technology in health care should meet Scharmaine Lawson-Baker, a dynamic nurse practitioner who was running a geriatric practice in New Orleans when Hurricane Katrina struck. Her office was inundated with five feet of water, and all her papers were destroyed, including her patients' medical records.

Several of the 100 people she cared for—homebound and mostly indigent—died in the storm or its immediate aftermath. Like Lawson-Baker herself, some of the survivors relocated to other counties and states, and they began calling her for help. Their new doctors and pharmacies needed to know about their medications, allergies, and lab test results—all the vital information in those records lost in the storm.

Amazingly, Lawson-Baker was ready with the answers. Long before Katrina, she had taken the precaution of entering her patients' contact information and key medical data in her Palm Pilot, which survived the storm intact. Resettled in San Antonio, Texas, she began calling patients herself to pass along the data.

When she returned to New Orleans in the fall, she picked up where she had left off, setting up a new clinic in a house she cleaned and painted herself. Now, though, Lawson-Baker was often making house

calls on “four or five old people banded together in a single home, desperately trying to take care of each other.”

In urgent need of funds, Lawson-Baker called the Healthcare Information and Management Systems Society (HIMSS), a nonprofit organization dedicated to supporting the use of health information technology to improve health care. HIMSS was scheduled to hold its annual conference in New Orleans in 2006. Maggie Lohnes, the Administrator for Clinical Information Management at MultiCare Health System in Tacoma, Washington—who we will meet later—was in New Orleans scouting for possible off-site visits for convention delegates when she found Lawson-Baker’s clinic and heard the amazing story of her and her Palm Pilot.

Soon the story was picked up by the media, contributions came rolling in, and sponsors appeared. It took time, but Lawson-Baker has established a successful nonprofit practice that serves hundreds of the neediest people in New Orleans. Technology can help do that, and more, for health care providers.

In fact, medicine today is basically a product of technological advancement.

In fact, much of medicine today is a product of technological advancement. Before the X-ray ushered in contemporary diagnostic tools and scientists discovered biotechnology, doctors could do little beyond making rough repairs to obvious injuries and soothing patients with their calm authority. These days, technology promises to revolutionize the entire health care field, with innovations ranging from robotic surgery and digitized medical recordkeeping to gene-based therapies and the regeneration of human organs.

When it comes to reengineering health care delivery, it's vital to remember that technology is only an enabler. Care will be improved only if the work is carefully thought through, the technology fully integrated into the total system, and the care providers thoroughly trained in both the processes and the technology.

When it comes to reengineering health care delivery, however, it's vital to remember that technology is only an enabler.

The story of the MultiCare Health System illustrates how to do just that by embracing the challenges and benefits of implementing an electronic health record it calls "MultiCare Connect."

GIVING CARE

Maggie Lohnes is a registered nurse who had spent a decade working in intensive care. But when she realized how technological advances were changing medicine, she saw greater potential for helping others through automation rather than caring for patients directly. “This is my way of giving care,” she told us.

In 2006, Lohnes left her job at Huntington Memorial Hospital in Pasadena, California, where she worked to convince physicians of the benefits of electronic health records. Now she feeds her passion for technological caregiving at MultiCare Health Systems in Tacoma, which she describes as “unusually proactive in the adoption of electronic health records,” EHR for short. As far back as 1998, MultiCare led the way in Washington State by selecting software from Epic Systems to help automate its ambulatory clinic records.

In 2001, MultiCare’s leaders involved all levels of staff, as well as providers and patients, in forging the long-term vision for MultiCare. In a series of conferences called Multivision, the participants tried to look ahead 10 years to determine where health care was heading and what MultiCare needed to do to stay ahead of the curve. Over the course of multiple

sessions involving hundreds of people, a mission and vision for the system was articulated.

As a result of those meetings, MultiCare decided to expand its electronic health record throughout the organization, laying the foundation for the technological innovation that infuses the MultiCare Health System today.

The MultiCare Health System mission, "quality patient care," is simple yet profound. The vision is more complicated. Chang freely admits that MultiCare's revenue-cycle and information-management processes needed improvement: "There were three hospitals and multiple clinics at the time, and we had different information systems that didn't talk to one another."

Chang recalled discussions about how to create a seamless, easy-to-access, valued, and sustainable health care-delivery system "that would enhance the experience of our patients, providers, caregivers, and employees." Technology became the tool for melding together the disparate health care processes in multiple locations with the guiding principle of "One Patient, One Record." Chang noted that this concept animated the MultiCare strategy from the beginning, although it didn't win immediate board approval.

Finally, in 2004, this proposal was endorsed by the hospital's Board.

Not everyone was enthusiastic at the beginning. It would be rare if there weren't some pushback from various constituencies. But as the MultiCare Connect project advanced, problems were identified and solved and the technology improved. Lohnes related that over time there were fewer complaints from users. MultiCare had another advantage, she told us: its Tacoma Family Medicine residency program in partnership with the University of Washington included young, eager residents. These residents were immediately enthusiastic about the system, and they provided firm support. One other advantage is that MultiCare began offering its electronic health record to community providers using an application service provider model. Its branded community health record is called "Care Connect." With each new clinic implementation, MultiCare has learned how to effectively and efficiently implement its electronic health record at additional ambulatory sites. Now whenever MultiCare acquires a new practice or signs up a new community practice, it can automate these practices successfully without delay.

At this juncture, computerized physician order entry (CPOE) is fully operational at the three MultiCare hospitals on the Tacoma campus and all of the

ambulatory and urgent care sites. All the ambulatory orders are online, as are 95 percent of all acute care orders. Exceptions are limited to emergency (code blue and trauma) events, downtimes, and a small number of faxed perioperative orders. In fact, the ambulatory and urgent care environments are totally paperless. In the acute care setting, almost all of the clinical documentation is also online and available to providers wherever they can access the internet. Lohnes noted that the only hand-written documentation includes anesthesia records entered during surgery, some consent paperwork, or system downtime. Beginning in 2009, MultiCare also implemented an integrated bedside bar-coded medication administration system in three of its four hospitals to improve medication safety. Lohnes noted that the MultiCare Health System is now functioning at what's called by HIMSS as a "level six" for electronic health record adoption, on its way to the highest level of health information technology use or "level seven," an entirely paperless electronic health record everywhere that uses information from the record to improve health care quality.

There's still work to be done on the document-imaging piece, Lohnes explained. "Although our ambulatory medical record is entirely paperless, right now, our acute care records are a hybrid of the electronic record, and a small paper chart that

is used to keep track of paperwork collected from outside, some consent forms, and the few remaining paper forms. We are looking at every remaining piece of the paper record to see if it's something that can be interfaced from an outside computer system, whether it can be produced within our electronic health record or if it needs to be scanned into the electronic health record as we move towards an entirely paperless record. We are really trying to minimize scanning as we move to a paperless record everywhere," she said.

MultiCare's patients can access their electronic medical record via their own patient portal called "MyChart Powered By MultiCare." As more and more patients learn the convenience of accessing their records directly there are many fewer requests for copies of lab tests. MultiCare's Health Information Management Department still provides this service, Lohnes said, but the demand is dwindling. Patients can also see the results of imaging studies, review their immunization history, scheduled vaccines, and medication list , and schedule appointment dates and time.

▶ ***Get ready for the changeover***.

MultiCare's success in deploying its EHR can be attributed in large part to its extensive preparation. Early in the process, MultiCare's leaders took four key

actions that should serve as lessons for successful implementation. It established:

1. A clear vision of care delivery in the future and how it would evolve.
2. The capability to develop its people, learning, and organizational effectiveness.
3. A service-line strategy.
4. An IT strategy and IT competence.

"We were trying to look at the process from every perspective," Chang told us, "beginning with what health care should be and where we needed to go from that point forward for the next 10 years." And when she says "every perspective," she means it. "We looked at it from a revenue cycle perspective—how could we improve our financial performance? How could we create a learning organization? How could we continue to grow our care line services and develop a center of excellence? How could we use technology to execute our mission and vision, and how could we use that to sustain our financial performance?"

From top to bottom, the organization stresses the importance of its mission to provide quality patient

care. So when the Multivision effort began, Chang told us, "we made our mission the true foundation for our core strategies. We developed the care lines, and that allowed us to grow and expand, taking us to the next level. Our integrated electronic health record supports the patient's safety and quality." Everything traces back to the mission.

One of the major reasons MultiCare is successful, Chang declared, is that intense focus on the patient. "The implementation of electronic health records is not information technology's initiative; it's a mission-centered patient initiative."

▶ ***Establish guiding principles.***

Implementing and establishing an EHR system takes a long time. MultiCare spent 10 years on an arduous journey that had no lack of challenges, breakdowns, and course changes. During difficult periods, you will need a bedrock belief that guides you in your decision making and helps sustain your efforts. Develop a set of principles that will stand the test of time and return to those to remind your organization of your objectives, the critical outcomes that you want to accomplish, and the high values that you share.

For inspiration, we've included MultiCare's six project goals:

1. Improved patient safety.
2. Assured access to correct patient data for caregivers and administrators.
3. Guaranteed accuracy of the data contained in the record.
4. Simplified, optimized, and consistent processes across the organization.
5. Adoption of the EHR system by every physician and clinician.
6. Better financial performance.

The goals are accompanied by ground rules that start with the admonition to "have fun" and end with "appreciate the experience we all bring to the project." In between are 11 more behaviors such as sharing responsibility for achieving the goals; focusing on issues, not people and emotions; and making decisions based on the guiding principles that are aimed at keeping the project on track.

Chang told us that every time there is a debate going on about how to proceed, "we fall back on the guiding principles, which, by the way, everyone

involved in the project had to sign on to." The principles are particularly helpful when you go live, she said, "because issues arise that will have to be prioritized. We use the principles as evaluation criteria."

Your ground rules will obviously reflect your organization's character, but words and phrases like balance, respect, and learning from the past are commonsense admonishments that would suit just about any such undertaking.

▶ ***Engage clinicians in design and implementation.***

Building and implementing an EHR system should be more than just an IT project, more than a decision to install a new piece of technology. Technology, after all, is merely an enabler that helps you achieve your ultimate objectives. And in this case, your objective must be to change your hospital's or practice's clinical and administrative processes so that the EHR system will be able to deliver all it promises.

It won't be easy.

The annals of large information technology projects are littered with implementation work that ran up large costs and time overruns yet were never implemented. Why? Because the projects' leaders failed to engage the end users of the technology

systems early in all stages of the implementation. Such failures are well known and documented, but even savvy leaders can get caught up in large IT projects that seem to take on a life of their own. And when that happens, the projects often end up dead on arrival because the reality of how real work needed to change was ignored.

New technology will fail or prove inefficient unless its users feel comfortable with it. And post-installation training alone won't turn people into ardent users of a new system. It's critical, therefore, to engage clinicians early in the design and implementation of EHR systems. Physicians must see and experience these projects as integral to their work. They must be involved early in the technology's design and in discussions about how to integrate the technology with work procedures.

New technology will fail or prove inefficient unless its users feel comfortable with it.

Dr. Matthew Eisenberg, a pediatrician who came to MultiCare in 2007 as its Medical Director for Information Services, told us that MultiCare first hired a consultant to help learn about and implement a physician-adoption methodology. Out of that initiative grew a physicians' information

technology advisory board and a governance model aimed at opening channels of communication. Physicians were recruited to work directly on the implementation project to help merge software, clinical content, and workflows. Eisenberg told us his role "was to bring new energy, strong communication skills, and greater engagement based on the original model. Understanding the value to providers of any new technology was one of the key issues. Next, most important was managing expectations and the resistance to change. Training and strong project management, including a well designed communication plan, round out the physician adoption model. Finally, getting the medical staff leadership on board was critical so that providers could support and manage adoption." The medical staff was invited to workshops to discuss how the EHR system would work, its value, and the expected challenges.

Eisenberg singled out the privately contracted physicians' group that provides emergency services for its adult population. "We have a wonderful relationship with them," he said. "They were obviously quite concerned about the use of new technology and the potential hit to their workflow and productivity. We couldn't ignore that. Plus, we knew that at least half of all our hospital admissions came through the emergency department, so we really needed to partner with them.

"We were able to address some of the key workflow issues and target physicians who needed additional help. We worked together with this group to train and employ scribes to assist some providers with real-time documentation and order entry. Initial funding for the scribe program was provided by MultiCare," Eisenberg told us. "Remarkably, during our first two weeks of the go-live in October, we were able to minimize the decrease in patient volumes to just 3 percent, when everyone had told us that we should expect a 20 to 30 percent reduction over about three months. That cemented our relationship with the group. They understood that in order to be really successful, this needed to be a multidisciplinary partnership between operations and IT," he said.

Eisenberg credits MultiCare's focused and engaged leadership at every level. In addition, MultiCare Health System, under the direction of its executive leadership and hospital board, have implemented gain sharing for all employees. "If MultiCare has a good year, even the person who helps turn over the operating rooms can benefit directly," he said. That keeps everyone in our organization focused on their work and eager to make improvements.

Doctors, nurses, and technicians all have a frontline perspective and experiences that can be crucial in spotting flaws and potential weak spots in

new technological systems. The savvy leader of a reengineering project will seek out their advice and adjust to it.

Florence Chang comes at it from another perspective. Know your providers on an individual level, she counsels, if you want to get maximum buy-in.

"Prior to MultiCare," she told us, "I worked as a consultant with a lot of other organizations. But one thing that I always focused on was physician adoption and engagement, because it is critical to the success of electronic health records." She urges that reengineers get their doctors involved in designing the principles so as to identify who are the supporters and who are the naysayers.

She urges that reengineers get their doctors involved in designing the principles so as to identify who are the supporters and who are the naysayers.

"We looked at our community," she went on, "and I contended that liking or disliking EHR or change or technology of any kind wasn't really the issue. It's really about the history a doctor has with the hospital going back 10 to 20 years. That's what causes the

resistance, the pushback that we might potentially see."

For her part, Lohnes credits MultiCare's original decision to include frontline staff in the group of Multivision conferees who were charged with predicting and planning for future needs. "That really made them feel a sense of ownership about the decision to automate," she said.

▶ ***Identify champions.***

Leadership, as we've said more than once, is critical to changing health care delivery. Nowhere is this truism more apt than in the implementation of electronic recordkeeping. The enormity of the change in clinical and administrative work practices demands that champions man the front line.

Ideally, your champions will be respected members of the physician community. Their role is not just to overcome resistance to change, but to demonstrate how EHR can help improve the lives of individual physicians and patients, as well as the health care community. The champions should be enthusiastic users of the new system and vocal proponents of process change.

Champions may be found in unlikely places. Dr. Eisenberg told us that one of the most persuasive

champions of MultiCare's switch to EHR was a doctor in private practice who was heading up the hospital's intensive care unit at the time. This physician worked closely with Eisenberg and his staff on clinical content and workflow issues and was one of their physician super-users in the critical care department at implementation. He and other physicians in his workgroup were so impressed by, and invested in, the EHR project. Soon after when they were looking at changing their practice setting, they decided to join the MultiCare Medical Associates as employed intensivists. These doctors continue to champion the system.

"At MultiCare, we are focused on quality," Eisenberg told us. "That simply stated mission of 'quality patient care' is in the fabric of all of us—and the commitment to leverage information technology to help that along is everywhere." That same passion and engagement extends to the medical staff, he added, and a number of the department chiefs were super-users during the implementation.

▶ ***Adopt formal project-management methodologies.***

New technology is never implemented without some headaches, and the bigger the project, the bigger the headaches. An EHR project will be the largest process and technology undertaking most

hospitals or physicians' practices will ever undertake. When implemented correctly, it will touch most administrative and clinical processes; engage large numbers of clinicians, administrators, support staff, and technologists; take multiple years to implement fully; and cost a bundle.

Cost overruns and delays in implementation are all too common. But accepted management methodologies can help you get your project done right. We strongly recommend the establishment of a project management office, staffed by full-time clinicians and managers, to oversee both the technology and procedural work. A Web page that makes plans, progress, and breakdowns fully transparent to all participants is a decided plus.

"A project of this size needs the discipline and clear accountability," Chang said. "There were issues and risks that needed to be addressed, and the process of addressing those issues, including budget management, had to be as transparent as possible."

Eisenberg is enthusiastic about the way MultiCare's leaders embraced the importance of a project-management office. "We are blessed to have built a wonderful project management team and a

consistent methodology that we try to follow. It works very well," he told us.

The project-management office keeps track of MultiCare's enterprise project priority grid, each one mapped to their organizational goals. At a project level, "We can take the 15 issues that arise at our meetings," Eisenberg told us, "and prioritize them based on the standard scoring method that originated in our very first inpatient go-live back in 2007." From that list, the top three issues are scheduled for immediate attention. Without this sort of project-management discipline, he said, MultiCare's EHR problems and optimization requests would not get the kind of attention they deserve and like so many other organizations that can only say, "we'll get to them when we can."

▶ ***Protect physician productivity.***

Most of us tend to assume that new technology is an unmitigated blessing that will perform as advertised. Expectations of both its usefulness and performance can be badly distorted, and there are always unintended consequences of new technology adoption. Health information technology has a spotty record when it comes to improving the work and lives of clinicians. Breakdowns occur when

doctors are left out of the loop entirely or when they are included too late to make a real difference. Those mistakes typically occur when the project is seen as *just* an IT undertaking rather than part of a life-changing reengineering process.

MultiCare adopted a formal installation process that included very careful workflow analysis_both the current state and the desired future state. “Front-line physicians and nurses developed the desired future state,” Maggie Lohnes told us. “Once the workflows and content were analyzed, we mocked up scenarios in a development system and we asked the doctors, nurses, and other clinical staff to validate it.” In Lohnes’s opinion, allowing the practitioners to optimize their workflow was one of the keys to getting adoption. “They realized they were partners in this,” she said, “which led to a lot of tweaking to improve the system before we went live.”

But even when clinicians are engaged early on, it’s crucial that they pay special attention to how IT systems and hardware are incorporated into the patient visit. Many physicians worry about poorly designed systems that distract them from patient interaction and slow productivity.

Making sure you understand exactly how the EHR technology will work in the physician’s exam room

before it's installed is one of the keys to successful implementation of the system.

> *Making sure you understand exactly how the EHR technology will work in the physician's exam room before it's installed is one of the keys to successful implementation of the system.*

MultiCare found many of its physicians feared they'd end up staring at a computer screen during a patient visit instead of paying attention to the patient. Particularly those who considered themselves "more high-touch than high-tech," in Maggie Lohnes's words, had to be shown how to incorporate a computer into a visit without shortchanging patients in an impersonal interaction. One suggestion, she said, was to ask patients if they wanted to see their records on screen. That way, the patients would be engaging with the physician as he or she used the computer, rather than allowing the machine to become a wall that blocked interaction.

Noting that no physician is eager to decrease his or her productivity, Lohnes suggests that "you allow them some latitude during the first few weeks after adoption, giving them time to get comfortable before holding them to their usual output." Once the doctors and nurses become comfortable with the

EHR system, she says, they and you should expect improved productivity. And don't be surprised if that improvement shows up in unexpected ways. One MultiCare physician was quoted happily acknowledging that, "for the first time since starting my practice, I was able to go home and have dinner with my family, knowing that all of my records were completed." Medical practitioners take great satisfaction in being able to produce more on their own. They will increase their productivity levels as soon as humanly possible.

▶ ***You can never pay too much attention to detail.***

The number of decisions that must be made in the implementation of an EHR system are almost too numerous to count. Decisions about which technology, what information will be entered and how it will be structured and how tasks will be performed await a consensus view. Operating and governance issues also demand solutions.

Each decision must be carefully taken and differing opinions about choices given due consideration. And above all, you must be sure that the necessary decisions are actually being made. Keep track of the outcomes of all disputes to make sure you are getting closure, and then track the details of design and implementation. Errors or omissions can occur in a host of areas, so vigilance will be critical.

When MultiCare was designing its system, it formed a physician advisory group to help, and also designated full-time and part-time project physicians to engage in the actual work.

Florence Chang told us that as the system was being designed, Dr. Matt Eisenberg and his team took the product to every single physician's office in the community to get their approval. "We did 47 road shows prior to going live," she said. "We took the product to our pediatricians. We took it to every single specialty out there to get their endorsement so that when we went live, we went live with about 350 order sets, every single one approved and endorsed by our physicians' group."

Harry pointed out that going to 47 offices will usually produce at least 40 new requirements, slowing the process of implementation to a crawl. He wondered how Chang managed to get endorsements rather than demands for something new.

"You're right," she replied, "going to so many different sites will usually increase the number of requests. But from the beginning, we developed a guiding principle of providing standardized care to our patients. We wanted to reduce the variation, and we shared with the physicians our concerns about adding instead of eliminating steps that do not increase value."

The physicians responded admirably. In some cases, Chang said, "we had to bring colleagues together to discuss the system's design, reminding them that we were only going to create one system, one order set." They worked it out.

▶ ***Train and practice.***

Implementing an EHR system will affect the work of hundreds, if not thousands, of people in your organization. A training program must be developed for every area of your operation that will be affected. Make the training as experiential as possible. Practicing with both the new technology and the redesigned processes will give people more confidence and competence in their work, while also showing them how their lives will be improved by the arrival of EHR.

"We did very personal shoulder-to-shoulder work," Maggie Lohnes told us. "I had these great relationships with physicians, and I'd tell them that they got into medical school so they could learn how to incorporate computers into their workflow. And since they are used to using those minimally invasive tools during surgeries, they could certainly handle a mouse." Helping them side-by-side, one-by-one didn't eliminate the learning curve, she added, but it did help their practices.

"Another great training program," she said, "was aimed at MultiCare's employed physicians. During the years of go-live, we set aside part of their work schedule for class time and practice sessions with the computers. It was a cost well spent."

▶ ***Go with big bang implementation, but plan extensively.***

There is a valid debate that comes with every large technology project: Should it be implemented in phases, or should the switch be thrown systemwide in one big bang on a single day? The usual argument for a phased approach is that it poses less risk—and if the change is small, that's probably true. A rounds-making robot, for instance, can be tested in a pilot project and modified for missteps before a squadron is sent to roam a hospital's halls.

However, for all-embracing technological projects, such as the implementation of an EHR system, the big-bang approach is actually less risky than a slow rollout. As you begin your design, you'll see how these kinds of projects touch all parts of a hospital's or practice's operations. You might be able to exclude some areas of a hospital's operations initially, but you will then need patches to create connectivity and those patches will have their own risks. For example, if you don't go live with the system in the

pathology lab at the same time you bring on the operating suites, paper will have to travel between the locations, slowing processes and creating the potential for errors.

If you have paid adequate attention to detail, training, and practice, we believe the safer option is to go live with a major new system on a single day. But you must have a procedure in place for monitoring and quickly fixing any breakdowns that occur. People are always uneasy when a significant change is implemented, and if there are problems with the technology right out of the gate that aren't fixed immediately, you'll have a hard time winning back their confidence.

MultiCare decided to go big bang because many of its patients travel between the different hospitals and clinics, Lohnes said, "and we didn't want them to have part of their orders on paper and part electronic."

▶ ***Realize that the work is never done.***

All successful reengineering efforts have the additional benefit of developing an organization's appetite for change. So prepare for that eventuality from the outset of your EHR project by maintaining the capacity and capability to optimize the new processes you have developed, and then to move on

to other areas where reengineering will most improve performance.

In other words, don't let your new skills wither. Leverage the technology and process platform you have built to continue improving clinical outcomes, patient experiences, and your ability to attract an expanding range of customers. When properly used, an EHR is an incredibly valuable asset.

Dr. Matt Eisenberg told us that when visitors come to MultiCare, the team talks about its leadership, its engaging vision, its project-management skills, its training programs, its communications strategy, its well-skilled build team, and the need for implementation that never ends. In short, "we try and model that multi-disciplinary engagement," he says. It's not that hard if you can get people on the same page. But when all is said and done, "You can optimize until you die," he rightly notes. And that's a good thing.

First, as Florence Chang points out, it does pay for itself. She put together a total 10-year cost ownership and return on investment analysis. "We will break even in 2013," she told us, "but you have to have the discipline to continue driving operational change."

The payoff? "I do believe that quality prints money," Chang says. "If you improve the quality of care, you

can reduce costs within the health care system. But it does require significant discipline, and you will need to continue optimizing the system and changing the workflow process."

When MultiCare started its project, it had 3,000 different workflows in three hospitals, she said. When it was ready to go live, workflows had been reduced to 1,200, and the numbers continued to drop with each CPOE iteration—and change and modifications continue.

Chang has the last word. "Implementing electronic health records is probably the best thing that can happen to health care because it drives standardization," she said. It forces you to look at your organization from a very different perspective. It magnifies all your broken processes, all the fragmentation within your system. It's up to us how we want to change that. But forget about first trying to change what people think. Concentrate on changing what they do, because the faster we can change what people do, the quicker we can optimize the new process."

"Implementing electronic health records is probably the best thing that can happen to health care because it drives standardization."

THE BIG SECURE SYSTEM IN THE CLOUD

Hardly anyone disputes that thousands of lives and billions of dollars could be saved every year if all medical records were available whenever and wherever they were needed. If a man from Idaho were injured in a car accident in Florida, for example, the emergency-room physicians would know his medical history by the time the ambulance arrived at the hospital, and they could prepare accordingly. Even if the victim were unconscious, no time would be wasted on inquiries about drug allergies or pre-existing conditions. Mistakes could be avoided and treatment tailored to the patient's needs.

But deployment of electronic health records for the majority of Americans—a 2004 Bush administration initiative—remains a distant dream, even though Maggie Lohnes told us that "the technology is there. Standards are available. Selecting one and committing to it as a nation is all that is left." But she admits that "the politics of it"—forming a national committee and picking the people to serve—raised concern among different constituents that turned into a nine-month debate on that issue alone. According to the *New England Journal of Medicine*, just 1.5 percent of private hospitals have a

comprehensive electronic medical-records system. What's worse, most of the existing systems can't communicate with one another.

The lack of a national system directly affects the quality of U.S. health care and the magnitude of its costs. Both patients and providers spend countless hours filling out repetitive paper forms that must be filed away by the office staff. And the record-retrieval procedure steals more time from practitioners that could be spent with patients.

The Obama administration's 2009 stimulus act included more than $20 billion for health care information technology. The ultimate goal is to improve outcomes and control costs by collecting and sharing health data for better decision-making, while protecting patient privacy.

The United Kingdom began several years ago to build a nationwide, electronic health care records system. Billions of pounds have been spent and success may be within reach. But such an approach requires broad agreement on processes and information standards, and that is very difficult to achieve in countries highly dependent on private health care providers. Another way forward is emerging, however, one based on the creation of a

secure “cloud” into which health care records would be placed. Search engine technologies could then be used to locate the right information.

(For the less-sophisticated technology user, a “cloud” is a seemingly endless array of networked servers providing on-demand computing to multiple users. What makes the cloud viable today is the low cost of computing power, the ubiquitous network provided by the Internet, the abundance of bandwidth, and recently developed, sophisticated means for managing data. The technology world has been waiting nearly half a century for the convergence of these capabilities.)

Technology is helping to solve the problem of creating some form of a national health care-record repository—virtual or otherwise—but providers need solutions today. Work must begin locally now, but we hoist a large warning flag: An electronic health care-record project will be the largest technological endeavor a typical hospital or medical group practice will ever undertake. Done correctly, as we’ve seen, it will change almost all clinical and administrative work, while engaging numerous doctors, administrators, technologists, and support staff.

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Complete implementation will take many years and cost a lot. Join the movement, but make sure you thoroughly understand the issues and have a well-thought-out plan in place before you begin.

As new technologies like EHR systems are introduced, it is imperative that the three principles we spelled out at the beginning of this chapter are followed: The work must be carefully thought through, the technology fully integrated into the health care-delivery system, and the care deliverers fully trained in both the processes and the technology. Otherwise, not only will you will see a poor return on your investment, but you will risk making the work of physicians less, not more, productive.

A CHECKLIST FOR IMPLEMENTING NEW TECHNOLOGIES

Just as checklists have become an important part of medical protocols, we suggest the following checklist

for implementing new technologies focused on the EHR:

- Have you developed the capabilities and acquired the capacity to implement the new technology? Substantial incremental work is required for the adoption of new technologies. Good systems and process skills are critical for implementing an EHR, and you will need these skills well through adoption. Develop or acquire them early, and build the muscle you need.
- Have you established a set of principles to guide you through the change journey? No major reengineering effort ever plays out without argument, some second thoughts, and roadblocks. It's important to keep your final objectives in sight and to establish a set of principles that you will follow even when problems intervene. In many ways, these principles serve as a moral compass.
- Have you engaged the right people in the work redesign effort? We cannot stress how critical work redesign is to the successful implementation of new technologies. The people most affected by the work change must be engaged early in discussions of how their work will be redesigned.

- Have you identified the leaders who will shepherd the change? They must exhibit process sensibilities plus an appreciation for what the technology can achieve. And they must demonstrate their own practical use of the technology. With many organizations striving to implement systems, these leaders will be in high demand and increasingly in short supply.
- Have you established a governance process to answer questions of policy and oversee the effort? Policy issues almost always accompany a new technology—questions of use, privacy, access. The people implementing a new technology often aren't positioned to answer these questions. An elevated perspective may be required. A governing body of shared and diverse interests is always helpful.
- Have you established a project management structure and methodology? It takes exceptional discipline to manage any complex technology or system, and a fulltime staff dedicated to the effort is required. A standard project-management methodology will keep all the parts moving forward together.
- Are your project plans sufficiently detailed to allow you to manage all of the parts effectively? Big ideas and big technologies don't get

implemented without a lot of attention to detail. You don't want to get lost in the "woods" of your work, but you do want to identify all of the "trees" that will need attention.

- Have you established training programs and practice facilities to enable people to become familiar with both the new technology and the new work processes? There is nothing like experience and practice to build confidence in the workability of new technologies and processes and to reduce risk to patients.

Technology isn't the universal solution for reengineering health care, but it's safe to say that technology will be a critical enabler of many reengineering initiatives. That, however, is just the beginning of reengineering, since a technological innovation will inevitably lead to changes in most or all of the processes in place at hospitals, medical groups, and individual physicians' offices. Process changes are the subject of the next chapter.

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