Institute for Healthcare Improvement

Innovation Series 2009

Increasing Efficiency and Enhancing Value in Health Care

Ways to Achieve Savings in Operating Costs per Year

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We have developed IHI's Innovation Series white papers as one means for advancing our mission. The ideas and findings in these white papers represent innovative work by IHI and organizations with whom we collaborate. Our white papers are designed to share the problems IHI is working to address, the ideas we are developing and testing to help organizations make breakthrough improvements, and early results where they exist.

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Ways to Achieve Savings in Operating Costs per Year

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Executive Summary

Until recently, the rationale for health care providers to undertake quality improvement (QI) initiatives rested largely on "doing the right thing"; any financial benefit resulting from QI efforts was regarded as an attractive side effect. However, changes in the current economic environment and mounting evidence that better care can come at lower cost provide additional motivation. Thus far, the Institute for Healthcare Improvement (IHI) has focused efforts to make the business case for improving quality on trying to identify the "dark green dollars" (i.e., actual savings on the bottom line, as opposed to theoretical cost savings that cannot be tracked to the bottom line, or "light green dollars") resulting from QI projects. This method has proved very challenging; although hospitals often claim cost savings from such projects, it is rarely (if ever) possible to track the savings to a specific budget line item.

A new approach to the business case is *the systematic identification and elimination of waste, while maintaining or improving quality*. Here, the aim is primarily financial; any positive impact on quality, while desired, is secondary. IHI's new way of thinking about "dark green dollars" is to express the improvement aim in terms of waste reduction—that is, to identify inefficiencies in the system and remove them, rather than separating out, or not addressing, the cost of a quality improvement project and the potential savings it generates. This paper proposes a set of steps health care organizations can undertake to systematically identify and eliminate inefficiencies to create a portfolio of work leading to a 1 percent to 3 percent savings in operating costs per year. Methods for developing a balanced portfolio of projects and for calculating and tracking cost savings are also described.

Background

Changes in the US economy are intensifying pressures on our health care system. Health care costs are increasing faster than reimbursements, and the opportunity to shift costs among payers has been severely limited. Employers are looking to cut costs and pass more responsibility for health care benefits to their employees,[1] government organizations are cutting benefits for their program members, and care-seeking patterns are changing as patients delay care for reasons of cost.[2] The impact of these forces on hospitals is already apparent. An American Hospital Association survey in November 2008 noted that 38 percent of facilities saw at least a moderate decrease in admissions, while 51 percent saw a moderate or significant increase in uncompensated care.[3] Furthermore, early in 2009 the US federal government, under the new Obama administration, made health care reform a top priority and is approaching reform through the lens of cost reduction. Their resolve is reinforced by evidence that high quality and relatively low cost can coexist.[4,5]

Many of the components that are necessary to achieve high quality care at a lower cost—including patient safety, patient flow through the system, and reliability of care—are core competencies of IHI and the health care organizations with which it works. However, health care as a whole has not traditionally focused on waste elimination as a dimension of cost reduction. This aspect of carefully targeting waste reduction is rapidly developing. For example, in 2008 the National Priorities Partnership, a partnership between the National Quality Forum and 28 other business and health care organizations, released nine waste reduction targets to help manage cost.[6]

This white paper seeks to offer an approach to addressing these difficult issues, asserting that health care systems can indeed drive out waste, and thereby reduce associated cost, from their systems, while also maintaining or improving quality. To do so, it is necessary to deconstruct existing processes and ask questions such as: Which elements in the care delivery process add value to patient experience, outcomes, or population health? Could the same or greater value be delivered at lower cost? Identifying waste in a health care organization does not mean that leaders have been intentionally wasteful in their operations; rather, it is an approach nearly all other industries use to look for inefficiencies and then identify ways to remove them and redesign processes to increase efficiency. By continuously looking for ways to reduce waste, leaders are continuously looking to improve value.

IHI's strategy for reducing waste and enhancing value in health care is based on the following assumptions:

- Better care does not always mean higher-cost care.
- Providers will face steadily increasing pressure to take cost out of the system (i.e., reduce waste) while maintaining or increasing the quality of care.
- Health care organizations can remain financially viable and maintain an acceptable margin when revenues fall only if systems are fundamentally redesigned.

This white paper has five sections that describe the concepts and steps necessary to systematically identify and eliminate waste while maintaining or improving quality.

- Section One: Three Approaches to Improving Value
- Section Two: Understanding the Opportunity to Decrease Cost by Reducing Waste
- Section Three: Developing a Portfolio of Waste Reduction Projects to Reach the Goal
- Section Four: Tools for Tracking "Dark Green Dollars"
- Section Five: Integrating Waste Reduction into Organizational Strategy

Section One: Three Approaches to Improving Value

Although there are many strategies for reducing waste and enhancing value in health care, they tend to be isolated in focus and frequently do not address the system dynamics of health care. Noriaki Kano, a visionary in the science of process design and quality improvement, offers a more comprehensive view. Kano outlines three possible approaches to improving the quality of a product or service—and thereby increasing value:[7,8]

- Approach 1: Eliminate the quality problems that arise because the customers' expectations are not met.
- Approach 2: Reduce cost significantly while maintaining or improving quality.
- Approach 3: Expand customers' expectations by providing products and services perceived as unusually high in value.

Each of these three approaches to improving quality has yielded striking results in hospitals. Examples of success for each of the approaches follow. Some examples result from IHI's interviews with leaders from health care organizations that had undertaken cost reduction initiatives focused on removing waste from their systems.

Approach 1: Eliminate the quality problems that arise because the customers' expectations are not met.

- Patients expect that a hospital visit will improve their condition, not harm them. Richard Shannon, MD, Chair of the Department of Medicine at the Hospital of the University of Pennsylvania in Philadelphia, demonstrated cost savings by reducing hospital-acquired infections (HAIs). Dr. Shannon supported front-line teams of physicians, nurses, pharmacists, and other clinicians in systematically reducing HAIs at the hospital over a two-year period. This activity prevented many debilitating and painful infections, and saved an estimated 57 lives. While the clinical team improved care for patients, Dr. Shannon worked with financial experts at the hospital to quantify reductions in length of stay in the ICU (which also improved patient flow and throughput), along with reductions in labor, supply, and pharmaceutical expenses, calculating $1.2 million in savings over the two years. After an investment of $85,607 to support the work of the improvement teams, the hospital achieved total cost reductions for all HAIs of over $5 million.

Approach 2: Reduce cost significantly while maintaining or improving quality.

- Intermountain Healthcare, based in Salt Lake City, Utah, is a nonprofit health care system that serves the medical needs of Utah and southeastern Idaho, and is known for its advances in health care quality improvement. As part of their efforts to remove waste and enhance value to patients, Intermountain sought to reduce the amount of time patients were on ventilators. They were able to reduce ventilator time by 60 percent. This reduction resulted

in a 30 percent reduction in thoracic ICU length of stay (i.e., unnecessary days in the hospital for both the patient and the staff). By reducing this length of stay, Intermountain Healthcare was able to decrease the total cost of performing open heart surgery by 15 percent. Over their entire health care system, this change affected approximately 3,000 patients and resulted in a savings of $5.5 million per year.

- Washington Hospital Center (WHC), in Washington, DC, serves over 200,000 patients each year. WHC has an Automated Services Laboratory that processes more than 2,400 tubes of blood per day. WHC's target turnaround time for blood test results was a one-hour maximum, although doctors were frequently waiting over 75 minutes. An improvement team was established to analyze the current process and identify factors that might contribute to long turnaround times (e.g., clotted blood samples, mislabeling, equipment failures). The team then developed a list of changes to help address these factors (e.g., eliminating clotting by switching to plasma, decreasing centrifuge time, relying less on paper forms and using more autoverification) and ran tests to verify that the changes would result in improvement. The result was a decrease in the mean turnaround time to 46 minutes. The decreased turnaround time and reduced staffing needs enabled WHC to leave two technical positions unfilled; this, along with reduced printing and storage costs, resulted in a savings of $79,000 per year.[9]

Approach 3: Expand customers' expectations by providing products and services perceived as unusually high in value.

- Anthony DiGioia, MD, a leader at Magee-Womens Hospital of the University of Pittsburgh Medical Center (UPMC) in Pennsylvania, redesigned care for patients undergoing hip and knee replacements. Dr. DiGioia hired medical students to "shadow" patients throughout the entire care experience—from the initial diagnostic visit, through surgery and the hospital stay, and finally to the patient's return to functional life at home. The team worked with a set of ambitious aims to redesign care for these patients and created new care designs, including the following:

  - Perioperative testing and teaching;
  - Group meetings to coach patients;
  - Pre-surgery discharge planning;
  - Strong focus on complete pain management; and
  - "Wellness" design in the orthopedics unit.

  Patient care at UPMC is safe (with very low mortality and infection rates) and reliable (zero dislocations and 98 percent compliance with the Surgical Care Improvement Project (SCIP) recommendation for antibiotic administration[10]). Patient satisfaction is in the 99th percentile ranking of Press-Ganey scores, and 91 percent of patients are discharged directly to home

without assistance or devices (compared to a national average of 23 to 29 percent). Ninety-nine percent of patients report that pain is not an impediment to physical therapy, including therapy that begins on the same day as surgery. The length of stay for these patients is 2.8 days for total knee replacement (compared to a national average of 3.9 days) and 2.7 days for total hip replacement (compared to a national average of 5.0 days).[11]

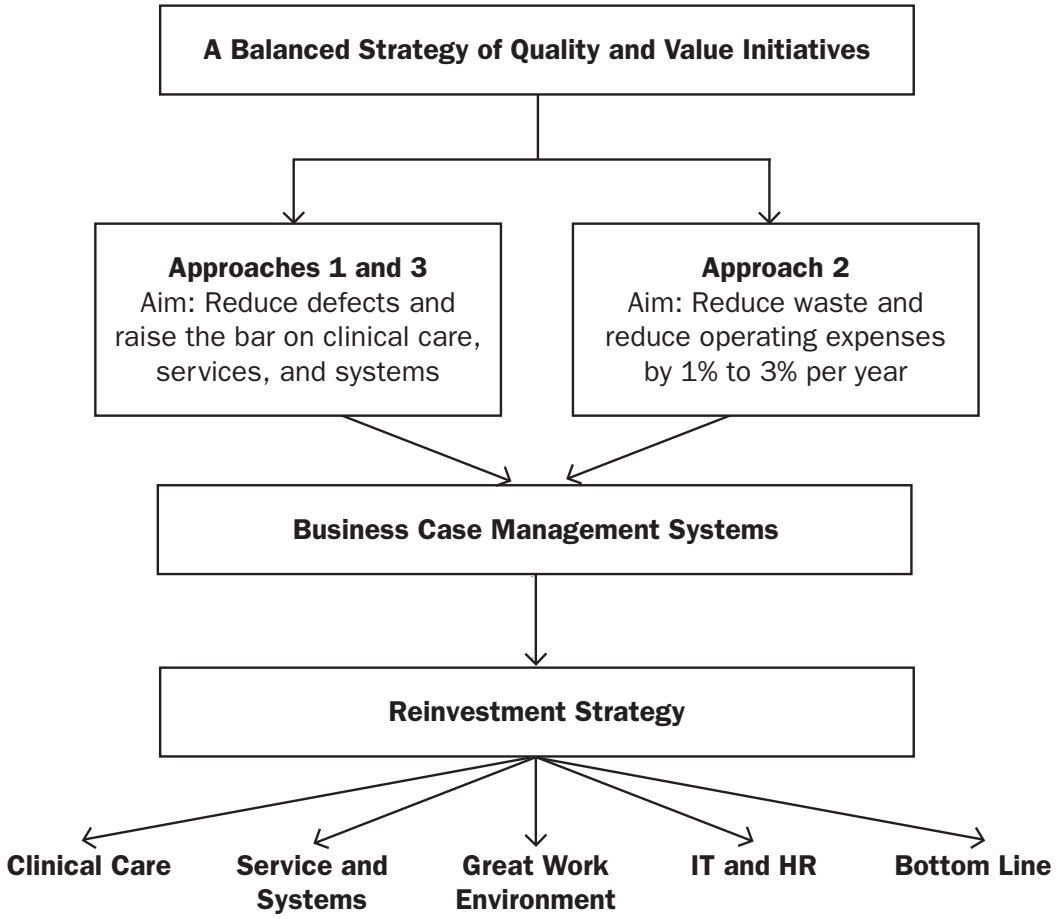
The Power of Approach 2: Reduce Cost Significantly while Maintaining or Improving Quality

While there are many more examples of health care organizations' success using all three approaches, historically the US health care industry, unlike most other industries, has focused almost exclusively on Approaches 1 and 3. This seems to stem from a reluctance to address cost reduction directly and instead to hope that improving quality will be an effective method for cost reduction, or that creating new services will lead to revenue enhancement. While many improvement projects aimed at reducing defects in quality do reduce waste because many defects stem from inefficient clinical systems, there are often larger opportunities for cost reduction that do not stem from or manifest themselves as quality defects. It is best to pursue these opportunities directly using Approach 2. Within health care, however, Approach 2 often represents radically new thinking, even a cultural shift. This is not traditional cost cutting, which is all too often (correctly) perceived by clinicians as arbitrary and harmful to care. Approach 2 is a systematic focus on *waste reduction*, yielding cost savings while also maintaining or improving quality.

In theory, if all or nearly all waste were to be removed from the health care system and it became exceedingly efficient, it would cost less to deliver the same amount of care, which would presumably mean reduced total health care expenditure and decreased reimbursements. In turn, this could threaten margins. While this is true, the scale of waste that exists in the current system means that we have a very long way to go before reaching this limit of efficiency; providers can, for now and the foreseeable future, tackle waste without fear of reaching these perverse incentives to further improvement.

In a 2006 article, Tom Nolan and Maureen Bisognano began building a strategy for balancing cost and quality for health care, similar to what other industries have been doing for years (see Figure 1).[12] To create a balanced strategy of quality and value initiatives, according to Nolan and Bisognano, organizations need to establish a specific waste reduction aim in cost reduction terms (for example, 1 percent of operating expense per year or a specified dollar amount per year), in addition to the aims they set for improving performance in other areas. By including a waste reduction aim, organizations can calculate the cost savings they achieve from such efforts and reinvest the savings in other areas of the organization.

Figure 1. Strategy to Balance Cost and Quality in Health Care[12]



Section Two: Understanding the Opportunity to Decrease Cost by Reducing Waste

This section examines the financials of a hypothetical 235-bed acute care hospital (Hospital ABC) to identify the opportunities to reduce cost by 1 percent to 3 percent of operating expense. There are five steps in this process.

Step 1: Understand the financials.

Table 1 is a sample profit-and-loss (P&L) statement for Hospital ABC, demonstrating an operating margin of 3.3 percent. (The revenue and expense categories are based on "normal" operating parameters.)

Table 1. Sample Hospital ABC Profit-and-Loss (P&L) Statement

Hospital ABC (235 Beds)

Consolidated Statement of Revenue and Expense (for a 12-month fiscal year)

	Annual P&L in $ ($000s Omitted)
Operating Revenue	
Inpatient Service Revenue	265,421
Outpatient Service Revenue	168,220
Gross Revenue	433,641
Less: Contractuals	(279,495)
Other Deductions	(8,637)
Net Patient Service Revenue	145,509
Other Operating Revenue	13,750
Total Operating Revenue	**159,259**
Operating Expenses	
Salaries-Wages	61,315
Employee Benefits	18,315
Purchased Services	21,564
Supplies	26,270
Physician Fees	1,843
Rent, Utilities, etc.	16,853
Depreciation and Amortization	7,906
Total Operating Expenses	**154,066**
(Before Interest Expense)	
Operating Margin Before Interest	**5,193**
	3.3%

Step 2: Understand capacity and demand.

Table 2 shows various operating indicators that provide an understanding of Hospital ABC's capacity and demand.

Table 2. Hospital ABC Key Operating Statistics (235 Beds)

Average Percent Occupancy	72%
Average Bed Occupancy	169
Length of Stay (in days)	4.6
Annual Patient Days	61,758
Annual Number of Patient Discharges	13,426
Inpatient Revenue per Day	$4,298
Adjusted Annual Patient Days	100,899
Adjusted Average Bed Occupancy	276
Adjusted Annual Number of Patient Discharges	21,935
FTEs per Adjusted Average Bed Occupancy (33rd percentile)	4.03
Total FTEs	1,114
Overtime (33rd percentile)	2.53%
Purchased Services (Agency) Usage	2.0%

FTEs = Full-Time Equivalents

Step 3: Outline the overall savings potential.

Table 3 outlines the effect that a year-on-year (for four years) compounded expense reduction initiative would have on a 1 percent, 2 percent, or 3 percent decrease in total operating expense—what is referred to as the "aim" in the table below. The total operating revenue at hypothetical Hospital ABC is $159,259,000; total operating expenses are $154,066,000; the income (loss) from operations is $5,193,000; and the margin is 3.3 percent. Frequently, a 1 percent reduction in total operating expense is thought to have little, if any, effect on the bottom line. However, this is not the case in Hospital ABC; a 1 percent decrease in total operating expense results in an increase in margin from 3.3 percent to 4.2 percent. A 2 percent decrease in expense brings the margin to 5.2 percent, and a 3 percent reduction nearly doubles the margin to 6.2 percent.

By reducing total operating expense by 1 percent to 3 percent per year, organizations will be able to increase their margin and offset costs. For example, if Hospital ABC reduces total operating expense by an additional 1 percent in Year #2, the margin increases to 5.2 percent; after three years of

making a 1 percent reduction per year, they achieve a 6.1 percent margin; and after four years, the margin increases to 7.1 percent. (Note: For the purposes of illustration, the revenue for this hospital is held constant with the understanding that this assumption is not the norm.)

Table 3. Hospital ABC Potential Savings from an Expense Reduction Initiative ($000s Omitted)

		Percent Decrease in Expenses		
	Current Year	**1%**	**2%**	**3%**
Total Operating Revenue	$ 159,259	$ 159,259	$ 159,259	$ 159,259
Total Operating Expenses	$ 154,066	$ 152,525	$ 150,985	$ 149,444
Income (Loss) from Operations	$ 5,193	$ 6,734	$ 8,274	$ 9,815
Margin	3.3%	4.2%	5.2%	6.2%
The Aim		**$ 1,541**	**$ 3,081**	**$ 4,622**

		Percent Decrease in Expenses		
	Year #2	**1%**	**2%**	**3%**
Total Operating Revenue		$ 159,259	$ 159,259	$ 159,259
Total Operating Expenses		$ 151,000	$ 147,965	$ 144,961
Income (Loss) from Operations		$ 8,259	$ 11,294	$ 14,298
Margin		5.2%	7.1%	9.0%
The Aim		**$ 1,525**	**$ 3,020**	**$ 4,483**

		Percent Decrease in Expenses		
	Year #3	**1%**	**2%**	**3%**
Total Operating Revenue		$ 159,259	$ 159,259	$ 159,259
Total Operating Expenses		$ 149,490	$ 145,006	$ 140,612
Income (Loss) from Operations		$ 9,769	$ 14,253	$ 18,647
Margin		6.1%	8.9%	11.7%
The Aim		**$ 1,510**	**$ 2,959**	**$ 4,349**

		Percent Decrease in Expenses		
	Year #4	**1%**	**2%**	**3%**
Total Operating Revenue		$ 159,259	$ 159,259	$ 159,259
Total Operating Expenses		$ 147,995	$ 142,106	$ 136,394
Income (Loss) from Operations		$ 11,264	$ 17,153	$ 22,865
Margin		7.1%	10.8%	14.4%
The Aim		**$ 1,495**	**$ 2,900**	**$ 4,218**

Step 4: Identify areas that are not subject to waste/cost reduction and calibrate the aim.

For example, at hypothetical Hospital ABC, staffing will not be decreased through layoffs, although reductions in staff caused by natural attrition will be considered, as replacements may not be necessary if processes are redesigned to be more efficient. Management can reliably predict attrition and plan for it through work redesign and/or staff development. Expenses that are difficult to impact such as rent, utilities, depreciation, and amortization have been removed from the costs to be reduced. After removing these items, one-quarter of the total operating expense is unavailable in Year #1. In order to achieve a 1 percent to 3 percent savings in Year #1, controllable expenses would have to be reduced by 1.4 percent to achieve an overall 1 percent reduction in total operating expenses; a 2.8 percent reduction in controllable expenses would result in a 2 percent reduction in total operating expenses; and a 4.2 percent reduction in controllable expenses would result in a 3 percent reduction in total operating expenses (see Table 4). In this example, a 2 percent ($3,081,000) goal for Year #1 has been established.

Table 4. Hospital ABC Organizational Areas for Potential Waste Reduction ($000s Omitted)

Operating Expenses			**Controllable Operating Expenses (Potential for Waste Reduction)**		
Salaries-Wages	$	59,764	Salaries-Wages	$	59,764
Overtime	$	1,551	Overtime	$	1,551
Employee Benefits	$	18,315			
Purchased Services (Agency)	$	1,226	Purchased Services (Agency)	$	1,226
Purchased Services (Other)	$	20,338	Purchased Services (Other)	$	20,338
Supplies	$	26,270	Supplies	$	26,270
Physician Fees	$	1,843	Physician Fees	$	1,843
Rent, Utilities, etc.	$	16,853			
Depreciation and Amortization	$	7,906			
Total Operating Expenses	**$**	**154,066**	**Total Controllable Expenses**	**$**	**110,992**
Year #1 Aim: 2% Reduction in Total Operating Expenses = $3,081			**Percent Reduction in Controllable Expenses to Achieve Aim = 2.8%**		

Step 5: Identify areas of focus for waste reduction efforts.

It is important to be clear about both the waste reduction effort and the target within each area of focus. Several strategies can be used when selecting areas of focus for waste reduction; it is possible to focus all efforts in one area of the organization or to select several areas from across the organization. The organization's approach depends on its specific needs. For this example, the areas of focus for waste reduction and the derivation of the potential cost savings targets resulting from the reduction efforts are shown in Table 5.

Table 5. Hospital ABC Waste Reduction Efforts and Potential Cost Savings ($000s Omitted)

Cost Reduction Aim: $3,081			
Area of Focus	**Effort and Target**	**Implied Cost**	**Savings**
Supplies and Medication	Reduce supplies needed by 2% by reducing the number of adverse events and complications.	$ 25,745	$ 525
Purchased Services (Agency) Fees	Reduce agency fees by 25% due to improved predictability in demand and improved staff morale that results from the change.	$ 920	$ 307
Overtime	Reduce overtime by 20% due to improved predictability in demand and reduced demand on staff from fewer adverse events and complications.	$ 1,226	$ 325
FTE Reduction from Attrition	Reduce FTE salary and wages by 4% by not replacing staff following attrition, if improved work processes permit.	$ 58,862	$ 2,453
		Total bottom line impact	**$3,610**
		Total as a percent of the aim	**117%**

Section Three: Developing a Portfolio of Waste Reduction Projects to Reach the Goal

As part of a research-and-development project on waste reduction, IHI interviewed leaders from six health care organizations that had undertaken cost reduction initiatives focused on removing waste from their systems. The purpose of the interviews was to understand the components necessary to create a successful balanced strategy that included cost savings through waste reduction (Approach 2). The cost reduction goals within the organizations ranged from $1 million to $15 million (see Table 6). Based on both this research and previous work with these organizations, IHI believes these organizations are industry pioneers in the application of systematic methods to reduce waste in health care delivery.

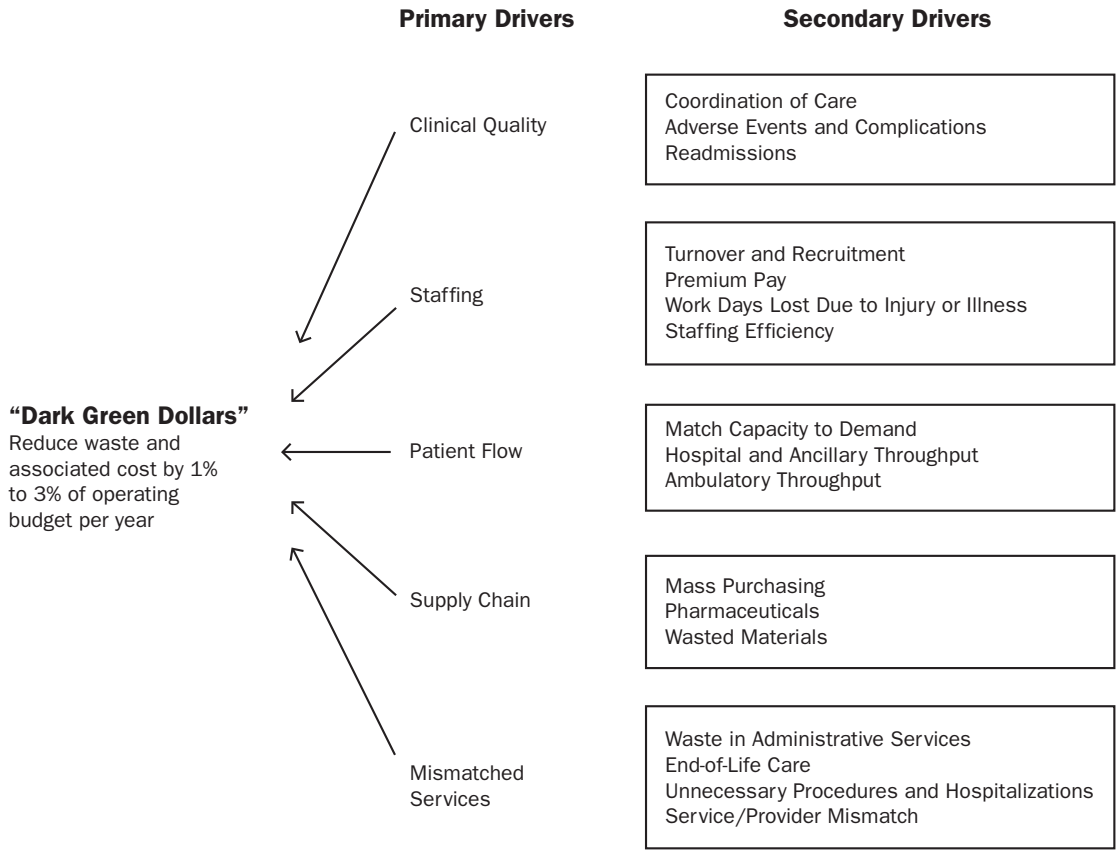
Table 6. Health Care Organizations Interviewed and Their Cost Reduction Goals

Organization	**Cost Reduction Goal (per year)**
An integrated health care network	$6 million
A hospital system	$12 million (0.5% of operating budget)
A children's hospital	$15 million (1.5% of operating budget)
A 300-bed hospital and health care network	$1 million (0.6% of operating budget)
A 500-bed academic medical center	$15 million
A 300-bed community teaching hospital	$8 million (3% of operating budget)

By examining the success these six organizations were able to achieve, IHI created an approach to help other health care organizations in their efforts to achieve cost savings through waste reduction. Achieving ambitious system goals such as reducing cost by 1 percent to 3 percent of expenses will require several complementary projects—a waste reduction portfolio. These projects must be coordinated but each can be executed independently, making the overall waste reduction effort easier to manage. One way to organize setting priorities and selecting areas of focus for waste reduction is to use a driver diagram to identify and detail the core strategies (primary drivers) and associated processes (secondary drivers) that are the most likely to lead to the improvement goal.

Figure 2 depicts the driver diagram for achieving cost savings through waste reduction in health care. The primary drivers directly affect the desired outcome—in this case, generating "dark green dollars" by reducing the annual operating budget by 1 percent to 3 percent. Secondary drivers are those items that directly affect the primary driver. Based on a secondary driver, an organization could charter a project to achieve the goal. Well documented savings in budgeted items are referred to as "dark green dollars"; conversely, the savings that cannot be accounted for are referred to as "light green dollars."

Figure 2. Driver Diagram to Achieve Cost Savings Through Waste Reduction in Health Care



The primary drivers for reducing waste and improving bottom-line performance (by reaching the aim of 1 percent to 3 percent reduction in the operating budget) include the following:

- **Clinical Quality**: Many health care processes are wasteful for both patients and staff. Organizations realize savings by better coordinating care and preventing adverse events and complications.

  Example: Through a program to reduce rehospitalizations, a large, capitated, non-profit system in Colorado reduced its readmission rate by 3.5 percent, saving $295,000 in one year.

- **Staffing**: Redesigning wasteful processes allows staff to perform to their highest capacity, resulting in higher staff satisfaction and productivity, less turnover, and safer care.

  Example: One hospital determined that costs incurred through recruitment, orientation, precepting, and productivity meant that the turnover cost for each nurse was between $48,000 and $74,000.[13]

- **Patient Flow**: By redesigning and smoothing patient flow through inpatient and outpatient services, throughput can be maximized to meet demand.

  Example: Intermountain Healthcare optimized its ICU and lowered the total cost of open heart surgery by 15 percent, saving $3,000 per patient and reducing annual system-wide costs by $5.5 million. After improving its patient flow, Providence Health System reduced its ED diversion rate and generated $1.04 million in increased net revenue annually.

- **Supply Chain** (both clinical and non-clinical): Better management of purchasing and more efficient utilization of non-clinical supplies, medications, and clinical materials (e.g., standardization of equipment, reduction in unused but discarded supplies) can lead to significant cost savings. Because this is perhaps the most developed area of waste removal in health care, it is sometimes mistakenly overlooked. However, supply chain management will yield savings even in organizations that have previously worked to reduce waste in this area.

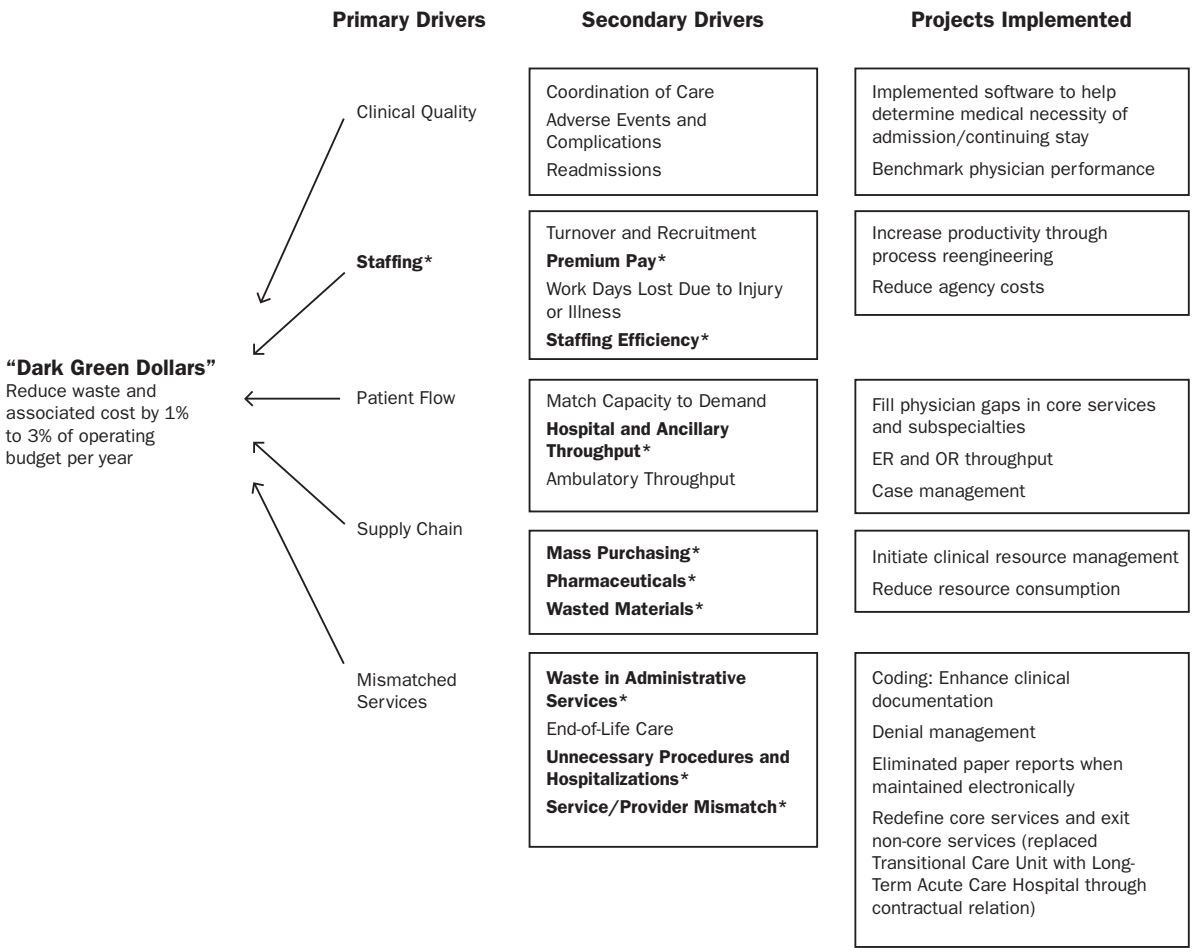
  Example: By eliminating the unnecessary use of a single medical device, St. Joseph Regional Health Center eliminated $100,000 in one year. A Georgia hospital renegotiated its food contract with an outside vendor and saved more than $1.0 million.

- **Mismatched Services**: Successful facilities identify services that either occur in the wrong setting (e.g., end-of-life palliative care in the ICU) or that should not occur at all (e.g., unnecessary hospitalizations) and eliminate them. There is ample room to remove waste in administrative services through elimination of redundant tasks, and to improve efficiency through relocation of services.

  Example: A 500-bed academic medical center found that by aligning its accounts receivable department processes with industry benchmarks, it could save $10.5 million.

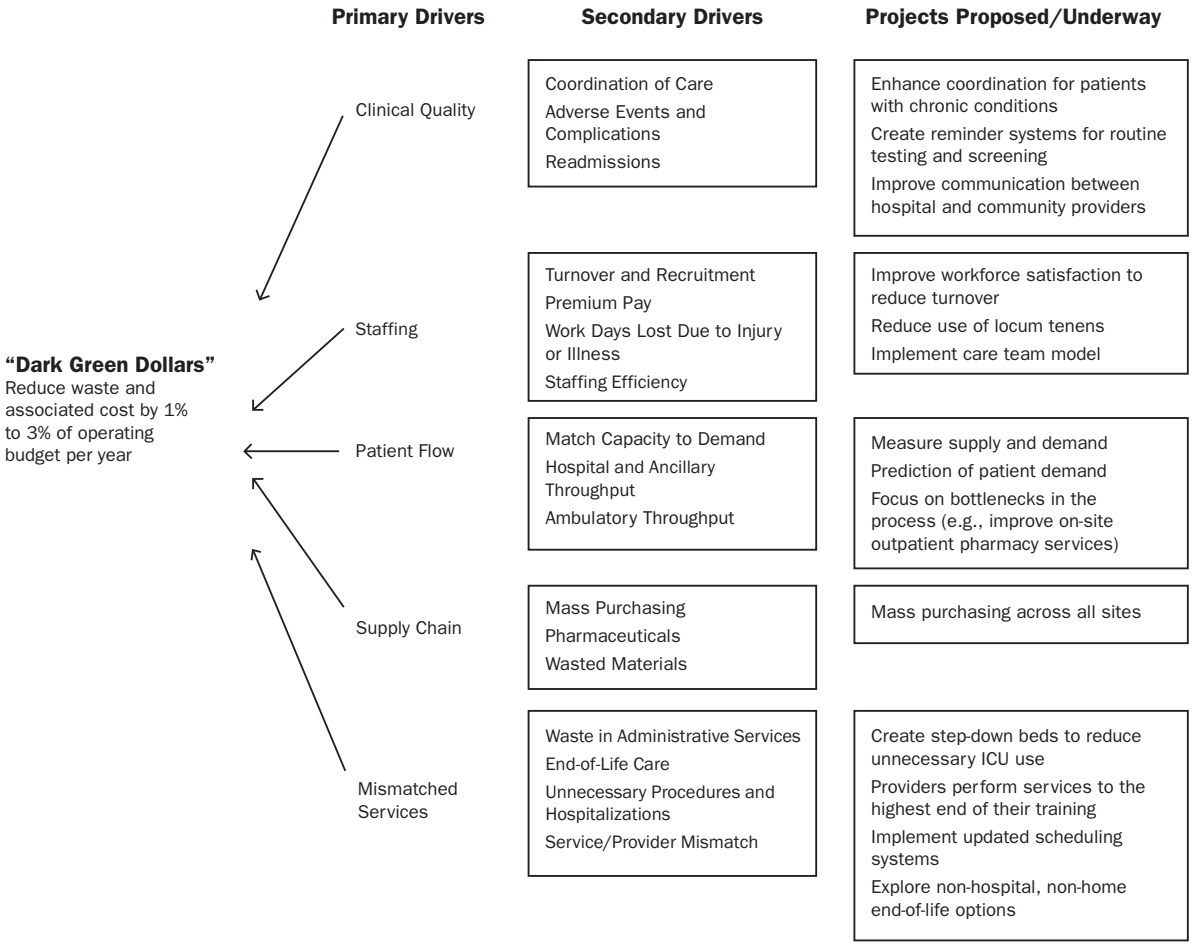
As part of IHI's work to develop a framework for achieving cost savings through waste reduction in health care, the driver diagram was tested in a variety of settings. One such setting was a private, not-for-profit community teaching hospital that was in financial peril and needed to make significant changes in one year in order to continue operating. A large part of the hospital's improvement efforts included driving out $8 million in operating expenses through waste reduction. The driver diagram in Figure 3 demonstrates a subset of the projects this organization undertook to achieve its goal. The areas in which the organization achieved the greatest savings are highlighted in bold with an asterisk.

Figure 3. Driver Diagram to Achieve Cost Savings Through Waste Reduction: Projects Implemented in a One-Year Effort in a Private, Not-for-Profit Community Teaching Hospital



IHI continued to test the theory that the driver diagram applies across the continuum of care by working with a large, multi-site health care organization that provides both inpatient and outpatient services across multiple states. This system began a multi-year effort to improve the care they provide, including improving the value of services to patients and driving down costs to enable the redistribution of funds to services that patients required. They developed a list of projects in multiple sites, either currently underway or proposed, that aligned with the driver diagram to drive out waste in their system (see Figure 4).

Figure 4. Driver Diagram for Achieving Cost Savings Through Waste Reduction: Projects in a Multi-Site Health Care Organization Providing Inpatient and Outpatient Services



Another method for setting priorities and identifying the areas of focus for projects that achieve cost savings through waste reduction is to assess the impact of improvements on cost. To do this, organizations must break down individual line items in the P&L statement into their component parts to identify potential sources of waste. In their article, Nolan and Bisognano outlined two formulas to help organizations assess the impact of improvement efforts on different aspects of the hospital's costs.[12] Because health care is a labor-intensive industry, the first formula focuses on labor costs:

> Total wages per admission =
> (Average wage per hour) x (Worked hours per patient day) x (Patient days per admission)

By breaking down the ratio of total wages per admission into its separate components, hospitals can identify different potential sources of waste:[12]

- Average wage per hour:
  - Costs associated with recruiting and training new nurses to fill vacant positions
  - Increased cost associated with contract labor such as nurses from a temporary agency because of vacancies for full-time staff
  - Premium pay associated with overtime or last-minute scheduling of nurses due to inadequate planning
  - Overtime pay associated with failure to complete the day's surgery schedule on time
- Worked hours per patient day:
  - Inappropriate staff time in the ICU because a patient is unable to be discharged to a lower-acuity unit due to problems with the discharge of patients from these units
  - Hours in excess of budget hours because of the uneven workload between days of the week due to scheduling of surgery cases without regard to the impact on downstream resources
  - Hours in excess of budget because of failure to predict demand a day or two ahead and match staffing appropriately
- Patient days per admission:
  - Excess patient days resulting from delays in discharge because of poor coordination of the processes associated with discharge
  - Excess patient days resulting from a lack of setting and executing daily goals for the patient and the care team to accelerate the recovery of patients
  - Excess patient days associated with an adverse event or complication

In addition to labor costs, medication costs are a substantial expense during a patient's hospital stay. Nolan and Bisognano created the following equation to break down the different components of total medication costs per admission to highlight potential waste:

> Total medication costs per admission =
> (Average cost per dose) x (Number of doses per admission)

The following potential sources of waste are identified by breaking down the total medication costs per admission into its separate components:[12]

- Average cost per dose:
  - Excess cost of brand medications when generics are available
  - Excess cost associated with failure to make a timely switch from expensive administration routes to less expensive ones (for example, switching from IV to oral administration of antibiotics for patients with pneumonia)
  - Excess cost associated with overuse of expensive medications when less expensive ones are available
- Number of doses per admission:
  - Excess cost associated with failure to stop medications appropriately (for example, continuing prophylactic use of antibiotics for longer than 24 hours after surgery)
  - The cost associated with treating adverse events (for example, the use of medications to reverse oversedation)

Financial staff are very familiar with equations that break down the components of a P&L statement. The operations team and improvement teams can work with financial staff to establish priorities for waste reduction projects that will achieve cost savings, while also maintaining or improving quality.

Section Four: Tools for Tracking "Dark Green Dollars"

After establishing a waste reduction portfolio, the execution of the projects begins. To aid in managing and overseeing the portfolio, the leaders of the overall initiative will need methods for tracking savings from the projects. Tracking savings in a hospital can be a difficult task because of the way money flows through the organization. Savings can be "lost" within the cost accounting system, as when waste reduction efforts in one department actually lead to savings in another (e.g., practices to improve nurse retention result in reduced overtime and agency costs on the ward, and also reduce the human resources department's costs to hire and train replacement staff). There are also many examples of projects that claim to save money, but these savings cannot be documented in the organization's bottom line.

Efforts to decrease cost by reducing waste tend to result in claims that the improvement team generated savings, but these may not be reflected in the budget or P&L statement. "Light green" savings can cause great frustration for both the finance department and the improvement team; finance becomes skeptical of claims made by improvement teams, while clinicians feel that their efforts go unrecognized and unrewarded. In one organization's example of such "light green" savings, improvement in pneumonia care processes resulted in a switch from IV to oral antibiotics in 370 patients, for supply-cost "savings" of $319,000. However, it was difficult to identify these savings because the year-on-year increase in drug costs meant that the savings were lost in annual cost increases. Without this improvement, total drug spending might indeed have been $319,000 higher than it actually was in the subsequent year. To move from "light green dollars" to "dark green dollars," the dollar amount saved from improvement needs to be identified and isolated within the budget. This allows decision makers to reallocate funds or to remove this cost from the budget. Distinguishing between "light green dollars" and "dark green dollars"—and understanding the process by which the former are converted to the latter—are crucial in an organization that wants to enhance value. Doing so requires the following: a) a clear method for making that conversion and for tracking costs across the organization; b) a clear sense of potential savings before the project begins; and c) an expectation of how savings will ultimately be applied.

IHI provides two alternatives for tracking the cost savings associated with waste reduction efforts, both of which use adjusted versions of standard financial figures to demonstrate if "dark green dollars" have been achieved.

Method 1: Using a Standard Tool Throughout the Organization to Track Savings Associated with Waste Reduction Efforts and to Adjust for Annual Changes

The previous section presented two formulas to help assess the impact of improvements on cost and identify potential sources of waste related to staffing and medication budget items. The staffing line item was broken down into three components:

- Average wage per hour
- Worked hours per patient day
- Patient days per admission

Data on staffing costs and these three related components are readily available in any hospital and can be used to track savings. The appropriate budget item then becomes the key measure of success for a waste reduction project. To increase the precision of the estimate of savings, it may be necessary to adjust the measures for changes outside the scope of the project. For example, a team might have had a favorable impact on average wage per hour by instituting improvements that enable all staff to work to the "top of their license." During the same time period, a yearly cost-of-living wage increase may have occurred. It is reasonable to track the savings by adjusting for the wage increase, which was not in the control of the project team.

This approach was formalized by Sigma Aldrich, a life science and high technology company, to support their cost-reduction efforts. Sigma Aldrich saves approximately 2 percent of operating expense each year through process redesign and has developed a simple Excel worksheet that can be used in any division, in any plant, and in any country to track savings. The Quality Improvement Savings Tracker Worksheet enables the organization to compare expenses in the area of interest to expenses incurred the year prior and adjust for wage increases and productivity/volume changes. The organization can then use the worksheet to track any investments made with the savings accrued. There are nine steps to complete in the worksheet (see Figure 5):

1. Complete the "Department, Location, Currency, and Prepared By" information in upper right corner.
2. Select the reporting month from the drop-down menu.
3. Select the appropriate account(s) from the drop-down menu where savings has occurred.
4. From your department/location expense reports, record the year-to-date (YTD) expense from this year and last year for the appropriate month.
5. For savings in Payroll costs, input the estimated annual wage increase for the current year.
6. Input your productivity measure amounts for this year and last year. Remember to use the YTD amounts for the month selected in step #2.
7. Complete the details of savings for each significant process improvement project.
8. Complete the details of reinvestments from savings achieved in the project.
9. Briefly describe the unit of measure for the productivity measure used in step #6.

By using this worksheet tool across all projects, savings can be calculated regardless of the area of improvement. Furthermore, by requiring that the details of the savings are written out in terms of process improvement, this tool reinforces that the goal is not traditional cost cutting but rather waste removal through redesign. Finally, a key to identifying "dark green dollars" is to make a concerted decision as to how the funds will be reinvested; this tool creates a public space for that decision. IHI adapted Sigma Aldrich's Quality Improvement Savings Tracker Worksheet to fit the appropriate components for tracking health care delivery costs (see Figure 5).[14]

One health care organization that has worked with IHI for several years to improve patient flow through their system has achieved "dark green dollar" savings. The hospital tracked its progress using several measures; one key measure for tracking flow is adjusted bed turns (i.e., the number of times functional beds turn over during a specified time period, adjusted by case mix index). As a result of their improvement efforts, the hospital achieved a 15.2 percent increase in their yearly adjusted bed turns from fiscal year (FY) 2002 to FY 2005. Table 7 highlights the hospital's improvement for one fiscal year.

Table 7. Improvements in Patient Flow: Cost per Bed Turn (FY 2004 - FY 2005)

	Adjusted Bed Turns	Actual Bed Turns	Number of Beds	Total Paid Hours	Paid Hours per Actual Bed Turn	Cost per Actual Bed Turn
FY 2004	89	60.7	213	$738,000	57.1	$1,425
FY 2005	96.7	65.2	215	$741,835	52.9	$1,313

The "dark green dollars" derived from the hospital's work to improve flow resulted from the increase in staff productivity that was possible by removing waste in the hospital. Using the Quality Improvement Savings Tracker Worksheet, it is possible to establish the "dark green dollars" generated (see Figure 5). From FY 2004 to FY 2005, the hospital increased salary and wages by $95,875; this wage increase needs to be considered when calculating "dark green dollars." By improving flow through the hospital, patient volume increased from 12,929 in FY 2004 to 14,018 in FY 2005, resulting in an approximate 8 percent increase in volume. This 8 percent increase in volume translates into $1,554,030 and is calculated as:

[FY 2004 Salary and Wages – (1 + (1-Volume Factor)) x FY 2004 Salary and Wages]

By subtracting the increase in Salary and Wages ($95,875) from the 2005 savings generated by the volume increase ($1,554,030), the hospital generated $1,458,155 in "dark green dollars."

Figure 5. Example Using the Quality Improvement Savings Tracker Worksheet to Calculate Cost Savings Resulting from a Hospital Project to Improve Patient Flow
(Worksheet adapted from Sigma Aldrich)

							Step 1	Department					
								Location					
								Currency	U.S. Dollar				
								Prepared by					

Step 2. Select Reporting Month 1/31/2006			Step 4			Step 5				Step 6			
		FY 2004	FY 2005		Adj. for Annual Wage Increase				Productivity/Volume Measure Adj.				
Step 3. Select Account Where Savings Occurred	Account Code	YTD Actual	YTD Actual	2005 Savings	Wage Incr %	Wage Adj. to Savings	2005 Adjusted	2005 Savings	FY 2004 Volume	FY 2005 Volume	Volume Factor	2005 Savings	Run Rate + Productivity Savings
Not Applicable	N/A	18450000	18545873	-95875		0	1854875	-95875	12929	14018	1.08	1554030	1458155
Not Applicable	N/A	0	0	0	0	0	0	0	0	0	0	0	0
Not Applicable	N/A	0	0	0	0	0	0	0	0	0	0	0	0
		Total Actual Savings		$(95,875)		Total Run-Rate Savings		$(95,875)		Total Productivity Savings		$1,554,030	$1,458,155

Step 7. Process Improvement Savings Detail			YTD Savings Contribution		Step 8. Savings Reinvested or Lost							YTD Reinvestmemt Amount	
List/Describe Major Improvements or Changes					List/Describe Reinvestments or Lost Savings								
1 IHI Flow Concepts			$1,458,155		1								
2					2								
3					3								YTD Savings Less Reinvestment
4					4								
5					5								
Total Estimate YTD Savings			$1,458,155		Total Estimate YTD Lost or Reinvested Savings							$	$1,458,155
												Difference from amount reported above	$ (0)
Step 9. Describe the Productivity Measure Used in Step 6													

Method 2: Using a Matched Case Study to Identify "Dark Green Dollars"

Identifying savings resulting from a waste reduction project focused on the clinical quality driver, such as those presented in Figure 2, can be difficult. The following is another example of how to calculate such cost savings.

One organization began a quality improvement project to reduce surgical site infections (SSIs). After a successful project resulted in a decrease in SSIs, the organization wanted to calculate cost savings from the initiative. They identified 16 patients who had an SSI and whose increased hospital costs could be tied to the SSI. To the best of their ability, the hospital then matched 16 patients who did not have an SSI—based on surgery, age, diagnoses, and other conditions. They then reviewed and compared costs for both groups.

The aggregate number of hospital days for patients with an SSI was 240 days; 74 of these days occurred before the SSI, and 166 days occurred after the SSI. The aggregate number of hospital

days for the matched patients who did not have an SSI was 70 days. Therefore, the difference between the aggregate number of days for patients with an SSI and the aggregate number of days for patients without an SSI was 170 days. The aggregate cost for the patients with an SSI was $843,299, of which $376,863 was incurred prior to the SSI and $466,436 was incurred after the SSI. The aggregate cost for the patients without an SSI in the matched group was $406,692, resulting in a $436,607 difference between the two groups. The difference between the two groups with respect to the average adjusted length of stay per patient was 10.6 days.

Using this comparative information, the hospital was able to calculate an average incremental cost per SSI of $27,288 (see Table 8). They then determined the top five cost categories that made up this incremental cost per SSI to help identify additional areas of focus for future planning:

- Room and board (including nursing)
- Pharmacy
- Surgical (revisits to the operating room)
- Radiology
- Other ancillary

Table 8. Comparison of Length of Stay and Costs: Patients with an SSI vs. Patients without an SSI

			Average per Case	
	Length of Stay (in days)	**Cost**	**Length of Stay (in days)**	**Cost**
SSI Patients (n=16)				
Pre-SSI	74	$376,863	4.6	$23,554
Post-SSI	166	$466,436	10.4	$29,152
Total: SSI Patients	240	$843,299	15.0	$52,706
Total: Non-SSI (Match) Patients (n=16)	70	$406,692	4.4	$25,418
Total Difference	170	$436,607	10.6	$27,288
% Difference	243%	107%	243%	107%

From FY 2005 to FY 2006, this organization had 33 fewer Class I and Class II SSI cases. Therefore, the annual cost savings from reducing SSIs was $900,504 (33 cases x $27,288 cost per case). These savings could be further broken down using the Bisognano and Nolan formulas described above. Both patient days per admission and the number of doses per admission are positively affected by reduced SSIs. Patient flow through the hospital is also positively affected, as patients without

infections do not require longer stays and bed access therefore increases.

Section Five: Integrating Waste Reduction into Organizational Strategy

Achieving a 1 percent to 3 percent reduction in operating budget per year is an ambitious goal that requires a significant shift in the management of an organization. From the health care organizations that IHI studied, it was clear that the creation of a waste reduction portfolio needs to be integrated with the organization's overall strategy to be successful. The components that follow are essential.

Use a system of measures.

Continually measure all aspects of the business and manage them accordingly.

- Use monthly reporting on case mix trends and their financial impact.
- Use a comprehensive strategic dashboard to monitor organizational improvement over time and compare to national benchmarks. The IHI Whole System Measures and Toyota Specifications provide a framework for creating such a dashboard.[15]
- Determine an appropriate organizational goal for cost savings and track progress towards it.

Adopt and reinforce a sense of urgency and accountability.

- Use the board's strategic planning efforts to prioritize improvement initiatives, assign specific responsibilities, and implement them on an expedited basis. This concept is further outlined in IHI's white paper, *Execution of Strategic Improvement Initiatives to Produce System-Level Results.*[16]
- Shift the focus of accountability from "staying within budget" to "managing to the benchmarks." All too frequently, the goal is to stay within the yearly budget. The problem with this approach is that it does not encourage reduction in cost or additional savings, it can stifle creative thinking, and it often does not take into account financial changes that happen over the course of the year. By "managing to the benchmarks," managers and staff will focus on continuously improving their systems to be as efficient as possible and perhaps surpass the financial goal for the year.
- Provide tight feedback loops and sound data in order to make mid-course adjustments and avoid impression-based decision making.

Use the Model for Improvement to reset the rhythm of testing.[17]

- Use the Model for Improvement to establish clear aims, frequently test new ideas to enhance value, and measure progress in clear and transparent ways.
- Set a tempo for progress by increasing the frequency of testing (e.g., tests that previously occurred monthly should occur weekly, those that happened weekly should be daily, and those that happened daily should now be hourly), and increase confidence in the organization's ability to make changes.

Gather support from all constituents.

When asking clinical staff to engage in waste reduction initiatives, it is important to "give more than you ask for." Clinical staff are excited by improving clinical quality and typically much less excited about (or even suspicious of) efforts focused on cost reduction. However, a majority of improvement projects will still be focused on clinical quality improvement rather than on waste reduction that may or may not have a clinical focus; it is important to support improvement projects that may not result in cost reduction, to both improve care and to build will among staff for waste reduction efforts that use Approach 2. For example, one organization IHI studied aims to achieve $5 million to $6 million in cost savings each year. Most of this cost savings is achieved through only 20 percent of their improvement projects; the other 80 percent of projects are improvement efforts that management or clinical staff feel are essential purely for a clinical quality imperative. By working on the 80 percent, the organization is able to build will among staff to contribute to the 20 percent of projects that are specifically focused on decreasing costs.

Be explicit from the start about how the savings will be used.

If the organization is in a state of financial difficulty, all savings may be used for improving the bottom line. Some organizations choose to allocate some of the savings for other purposes such as staff bonuses, facility improvements, or enhancing access for underserved patients. Whatever the decision, the organization should clearly communicate how cost savings resulting from any improvement efforts will be used.

Conclusion

The most successful health care organizations must not only deliver high-quality care, but also do so with minimum waste. Competitive forces and a difficult economy are resulting in a reduction of revenues in health care, as is typical in other industries. Cost controls are increasingly part of the quality conversation in health care, and the systematic identification and elimination of waste while maintaining or improving quality is imperative for future success. Sustainable, high-quality care is only possible through simultaneous attention to enhancing the entire experience of care for patients and managing the costs of delivering that care.

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