The Performance Pivot

Using Theory of Constraints, Lean & Six Sigma to make breakthrough improvements

BY PAUL SCHILSTRA

> Long-term commitment to new learning and new philosophy is required of any management that seeks transformation. The timid and the fainthearted, and the people that expect quick results, are doomed to disappointment.
>
> W. EDWARDS DEMING, 1982

Cancer programs around the country are currently pursuing a number of strategies to improve their services, stay competitive, and achieve profitable growth. Unfortunately, many of these strategies fail to deliver the long-term expected benefits (see Table 1, page 50). A number of underlying factors—usually based on incorrect or incomplete assumptions—may ultimately lead to the failure of these improvement and growth efforts, including:

1. The "productivity paradox" combined with cost accounting
2. Incomplete and incorrect use of Lean and Six Sigma
3. Sub-optimization within the cancer program
4. An overall failure to create a continuously learning, improving, and growing organization.

The "Productivity Paradox"

It's every cancer program administrator's dream: everybody and everything in the cancer program working at 100 percent efficiency (read: doing more with less) and 100 percent productivity (read: be 100 percent busy all the time). But how does a cancer program achieve this outcome? And is it even realistic? Before we can answer these questions, we have to define what these terms really mean.

Efficiency is defined as the number of units of output or desired results (e.g., revenues, outcomes, etc.) generated per unit of input or resource (e.g., money, people, equipment, etc.). Ideally, efficiency should at least be equal to or greater than one.

Utilization is the one and only measurement for determining how busy a resource is. However, a resource should never and cannot ever be busy 100 percent of the time. It is mathematically impossible. Variations in demand, available capacity, treatment duration, and quality all conspire to make it impossible to achieve 100 percent utilization. Cancer programs that strive for this goal will only experience longer wait lines and wait times.

Productivity is often equated with "being busy," but that interpretation is wrong. Productivity should measure to what extent a cancer program is able to reach a specific goal—not whether somebody or something (a piece of equipment) is busy all the time. As such, productivity and efficiency are closely related. Any activities or resources that bring a cancer program closer to achieving its goals are productive; activities or resources that do not are unproductive and, therefore, wasteful.

The problem with pursuing efficiency ("doing more with less") and utilization ("being busy") is that it can lead to erroneous decisions about individual performance and staffing levels, as well as required capacity for equipment, rooms, chairs, beds, and more. Worse yet, these efforts may have a serious and negative impact on safety, quality, cost, and the overall patient experience if pursued in a vacuum.

Cost Accounting Challenges

Cost accounting, as it is usually practiced with fully-loaded cost per patient or unit of service, can cause a number of problems.

For example, the idea that it is critical to reduce the total cost per procedure or patient often leads to the desire to increase utilization at the departmental level. This goal may adversely affect the performance of the cancer program as a whole because it may unintentionally create bottlenecks and issues with patient throughput. A cancer program's goal should not be to reduce the cost per patient or procedure, but rather to provide superior outcomes and stellar patient services—at a price the market is able and willing to pay. Healthcare is a business. As such, cancer programs are expected to bring in revenue and profitable growth. Remember: no margin, no mission!

Second, the traditional fully loaded cost plus profit margin per procedure and patient approach frequently leads to inflated costs and prices. This practice, in turn, may lead cancer programs to forego valuable opportunities for profitable growth. An example of this thinking was the recent announcement by a number of physician-owned cancer clinics to turn away Medicare patients because they became "unprofitable" as a result of the reimbursement cuts caused by sequestration. Table 2, page 51, shows a simplified example of a cancer clinic affected by the sequestration cuts. In this example, the current patient volume is 100 patients per year while its maximum capacity is 140 patients per year. This example shows that accepting more Medicare patients can actually increase a program's net revenue and profit. In this example, a cancer program could actually

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Table 1. Improvement & Growth Strategies

INITIATIVE	OBJECTIVE	REASON FOR FAILURE
Stop investments and reduce operating expenses	• Improve the bottom line • Improve productivity	• Narrow, short-term focus on reducing cost • Fails to take the need for revenue growth into account
Pursue accreditation	• Improve the program's image for marketing efforts • Attract more patients • Improve the quality of care	• Focus on improving the image only
Start a marketing campaign	• Attract more patients	• Insufficient investment • Poorly-defined goals • Poorly-defined targeted audiences • Poorly-defined value propositions for each targeted audience • Ineffective or inappropriate communication channels and media
Acquire physician practices	• Secure referrals • Increase market share	• Poor integration of physicians and practices • Poorly-validated assumptions about the impact on growth
Partner with a major academic medical center or national oncology network	• Improve the program's image for marketing efforts • Attract more patients • Improve the quality of care	• Focus on improving the image only • Poor alignment of stakeholders • Poor integration of the two organizations
Invest in new cancer treatment capabilities and services	• Improve the program's image for marketing efforts • Attract more patients • Provide more value	• Focus on improving the image only • Failure to conduct the necessary research to justify purchases or additions to service line (i.e., does patient volume and patient mix support new equipment or new services) • Failure to include patients and staff in purchasing decisions • Not improving and redesigning processes
Build a new cancer treatment facility	• Improve the program's image for marketing efforts • Attract more patients • Improve the quality of care	• Focus on improving the image only • Failure to include patients and frontline staff in the design • Poor design of the new facility • Not improving and redesigning processes
Acquire or merge with another hospital or network	• Reduce operating expenses • Capture greater market share • Secure better leverage with payers	• A power struggle ensues between the two leadership teams • The two organizational cultures do not integrate well
Apply Lean and/or Six Sigma	• Eliminate waste • Reduce errors • Reduce variation • Reduce cost • Improve the quality of care	• Cost reduction is really the primary driver • Senior management is not engaged and supportive • Lean and/or Six Sigma are not applied correctly

increase its total profit from $400,000 to $440,000, even though the profit per patient decreases by $333.

The allocation of total fixed expenses—both direct and indirect—across individual procedures and patients is often where problems lie. Fixed costs typically make up most of a cancer program's total expenses so they are vulnerable to distortions. Few costs can be directly linked to an individual patient, except perhaps, for items like medication, meals, gowns, etc. In addition, many cancer programs are part of a larger organization that allocates a portion of its overall overhead to the cancer program, which further increases the total cost per patient or unit of service.

Other cost accounting challenges include:

- Cost accounting often ignores available extra capacity that can be used to increase revenues and overall profitability of a cancer program.
- Inventory, equipment, and facilities are treated as assets on the balance sheet, even though, in reality, they are liabilities that generate a host of operating expenses, e.g., maintenance, support, and upgrades. These expenses further add to the total cost of a cancer program.
- Traditional accounting metrics, such as cash flow, profit & loss, and return on investment are not easily translated into specific management actions.

Incorrect Use of Lean & Six Sigma

For some cancer programs, Lean and Six Sigma may not always consistently yield profound and sustained improvements. The reason is that few are aware of the history and context in which Lean and Six Sigma were developed or limitations to this approach. Lean has been mostly used to eliminate waste (Muda) in order to reduce cost. However, many Lean projects often overlook unevenness in patient flow (Mura) and overburdening of physicians and staff (Muri). These Lean improvement efforts tend to fail if frontline people (lower-level managers, physicians, and staff) are not properly trained, empowered, engaged, and supported. Often, these staff are already overburdened and stressed by just doing their job and sacrificing personal time in the process. Assigning yet more work to them in the form of improvement projects may very well tip the balance toward a culture of burnout, apathy, and cynicism.

A Lean project that does not take into account patient flow and overburdening of staff will often look like this:

✓ **Step 1:** Reduce inventories

Table 2. Reimbursement Example Before and After Sequestration*

	Before	After	Gain (Loss)	Decision
Maximum Capacity in Patients Per Year	120	120		
Total Patients Per Year	100	120		
Total Fixed Costs Per Year	$ 1,000,000	$ 1,000,000		
Traditional Cost Accounting Approach (Per Patient Analysis)				
Average Net Revenue Per Medicare Patient	$ 100,000	$ 98,000	$ (2,000)	
Average Cost of Drugs Per Medicare Patient	$ 86,000	$ 86,000		
Average Contribution Margin Per Patient	**$ 14,000**	**$ 12,000**	**$ (2,000)**	
Total Fixed Costs Per Patient	$ 10,000	$ 10,000		
Average Profit Per Patient	**$ 4,000**	**$ 3,667**	**$ (333)**	**Reject More Medicare Patients**
Recommended Approach (Throughput-Based Accounting)				
Total Net Revenues	$ 10,000,000	$ 11,760,000	$ 1,760,000	
Total Cost of Drugs	$ 8,600,000	$ 10,320,000		
Total Gross Margin	**$ 1,400,000**	**$ 1,440,000**	**$ 40,000**	
Total Fixed Costs	$ 1,000,000	$ 1,000,000		
Total Profit	**$ 400,000**	**$ 440,000**	**$ 40,000**	**Accept More Medicare Patients**

*Under the traditional cost accounting approach, where all fixed costs are allocated proportionally to individual patients, sequestration results in a net loss of $400 per patient. Under the recommended approach, when patient volume grows to meet its maximum capacity, profitability is reached.

Table 3. Lean and Six Sigma Strengths and Weaknesses

	LEAN	SIX SIGMA
Origin	• Henry Ford: training within industry • Edwards Deming: The Toyota Way, production system and business practices	• Walter Shewart • Edwards Deming • Motorola
Typical Goals	• Provide better value to the customer • Improve flow • Do more with less • Reduce cost	• Reduce variation • Reduce defects or errors
Strengths	• Simultaneous focus on value, flow, efficiency, speed, and quality improvement • Can be effective for solving simple ("known knowns") and complicated ("known unknowns") operational problems • Limited need for statistical analyses • Can be taught to and adopted by many levels in the organization • Prefers proven, simple, and low-tech solutions	• Scientific, quantitative, and structured methodology • Can be effective for solving simple ("known knowns") and complicated ("known unknowns") operational problems
Limitations & Potential Points of Failure	• Is a significantly diluted and westernized version of the Toyota Way, the Toyota production system, and the Toyota business practices • Focuses mostly on operations and often ignores other important functions critical to growth, such as marketing • Assumes that patient volumes and case mix are fairly stable and that fluctuations in demand can be easily smoothed • Places too much emphasis on Lean as a set of tools and tends to ignore the concept of a learning, continuously improving and growing organization • May result in too much focus on short-term cost cutting rather than increasing and improving throughput and quality • Pays little attention to the impact of Lean projects on the existing workload of physicians and frontline staff • Is often applied in limited and one-time improvement projects instead of continuous, cancer-program-wide improvement efforts • May lead to sub-optimization of individual processes, teams, or departments within the cancer program if the cancer program as a whole system is not taken into consideration • Is not effective in dealing with complex problems or significant crises ("unknown unknowns"), where there is no obvious relationship between cause and effect	• Is a significantly diluted version of Total Quality Management and Continuous Quality Improvement • Focuses on the quality of operations only and ignores other important functions critical to growth, such as marketing • May not be appropriate in environments of regular and significant changes, e.g., due to rapid innovation • Places too much emphasis on Six Sigma as a set of tools and tends to ignore the concept of a learning, improving, and growing organization • Requires a great deal of measurements and statistical prowess • Does not include a focus on improving flow and workload leveling • Pays little attention to the impact of Six Sigma projects on the workload of physicians and frontline staff • Narrow focus may lead to sub-optimization of individual processes, teams, or departments within the cancer program because the cancer program as a whole system is not taken into consideration • Is not effective in dealing with complex problems or significant crises ("unknown unknowns"), where there is no obvious relationship between cause and effect

- ✓ **Step 2:** Reduce head count
- ✓ **Step 3:** Redistribute tasks among people
- ✓ **Step 4:** Step back and wait
- ✓ **Step 5:** Results are good enough, so let's move on to something else.

In addition, Lean and Six Sigma are often used only once and in one limited area, say Lab or Pharmacy, without continuous efforts to keep improving the area. Performance improvement—including the use of Lean and Six Sigma—is like gardening: you have to continue weeding or the weeds grow right back.[1] A short-term, one-time approach to Lean and Six Sigma can result in short-lived,

less than optimal improvements. Table 3, left, lists a number of reasons for why Lean and Six Sigma often do not yield the anticipated benefits.

In many cases, individual departments within a cancer program have their own performance objectives, which usually consist of some mix of revenue growth and cost reductions. If individual departments all adopt the "do more with less" strategy, it could potentially lead to internal conflicts and adverse consequences for a cancer program as a whole. Picture the cancer program as a chain, in which each link represents a different department, team, or service. The strength of the cancer program's chain is then defined by its weakest link. Most improvement efforts with Lean are one-time activities that focus on improving one link at a time, without knowing whether they strengthened the weakest link or a stronger one, and without knowing whether they, thus, strengthened the whole chain.[2]

For example, a pharmacy— reporting to a different manager from the cancer program administrator—may be tasked to reduce waste and staff because overall patient volumes are stagnant. At the same time, the cancer program administrator is tasked with growing the cancer program. It is easy to see how the pharmacy department can quickly become a serious bottleneck if it is not equipped to handle the anticipated increase in cancer patients.

Ultimately, the failure to pursue and create a continuously learning, improving, and growing cancer program is the main reason that improvements are often sporadic, limited in scope, and short lived.

The Transformation Journey

To successfully transform a cancer program into a vibrant center of excellence, follow these six steps:

- Start with a holistic, system-wide perspective of the cancer program
- Define the system's goals and critical success factors
- Understand the physics of the cancer program
- Define the key performance indicators
- Identify the "performance pivot" of the cancer program
- Improve and learn continuously.

1—A Systems Perspective

Cancer programs are complex and dynamic systems—mostly consisting of people—that have to continuously adjust to an ever-changing environment and demand for care (see Figure 1, below). Changes in demand often differ in acuity, frequency, and magnitude throughout the day, week, and year. These constant changes "shock" a cancer program and often result in the program being out of sync with its environment.[3,4] Cancer program leadership should seek to optimize the overall performance of the cancer program in light of these constant shocks.

2—Define the Goal

The next transformation step is to develop clear and succinct definitions of the cancer program's:

- ***Purpose.*** The difference the cancer program is trying to make.
- ***Vision.*** What the world will look like after the cancer program has fulfilled its purpose.
- ***Mission.*** How the cancer program will fulfill its purpose and vision.

The purpose and vision are the goals of a cancer program, while the mission represents its critical success factors: the things that must be done or must be in place to achieve the goals. Combined, these will guide future decisions and actions. Figure 2, page 54, shows an example of a possible set of cancer program goals, along with some corresponding critical success factors and necessary conditions. Consider constructing a similar diagram using this cause and effect structure.[5]

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Figure 1. A Holistic, System's Perspective of a Cancer Program

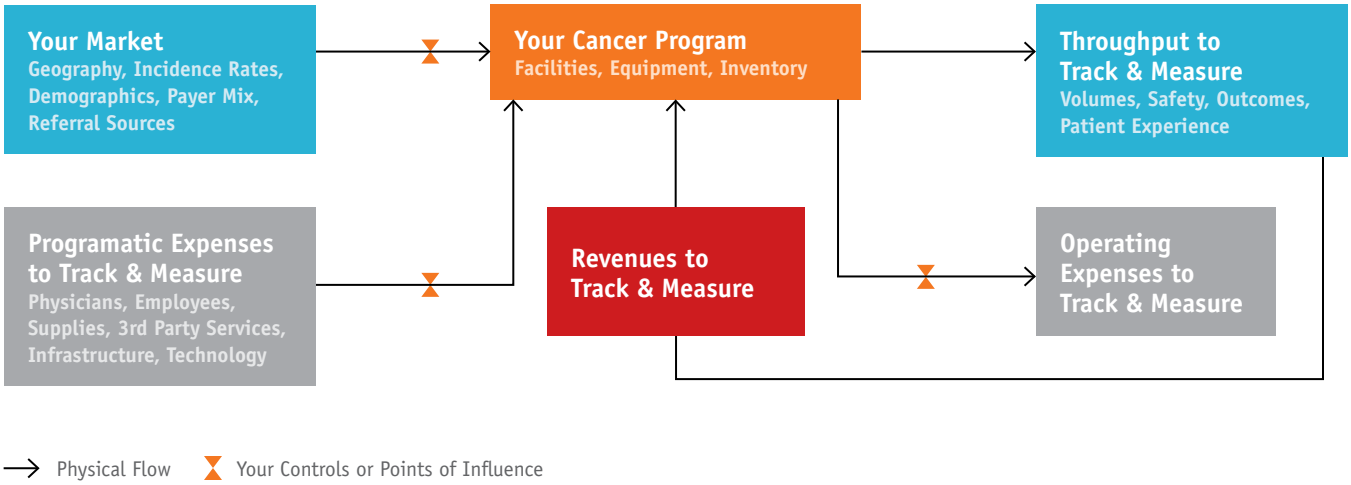


Figure 2. Cancer Program Goals, Critical Success Factors & Necessary Conditions

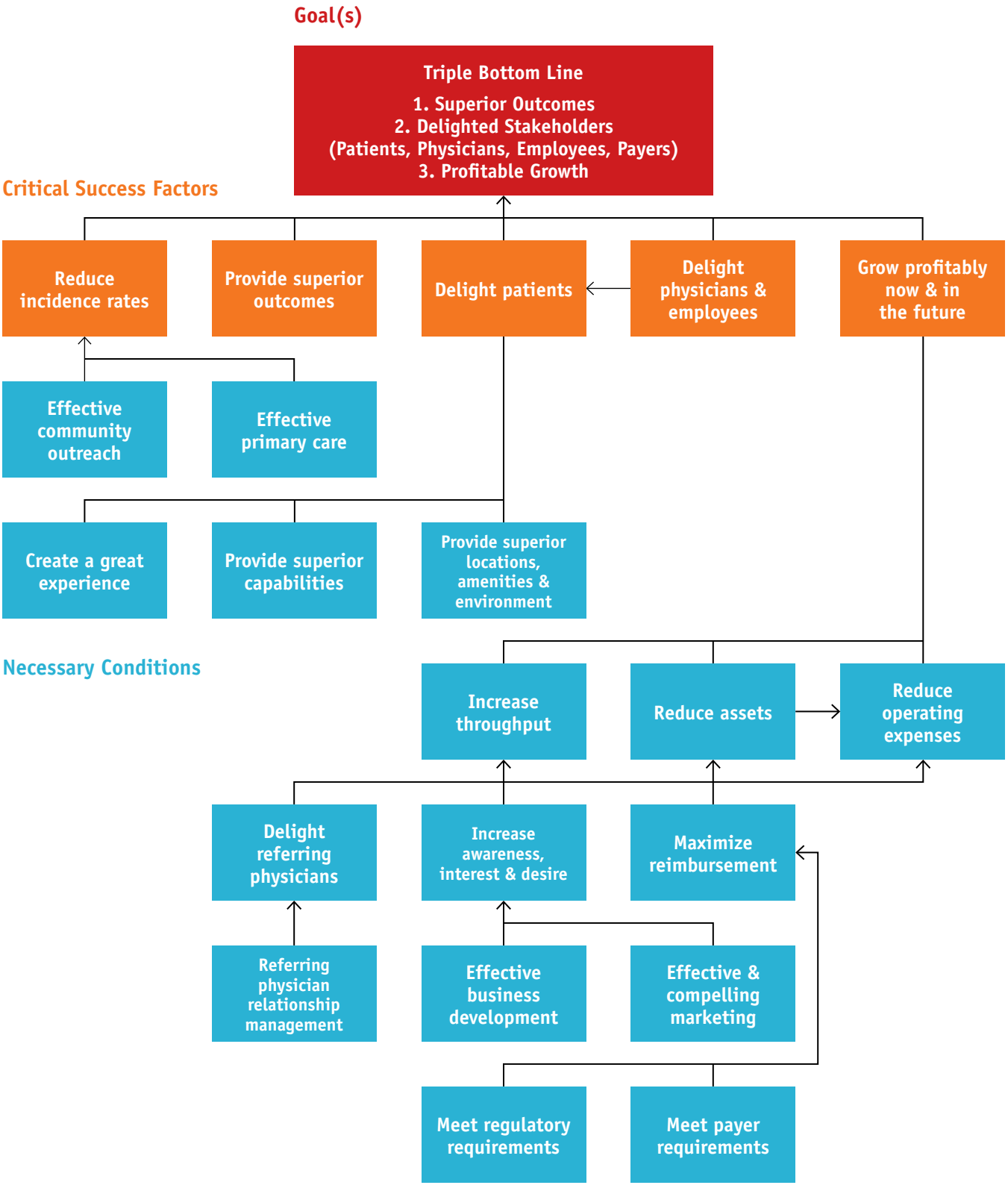
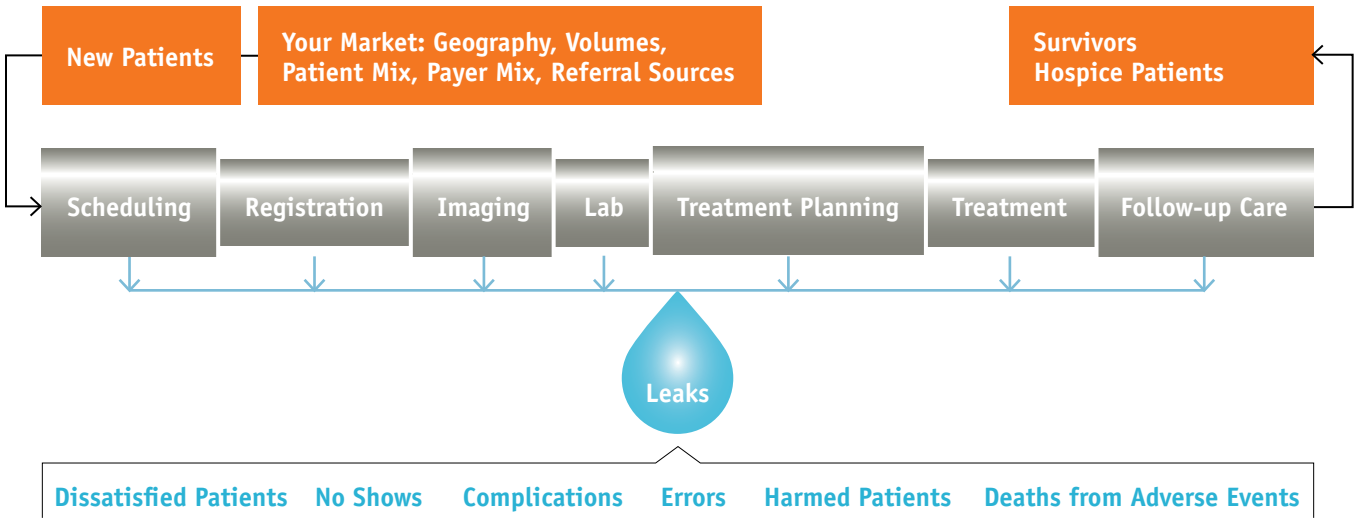


Figure 3. An Analogy of a Cancer Program as a "Pipeline"



3—Understand the Physics of the Cancer Program

Imagine a cancer program as a water pipeline that consists of different sections that represent different departments or resources (see Figure 3, above). The sections differ in diameter, representing different levels of maximum available capacity. In addition, each section of the pipeline contains leaks, representing patients experiencing complications, errors, harm, or death. In this example, water (i.e., patients) flows through this pipeline, and the rate at which the water flows through is defined as "throughput." A cancer program's throughput is determined by the narrowest section of the pipeline—the bottleneck or constraint—and by the number and sizes of the leaks along this pipeline. Constant changes in demand, bottlenecks, and leaks create turbulence and an uneven flow of patients throughout this pipeline. In turn this will lead to unevenness in the staff workload along the pipeline.

4—Define Key Performance Indicators

The next step is to use the systems-based framework and the cancer program's goals and critical success factors to determine which key performance indicators best define and measure the program's success. The task: optimize throughput—defined as the rate at which the cancer program achieves its goal(s). Throughput should be measured along five dimensions: volume, outcomes, safety, patient experience, and top line growth, i.e., revenues minus those direct variable costs that can be directly associated with an individual patient or procedure.

Once the cancer program's throughput begins to improve, focus on reducing cost—provided that such cost reduction efforts do not lead to a decrease in throughput. Two major factors drive cost:

1. ***Investments.*** All the money the cancer program has invested in assets to care for cancer patients, e.g., facilities, equipment, inventories, other assets, and liabilities.
2. ***Operating expenses.*** All the money the cancer program spends on caring for cancer patients. It is the sum of all direct fixed and all indirect expenses, i.e., those expenses that cannot be directly associated with individual patients or procedures.

Investments such as facilities and equipment often generate significant operating expenses associated with maintenance, support, and upgrades. Careful and appropriate reduction of investments will, therefore, lead to reduced operating expenses. Often, efforts to improve throughput will simultaneously lead to opportunities for reducing investments and operating expenses.

Effective Oncology Dashboards track a limited number of key performance indicators that:

- Matter to all stakeholders: the cancer program, patients, payers, employers, physicians, and employees
- Are directly related to the cancer program's goals, i.e., results
- Are well understood, valid, reliable, and easy to convert into corrective actions.

Figure 4, page 56, shows an example of an Oncology Dashboard with key performance indicators. Define concepts such as quality care, superior outcomes, and patient experience in actionable terms. For the purpose of this article, quality cancer care is defined as the combination of superior outcomes and a great patient experience. Together clinical quality and the level of service that a cancer program provides determine the patient experience as a critical success factor.

Figure 5, page 57, shows how these concepts relate to each other from the customer's point of view, i.e., patients and their families, referring physicians, employers, and payers. Note: the safety of a cancer program's services is often assumed and taken for granted by the general public. It is not a dimension of cancer care that new cancer patients will typically and explicitly consider in their choice of where to go for their treatment.

Figure 4. Example of an Oncology Dashboard

KEY PERFORMANCE INDICATOR	CATEGORY	VERSIONS OR DEFINITION	PURPOSE	FREQUENCY OF MEASUREMENT
Throughput	Volume	**Inpatients** • Admissions (scheduled, unscheduled, emergency, no shows) • Case mix (new and current patients, disease site) • Discharges **Outpatients** • Visits (scheduled, unscheduled, emergency, no shows) • Case mix (new patients, current patients, survivors, disease site) • Discharges	**Purpose** • Identify constraints • Level workload (Mura) and create flow • Prevent overburdening of physicians and staff (Muri) • Eliminate waste (Muda)	• Daily • Weekly • Monthly • Quarterly • Annually
	Safety	• Patients experiencing complications during treatment • Patients harmed as a result of errors	• Identify constraints • Strive for perfection • Improve the patient experience	• Daily • Weekly • Monthly • Quarterly • Annually
	Outcomes	• 5-year disease-free survival by cancer site and stage • 5-year progression-free survival by cancer site and stage	• Identify constraints • Strive for perfection • Improve the patient experience	• Monthly • Quarterly • Annually
	Patient Experience	• Dissatisfied patients	• Identify constraints • Improve the patient experience • Strive for perfection	• Monthly • Quarterly • Annually
	Financial	• Total net revenues—total direct variable expenses	• Identify constraints • Measure financial value added	• Monthly • Quarterly • Annually
Investment	Financial	• Total value of facilities + equipment + inventory + other assets and liabilities	• Eliminate waste (Muda)	• Monthly • Quarterly • Annually
Operating Expenses	Financial	• Total direct fixed expenses + total indirect expenses	• Eliminate waste (Muda)	• Monthly • Quarterly • Annually

5—Identify the "Performance Pivot"

In our current, dynamic, and complex healthcare environment, cancer programs require a powerful set of tools to effectively guide them towards their goal(s). The transformation process proposed in this article is adapted from three well-established and proven methods. Together, they complement each other and overcome the limitations of each:

1. ***Theory of Constraints*** (TOC) for optimizing an entire cancer program's performance as a whole.
2. ***Lean*** for continuously improving value, flow, quality, and the workload of physicians and staff, while eliminating waste.
3. ***Six Sigma*** for further reducing variation, complications, and errors.

TOC was developed by Dr. Eliyahu Godratt, an Israeli physicist who became an international manufacturing and business "guru" in the 1990s. In his book *The Goal*, he outlined his Theory of Constraints, a dynamic, systems-based and systematic approach to creating breakthrough improvements.[2] TOC enables cancer programs to focus first and foremost on the most critical factor—the constraint or weakest link—that limits the program's ability to achieve its goals. The result: the constraint becomes the

"performance pivot." By effectively leveraging the constraint, cancer programs can "pivot" towards their goals and, thus, create a breakthrough improvement. A cancer program's main constraint is often one of the following:

- Market
- Referral network
- Capacity
- Quality
- Management time
- Policies.

Improve & Learn Continuously

Constraints can and do move around over time, with or without active intervention, so it is important to establish an ongoing process of learning and improving. TOC consists of five focusing steps that enable cancer programs to effectively increase their throughput:

1. Identify the constraint
2. Exploit the constraint and generate as much throughput as possible with it
3. Subordinate everything else to the constraint to ensure a level and consistent throughput—and workload—across the entire cancer program
4. Elevate the constraint to increase throughput as needed
5. Don't stop; repeat step 1.

In many instances, the market or the referral network is the constraint, rather than current capacity or quality problems. A number of tools are available if a cancer program is looking to attract more patients.[6] Of course, cancer programs will need to have a compelling value proposition—i.e., unique selling points—to convince more patients to come to their cancer program rather than to the competition. In addition, stellar patient services and an excellent patient experience should be critical elements in the value proposition.

Figure 6, page 58, shows how to best integrate TOC with Lean and Six Sigma. TOC enables cancer programs to maintain a holistic system perspective, combined with a prioritization of key performance indicators. At the same time, Lean and Six Sigma allow cancer programs to exploit constraints, subordinate other processes and resources to the constraints, and, finally, elevate the constraint if feasible. This integrated approach focuses major efforts on addressing the constraint that most holds a cancer program back, while also learning about the many operational and clinical aspects and dynamics that ultimately drive the success of the cancer program. In addition, this approach is scalable in that it can be applied at all levels of the organization down to individual processes, departments, and teams. OI

Paul Schilstra is President of primeASCENT, LLC, an oncology management consulting firm that helps cancer programs increase their patient throughput and profitability. www.primeascent.com.

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Figure 5. Quality Care from the Customer's Point Of View

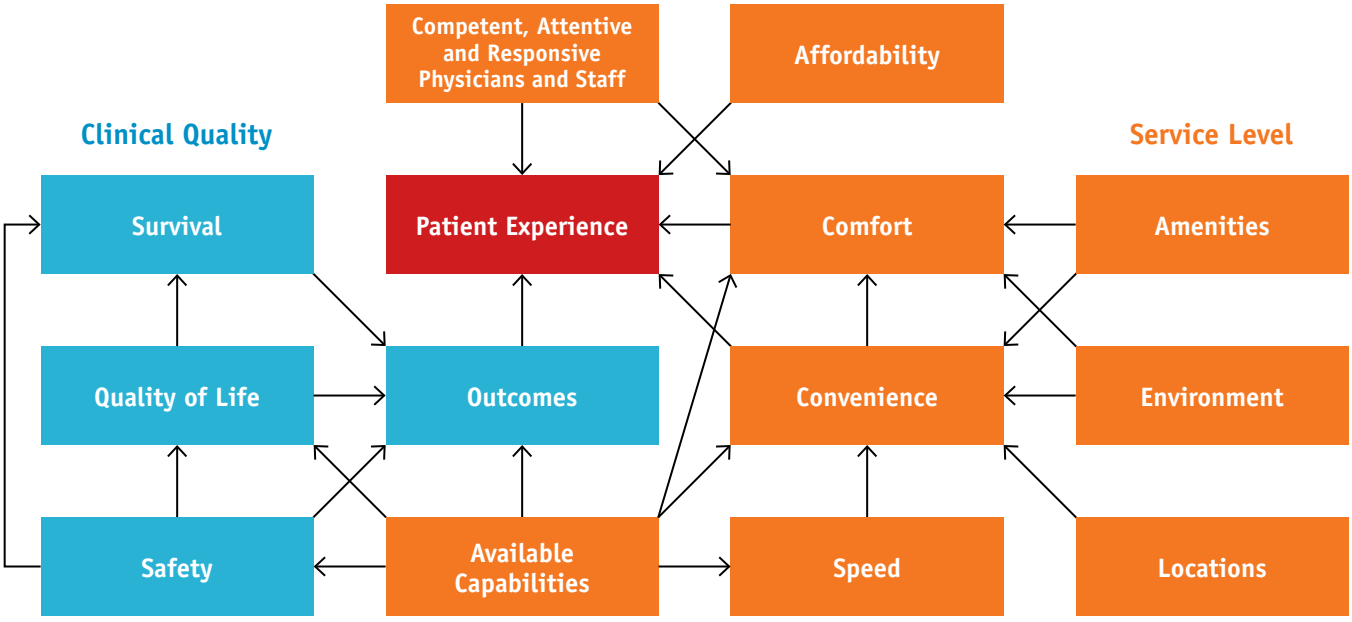
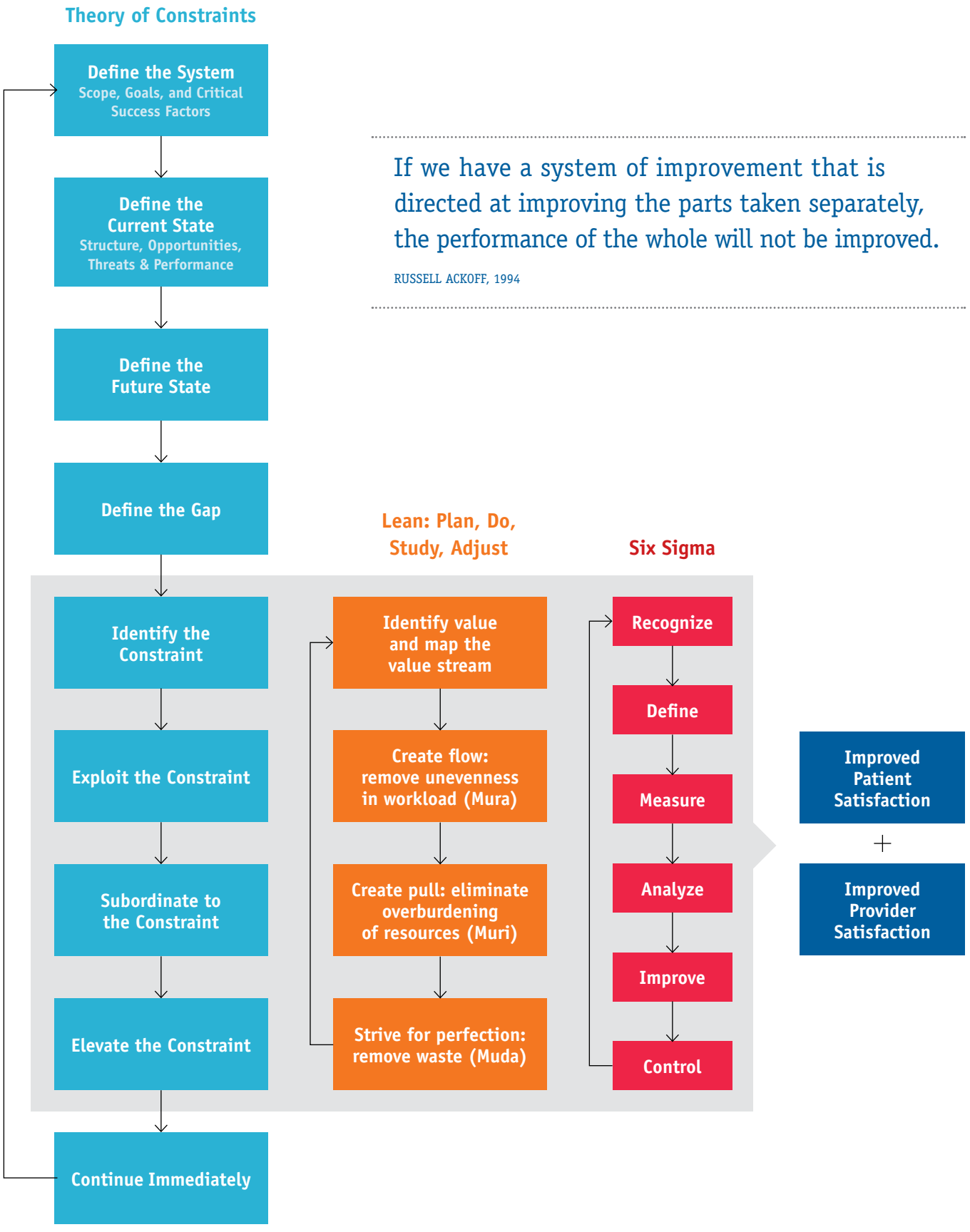


Figure 6. An Integrated Process of Ongoing Improvement



If we have a system of improvement that is directed at improving the parts taken separately, the performance of the whole will not be improved.

RUSSELL ACKOFF, 1994