Improving and Proving Healthcare Quality and Value through Physical Simulation

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ABSTRACT

Healthcare providers world-wide are discovering how simulation modalities in clinical care settings change practice behaviors. Not only must new behaviors result in improved and safer patient care, but the investment of limited resources must prove worth the tangible and intangible outcomes. This paper presents an Organizational Change Management (OCM) framework used by two healthcare provider systems (one government and the other private) to satisfy this dual imperative—to improve healthcare quality through physical simulation; then prove its value. The first example involves the US Department of Veterans Affairs (DVA) hospital in Durham, NC. To meet current American Heart Association (AHA) guidelines for resuscitation, the DVA used an OCM framework to guide physical simulation efforts during the rollout and implementation of three, necessary changes: 1) a stroke code emergency policy; 2) use of new emergency code carts; and 3) intraosseous needle (IO) use for cardiac arrest patients. The OCM framework positioned grassroots stakeholders to increase adoption and sustained commitment by role-playing emergency response situations requiring decision-making. The second example involves a healthcare system in Birmingham, AL with an objective to reduce central line blood infections in intensive care units at local hospitals. This healthcare system also implemented a comprehensive value stream measurement methodology which generated six types of quantitative and qualitative metrics to prove the value (including Return on Investment (ROI)) of quality care and patient safety culture change initiative. Both the OCM framework and the ROI value stream evaluation methodology assisted with *planning* and *proving* the value of simulation to support organizational and behavioral change initiatives as well as address organizational education and training requirements.

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INTRODUCTION

Change is a constant in healthcare organizations today. The speed and rate of change is making it more difficult to provide safe, quality care patient outcomes that society demands and deserves. As a result, healthcare providers are discovering new ways to use simulation outside of the traditional simulation centers and simulation labs.

Since simulation is a means to achieving an end (i.e., qualified people performing to a specified work standard to produce required accomplishments), healthcare simulation can position its capabilities to improve and sustain worthy human performance accomplishments as part of larger organizational performance improvement change initiatives. One such framework is the Organizational Change Management (OCM) methodology. The OCM methodology integrates simulation for testing new processes, policies, and equipment while engaging people from the grassroots level as an integral part of the change process rather than passive receivers of top-down organizational change.

To demonstrate this assertion, this paper discusses how a Veterans Affairs (VA) Hospital at Durham, NC used the Organizational Change Management framework. They integrated physical simulation during the rollout and implementation of new emergency code carts, intraosseus needles, and a stroke code emergency policy to meet quality care standards.

As important as it is to improve and sustain human performance using physical simulation, it is also important to measure and prove the value of the means used to achieve and sustain the patient safety and quality care outcomes. Those funding change initiatives are as resistant to change as anyone else when it comes to how they make those funding decisions. How do you justify the additional costs associated with integrating simulation into a performance improvement change initiative? How do you credibly answer skeptical inquiries whether or not the performance results were worth the investment based on the tangible and intangible metrics the organization values? There is a Return on Investment (ROI) value stream evaluation methodology that provides a framework that easily integrates with the OCM methodology to help credibly answer these skeptical questions.

The second part of this paper will focus on this ROI value stream evaluation methodology. It will discuss how this evidence-based evaluation system was integrated into an OCM-driven performance improvement initiative using physical simulation to change behavior at a group of local hospitals at Birmingham, AL to reduce central line blood infections of intensive care units.

IMPROVING HEALTHCARE QUALITY THROUGH PHYSICAL SIMULATION

The Organizational Change Management Framework

Organizational Change Management is a framework used to manage the effect of new business processes, changes in organizational structure, or cultural changes within an enterprise (Rouse, 2009). Simply put, OCM addresses the "people" side of change management. OCM is:

- a systematic approach;
- beneficial when change requires people throughout an organization to learn new behaviors and skills;
- a means to proactively gain and retain stakeholder buy-in and commitment;
- formally sets expectations; and
- actively manages communication (Rouse, 2009).

A successful OCM strategy includes:

- agreement on a common vision for change with no competing initiatives;
- strong executive leadership to communicate the vision and sell the business case for change;
- a strategy for educating employees about how their day-to-day work will change;
- a concrete plan for how to measure whether or not the change is a success;
- follow-up plans for both successful and unsuccessful results; and
- rewards, both monetary and social, that encourage individuals and groups to take ownership for their new roles and responsibilities (Rouse, 2009).

OCM is a strong contrast to the traditional "communicate and train" approach that is the norm in too many organizations where several people make a decision and then:

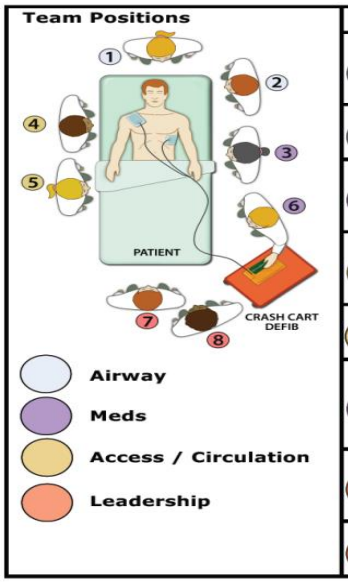
1. send out e-mails with a target start date;
2. produce a non-iterative slide presentation on the Learning Management System (LMS);
3. expect everyone to click through the LMS presentation and actually pay attention to it; and
4. rarely ask for user input (Maurer, 2010).

This traditional approach fails to identify latent threats and unforeseen barriers to change implementation. These unforeseen threats and barriers require unplanned meetings to determine why the change is not working and perplexed confusion when answers are not forthcoming. The OCM methodology avoids these issues.

An OCM at Durham Simulation Program Performance Improvement Initiative

The Durham VA Medical Center (DVAMC) is a 271-bed tertiary care facility serving the healthcare needs of Veterans in a 26 county area of North Carolina. It is located in the Veterans Integrated Service Network (VISN) 6, which includes facilities in NC, Virginia, and West Virginia. Due to the regional organization of the VHA, there are often VISN leads in specific functional areas, such as Simulation. The co-author serves as the VISN lead for Simulation.

The DVAMC Simulation Program started in 2010 with the advent of a hospital-wide Code Response Team (CRT) Training program. The goal of this program has been to emphasize teamwork and communication skills among healthcare providers who are part of the Emergency Response Team. The team members are from different areas of the hospital and often do not know one another, yet are expected to come together to form a cohesive unit. Figure 1 is the chart used to show the roles that each team member has during the actual response.



	Who	Role	Responsibilities
1	SICU resident / Respiratory Therapist	Airway Manager	• Provide airway equipment • Intubate • Ventilate • Check pupils
2	Respiratory Therapist / SICU Intern	Airway Assistant	• Assist airway manager • Oxygen and Suction • Draw ABG
3	MICU Nurse	Bedside Assistant	• Check pulse • Obtain vital signs / SPO2 • Obtain peripheral IV access • Push medications
4	SICU Nurse	Circulation Manager	• Provide glucometer • Check pulse • Place defibrillator pads • Perform chest compressions
5	MICU Resident	Procedure MD	• Central venous access • Draw lab samples (syringe) and hand to CCU RN
6	CCU Nurse	Crash Cart Manager	• Deploy code cart, BVM, backboard and defib pads • Prepare drugs • Operate defibrillator • Prep/send blood for labs
7	CCU Resident	Treatment Leader	• Assess team and data • Direct treatment • Set priorities • Triage
8	Nurse Manager / OTC	Data Manager	• Deploy record of CPR • Document • Prepare label for labs

Figure 1. CRT Roles and Responsibilities

Over 90 CRT's have been held throughout the hospital over the past several years with over 400 different individuals having participated in one or more sessions. Using a high fidelity computerized patient simulator that can talk, breathe, and react to interventions, these healthcare providers have practiced teamwork and communication skills in a safe learning environment. The CRT's have also identified and fixed systems issues related to telephone paging issues, hospital signage, locked doors, and faulty equipment. Given the success of CRT's, it has been a natural progression to use simulation methodology to effect change at the grassroots level. Figure 2 is the poster used to display teamwork and communication topics:

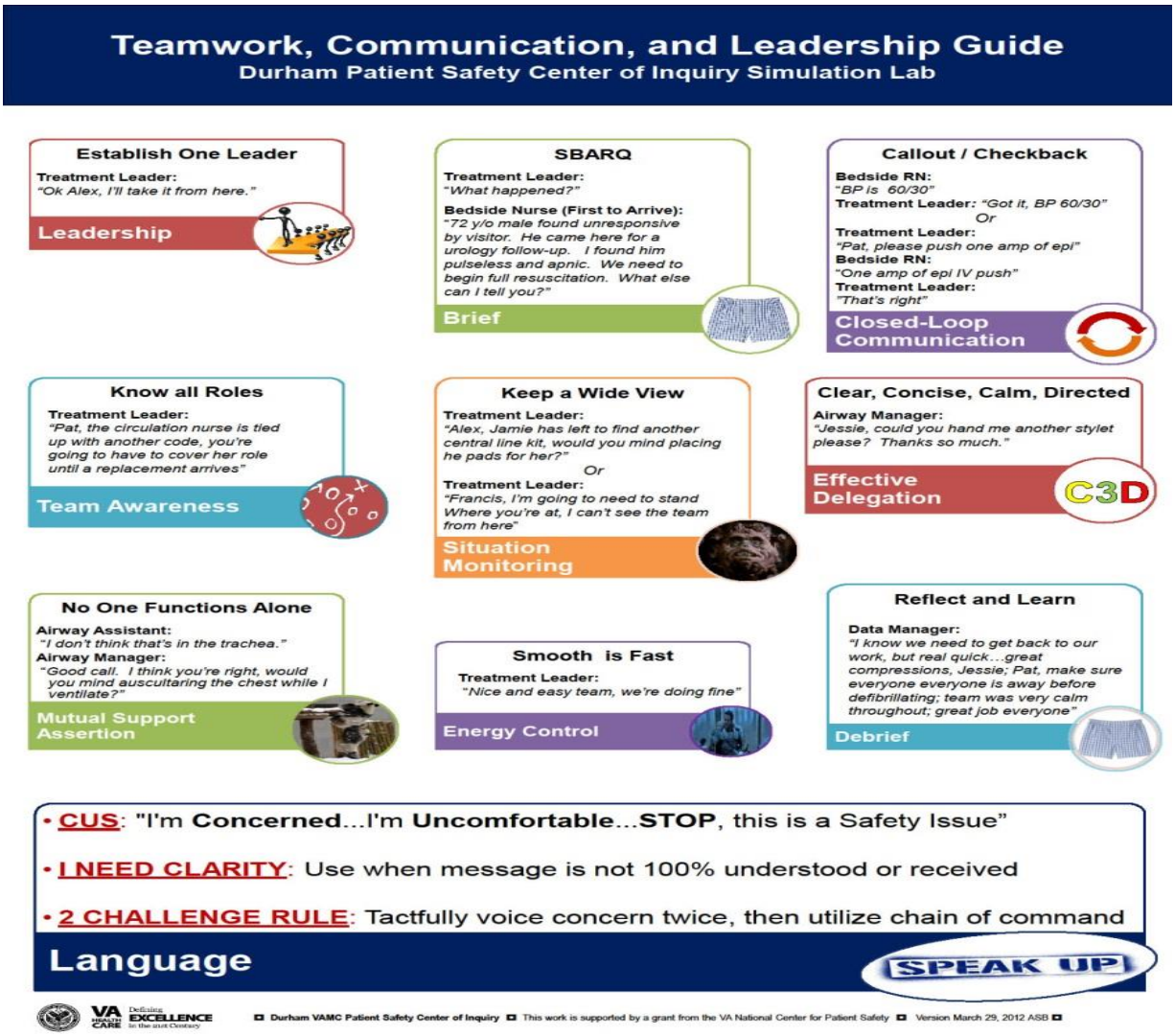


Figure 2. Teamwork and Communication Poster

Approximately one year after the implementation of the CRT program, the hospital was charged with developing a new stroke code response plan due to national VHA mandate. Rather than have a committee gather around a conference table and decide development and implementation, the Simulation Program stepped up to the challenge and used the CRT program as a starting point to analyze how to develop this new process.

First, a CRT was called. When the responders arrived, the facilitators declared that the patient had right-sided weakness, facial droop, and slurred speech. This was indicative of a stroke rather than a cardiac arrest.

Unlike the CRT simulations, a standardized patient (or trained medical actor) was used for stroke codes to help provide realism. Figure 3 shows the response team interacting with a standardized patient.

The Simulation Program engaged responders in discussions about who would be the appropriate responders for this situation. It was agreed that the entire code team was not needed.

The Cardiac Care Unit (CCU) emerged as the rightful leader for stroke care and agreed to be the team paged in the future. Over the next 6–8 months the stroke code process was solidified using simulation. Stoke codes were called on several of the inpatient floors, and the CCU responders came.

As the main stakeholder for this process, the Neurology resident was also paged. Roles were delineated for these responders as well as the first responders on the floors (patient care nurse, charge nurse, nursing assistant, ward clerk, patient transport, chaplain).

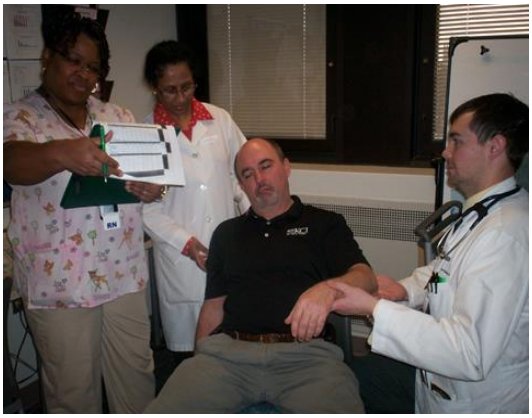


Figure 3. Interacting with a Standardized Patient

Debriefing for these simulations, improved processes such as: the paging system; the electronic medical records order sets; and the establishment of one number to call for any emergency. This change implementation engaged the staff and allowed questions to be raised that otherwise would have only been raised around real patients—which is not ideal. The process was developed and implemented sooner, rather than later, due to simulation use.

Current stroke code simulations over the past year have focused on the patient entering the Emergency Department with stroke symptoms, going to CT scan, and coming back to the ED for treatment including tPA administration.

Using the CRT platform to launch this change was a successful strategy. Given that success, the Simulation Program analyzed and implemented a rollout of new code carts as the old ones were getting old and in need of repair. Because the cart manufacturer would not repair the old carts, the facility was forced to obtain new ones.

Code cart configuration (see Figure 4) proved to be a challenging experience, as each drawer needed to have optimal organization. The Simulation Program obtained a demonstration cart and used it in CRT's to test how healthcare providers accessed it and then commented on the content organization.

In addition, the demonstration cart was made available in the Simulation Center for stakeholders to view and suggest changes. This bottom-up effort proved to be successful to the change management process as the new code carts were seamlessly replaced over a long, holiday weekend.

The simulation program staff realized that the new code cart rollout could be viewed as a new process improvement, rather than just a new piece of equipment. In this vein, the use of intraosseous (IO) needles was introduced along with the new code carts.

Figure 4. Configured Code Cart

In the past, clinicians often found it difficult to get quick intravenous access for cardiac arrest patients. Data showed that starting an IO needle was quicker, easier, and safe for the patient than using central line kits stored in the old carts. However, central line kits have been kept in the new code carts so those wishing to use them could still do so, though the use of IO's is strongly encouraged.

PROVING HEALTHCARE VALUE THROUGH PHYSICAL SIMULATION

While OCM provides a workable framework for improving healthcare quality through physical simulation, CEOs and CFOs at hospitals are increasingly demanding to see the value of their investments using financial (typically ROI) and non-financial (typically intangibles) metrics. They also want to see evidence that results claimed by the change effort are credible or part of a larger set of investments in other programs.

Why? Analyzing data collected during interviews of Health Care Advisory Board members, The Advisory Board Company identified four forces shaping future margins for healthcare providers (Kern, 2014). These four forces—Decelerating Price Growth; Continuing Cost Pressure; Shifting Payer Mix; and Deteriorating Case Mix—are producing dramatic shifts with financial and clinical profiles. Determining the tangible and intangible impact at the societal and provider levels, to include ROI, requires a new set of skills for these new models to establish value of the investments for the healthcare system (Buzachero, Phillips, Phillips, & Phillips, 2013).

In addition to this shifting margins challenge, recent federal mandates require healthcare providers to shift costs from a Pay-for-Service to a Pay-for-Value model for Medicare reimbursements. This change alone is projected to require hospitals to reduce their costs between 14.5 to 17% to break even on Medicare reimbursements (Sachs, 2010). Even more challenging is the Triple Aim model that focuses on decreasing costs, increasing value through improved outcomes and services, and expanding coverage to care for the population or communities of health (Berwick, Nolan, & Whittington, 2014).

As a result, there is a heightened imperative by healthcare executives to build internal systems that meet the four margins shift and the Triple Aim and Pay-for-Value requirements. But how does one prove that one has achieved the desired organizational change and also prove the value of the needed behavioral changes desired from the investment funding? Recently, hospitals have increasingly turned to establishing ROI measurements from a business perspective by focusing on cost, revenues, or operating efficiencies. They struggle with proving the benefits and value of clinical applications in financial terms that are typically considered quality and safety matters (the domain of healthcare simulation).

Given this dramatic shift in how healthcare value is defined, the challenge is how to measure clinical ROI in terms of measurable impact on patient care (Page, 2010). It is not limited to a mathematical ROI calculation anymore. As the Best Practices Committee for the US Chief Information Officer and the Federal CIO Council recommended, to create a better understanding of value as it relates to ROI, we must develop a "value measuring methodology" (2002). Even more, crafting and aligning the initial and ongoing program objectives and measurements with program and stakeholder needs is a puzzling challenge. This is especially true when credible ROI results are expected to ensure measurable accountability is in place when delivering successful programs through people using technology to learn and perform (Spires, 2011). Healthcare simulation has a foot in both the patient safety/quality care and healthcare technology camps and can, therefore, play a critical role in helping the transition to aligning ROI measures with a value measuring methodology. The following case study will show how one healthcare provider accomplished this.

A Comprehensive Unit Based Safety Program Performance Improvement Initiative

A group of hospitals located at the Birmingham, AL metro area initiated a Comprehensive Unit Based Safety program to reduce central line blood infections in their intensive care units (ICU) (Buzachero et al., 2013). These types of infections are dangerous and hard to treat. The Centers for Disease Control and Prevention reports that almost 250,000 bloodstream infections occur in hospitals every year. They occur most often in patients with a central vascular catheter that is needed to provide medication or fluids or to check blood oxygen levels and other vital signs. These catheters are very important for treatment. They are complicated to insert them correctly. It is also difficult to keep the entry site and dressing clean to prevent infections.

To reduce these infections at their ICUs, these hospitals decided to implement a new set of clinical and communication procedures. This behavior change involved a checklist system that established specific steps for doctors, nurses, and technicians to follow. It also included an increased use of the "speak up" technique to enforce compliance through peer accountability.

Physical simulations played an important role in validating the new procedure, adapting them to the hospital's setting, and familiarizing the ICU teams with the new clinical and communication procedures by having them practice using them in a safe environment. The new challenge was twofold. First, they needed to prove the value of the investment to this approach. Second, they needed to align this program to satisfy the needs of the all key stakeholders to ensure adoption and sustainment.

Chain of Impact (Value) Alignment

Aligning performance improvement efforts to provide better quality care while ensuring patient safety, decreasing health delivery costs, and increasing services to the local community is a daunting task. Earning the support of the affected stakeholders adds another challenge. What is needed is a conceptual model to frame and manage this organizational change need alignment, adoption, and sustainment challenge.

The Chain of Impact (Phillips & Phillips, 2007), or ROI Value Stream Impact Chain, (see Figure 5. ROI Value Stream Impact Chain) provides such a framework. Because simulation is a means to improve human capital performance to deliver valued heath care, the alignment chain must reflect the desired patient care outcomes and healthcare results. This chain of impact connects the dots using six types of measures that are both quantitative and qualitative to deliver credible bottom-line accountability to establish the level of quality care and operational efficiencies that are critical to survival in this new healthcare market.

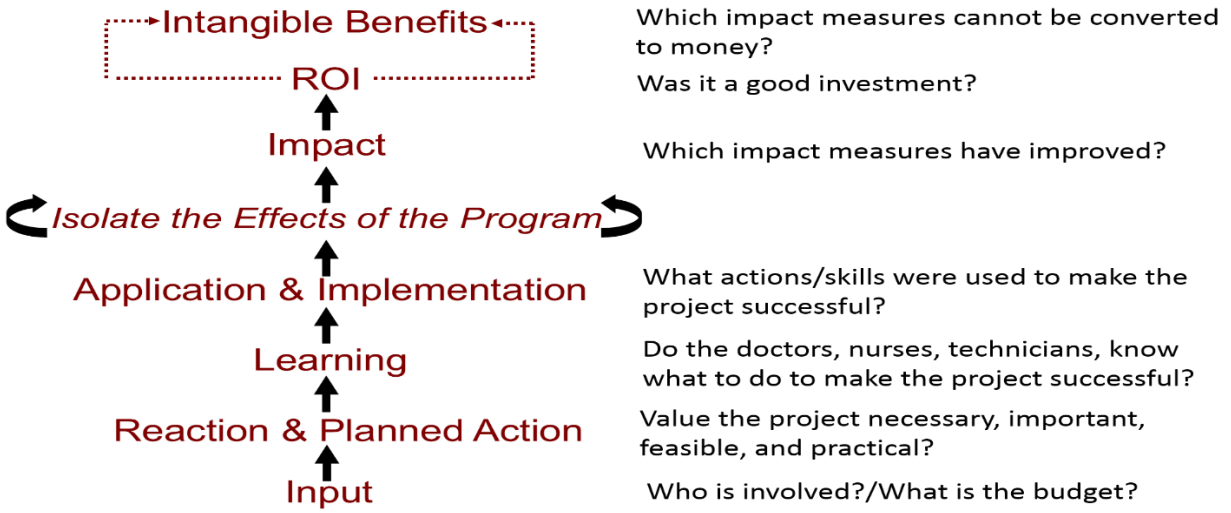


Figure 5. ROI Value Stream Impact Chain

One phase of this value chain is to isolate the effects of the program from other initiates that could directly or indirectly contribute to improved performance outcomes. This is important to establish credibility with senior executives by proving performance improvement credit is isolated to what the program achieved. An article in Health Affairs, published by Project HOPE, emphasized this point by stating, "The business case would be easier to assess if interventions were implemented with strong evaluation designs that could isolate intervention effects" (Lurie et al., 2008). There are ten isolation methods to consider based on what works best for an organization but they are beyond the scope of this paper.

Program Alignment Value Model

Establishing a Chain of Impact framework positioned this chain of hospitals to align the value of this bloodstream infection reduction program at five levels. Five levels of data were defined to address the needs of stakeholder issues at these different levels and establish the metrics they will use to prove the value added by this program. Research indicates that the lack of business alignment is the number one cause of project failures (Buzachero et al., 2013). Obtaining and retaining program funding must focus clearly on desired outcomes in terms of business needs and business measures to produce credible ROI. It is important not to overcomplicate this needs assessment. It is important to complete because it establishes the program objectives and measures you will use to prove the value of the program.

Alignment in this case started with asking whether or not the program was worth the investment. The answer was clearly "yes", given the Pay-for-Value and Triple Aim shifts along with the CDC report previously discussed. Once this decision is made, answering the Chain of Impact questions align the Impact, Application, Learning, Reaction, and Input levels. Figure 6 indicates the alignment for these hospitals.

Figure 6. ROI Value Stream Chain Needs Alignment

These questions are not answered in isolation. Rather, it involves the key stakeholders at various levels of the organization from the doers to the funders. This is an important element of OCM and the ROI value stream methodology. This alignment also provides the foundation for establishing the aligned measures required to produce credible ROI.

With these aligned needs in place, the next step is to develop objectives for each level that will define how you will measure each level. Figure 7 below indicates the objectives and outcome value stream measurements for meeting the needs established at Figure 6.

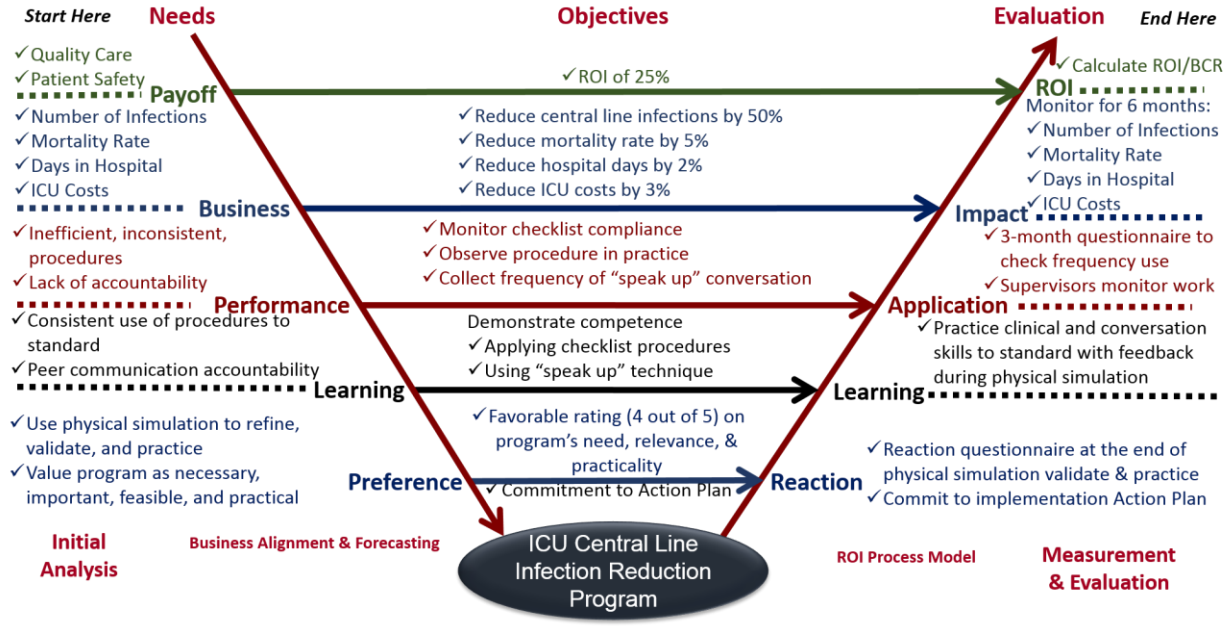


Figure 7. ROI Value Stream Alignment Model

Developing these objectives involved the stakeholders who drove the value stream of aligned needs for the program. These same stakeholders likewise collaborated with the clinical performance improvement team to develop the measurements used to link these metrics with the stakeholder needs at each value stream level. They also decided the level of evaluation they were willing to fund based on organizational priorities and program impact.

Taking this alignment approach allowed measurements to align to the needs of stakeholders critical to the success of the program. Further, both quantitative and qualitative measurements where collected to provide a balanced perspective. Measurements also occurred at different time to produce tactical metrics that allowed adjustments during implementation to achieve the desired strategic results. Adding the ROI value stream methodology to the OCM framework produces a methodology that can improve and prove the quality and value of healthcare using physical simulation.

Credible ROI is More Than a Calculation

A common question asked is how to establish a credible ROI percentage objective. The ROI formula is simple: (Program Benefits – Program Costs)/Program Costs multiplied 100%. Credibility is addressed by the quantitative and qualitative data defined and aligned by the key stakeholders using the ROI Value Stream of Impact (see Figure 5). In addition, to continuously drive credibility, standard principles have been developed over the past 30+ years that provide a common frame of reference like Generally Accepted Accounting Principles provide for that profession. For example, always include all costs associated with OCM/ROI activities. Another cost principle when calculating an ROI is, when in doubt, put it in. For benefits, it is the opposite; when in doubt, leave it out. ROI calculation results are meaningless if they are not believable.

Global benchmarking data from the ROI Institute indicates that CFOs and CEOs are expecting the same ROI for non-capital investments represented by the two cases presented in this paper as they do for capital investments (e.g., buildings, equipment, tools, etc.). Simulators can have a foot in both camps since they can be a capital investment to support a non-capital investment. Since simulators exist to support non-capital performance improvement investments, their prorated costs are included in the non-capital ROI calculation. The expected ROI can range from 0 (or breakeven) to 30%. The average ROI sought is 11-15% (Phillips & Philliips, 2010). Where there is a higher risk, higher ROI goals are sought. The five objectives sought in the above case study were achieved but not officially published.

In addition, not every OCM/ROI Methodology effort will generate an ROI calculation. Costs increase as data collection and interpretation activities move up the Evaluation side of the ROI Value Stream Model (Figure 7). In addition, lower level evaluation metrics also establish valuable, non-financial ROI metrics. Therefore, executives decide what levels they want to fund during the evaluation planning phase. Global benchmarking studies indicate ROI is calculated on 5-10% programs and level 4 business impact data is collected for 10-20%. Criteria executives use to fund Impact and ROI evaluations include the cost of the program, the importance of the program to strategic objectives, executive interest in the program, and the visibility of the program (Phillips & Phillips, 2009).

Two published ROI Impact Studies using this value stream methodology as part of the performance improvement solution are offered as evidence this OCM/ROI methodology has broad application potential in the training and simulation industry. One included the use of physical simulation in the performance improvement and the other did not, but should have. Healthcare simulation professionals are finding growing interest in their capabilities by healthcare educators and providers. ROI Impact studies are also gaining wider acceptance and adoption. The two examples are offered as evidence.

The first ROI Impact Study offered involves a hospital training program designed to prevent sexual harassment in the workplace. Two costly impact results of this unacceptable behavior were complaint investigations and turnover. The program reduced a 24% turnover rate involving 8,000 employees to 20% and produced a defendable and credible ROI of 1,054%. The ROI objective was 25%. This ROI does not include the intangible benefits of improved job satisfaction, reduced absenteeism, stress reduction, and community image.

A second ROI Impact Study occurred at a Canadian general hospital within Interior Health, British Columbia. It documents the results on a training and education program to improve patient outcomes, reduce complications and length of stay, and lower per-capita costs during recovery after colorectal surgery. This program resulted in an ROI of 118%. The ROI figure and improved patient safety and quality care results attracted interest from other surgical specialties within the hospital (Schell, 2012).

It is important to note that a negative ROI does not necessarily mean a program is discontinued. This OCM and ROI Methodology provides data that allows decision makers to understand what happened to make evidence-driven

changes in the denominator (the costs) that can turn the ROI positive in the future to drive value. Remember, ROI is simply a formula used to establish comparable value and return on dollars invested. Analysis by the ROI Institute indicates that 20%-30% of programs have a negative ROI with 10% of those being discontinued (Phillips & Zuniga, 2008). It is rare when ROI is the only factor. Intangibles (e.g., reputation, culture, social responsibility, national security, lives saved, etc.) in the Chain of Impact can offset a negative ROI.

CONCLUSIONS

Including the use of physical simulation at the Durham VA Hospital and Birmingham metro hospitals helped influence the organizational framework by identifying deficiencies in current and proposed process and procedures from the perspective of the people expected to implement and comply with them. It also addressed resistance issues by involving all stakeholders in the change process to create a collaborative effort rather than a top-down mandate.

Both quantitative and qualitative measurements were used to establish credible data metrics and engage the affected stakeholders to drive positive change. Tactical level measurements at the Reaction, Learning, and Application phases allowed for adjustments earlier to achieve the desired strategic results at the Impact and ROI phases at a lower cost. This is opposed to implementing a solution and then trying to figure out and then fix what went wrong after the Impact and ROI metrics are established.

This combined OCM/ROI Value Stream Measurement framework seems to indicate easy adoption to other healthcare modalities committed to improving quality care and patient safety outcomes. This paper discussed two—(1) inserting updated technology insertion (i.e., code cart) that included improved procedures and (2) implementing a new procedure (i.e., ICU central line clinical and communication accountability procedures) to meet higher quality care and patient safety standards. Since the focus was on the people side of the performance change equation, any healthcare change effort could benefit from wrapping the change initiative within this performance results-focused framework.

Driving aligned quantitative and qualitative metrics that provide the foundation to establishing credible ROI for non-capital investments is growing around the globe. The 2014 International Meeting for Simulation in Healthcare Conference offered multiple education sessions where establishing the ROI of simulation was the central topic. Attendance at these sessions revealed strong interest by healthcare simulation professionals in proving the value they bring in the healthcare value stream in response to cost-cutting trends CEOs and CFOs are directing at hospitals and healthcare chains. This includes the ability to establish credible, sustainable, and repeatable financial and non-financial ROI metrics and results.

Simulation experts can prove the value of using simulation to change and/or sustain improved human performance. It is possible to produce six types of quantitative and qualitative metrics that matter to stakeholders at various levels of an organization to justify human capital capability development investments that include simulation as a means to the end.

Using a simple organizational change management framework and value-stream driven evaluation methodology that is aligned to meet strategic needs as well as easy to explain and implement (if properly planned) will appeal to decision-makers and stakeholders. We can credibly prove the value that simulation adds to the bottom-line; however it is defined in tangible and intangible terms.

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