Systems Thinking, Healthcare Organizations, Global Health, and the Advanced Practice Nurse Leader

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> *The true professional is a person whose action points beyond his or herself to that underlying reality, that hidden wholeness, on which we all can rely.*
>
> —Parker Palmer

Introduction

Health care's tenuous outlook, both within the United States and globally, necessitates the rapid evolution of advanced practice nursing to a station of independent practice, autonomy, flexibility, and leadership. As the "powers that be" struggle to make sense of fragmented systems, a dwindling budget, significant global health issues, and an ever-expanding deficit, coupled with a clamoring for increased access to care for all, the Institute of Medicine (IOM), The Joint Commission, the Robert Wood Johnson Foundation (RWJF), the United Nations (UN), and other national and international authorities, along with the American Association of Colleges of Nursing (AACN) and the National Organization of Nurse Practitioner Faculties (NONPF), have called for a reconceptualizing of health professions education and development to meet the needs of the

healthcare delivery system while maintaining quality, safety, and ethical practice. Meanwhile, nursing has been catapulted into the limelight as a solution to the burgeoning masses who are now accessing insurance benefits.

Transforming the healthcare system in the United States to meet the demand for safe, quality, and affordable care has necessitated a fundamental shift in thinking regarding the roles of many healthcare professionals, including advanced practice nurses. The 2010 Affordable Care Act represented the broadest healthcare overhaul since the 1965 creation of the Medicare and Medicaid programs, but the current healthcare workforce remains woefully unprepared to meet the need. Nurses, heretofore unable to fully participate in the resulting evolution of the U.S. healthcare system because of a variety of historical, cultural, regulatory, and policy barriers that limited nurses' ability to contribute to broad, meaningful change, are now being called on to lead the charge in primary care as well as wellness and prevention efforts.

Dubbed "Obamacare" by many, the Affordable Care Act has given tens of millions of previously uninsured Americans access to care. These individuals are now looking for primary care providers, and estimates reflect a shortage of providers ranging from a low figure of 52,000 to as many as 90,000 by 2025 and will worsen because of the aging population. It is no exaggeration to say that the success of the healthcare law, and indeed the U.S. healthcare system, rests on providers choosing to do something that is not always in their economic self-interest, given that reimbursements in primary care are low when compared with those of specialty care venues. Acceptance of advanced practice nurses as a viable solution to the primary care crisis has been slow in coming; even with these staggering figures, some state medical boards and medical advocacy groups have remained oppositional (Iglehart, 2013).

Causing even more alarm, the dearth of a systems approach to global health care became acutely evident with the recent Ebola crisis, with its rapid, unchecked spread to adjoining countries and other countries around the globe in which the United States has a large stake. The message by senior UN officials briefing an informal meeting of the General Assembly at UN headquarters on the public health crisis emanating from the Ebola virus outbreak was threefold: the need for resources for immediate response to the disease that has affected some 23,000 people, with 9,300 deaths; the need to begin planning for revival and recovery; and the need to implement systems to limit spread to other countries. Dr. David Nabarro, the Secretary-General's Special Envoy to the United Nations, noted in January 2015

that having strong surveillance capabilities on the ground to identify people with Ebola, confirming diagnosis, quickly arranging effective treatment, identifying people the patient was in contact with, and keeping those people under review for 21 days "is a really difficult task"—especially given that all these steps must be coordinated through 63 different government structures in an area the size of France (UN News Centre, 2015).

Despite the increased prominence and funding of global health initiatives by the United States and other countries, efforts toward expansion of contiguous health services across the globe have fallen short of the policy dictates in the United States and United Nations Millennium Development Goals (United Nations, 2015). Advanced practice nurses, as change agents, are needed to define the view of global health as a compilation of complex adaptive systems with path dependence, feedback loops, scale-free networks, emergent behaviors, and phase transitions and to uncover relevant lessons for the design and implementation of health policy and programs and strategies. The implications of the application of systems thinking include more attention to local context, incentives, and institutions; anticipating certain types of unintended consequences that can undermine efforts; and developing and implementing programs that engage key players through transparent use of data for ongoing problem solving and adaptation.

In 2008, the RWJF and the IOM launched a two-year initiative to address the need to assess and transform the nursing profession. Through the RWJF initiative, the IOM appointed the Committee on the Future of Nursing, with the purpose of producing a report that would make recommendations for an action-oriented blueprint for the future of nursing. Through its deliberations, the committee developed four key messages:

- Nurses should practice to the full extent of their education and training.
- Nurses should achieve higher levels of education and training through an improved education system that promotes seamless academic progression.
- Nurses should be full partners with physicians and other healthcare professionals in redesigning health care in the United States.
- Effective workforce planning and policy making require better data collection and an improved information infrastructure.

As part of its 2010 report, *The Future of Nursing: Leading Change, Advancing Health* (IOM, 2010), and its 2013 report, *The Future of Nursing:*

A Look Back at the Landmark IOM Report (IOM, 2013), the committee considered the obstacles that all nurses encounter as they take on new roles in the transformation of health care in the United States. Although nurses face challenges at all levels, the committee took particular note of the legal barriers in many states that prohibit advanced practice registered nurses (APRNs) from practicing to their full education and training. The committee determined that such constraints must be lifted for nurses to assume the responsibilities they can and should have during this time of great need. Advanced practice nursing, now with the support of many state legislators, state boards of nursing, and the federal government, coupled with additional funding for advanced practice education, is answering this call by preparing transformational leaders to shape evolving practice and the future of health care (IOM, 2010, 2013).

AACN lends credence to this evolution in the second essential of the doctor of nursing practice (DNP), which accompanied the call for moving the level of preparation necessary for advanced nursing practice roles from the master's degree to the doctorate level by 2015:

> *DNP graduates must understand principles of practice management, including conceptual and practical strategies for balancing productivity with quality of care. They must be able to assess the impact of practice policies and procedures on meeting the health needs of the patient populations with whom they practice. DNP graduates must be proficient in quality improvement strategies and in creating and sustaining changes at the organizational and policy levels. Improvements in practice are neither sustainable nor measurable without corresponding changes in organizational arrangements, organizational and professional culture, and the financial structures to support practice. DNP graduates have the ability to evaluate the cost effectiveness of care and use principles of economics and finance to redesign effective and realistic care delivery strategies. In addition, DNP graduates have the ability to organize care to address emerging practice problems and the ethical dilemmas that emerge as new diagnostic and therapeutic technologies evolve. (AACN, 2006)*

In 2011, NONPF showcased a description of core competencies; an emphasis on population focus was added in 2014, consistent with the IOM report for advanced practice nurses, inclusive of DNPs:

> *Nurse Practitioner graduates have knowledge, skills, and abilities that are essential to independent clinical practice. The NP Core Competencies*

are acquired through mentored patient care experiences with emphasis on **independent** *and* **interprofessional** *practice; analytic skills for evaluating and providing* **evidence-based, patient centered care** *across settings; and advanced knowledge of the health care delivery system. Doctorally-prepared NPs apply knowledge of scientific foundations in practice for quality care. They are able to apply skills in technology and* **information literacy***, and engage in practice inquiry to improve health outcomes, policy, and healthcare delivery. Areas of increased knowledge, skills, and expertise include advanced communication skills, collaboration, complex decision making, leadership, and the business of health care. (NONPF, 2011, 2014)*

The advanced practice nurse must be able to discern issues quickly and effectively and contribute to strategic energy and system redesign. This phenomenon was perhaps best described by Senge (1990) in *The Fifth Discipline*, when he conveyed the development of the *mental model* as "turning the mirror inward; learning to unearth our internal pictures of the world, to bring them to the surface and hold them rigorously to scrutiny" (p. 9). "Learningful" conversations result in intense scrutiny that balances inquiry and advocacy and allows leaders to expose their own thinking effectively and make that thinking open to the influence of others. In 2003, and again in its 2010 *Future of Nursing* report, the IOM emphasized the necessity of such an approach in declaring the following competencies as foundational: patient-centered care, teamwork and collaboration, evidence-based practice, and quality improvement strategies.

In her treatise *Holistic Nursing: A Handbook for Practice*, Dossey (2008) reiterated a still-relevant plea:

Our time demands a new paradigm and a new language where we take the best of what we know in the science and art of nursing that includes holistic and human caring theories and modalities. With an integral approach and worldview we are in a better position to share with others the depth of nurses' knowledge, expertise, and critical-thinking capacities and skills for assisting others in creating health and healing. Only an attention to the heart of nursing, for "sacred" and "heart" reflect a common meaning, can we generate the vision, courage, and hope required to unite nurses and nursing in healing. This assists us as we engage in healthcare reform to address the challenges in these troubled times—local to global. This is not a matter of philosophy, but of survival. (p. 34)

Systems Thinking: Dealing with Complexity and Chaos

The AACN essentials statement (2006) further noted,

> *Advanced nursing practice includes an organizational and systems leadership component that emphasizes practice, ongoing improvement of health outcomes, and ensuring patient safety. In each case, nurses should be prepared with sophisticated expertise in assessing organizations, identifying systems' issues, and facilitating organization-wide changes in practice delivery. In addition, advanced nursing practice requires political skills, systems thinking, and the business and financial acumen needed for the analysis of practice quality and costs.*

In his 2002 book *The Ingenuity Gap: Can We Solve the Problems of the Future?* Homer-Dixon presented evidence that the demand for ingenuity arising from the ever-increasing complexity of our world is far outstripping our capacity to supply it. Although in the past we have been able to find solutions—and, in Homer-Dixon's words, "throw huge amounts of energy at our problems" (p. 187)—to keep our ever-expanding complex systems glued together, in the future we will almost certainly find it necessary to accept some large breakdowns in human and natural systems and to develop radical new ways of running things. Homer-Dixon added, "There are a couple of areas where I sometimes despair about our capacity to deal with what lies ahead. One is our cognitive characteristics and the other is the self-reinforcing nature of our economic system" (p. 2). When Homer-Dixon referred to "cognitive characteristics," he underscored that societies adapt easily to small-scale, incremental change. It is this slow evolution that makes it possible for humanity to face each day and not feel as though our foundations have been shaken; it is part of self-preservation. And yet, Homer-Dixon said, this human capacity is "a real handicap when it comes to dealing with 'slow-creep' problems. We just don't see the change, and the thing about slow-creep problems is they may be slow-creep for a while, but then all of a sudden there's a non-linear shift and we find ourselves in a crisis" (p. 4).

The transformation of U.S. health care was not a "slow-creep" change. The nonlinear shift from a volume-based system to a value-based system has rocked the healthcare system and left legislators and providers frantically strategizing as to how to meet the needs of patients with newly acquired access to care. The goal of improving efficiency, access, and outcomes while reducing costs demands the realignment of stakeholder incentives and the development of a new payment structure that rewards

those collective goals for all concerned. How well Homer-Dixon describes our current crisis in health care and the need for advanced practice nurses to be well versed in systems thinking and steeped in competency with regard to essential core skills!

Vision and Perspective: Keys to the Future of Advanced Practice

The evolution of the DNP advanced practice role as that of strategic systems thinker and visionary for health care lies largely within the profession's commitment to lifelong learning and the realization that people and organizations do not exist as islands unto themselves, but rather as part of a larger network, web, or matrix of systems that all function more or less independently, yet *inter*dependently. Burns's transformational theory (1978) described this matrix as a melding of social and spiritual values. He recognized it as a motivational lever that gives people an uplifting sense of being connected to a higher purpose, thus playing to the need for a sense of meaning and identity. Ultimately, one must realize the necessity of developing a dedication to disrupting the system as we know it, while at the same time retaining flexibility, balance, and a sense of social intelligence and responsibility.

Broadly, as we examine the healthcare landscape over the past two decades, common themes emerge. In general, the concern about dwindling access to health care—often linked to cost—that commanded much of the literature around the turn of the century has most recently been eclipsed by a general sense of alarm (perhaps panic) about the rising cost of health care and the inadequacy of globe-spanning systems to address burgeoning health concerns. These observations may have been influenced by rising health insurance rates, by the increasing healthcare needs of baby boomers reaching retirement, and by the release of a series of long-range healthcare cost projections. At one extreme are those who hotly contend that Americans have the "best healthcare system in the world," pointing to the freely available medical technology and state-of-the-art facilities that have become symbolic of the system. At the other extreme, however, are those who strongly criticize the American system as being fragmented and inefficient, pointing to the fact that America spends more on health care than any other country in the world, yet our nation still suffers from rampant lack of insurance, inconsistency in quality, and excessive administrative waste (Casoy, 2008).

In light of the new and growing evidence about the U.S. health disadvantage, the National Institutes of Health asked the National Research Council (NRC) and the IOM to convene a panel of experts to study the issue. The Panel on Understanding Cross-National Health Differences Among High-Income Countries, convened in 2013, examined whether the U.S. health disadvantage exists across the life span, considered potential explanations, and assessed the larger implications of the findings.

U.S. Health in International Perspectives

The United States is among the wealthiest nations in the world, but it is far from the healthiest according to the Panel on Understanding Cross-National Health Differences Among High-Income Countries (Woolf & Aron, 2013). Although life expectancy and survival rates in the United States have improved dramatically over the past century, Americans live shorter lives and experience more injuries and illnesses than people in other high-income countries. The U.S. health disadvantage cannot be attributed solely to the adverse health status of racial or ethnic minorities or poor people: even highly advantaged Americans are in worse health than their counterparts in other, "peer" countries.

In 2005, the Employee Benefits Research Institute (EBRI) first reported that the erosion of employer-based coverage was offset by increased enrollment in Medicaid, which was initially designed to provide a safety net for the lowest income Americans (EBRI, 2012). However, as the *Washington Post* noted in late 2008, Medicaid had become the subject of relentless funding cuts by budget-strapped states and congressional representatives who were ideologically opposed to welfare programs. As the program continued to be slashed, it was increasingly evident that Medicaid or other state-funded programs would be unable to offset the losses in employer-based insurance, resulting in more and more uninsured individuals. Thus, the insecurity of health care rose to an all-time high as thousands of people lost their health insurance as a result of a sagging job market. Health care, as a result, has become increasingly elusive, even for affluent Americans. Because any employee is just one pink slip away from becoming uninsured, it is clear that some solution in health care is not just important to achieve, but imperative.

In early 2014, the EBRI reported that more than 20%, or 1 in 5 Americans 50 or older, reported saving on health costs by switching to cheaper generic drugs, getting free samples, and stopping pills or reducing dosages, and nearly as many skip or postpone doctor appointments for the same reason. Many also questioned their providers regarding the costs

of procedures before agreeing to have them performed, especially those with high-deductible insurance policies. In fact, the data suggest that spending by those near or in retirement has declined to match income, even when it may mean giving up critical care.

Specifically, the 2014 analysis found that more than 1 in 5 (21.5%) households reported making some changes in their prescription drugs to save money, and nearly as many (19.4%) said that they have either skipped or postponed doctor appointments to do so. The report found that these reductions were spread almost equally among households, whether they reported increasing or decreasing their annual spending. Even for those who reported that their spending was unchanged, 16.5% reported making prescription drug changes, while 11.7% reported skipping or postponing doctor visits to save money.

The study also found that about 1 in 10 of those in excellent health reported skipping or postponing doctor appointments to save money, while more than three times as many (36.5%) of those in poor health reported doing so. Similarly, nearly 1 in 3 (29.9%) of those in poor health reported making prescription drug changes to save money, which is nearly twice the number of those in excellent health.

Even with the recent unrest and disconcerting statistics, it is tempting to believe that the current design of the healthcare system is beyond repair. Yet, a look back reveals the countless metamorphoses of an externally different yet eternally fundamentally flawed entity. Thus, transformational DNPs can drive the avoidance of this abysmal cycle through full dissection and understanding of the underlying structure and root cause(s) of the dysfunction. Will value-based care and increased access create appropriate solutions? Is it acceptable to deny people health care based on their ability to pay? Is health care a basic need that should be provided to every American as a matter of course? Or does the solution lie somewhere between the two extremes? Regardless of the answer, we must ensure that the DNP is well armed to overcome the remarkably complex inertia of the American healthcare system and spearhead the effort to create a society in which health care is, at a minimum, cost effective, of reasonable quality, and readily accessible.

The Advanced Practice Path to Healthcare Solutions

Many of the healthcare problems that plague us today are complex, involving multiple factors that are at least partly the result of past actions taken to alleviate problems. Traditional approaches often attack single factors or problems with little regard for the impact on the whole.

Dealing with such problems is notoriously difficult, and the results of conventional solutions are frequently poor enough to create great discouragement about the prospects of ever effectively addressing them. One of the key benefits of the application of systems thinking to such massive, complex concerns is the ability to deal effectively with a variety of problems from a holistic viewpoint. The systems approach helps us raise our thinking to the level at which we create the results we want as individuals and organizations, even in those difficult situations marked by complexity, great numbers of interactions, and the absence or ineffectiveness of immediately apparent solutions (Bass, 1990).

In his book *The Fifth Discipline*, Senge (1990) described the process of systems thinking as "seeing the world anew." He noted, "There is something in all of us that loves to put together a puzzle, that loves to see the image of the whole emerge. The beauty of a person, or a flower, or a poem lies in seeing all of it. It is interesting that the words 'whole' and 'health' come from the same root as the Old English hal, as in 'hale and hearty.' So, it should come as no surprise that the unhealthiness of our world today is in direct proportion to our inability to see it as a whole" (pp. 42–43).

In considering the fragmented state of national health care, the astute DNP can readily see that systems thinking can likely be employed as the much-needed framework for seeing the diversity (and fragmentation) as a "whole." A systems approach provides the framework for seeing interrelationships and patterns of change rather than individual issues. The approach uses a focused sensitivity to the interconnectedness that gives social systems of extreme complexity their unique character.

Systems Thinking and Advanced Practice

Systems thinking has its roots in the field of system dynamics, honed most successfully in 1958 by Massachusetts Institute of Technology professor Jay Forrester, who acknowledged the need for a better way of testing new ideas in complex engineering problems and, additionally, realized its value in addressing issues within social systems, such as the provision of health care. Systems thinking allows people to gain an explicit understanding of social systems and improve them in the same way that people can use engineering principles to make explicit and improve their understanding of mechanical systems. Complexity can easily undermine responsibility and creativity and result in feelings of helplessness and hopelessness. To combat this, systems thinking across organizations offers a discipline for understanding the unique structures

that undergird complex systems and, through that understanding, a way to effect change that is significant and enduring.

Schyve (2000) noted that systems thinking has already become ubiquitous in health care, largely due to continuous quality improvement initiatives in patient safety. Even 10 years ago, the idea of "looking at the whole" (the process) with regard to medical errors rather than at the individual might not have been acceptable. The advent of "blameless" cultures within this context provides a much less threatening venue than the former reliance on accusations of error. It is this systems thinking that has enabled many in health care to traverse beyond the old (and extremely ineffective) "name, blame, and shame" approach to patient safety and toward a more effective focus on human factors engineering and the systems within which doctors, nurses, pharmacists, and other healthcare professionals function. If systems thinking can be successfully applied to this one critical aspect of patient safety, could not the transformational advanced practice nurse leader consider an application of this strategy to the whole?

Adopting a Systems Perspective

Transformational leadership in advanced practice roles involves a willingness to take reasonable risks based on empirical data, a commitment to action, reflection of core values, and a drive for excellence at all levels. As leaders seek to hone their skills in their enthusiasm for creating the future, systems thinking must be an integral part of problem solving. Bass (1990) noted that more charismatic transformational leaders may achieve this alignment with systems thinking through evoking strong emotions that result in the identification of followers with the leader, perhaps through stirring appeals. Others may achieve the same result through quieter methods such as coaching and mentoring.

Nevertheless, the approach to any complex situation must begin with the deep insight that the problems and the hopes for improvement are inextricably tied to how the problem solvers think. Learning about a problem of great complexity requires a conceptual framework of "structural" or systems thinking to facilitate the ability to discover the underlying structural causes of poor performance (Wheatley, 2002). Lynham and Chermack (2006), in their theory of responsible leadership for performance (RLP), suggested a general, integrative theoretical framework of leadership that addresses the nature and challenges of leadership and is both responsible and focused on performance. Two core premises govern the framework. The first is that leadership is itself a system consisting of purposeful, integrated inputs, processes, outputs, feedback,

and boundaries. The second is that leadership takes place within a performance system—that is, a system of joint, coordinated, and purposeful action. Leadership can therefore be conceived of as a system of interacting inputs, processes, outputs, and feedback that derives meaning, direction, and purpose from the larger performance system and environment within which it occurs. From this perspective, leadership is defined as a focused system of interacting inputs, process, outputs, and feedback wherein individuals or groups influence or act on behalf of specific individuals or groups of individuals to achieve shared goals and commonly desired performance outcomes within a specific performance system and environment.

As leaders come to understand the structures within systems that cause patterns of behaviors or patterns within relationships that result in problems (inputs), they see more clearly how to effect change and adopt mechanisms that will work successfully on a larger scale (outputs). Ouchi's (1981) "Theory Z" (sometimes called participative theory or "Japanese management") also speaks of an organizational performance-driven culture that mirrors the Japanese culture, in which workers are participative and capable of performing many and varied tasks. Theory Z emphasizes such things as broadening of skills, generalization versus specialization, and the need for continuous training of workers to address this need for redesign. Redesigning the way one addresses decisions or behaviors (throughputs) through careful analysis of as many problem patterns as possible on a small scale inherently leads to redesign of the larger system structure; only then can consumers of the system provide feedback to validate the effectiveness of the changes.

The Essence of Problem Solving

Senge (1990) noted that there are multiple levels of explanation in any complex situation. These include reactive, responsive, and generative explanations. As leaders begin to look for patterns within relationships, it is critical that these investigations remain focused on structure and patterns rather than on specific events.

Event explanations "lay blame" or result in a *reactive* stance to problems. To further explore this concept, let's take the example of the patient who has a fall. A reactive stance might be to immediately restrain the patient in response to that event. We assume in this instance that because the patient could move and has fallen, we must keep him from moving in the future. As one can quickly see, the reactive stance leaves no room for discussions about why the fall occurred or what could be done

to improve the patient's fall risk, if one even exists. There are no discussions regarding quality of life for the patient, and certainly there are no explorations of root cause or how falls might affect other patients. This type of explanation is tied to a single event and is the most likely type to reinforce the flaws within a reactive system, maintaining the status quo. Little room is left for problem solving or quality improvement.

Approaching this same scenario from a *responsive* stance, we might look at patterns of behavior and ask whether the patient had incurred falls in the past. If he had multiple falls, at what times did the falls occur? We might also look at fall risk and prevention for this patient and ultimately for other patients within the system, tracking and trending in response. The responsive approach focuses on explaining patterns of behavior and envisioning long-term results and trends that can benefit the larger system. The responsive approach allows for quality improvement in response to data gathered through tracking and trending within a system, thus breaking the hold of reactivity and the "short-term fix."

Generative explanation, the most powerful of the three, focuses on finding the root cause(s) of patterns of behavior. In the case of the falling patient, for example, we might look at the types of situations in which the falls occur. We could ask, "Under what circumstances did the falls occur?" We could consider falls occurring during transfers; perhaps staff are not using appropriate transfer techniques or appropriate equipment. Perhaps there are critical steps missing from transfer procedures that result in the failure of the process. It is at this level of explanation that patterns of behavior can be changed—not just reacted to or responded to, but actually *changed*.

Ultimately, the systems perspective tells advanced practice leaders that we must look beyond individual mistakes, karma, or unrelenting bad luck to understand important issues. We must also look beyond personalities, politics, and events to observe and explain the structures that result in individual actions and use this knowledge to discern processes whereby certain types of events become more likely. Senge (1990) quoted Donella Meadows, who said, "A truly profound and different insight is the way you begin to see that the system causes its own behavior" (p. 68).

Systems Thinking, Advanced Practice, and the Learning Organization

"Experience is the best teacher" is a phrase that has been a mantra within the healthcare environment for many years. "See one, do one, teach one" has long been a part of nursing and medical education. We learn through

taking an action and observing the consequences of that action; then we adjust and take a new and different action. Thus, learning is woven throughout the fabric of life and indeed throughout complex healthcare organizations—at least the ones that are successful. Lack of learning within an organization often results in its demise or in very poor performance.

In a large, complex organization, however, the primary consequences of our actions may well be in the distant future or in a distant but interrelated part of a larger system in which we operate. For this reason, we are often puzzled by the underlying causes of current problems within our organizations. We are unable to look at underlying structures or patterns of behavior that may have resulted in less than stellar outcomes. Instead, we are very likely to fixate on events and on "working harder" to try to resolve or troubleshoot current issues.

Early in 1992, Jeanie Duck of the Boston Consulting Group wrote about the "reductionist" approach to managing an organization and ferreting out issues. The reductionist management model has long been popular in the United States as a means of explaining and quickly addressing issues. Duck noted that the premise of reductionism is that to understand something, you reduce it to its simplest components and analyze the components in great detail. At the outset, the reductionist approach makes complex tasks (or problems) more manageable. However, the disadvantage to this approach is that the organization is no longer able to see the consequences of actions or decisions, and the connection to the larger system is lost. Learning organizations must successfully abandon reductionism. Once that occurs, leaders and employees within the organization can continually expand their capacity to create results. New and expansive patterns of thinking that foster interconnectedness within the organization are encouraged.

As the role of nursing leadership continues to expand, the advanced practice leader will no doubt be called on to foster the development of learning organizations and to function as a change agent to facilitate organizational functioning within larger complex systems. Adopting a sustained culture of learning enables an organization to maintain a competitive advantage in times of change and to inspire its workforce to achieve greater results and improved quality. Furthermore, organizations can draw on a learning culture to encourage innovation or manage change.

David Garvin, of Harvard Business School and QualityGurus.com fame, defined a learning organization as "skilled at creating, acquiring, and transferring knowledge, and at modifying its behavior to reflect new

knowledge and insights" (Garvin, Edmondson, & Gino, 2008). This is best accomplished by first assessing the organization's culture, leadership, and tolerance for change. The organization must be open to developing a conceptual framework for systems thinking and a shared vision to make patterns clearer and effectively initiate change (Gill, 2015).

Advanced practice leaders have the responsibility for instilling the ideas of personal mastery in all employees as a basis for shared vision and connection throughout the organization. As a basis for change, personal mastery (Senge, 1990) is the discipline of continually clarifying and deepening one's personal vision, of focusing one's energies, of developing patience, and of seeing reality objectively and letting go of mental models (ingrained ideas) from the past. An organization's commitment to and capacity for learning can be no greater than those of its employees. The roots of this idea are detailed in both Eastern and Western spiritual traditions, as well as in some secular traditions. More and more healthcare organizations are tapping into this idea; healthcare entities around the country are now developing leadership residencies aimed at personal leadership growth as a valuable resource within the organization. The learning organization grows and changes as its people learn and develop personal mastery. Thus, becoming a learning organization can be viewed as a continual process involving employees at all levels.

As an organization focuses on personal mastery for employees, it progresses to team learning and a free flow of information and ideas that eventually, if carefully guided, leads to a shared vision for the organization and, ultimately, a more effective organization. James P. Lewis (2001) noted the impact of team learning and the shared vision in his book *Project Planning, Scheduling, and Control*. He cited the example of a non–learning organization that decided to implement an electronic charting system based on executive input only. Final decisions were based on the huge financial outlay already made, choice of product, and scope of implementation. Contract negotiations were completed at a high level without the involvement of clinicians. Not involving those on the front line (clinicians) in the early stages cost the organization financially and functionally when the unwieldy system caused patient care to be more difficult than it was before the implementation.

Senge (1990) noted, "To practice a discipline is to be a lifelong learner. You 'never arrive'; you spend your life mastering disciplines. You can never say, 'We are a learning organization,' any more than you can say, 'I am an enlightened person.' The more you learn, the more acutely aware you become of your ignorance" (p. 43). A learning organization is one that constantly provides its employees timely access to relevant,

practical information that inspires innovation. It involves creating a culture in which learning is embedded and in which it is communicated to and understood by all that there are many places to seek information. As Margaret Wheatley (1992) expounded, "Innovation is fostered by information gathered from new connections; from insights gained by journeys into other disciplines or places; from active, collegial networks and fluid, open boundaries. Innovation arises from ongoing circles of exchange, where information is not just accumulated or stored, but created. Knowledge is generated anew from connections that weren't there before" (p. 113).

The Downside to Systems Thinking

Systems thinking has a proven track record as a means of addressing problems within complex systems and has been successfully applied in healthcare venues. However, the principles of systems thinking are not typically conveyed in basic healthcare education. Although the DNP competencies clearly proclaim these principles as essential, nurses at the undergraduate level are generally educated in the personal mastery of knowledge, skills, and abilities to provide assistance to sick, often frail and vulnerable, individuals or populations. The individual ethical creed to "do no harm" pertains primarily to the nurse as an individual assisting individuals, not to systems and processes.

Given this perspective, a systems thinking approach to healthcare reform presents challenges for the advanced practice leader. The general understanding is that a system is perfectly designed to produce what it produces; or, conversely, whatever we get from a system is what the system is designed to produce, regardless of whether the design of the system was planned or unplanned and whether the results were intended or unintended. Different individuals within the same structure tend to produce similar results. Therefore, when performance is poor or expectations are unmet, it is relatively easy to find someone or something to blame. The paradigm shift of interrelationships and interrelatedness reinforces the fact that systems may cause their own crises. Such crises are not the fault of individuals, nor the result of external factors, but inherent within the system or processes that fall short.

According to Lynham and Chermack (2006), systems are composed of many related components: people, equipment, processes, and data. Each component directly or indirectly has the potential to affect not only the function of the system but also the functions of other components within the system. Traditional nursing leaders tend to consider structure

as an external constraint based on the performance of individual components; however, in human systems, it is the basic *interrelationships* among components, not structural constraint, that control behaviors. As a result, the purpose of a system then becomes to maximize the output of the system, not the output of each of its components. The silos of leadership that exist throughout health care generally focus only on their own decisions and may ignore how their decisions affect others, creating instability within the system as a result. Senge (1990) illustrated this concept in the example of the engineer who noted that one could build a car from the then "best" engine, drive train, suspension, and tires, but it would be unlikely to run. Every system, including those in health care, must *optimize*—rather than *maximize*—the performance of each of its components to bolster the system's production.

As noted in the IOM competencies, the production (output) of a healthcare system has multiple dimensions. The dimensions of safety, effectiveness, patient centeredness, timeliness, efficiency, and equity are often used to describe the output of the system (IOM, 2003). It is uncommon for the system to *maximize* the level of each of the multiple dimensions of its output; rather, the system must *optimize* the level of each dimension. This optimization, however, is a value judgment by those who design and manage the system and, to some degree, those who use the output of the system. These stakeholders in the healthcare system do not always agree on the relative priorities for the dimensions of the system's output, thus presenting a problem but also an opportunity for compromise that must be recognized by the astute leader.

Multifaceted, multilayered healthcare systems are all at significant risk of producing unintended consequences. Even apparently "inconsequential" changes in healthcare systems at any level will almost always produce unintended consequences. It is predictable that unintended consequences will likely emerge, but what those consequences will be, and whether they will be beneficial or destructive, is often unpredictable. At worst, well-intentioned changes could result in unintended harm. Margaret Wheatley (1992) espoused an interesting perspective on unintended consequences, seeing them as unintended opportunities to find new ways of looking at things and to redesign poor processes. In her book *Turning to One Another: Simple Conversations to Restore Hope to the Future*, written in 2002, Wheatley noted that failures within organizations are the signal that more connections need to be made within the organization; she contended that the solution lies within untapped conversations and undiscovered connections.

A Challenge to Advanced Practice Leaders: Operationalizing Systems Thinking

The evolution of the advanced practice leader is the by-product of concerted efforts to align personal behavior with values and to learn how to listen and to appreciate others' talents, abilities, and insights. Without this diligent effort dedicated to the development of the capacity to lead, a lack of personal charisma, personal mastery, information sharing, and mental mastery would render us ineffective in the pursuit of the shared vision and the transformational leadership so vital to the survival of health care in the future (Ouchi, 1981).

Once personal mastery is achieved, however, one must transcend the traditional activity of management as most of us know it and focus on wielding power within a system. This endeavor not only encompasses the balancing of structures within an organization or system but also is the embodiment of shared vision and empowerment, inducing people and resources to migrate from the current state to the desired state while seeking their own personal mastery (Senge, 2006). Although this sounds very noble, the reality is that as the current state approaches the desired state, promotion of the activity and motivation typically decline; this goes on until someone takes notice and raises the red flag of organizational panic and urges reactive decision making (which rarely produces good results). Therefore, the task of the leader becomes sustaining the effort long enough to close the gap between what *was* and the present while avoiding panic, reactivity, and, ultimately, disaster.

The Learning Organization and the Inquiring Mind: Sustaining the Effort

In *The Fifth Discipline*, Peter Senge (1990) described five basic disciplines that support shared vision and empowerment, placing systems thinking in the primary position. He called it "the fifth discipline" because it is the conceptual cornerstone that underlies all the other learning disciplines. As he noted, all are concerned with a shift of mind from seeing parts to seeing wholes, from seeing people as helpless reactors to seeing them as active participants in shaping their reality, from reacting to the present to creating the future.

When it comes to operationalizing and applying systems thinking concepts within the learning organization or across many organizations, Charles West Churchman (1913–2004), a pragmatic philosopher with a deep concern for the welfare of humanity, laid the groundwork for the

most practical approach to creatively shaping the future. In the 1950s, he worked with Russell L. Ackoff and E. Leonard Arnoff to develop and describe the philosophical and methodological aspects of operations research, designed as an interdisciplinary approach to "real-world problem solving" (Ulrich, 1988/2009, 2012).

Early in 1971, Churchman adapted the design of what he called "inquiring systems"—systems capable of facilitating learning and organizational change. The purpose of these inquiring systems is to create knowledge, thereby "creating the capability of choosing the right means for one's desired ends" (Churchman, 1971, p. 200). Churchman's model for the design of inquiring systems provides the basis for sustaining evolving organizations. Churchman's theoretical work was driven by his unrelenting interest in determining whether it is "possible to secure improvement in the human condition by means of the human intellect" (Ulrich, 1988/2009). One of his significant contributions to the development of systems theory was his recognition that "problem solving often appears to produce improvement, but the so-called 'solution' often makes matters worse in the larger system" (Churchman, 1982, p. 19n). He argued that "simple, direct, head-on attempts to 'solve' system problems don't work and, indeed, often turn out to be downright dangerous" (Churchman, 1979, p. 4). No problem exists in isolation; rather, problems are inextricably linked to each other and to the environment, thus requiring an approach to the whole.

Underlying Concepts of Churchman's Systems Model

Churchman's inquiry systems model is centered on the *client* as the "complex of persons whose interests ought to be served" (Churchman, 1971, p. 48). Clients can be described by their value structure. Each client has a set of possible futures (i.e., goals or objectives) and a preference for one future over others. Clients have trade-off principles that reveal how much of one objective they would relinquish in order to achieve or increase another objective, establishing a means of "balancing" a given system.

Within Churchman's model, the *environment* is limitless. It consists of all things outside the system that may, in some direct, indirect, or even barely comprehensible way, affect—or be affected by—what happens within the system. Also within the model, a *decision maker* controls system resources. He or she "*co-produces* the future along with the environment, which he [or she] does not control" (Churchman, 1971, p. 47). The decision maker's preferred future may not be identical to that of other stakeholders (clients), and his or her trade-off principle may not be the same.

The system *planner* is the person who should at all times strive toward improvement of the human condition. Churchman (1971, 1979)

envisioned a planner who seeks to identify the client's underlying princi-ples and trade-off principles, to create measures of performance based on those principles, and to trace out all potential consequences of any given action. The planner's intentions are presumed to be "always good with respect to the client" (Churchman, 1971, p. 47), and the planner assumes the role of trying to ensure that the decision makers' value structure also supports that of the client. The *measure of performance* is, in simple form, the degree of attainment of a stated goal, purpose, or objective, sometimes measured by the probability or amount of attainment and sometimes by evaluating benefits and costs (Churchman, 1979).

Agents and factors both within and outside the system may be said to *co-produce* the measures of performance. By their influence, co-producers may either assist to actualize or prevent the achievement of the client's objectives. Following the work of Edgar A. Singer, Churchman stated that "something is a producer of an event if at least one description of the event would be different were the producer not there" (1979, p. 87). Churchman went on to note that "in the case of organizational decision making, the co-producers are many but often operate in subtle and non-formalized manners." Indeed, "part of an organization's 'unconscious' is the existence of co-producers who block the implementation of 'good' ideas, but are never mentioned" (p. 87).

The aforementioned roles belie Churchman's dedication to creating learning systems within organizations. Foremost in these systems is the recognition that decision makers must be as open-minded and creative as possible so that their problem identifications and proposed solutions reflect not merely the concerns of interest to the decision makers but also the implications of the problem and its solutions for the whole system—indeed, for the environment itself (Ulrich, 1988/2009; 2012).

To create a learning system, leaders, acting as planners, must move away from focusing on the obvious (e.g., data, hard facts). For planners who focus on the obvious—*goal planners*—"reality stops at the boundaries of the problem" (Churchman, 1979, p. 108). In contrast, *objective planners* attempt to reframe the obvious within the context of a larger problem. For the objective planner, "reality stops at the boundaries set by feasibil-ity and to some extent by responsibility" (p. 106). Although this larger perspective moves the system in the direction of learning, Churchman pondered another level: *ideal planning.* Whereas goals are deemed short term and objectives long term, ideals are considered to stretch indefi-nitely into the future and to approach the essential question of how to improve the human condition. The ideal planner moves past the feasible and the realistic and attempts to define purposes that could hold if these restraints were removed. In the ideal system, planners and decision

makers work not with the obvious and the tangible but with limitless imagination (Churchman, 1979; Ulrich, 2012).

Because the bounds of creativity can never fully be known, Churchman's model (1979) for inquiring systems is one constructed not of answers but of many questions. Inquiry—and its corollary, decision making—is conducted in a learning system through a process of unfolding questions. As each new aspect of the environment is considered, more layers of influence (co-production) or impact are discovered and must be addressed in turn. Churchman laid out a dialectical framework within which the questions are posed, stakeholders' interests are considered, the environment is limitless, and the ethics are those of the whole system. The inquiry model begins with the questions in **Table 2-1** and can be readily applied in problem solving (Churchman, 1971, pp. 79–80).

Table 2-1 Churchman's Problem-Solving Model
The Client
What is his or her purpose(s)?
What should be his or her purpose(s)?
How is the variety of his or her purposes unified under a measure of performance?
How should the variety of his or her purposes be unified under a measure of performance?
The Decision Maker
What is the decision maker able to use as resources?
What should the decision maker be able to use as resources?
What can the decision maker not control, which nonetheless matters—the environment?
What should the decision maker not control, which nonetheless matters—the environment?
The Planner
How is the planner able to implement his or her plans?
How should the planner be able to implement his or her plans?
[Ideally] What is the guarantor that his or her planning will succeed, that is, will secure improvement in the human condition?
[Ideally] What should be the guarantor that his or her planning will succeed, that is, will secure improvement in the human condition?

Reproduced from Churchman, C. W. (1979). *The design of inquiring systems (*pp. 79–80). New York, NY: Basic Books.

Within any human service organization dedicated to benevolent purposes, the DNP leader can readily see how Churchman's model could be used to provide organizational assessment and a blueprint for a holistic systems approach to problem solving. The complexities of healthcare issues lend themselves to the use of Churchman's design of inquiring systems and provide the transformational leader with a solid, methodical approach that promotes engagement by all parts of the organization.

If we consider the example of an organization that provides primary family care, the construction of a simple spreadsheet could readily identify key stakeholders whose purposes and counterpurposes the organization must consider in addressing problems. The spreadsheet might list each stakeholder as a *client* with particular needs and objectives— purposes—relating to optimal health care. For example, geriatric clients served by the practice might be identified as having several purposes, including a desire for fulfilling quality of life, for the attention of a cost-effective skilled medical provider, and for the cost-effective provision of medication. In Churchman's model, client purposes are both those things that the client desires (e.g., fulfilling quality of life) and those things that the client *should* have (e.g., safe, cost-effective care and medications).

Continuing with the example, a stakeholder may be represented by more than one client category. Young adult clients of the primary care practice, for example, may have purposes both as "parents" concerned about their children's health and as "patrons" who may themselves access the healthcare system. In addition, every stakeholder has the potential to act as a *co-producer* of the solution to the problem posed. He or she may do so by assisting the decision maker or by placing obstacles in the decision maker's path. It is important to note that the decision makers are also clients, in that they too have purposes to be served.

Maximizing the Efforts of Inquiry

As one completes the inquiry just described, it becomes easier to observe patterns within the desires and needs of clients at all levels of the system. These patterns become the basis for understanding the overall system; leaders, as a result, can target innovation (change) efforts more effectively. This is where the approach of systems thinking is fundamentally different from that of traditional methods of analysis. Instead of isolating smaller parts of a system (e.g., individual clients), systems thinking looks at the whole, considering larger numbers (patterns) of interactions to gain understanding.

If we continue our consideration of the primary care clinic described earlier, we might, for instance, through traditional analysis, make a

change in practice that would benefit one group of clients but work to the detriment of another. Let's say that we decide to see all pediatric sick cases in the morning to accommodate working mothers and move geriatric chronic cases to the afternoon. We find, however, in examining feedback from the geriatric clients, that they are only able to get public transportation to appointments in the morning, with the latest senior bus picking up at 11:30 a.m. If the senior clients catch the earlier buses to make an afternoon appointment, they have a long wait time *and* are exposed to the sick children. Over time, if we continued with this plan (without the feedback), we would see that the benefits of this innovation would quickly begin to evaporate, and our organization and patients would suffer.

Avoiding this global failure is a key advantage of systems thinking. By closely examining all the interactions created by a decision, potential backfires within the system can be detected and, it is hoped, avoided (see **Figure 2-1**). In the example case, a compromise of selected days for
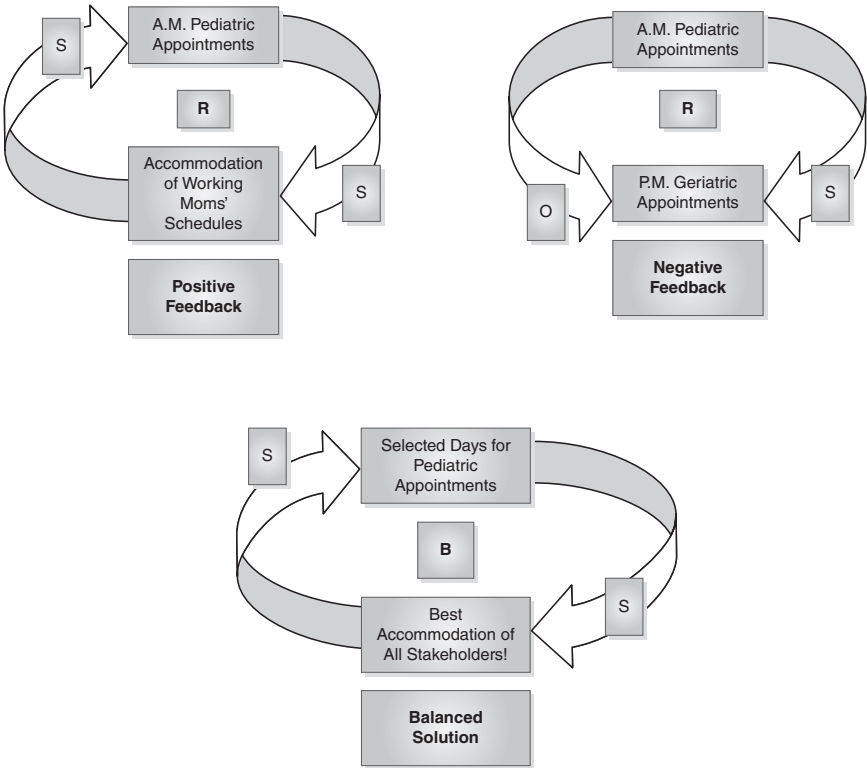
Figure 2-1 Advanced Practice Nurse Leader

pediatric morning appointments might achieve a balance of the needs of all patients accessing the system. Examination of feedback leads to innovation that is a better fit for the big picture and to results that create substantial, lasting benefits.

The arrows in a causal loop diagram are usually labeled with an "S" or an "O." "S" means that when the first variable changes, the second one changes in the same direction (for example, as you schedule more pediatric appointments in the mornings, the number of mothers who desire to make these appointments goes up too). "O" means that the first variable causes a change in the opposite direction in the second variable (for example, the more pediatric appointments scheduled in the morning, the fewer geriatric appointments occur in the afternoon because of exposure to sick children and long wait times for transportation).

In causal diagrams, the arrows join to form loops, with each loop labeled with an "R" or a "B." "R" means reinforcing and refers to causal relationships within the loop that create exponential growth or collapse. For instance, the more appointments made in the morning, the happier working mothers become; because the mothers are happier, they tell their friends, and more and more pediatric appointments are made, and so on, in an upward spiral. By the same token, as more pediatric appointments are made, fewer geriatric appointments are made overall. Pediatric patients are taking up the morning slots, so there are few morning appointments available for older patients. The geriatric patients do not like the afternoon slots because of long transportation wait times and exposure to sick children. This could cause a downward spiral in the business and a dire decrease in revenue for the practice. The "B" means balancing and refers to factors in the loop that could keep things in equilibrium. For example, if only selected mornings—one or two per week—are reserved for pediatric patients with working mothers, geriatric patients can continue to be accommodated at times they prefer. The result is a sustainable process that would be supported by both groups of patients (stakeholders).

Causal loop diagrams can be very complex and contain many different "R" and "B" loops, all connected with arrows. The use of these diagrams can offer leaders and their teams valuable perspectives on what is happening within an organization. This type of systems thinking helps avoid reactive decisions and explores the possibilities of negative outcomes for the business before they happen. For example, by understanding the relationship between morning pediatric appointments and the exposure of frail elderly clients to long wait times, a poor business decision can be avoided.

Summary: The DNP Systems Thinker

Advanced practice leadership must acknowledge the healthcare system as an open system, affected by and, to some degree, dependent on larger systems of which it is a part. We have learned the value of studying and changing the microsystems of health care—the people, equipment, and data at the level of direct patient care. But these microsystems are subsystems within macrosystems such as hospitals, nursing homes, and clinics. These macrosystems, in turn, are part of the megasystem of American health care, which itself is a component of the even larger economic, political, and social metasystems of society as a whole and, ultimately, a part of global systems.

Employing a systems approach to seeking solutions in health care will ultimately alter the role of the various disciplines within health care. This reconsideration of roles will become the purview of advanced practice leaders at all levels. These advanced systems thinkers will ultimately lead the way as we seek to begin the inquiries expressed by the following questions: What are the human vulnerabilities with respect to our capacity to keep up with new knowledge, to remember, or to analyze large amounts of data? How might the principles of distributed cognition (interaction and feedback) and information-sharing technology protect us from these vulnerabilities? How might system redesign as a result of a shared vision protect us from making fatal design errors? What are the human vulnerabilities with respect to our thinking, emotions, and actions?

The challenges ahead require that the advanced practice leader be well prepared in the application of systems thinking to the healthcare environment. Through careful analysis of the structure of both microsystems and macrosystems, how their performance is best measured, and how they interrelate, one can make a determination of their vulnerabilities and strengths within the context of a structural explanation. Detection of behavioral patterns in underlying structure may assist in optimizing system components to maximize results of the system. Systems thinking may further provide the tools for identifying and monitoring for unintended consequences and illuminate the possible interventions to prevent harm from such consequences.

References

American Association of Colleges of Nursing. (2006). *The essentials of doctoral education for advanced nursing practice.* Retrieved from http://www.aacn.nche.edu/publications/position/DNPEssentials.pdf

Bass, B. (1990). *Bass and Stogdill's handbook of leadership: Theory, research, and managerial applications* (3rd ed.). New York, NY: Free Press.

Burns, J. M. (1978). *Leadership*. New York, NY: Harper & Row.

Casoy, F. (2008, December 26). The case for universal healthcare. Written statement for the American Medical Student Association. *The Washington Post.*

Churchman, C. W. (1971). *The design of inquiring systems: Basic concepts of systems and organization*. New York, NY: Basic Books.

Churchman, C. W. (1979). *The systems approach and its enemies*. New York, NY: Basic Books.

Churchman, C. W. (1982). *Thought and wisdom*. Seaside, CA: Intersystems Publications.

Dossey, B. M. (2008). Integral and holistic nursing: Local to global. In B. M. Dossey & L. Keegan (Eds.), *Holistic nursing: A handbook for practice* (5th ed., pp. 17–41). Sudbury, MA: Jones and Bartlett.

Duck, J. (1992). *The seduction of reductionist thinking*. Boston, MA: Boston Consulting Group.

Employee Benefits Research Institute. (2005). Uninsured unchanged in 2004, but employment-based health coverage declined. *EBRI Notes, 25*(5). Retrieved from http://www.ebri.org

Employee Benefits Research Institute. (2012). 1 in 5 older Americans cutting back on health care to save money. *EBRI Notes, 33*(1). Retrieved from http://www.ebri.org

Employee Benefits Research Institute. (2014). How does household expenditure change for older Americans? *EBRI Notes,* 35(9). Retrieved from http://www.ebri.org

Forrester, J. (1958). Industrial dynamics: A major breakthrough for decision makers. *Harvard Business Review, 36*(4), 37–66.

Garvin, D., Edmondson, A., & Gino, F. (2008). Is yours a learning organization? *Harvard Business Review, 86*(3), 109–116.

Gill, S. (2015). Learning culture: A workplace environment for success, parts 1 & 2. *The Business Thinker.* Retrieved from http://businessthinker.com/?s=Learning+Organization

Homer-Dixon, T. (2002). *The ingenuity gap: Can we solve the problems of the future?* New York, NY: Vintage Books.

Iglehart, J. (2013). Expanding the role of advanced nurse practitioners—Risks and rewards. *New England Journal of Medicine, 368*, 1935–1941.

Institute of Medicine. (2003). *Health professions education: A bridge to quality*. Washington, DC: National Academies Press.

Institute of Medicine. (2010). *The future of nursing: Leading change, advancing health*. Retrieved from http://www.iom.edu/Reports/2010/The-Future-of-Nursing-Leading-Change-Advancing-Health.aspx

Institute of Medicine. (2013). *The future of nursing: A look back at the landmark IOM report.* Retrieved from http://www.iom.edu/Global/Perspectives/2013/The-Future-of-Nursing.aspx

Lewis, J. (2001). *Project planning, scheduling, and control: A hands-on guide to bringing projects in on time and on budget*. New York, NY: McGraw-Hill.

Lynham, S. A., & Chermack, T. J. (2006). Responsible leadership for performance: A theoretical model and hypotheses. *Journal of Leadership and Organizational Studies*, *12*(4), 73–88.

National Organization of Nurse Practitioner Faculties. (2011). *Nurse practitioner core competencies*. Retrieved from http://www.nonpf.com/displaycommon. cfm?an=1&subarticlenbr=14

National Organization of Nurse Practitioner Faculties. (2014). *Nurse practitioner core competencies content.* Retrieved from http://c.ymcdn.com/sites/ nonpf.site-ym.com/resource/resmgr/Competencies/NPCoreCompsContent FinalNov20.pdf

Ouchi, W. (1981). *Theory Z: How American business can meet the Japanese challenge.* Reading, MA: Addison-Wesley.

Schyve, P. M. (2000, September). *Testimony of Paul M. Schyve, Panel 5: State coalitions and public policy advocates.* Written statement. National Summit on Medical Errors and Patient Safety Research. Retrieved from http://www.quic .gov/summit/wschyve.htm

Senge, P. (1990, 2006). *The fifth discipline: The art and practice of the learning organization.* New York, NY: Doubleday.

Ulrich, W. (2009, March 26). *An appreciation of C. West Churchman* (Rev. ed.). Retrieved from http://www.wulrich.com/cwc_appreciation.html (Original work published 1988 as C. West Churchman—75 years. *Systems Practice*, *1*(4), 341–350).

Ulrich, W. (2012). CST two ways: A concise account of critical systems thinking. *Ulrich's Bimonthly (Formerly "Picture of the Month").* Retrieved from http:// wulrich.com/downloads/bimonthly_november2012.pdf

United Nations. (2015). *The Millenium Development Goals Report.* Retrieved from http://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%20 2015%20rev%20(July%201).pdf

UN News Centre. (2015, February 18). *Ebola: UN envoy likens final phase of response to "looking for needles in haystacks."* Retrieved from http://www.un.org/apps/ news/story.asp?NewsID=50118&Kw1=ebola&Kw2=&Kw3=#.VRB2L50o7IU

Wheatley, M. (1992). *Leadership and the new science: Discovering order in a chaotic world.* San Francisco, CA: Berrett-Koehler.

Wheatley, M. (2002). *Turning to one another: Simple conversations to restore hope to the future.* San Francisco, CA: Berrett-Koehler.

Woolf, S., & Aron, L. (2013). The US health disadvantage relative to other high-income countries: Findings from a National Research Council/Institute of Medicine report. *Journal of the American Medical Association, 309*(8), 771–772.