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Learning Health Systems

TECHNICAL REPORT

Networked health care: Rethinking value creation in learning health care systems

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Abstract

Creating better value in health care service today is very challenging. The social pressure to do so is real for every health care system and its leadership. Real benefit has been achieved in manufacturing sector work by the use of "value-chain" thinking, which assumes that the work is a series of linked processes necessary to make a product. For those activities in health care systems that are similar, this model may be very helpful. Attempts to "install" the value chain widely in health care systems have, however, been frustrating. As a result, well-meaning leaders seeking better value have resorted to programs of cost reduction, rather than service redesign. Professionals have not been very happy or willing participants. The work of health care service invites an expanded model of value creation, one that better matches the work. This paper proposes a networked architecture that can mobilize and integrate the resources of health care professionals, interested patients, family, and other community members in the delivery and improvement of health care systems. It also suggests how this value-creation architecture might contribute to research and the development of new knowledge. Two cases illustrate the proposed architecture and its implications for system design and practice, technology development, and roles and responsibilities of all actors involved in health care systems. We believe that this model better fits the need of making and improving health care services. This expanded understanding of how value is created invites attention by senior leaders, by those attempting to facilitate the improvement of current systems, by patients and clinicians involved in the daily work of health care service coproduction, by those charged with the preparation and formation of future professionals, by those who measure and conduct research in health care services, and by those leading policy, payment, and reimbursement systems.

KEYWORDS

learning health systems, organizational architecture, value in health care

1 | INTRODUCTION

Clinicians and patients coproduce health care services.[1] Good health outcomes, experience, and value are created by bringing the right people together with the right information, with the right technology, in the right way, and at the right time, in response to a patient's needs.[2] A person with multiple injuries from a car accident is likely to benefit from a highly customized emergency response that brings together multiple health professional competencies to achieve a diagnosis and treatment to stabilize the patient and create a path toward enduring recovery. A child experiencing recurring asthma represents a commonly occurring need in the general population of children with asthma and is likely to benefit from a reliable application of standardized asthma assessment and treatment guidelines. A patient with type-2 diabetes may benefit from being able to connect with other patients and with medical treatments and services that enable the patient to make lifestyle modifications, integrate services to manage his disease, and contribute actively to his own care. Including researchers in the development of those coproduced services further opens the possibility of linking the process of discovery as a natural outgrowth of patient care. This idea underlies the concept of the Learning Health System.[3,4]

System redesign is a priority for health care because current systems are not achieving the effectiveness and efficiency needed to improve care, spawn innovation, and accelerate research. Increasing investment or reducing costs without changing the architecture of the system is unlikely to increase value in ways that can be sustained.[5-8] Efforts to reduce costs without care redesign risks making the work of providing health care services more challenging. With mounting levels of burnout, such an approach may make matters worse.

This paper explores an organizational architecture for health care service that builds on three complementary and interdependent value-creating building blocks: the value shop, the value chain, and the value network.[9] We identify characteristics of each configuration and use two case studies to illustrate how value is cocreated and coproduced[10-13] in "networked health care service." The discussion of the case studies invites inquiry into how a networked organizational architecture aligns fundamental activities of the health care system—providing health care service, improving it, spawning innovation, and generating new knowledge through research. Appreciating how health care service is cocreated, and how these configurations coexist, we believe, is at the heart of creating value for the person whose health it is and in future health care systems that enable this work.

2 | ORGANIZATIONAL ARCHITECTURE AND HEALTH CARE SERVICES

Health care service today is highly specialized and involves diverse human and technological resources that can be combined in nearly infinite ways to foster better health. How work is done in the value shop, chain, and network drives both quality and cost.

The predominant way of creating value in health care today can be described as the *value shop*. It enables highly customized responses to individual problems. In health care service, it is based on one-to-one patient-professional relationships where there is a predictable cycle of steps including case acquisition, developing a diagnosis, selecting a customized treatment, and testing of the proposed solution. This configuration involves actors working in dyads and was formed in the last century when the complexity of medical care was far more limited. The main tradeoff in the value shop is between breadth (the number and diversity of conditions that can be managed) and depth (the level of expertise that can be provided). As the number of diagnostic and therapeutic interventions has increased, medical knowledge expanded, and expectancies for longer and better life increased, the "shop" has changed. The tradeoff has been managed by moving from work done by *individual professionals* who knew what was needed and acted accordingly to work done by multiple professionals from multiple disciplines in *organizational systems* supported by information systems and greatly increasing contributions by patients.[14]

The *value chain* represents another way of creating value.[15] It consists of linked repeatable, standardized treatment processes that professionals and patients use to produce the desired outcome. In product manufacturing, value chains have enabled gains in efficiency linking processes and standardization. For those products and activities in health care service systems that are similar, this configuration focused on standard work processes may be very helpful. For example, adopting a chain configuration for total hip and knee replacement surgery may result in efficiency of the linked processes, improved outcomes, and lower costs. Two key tradeoffs in the value chain are between cost and differentiation. Very efficient chains (eg, those with the fewest, most standardized processes) are less able to address a diversity of needs. This is why some attempts to "install" the chain configuration widely in health care service systems have been frustrating. The challenge is that only a modest percentage of health care service really fits this product-chain framework. Indeed, patients with complex medical problems might resent being treated to standardized solutions and experts who advertise that they are less expensive. When something major is wrong, patients want the most customized care possible.

The *value network* represents a third way of creating value. A value network is a configuration that facilitates flexible interaction among people, places, and things (eg, patients, clinicians, researchers, organizational entities, and databases). A network is composed of nodes or "actors" and the links that connect them.

Networks are widespread today, having grown dramatically because of the ubiquity of the Internet.[16] There is a vast literature from economics, computer science, business, mathematics, and evolutionary biology that provides the scientific basis for how networks function and create value.[16-19] In other industries, combinations of platforms and personnel facilitate networks to increase the efficiency and effectiveness of interaction and exchange. For example, people use Facebook to keep in touch, as well as to locate others, organize simple events, etc. And numerous companies

use networks to create value by enabling the exchange of information, knowledge, and resources (eg, Wikipedia, Amazon, and Airbnb).

Value in networks emerges from the types of actors that are connected and what is exchanged across the nodes.[9,20] Network services provide the infrastructure to enable connections and exchange. The focus of network services on connectivity and exchange also introduces a shift in organizational management. Networked organizations rely less on hierarchy or matrix structures to control and coordinate work and more on peers and self-organization among the members (nodes) of a network. The result is an "actor-oriented" organizational architecture, which has three main elements: (a) "actors", ie, people and organizational units, who have the capabilities and values to self-organize; (b) commons where the actors accumulate and share resources; and (c) protocols, processes, and infrastructures that enable self-organized, multiactor collaboration.[20] An actor-oriented architecture focuses on the actors and the ways that they interact. This infrastructure and the mechanism to promote self-organizing behavior enable a network to respond quickly and nimbly to a variety of needs because resources can be (re)configured as needed.

Combinations of nodes, linkage relationships, and activities for controlling and coordinating the combinations emerge in the course of creating and providing a health care service and conducting research. For example, doctors work with patients and each other to provide for the treatment of a patient. These same "actors" may also work with each other to conduct research. A networked organizational architecture has the potential to facilitate the diverse types of interaction required for clinical care, improvement, and research. For example, data collected during clinical care and stored in a shared database (a commons) can also support research that is accessible to self-motivated researchers. The networked services also allow the work done by people providing health care service in organizational entities configured as value shops or chains to be connected with activities such as research and improvement. By aggregating knowledge and information and applying it to the point of care, the network facilitates the integration of diverse and dispersed value shops and value chains into a larger flexible system of treatment resources.

Tables 1–3 outline some of the unique properties, roles, and benefits of the value shop, value chain, and value network. To illustrate

TABLE 1 Properties of value creation configurations

	Value Shop	Value Chain	Value Network
Activities/services that create value	Mobilization of resources, people, and tools to create customized solution on a case-by-case basis to individual problems	Efficient, repeatable management of linked processes to transform inputs into outputs	Facilitation of value-creating relationships among actors in a health care network
Key attributes, properties	Focused problem-solving, customizing to individual needs	Standardizable processes, automation predictability, reliability	Network creation—attracting and retaining actors. Connectivity among actors. Developing content and type of exchange (data, tools, and resources) (also known as "conductivity")
Resources and costs incurred	Most expensive model, providing one-to-one care	Less expensive model. Reduces cost by removing waste from processes, using industrial improvement methods. Has shown efficiencies, for example, in hip replacement, ophthalmologic surgery for vision correction	Lower cost per activity. Connecting aligned actors and resources reduces costs by unleashing unused capacity. Technology for connection, sharing, and contribution
Use of Information Technology	Manages information flow and access to resources. Better diagnostics, better support for planning and design of interventions, better evaluation of outcomes, better use of information by health care professionals	Manages information flow. Automation of certain steps. Predictive analytics	Technology allows patients, clinicians, and researchers to connect and collaborate
Helpful measurement	Effectiveness and quality of the treatment outcomes, cost, and value of care. Measurement of the choices made.	Effectiveness and quality of the treatment outcomes, cost, and value of care. Flow through the chain. Getting "entry" for the right people at the right time, experience of the linked processes, and appropriate "exit."	Effectiveness and quality of the treatment outcomes, cost, and value of care. Number and types of actors. Information and resources exchanged. Time and cost of problem solving. Capacity. Production of new knowledge. Speed and quality of answers. Customization to individual problems.

TABLE 2 Roles in the value configurations

	Value Shop	Value Chain	Value Network
Patient	Problem owner. Provide information and take prescribed actions. Coproducer of individual care	Problem owner that yields to a standardized treatment process	Problem owner, care resource, and network facilitator. Cocreator and coproducer of care, connector of actors and resources across network, insight and expertise, problem solver
Professional	Expert, consultant, mobilizer of resources. Obligation to take action. Designer.	Expert, technician for specific processes. Designer.	Network facilitator/connector. Recognizes that network exists. Maintain focus on shared purpose. Expert, contributor of knowledge and know-how. Designer.
Leader	Architect and builder of consultative organization	Oversee operational management of the system, make resources available for improvement	Facilitate formation of the network. Ensure vitality of the network and ongoing engagement of patients and professionals

TABLE 3 Benefits of value configurations

	Value Shop	Value Chain	Value Network
Benefit to the actor (patient and/or health care professional)	Able to deal with the complexity of unique situations and interventions that are relevant to the particular patient.	Efficiency gains from standardized predictable treatment, with well understood, Potential increase in quality.	Increases available resources. Flexible, adaptive linkages for clinical care and research. Increases parallel streams of problem solving, inquiry and learning. Expands resources by connecting shops and/or chains (information, facilities). Increases availability and access to resources for the patient, the clinician, and the researcher. Enables systems to manage quality, validity, and usefulness of information that is available. Efficiency in fluid activity/resource situations. Increased resource mobilization.
Benefit to the system	More effective customizing of treatments	Lower costs of routine treatment	Lower the overall resources consumed by reapportioning tasks to patients, clinicians, and researchers

how these configurations of value-creating activities work, we describe two cases of "*networked health care*" in which patients and professionals work together in a variety of ways to cocreate and coproduce health care service and to generate new knowledge. Case 1 is from Jönköping Sweden where health care service is created in regions, with tax-supported budgets. Case 2 is from Cincinnati Children's Hospital and Medical Center where health care service is created to serve communities of patients and families, sometimes crossing geopolitical boundaries and paid for with diverse payment modes including private and public insurance methods.

2.1 | Case 1. Self-dialysis unit at Ryhov Hospital, Jönköping, Sweden

Box 1.

Patrik lives and works in Jönköping, Sweden. He developed kidney failure and was treated in the dialysis center four times each week. Each session lasted 4 hours, which required him to stop working as a bricklayer. He was one of the patients who chose self-dialysis. Patrik eventually received a kidney transplant and now uses his own experience to help patients with questions related to dialysis and daily life with a chronic disease. In November 2012, he became one of Sweden's first employed "patient supporter." He works with patients at the dialysis clinic where he helps them connect with nurses and doctors. He assists in onboarding new patients in the self-dialysis network. When the question requires health care professional knowledge, such as the interpretation of a lab result, Patrik asks a nurse to explain. He facilitates educational courses for patients and their relatives. Doctors recognize the benefit of his work and refer new patients to him, before initiating a routine dialysis program.

Ryhov Hospital is the main hospital of Jönköping County. It serves a local population of 145 000 and offers regional services for the county population of 340 000 citizens. The dialysis unit at Ryhov started a self-dialysis unit after a patient requested the training to

manage his own dialysis. Britt-Marie Banck, an experienced nurse educator and team leader, responded to his request by creating a program to teach him how to manage his dialysis. Over time, more patients became interested in self-dialysis. A network of "patient supporters" emerged who worked together to facilitate the relationships among patients, doctors and nurses, and other patients. They also coproduced with the health professionals, the knowledge, and know-how to teach new patients how to conduct self-dialysis. Today, under the nurse educator's supervision, patients learn to prepare the dialysis machines and conduct dialysis sessions. During a dialysis session, patients monitor their own blood pressure and adjust the dialysis machine as needed. With the growth of interest in self-dialysis, a new Self-Dialysis Pavilion with 13 dialysis machines was built in 2011. After demonstrating the capability to perform hemodialysis safely, self-dialysis patients are given access to the dialysis center and to a shared electronic calendar. They can enter the building and start their own dialysis at any time during the day and night, even when there are no health care professionals on duty. Data about the dialysis session and the patient is available to the nurse. Although patients perform their own dialysis, they do so as networked actors in the organization. When needed, patients can be matched with the nurse-led, standardized hemodialysis or be seen on an individual basis with customized dialysis. The matching of the patient need with the system for accomplishing the dialysis is done with the shared judgment of the nephrologist, nurse, patient, and patient support system.

Data routinely collected from the dialysis clinic (before and after the self-dialysis expansion) and from the Swedish Renal registry do not show detrimental clinical results compared with the national data. The staff report that patients have fewer infections and higher quality of life and are more satisfied with their care and overall cost savings.[21]

2.2 | Case 2. ImproveCareNow inflammatory bowel disease collaborative chronic care network

The ImproveCareNow (ICN) Network has three elements of an actor-oriented architecture: actors (people and organizational units) with a common purpose, standardized protocols and processes, and a commons. Together, these elements facilitate the self-organizing properties of the network.

The ICN Network began as a quality improvement collaborative composed of clinical care sites. It advanced its network architecture as a result of the Collaborative Chronic Care Network (C3N) Project, funded via an NIH Transformative Research grant (R01 DK085719), which worked with the ICN Network to develop the social, scientific, and technological infrastructures to alter how patients, clinicians, and researchers engage in every aspect of the health care system to enable coproduction of service and care for Crohn's Disease and Ulcerative Colitis in children.[22] Since 2007, the proportion of patients in remission (inactive disease) has increased from 55% to >80%.[23] The ICN Network has grown to >100 sites that provide care for more than 25 000 patients across the United States and internationally. This network now includes about 55% of all children with the disease in the United States

Box 2.

Excerpt of comments by Justin Vandergrift (father of Kathryn, a child diagnosed with Crohn disease in 2011) at an ImproveCareNow Learning Session. Spring 2013.

Each family is dealing with their child's disease on a daily basis. Behind me, there are 160 patients at my care center. I am here to be their voice. Behind each of these parents are hundreds of kids at each care center. Together we represent over 16 000 kids with IBD. As parents, we all share a common goal. We want the pain, tears, and frustration to go away. We want to give our kids the highest quality of life possible. This is the reason why ImproveCareNow is so special. ImproveCareNow believes that you can go fast if you work alone—but you can go far if you work together. Changes made by QI Teams at care centers impact the lives of our families. We live with Crohn or Ulcerative Colitis 24 hours a day. Our child's disease is OUR disease. We recognize that the care teams invited us to participate because they trusted our feedback and recognize our commitment to the other children with IBD at our hospital. We offer you a sounding board for changes and actions—along with constructive criticism from our experience. We share YOUR goal—to improve the lives and care of other families.

The relentless focus on improving rates of clinical remission is the common purpose that maintains the focus of the community. The emphasis on outcomes includes consistent, regular transparent sharing of data, successful change examples among care centers, and personal narratives. There are standards and processes for sharing and coordinating efforts. Network participants interact through multiple events and collaboration platforms including semiannual conferences and monthly webinars and conference calls, online communities for parents, and digital commons for sharing ideas. An ICN norm of "stealing shamelessly and sharing seamlessly" promotes the spread of good ideas to all actors in the system. Examples of self-organized contributions include materials for newly diagnosed families (https://www.improvecarenow.org/tools) and the prioritization and design of research. Clinical teams have developed and shared care tools for group visits and how to improve clinical processes such as previsit planning. An "enhanced registry" technology platform was created to make it easier to produce data and knowledge for research and improvement. There are also standardized tools for data collection that can be embedded in the electronic health record that allow clinicians to capture data during routine clinical care and upload it into the registry. Automated registry reports make it easier for care teams to manage chronic illnesses through previsit planning and population management. By making gaps in outcomes transparent to all, the availability of the registry database facilitates research, observational comparative effectiveness studies, and clinical trials.[22]

3 | OBSERVATIONS ABOUT THE NETWORK HEALTH CARE CASE STUDIES

The two case examples of Rhyov and ICN illustrate different ways in which networked health care can create value for patients and care providers. The Self-Dialysis Unit example illustrates how a reconfiguration of actors and resources as a network can simultaneously decrease the burden of illness and its management while also reducing the costs of health care service. Patients were connected to knowledge and resources for managing their own care and became able to assume tasks typically conducted by health care professionals, thus becoming active contributors to their own care rather than passive recipients of dialysis services delivered by professionals. Connecting patients develop the capability to perform their own dialysis to the dialysis center and a shared electronic calendar that allows them to coordinate their own use of the dialysis machines. The role of nurse educator effectively shifts to that of a network facilitator—training and supervising the patients, monitoring the patient's treatment and capabilities, and providing support for unanticipated events, such as problems with venous access or infections and mobilizing physicians or other specialists as required. The physician focuses on diagnosis, monitoring progress and adjustments in the treatment program, and the operation and ongoing improvement of the various modes of dialysis as a system. In this example, the actors and material resources are familiar—doctors, nurses, patients, technologies, and treatment facilities—but their roles, interrelationships, and modes of interaction are new. The example also introduces a new type of health care actor—a facilitator of the patient community. Patrick, a bricklayer and then a patient, took on this role when given the opportunity to become a facilitator of the community. They participate in the national registry for dialysis where their data are collated with other Swedish centers.

The ICN Network demonstrates a way of aggregating and organizing resources when patient, clinician, researcher, and health system needs are complex and evolving, and necessary knowledge and capabilities are beyond the capability of even the biggest care centers. The fundamental shift is away from a hierarchical expert-driven approach to one in which all participants in the system share a common purpose and are encouraged to self-organize and act together to improve outcomes, generate innovations, and create new knowledge. In the increasingly complex world of health care, few organizations large or small have the breadth or depth of expertise to deal with every problem. Networked health care can improve the work of value shops (each care center) by expanding access to knowledge and expertise. The community of actors—including peers—can now augment the problem-solving functions of the value shop (care center) by increasing access to the expertise, knowledge, and know-how for specific problems that emerge. The network can also facilitate the spread and implementation of standardizable work elements using a chain configuration, increasing the speed of improvement and better use of the value chain to reduce the cost of care. Sharing of standardized care processes (eg, for previsit planning) facilitates the value-chain functions of each care center. Research is facilitated through greater shared situational awareness about gaps in outcomes, the capability to use the registry to support preresearch planning, and the ability to more easily engage clinicians and patients in studies. This opens the potential for significant cost savings in the conduct of the research.

3.1 | Strategies and challenges

Establishing a network and ensuring that it continues to function requires leadership practices that differ from those required in hierarchical or matrix organizations. This "service-dominant" framing, focused on working together to integrate resources for mutual value creation, is inherent in a network.[24] We summarize clusters of this leadership work in key tasks of developing and managing networks below.

3.1.1 | Network formation

Network leaders must attract, recruit, and retain actors in the network and encourage participation and contribution. A key leadership activity is to facilitate the formation of the network. This may begin by attracting innovators who are motivated to contribute and encouraging alignment around a shared purpose. The ICN Network illustrates the importance of creating shared purpose and norms to attract and mobilize actors. Leaders must recognize and facilitate relationships among patients, clinicians, and researchers—diverse actors who may not consider themselves to be interrelated and as part of the same network.

3.1.2 | Building robust facilitating infrastructure and services to connect actors

Networks help improve relationships among actors and nodes. These improved relationships can contribute to both clinical care and research. Operating the network at scale is enabled by new forms of technology for data repositories, online knowledge access, and social networking. Such technology could be developed within a single health care system, but the power of the network comes from the opportunity for large-scale connectivity and collaboration across multiple individuals and organizations. Developing such enabling technology is complex because of the array of technologies that must be used, the fast pace of digital innovation, and the rapid pace of refinement of new tools, the complexity of governance, and the high cost of technology investment particularly in the constrained environment in which current health care organizations operate. Other industries and sectors can offer health care settings some useful examples.

3.1.3 | Ensuring the quality of shared resources and leadership of the commons

A central role of network organizers is the development of culture, norms, and tools that promote shared responsibility for creating high-quality knowledge and resources for all participants.[20,25] Leaders can help establish "shared situational awareness" by a focus on outcomes

and a high degree of transparency. A wide variety of available technologies can help network participants share information about problems, do peer ranking of the relevance and rigor of contributions, serve as editors and curators of contributions, use moderation tools to reduce the propagation of poor ideas, and monitor resource use.

3.2 | Implications for practice, education, research, and policy

The examples we described were developed within the existing health care system, financing, and policy context. Bringing together diverse, previously disconnected networks of patients, clinicians, and researchers has the potential to disrupt existing power dynamics, fundamentally changing the relationships among clinicians, patients, and researchers and the work that they do. We believe there are implications for the roles of those involved in clinical care, education, research, leadership, and policy if the approach is to scale up the following:

3.2.1 | Those delivering clinical care

Those delivering clinical care become aware that networks exist and can offer sources of expertise. Routine health care services might facilitate connections among current system users.

3.2.2 | Those facilitating improvement and change

Those facilitating the improvement and change of existing health care service systems can use the network system architecture framework to design and test changes. For example, the leaders of improvement activities might ask questions to explore, test, and develop alternative ways to offer health care service, improvement, and research, such as the following: Who/what are the actors and what are their needs and goals? What information, services, and resources are needed to meet these needs? What are the ways in which a "shop," "chain," or "network" configuration add value in meeting the needs and goals? What is the appropriate mix of shops, chains, and networks? Could we offer more cost-effective, higher quality, safer care, and services if we realigned the work across the three models? (eg, what if we aligned work currently done as "shop" or a "chain" by linking them via a network?) What are the action steps to strengthen existing modes or to change to alternate modes/change the mix of modes?

3.2.3 | Those educating professionals

Moving from the "product-dominant" logic to a "service-dominant logic" invites a deeper insight into the basic elements of relationship and actions involved in health care service, to the multiple streams of knowledge that inform that work, and how they are integrated into the design of health care service, which limits the burdens of illness and treatment.

3.2.4 | Those conducting research

The network configuration opens new research opportunities. All actors, all aspects of treatment, and the integration of their contributions to the reduction of illness burden are open for exploration and assessment. Additional case studies of emerging networks can generate further hypotheses worth testing, insight into the best approaches for implementation, and ever-better methods of assessing quality, safety, and value.

3.2.5 | Those leading organizations and policy makers

Health care leaders can help those involved to understand how the different organizational configurations create value. By attending to the effects of scale, scope, and strategy, leaders can increase the health systems' impact, efficiency, and value. The use of value networks is dramatically expanding across most other sectors. As illustrated by our two cases, there are many currently underexplored uses of this way of creating value in health care systems. We believe that knowing how to match value creation with value configurations will be important for leaders at all levels who are interested in developing better future health care systems.

As health care organizations move toward value-based delivery models, newly acquired clinical sites require integration with established systems to reduce fragmentation. Leaders face the challenge of coordinating resources across a more diverse array of sites of care. The conventional approach is to try to reduce complexity through standardization and hierarchical integration by the control and coordination of diverse and dispersed organizational elements. A networked model offers the alternative strategy of creating value by connecting actors and enhancing the capability of nodes/actors to collaborate, share, and contribute in a flexible and responsive way to challenges as they arise.

Developing the financing, the incentives, the policies, and the quality improvement systems that foster effective networked health care systems will be key. For example, the End Stage Renal Disease program of Medicare in the United States pays providers to operate dialysis centers on a modified "fee for service" model. How would a reimbursement system need to be modified to take full advantage of a networked patient-managed dialysis program to incentivize health systems' investment of the time and resources required to create networks of patients, clinicians, and researchers produce and to observe sufficient return on investment? How would health care organizations need to communicate and educate patients about the potential benefits of participating in a network? What policies and processes would need to be in place to ensure

the validity of information that is shared? New approaches will be needed to achieve the substantial efficiency and effectiveness that networks have the potential to release.

What would motivate professionals and patients to contribute and share? Experience from open innovation has shown that contributors obtain both public and private benefits. They benefit from access to and availability of innovations that otherwise might be too expensive for any individual participant to create, as well as from being able to influence or adapt the innovations to match their particular needs.[26] They can also benefit from professional recognition and commercialization opportunities associated with cocreation/coproduction. Many such networks use mechanisms for tracking individual contributions where recognition is important. Some commercially oriented networks have solution posting systems where ownership to particular solutions is recorded such that others can build on them without compromising the property rights of the developers.[27] Although health care has many unique properties associated with both the creation and production of care, we believe that valuable lessons can be learned from collaborative arrangements in other sectors.

4 | CONCLUSION

Constructing a new frame for the coproduction of health care services will be difficult. It will need to be responsive to the individual experience of illness and health, in which humans *universally* experience illness and death but have *particular* diseases, diagnoses, and treatment. When we are sick, we are sick in particular ways (to us) and we benefit from treatment that recognizes and uses unique personal, biologic, financial, and social resources that can help each of us limit the burdens of illness and treatment in our own life. We realize that it is very difficult to "outsource" our own health, even to well-meaning professionals.

Cutting costs while preserving current organizational forms fails to offer the optimal social result. Trying harder to become more efficient without differently designed models for that work invites exhaustion, "burnout," and frustration by patients, providers, managers, and funders alike. The models that revolutionized the manufacturing of products are not sufficient for the work of improving health care services. Alternative paths will require work on both theory development and application testing.

We believe that the best value health care service will emerge through the appropriate application of these configurations. We envision a health care service system in which the relationships among professionals, resources, and patients are enabled by combinations of networking technology and people. The design must allow shared decision-making that honors patient preferences. It must offer the right services and no more. It must allow dynamic matching of resources and activities to patients and treatment situations. The availability of meaningfully connected networks, the development of those actors, the facilitation and augmentation of their relationships, and the technology that facilitates multiple modes of interaction can work together to increase the availability of health care resources. The resulting increase in interactions can reveal resources and helps us move away from the current overwhelming assumption of resource scarcity to one of greater capacity.

Organizational design facilitates or handicaps efforts to improve otherwise good professional work. Leadership and management can prioritize the design of systems that will mobilize the existing resources in ways that match the needs that individuals and populations present—and do so at a good value. We propose that this begins by rethinking the assumptions underlying value creation in health care service systems. By identifying different ways in which value is created, we can sharpen our efforts to design and improve health care service systems and assess their value.

CONFLICT OF INTEREST

Authors Øystein D. Fjeldstad, Julie Johnson, Pär Höglund, and Paul Batalden declare no conflicts of interest. Michael Seid and Peter A. Margolis are inventors of technology licensed by Cincinnati Children's Hospital Medical Center to Hive Networks, a company that provides software as a service to support learning networks.

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