Journal of Healthcare Leadership

Dovepress
open access to scientific and medical research

Open Access Full Text Article

PERSPECTIVES

Understanding Evidence-Based Practice (EBP) Implementation in HCOs Through the Lens of Organizational Theory

This article was published in the following Dove Press journal:
Journal of Healthcare Leadership

Pavani Rangachari

Department of Interdisciplinary Health Sciences, College of Allied Health Sciences, Augusta University, Augusta, GA 30912, USA

Abstract: Despite the increasing use of theory in the field of implementation science over the past decade, the literature has largely focused on using deterministic frameworks to retrospectively understand "what" factors are essential for the effective implementation of evidence-based practices (EBPs). On the other hand, gaps remain in using organizational theory to prospectively understand "how" successful EBP implementation occurs in health-care organizations (HCOs). This article discusses the theoretical and empirical contributions of two selected recent exploratory research works, which provide a starting point for addressing the identified gaps in the literature, with the purpose of deriving implications for theory, practice, and future research in implementation science. The selected works used the theory of "effective knowledge sharing network structures in professional complex systems (PCS)," developed through an integration of organizational theories, to design prospective interventions for enabling EBP implementation in HCOs. In doing so, these studies have helped explain "how" inter-professional knowledge exchange and collective learning occurred, to enable successful EBP implementation in HCOs. Correspondingly, the selected works have served a dual purpose in: 1) identifying evidence-based management (EBM) practice strategies for successful EBP implementation; while 2) further developing the theoretical literature on "effective knowledge sharing networks in PCS." Importantly, by addressing the identified gaps in the literature, the selected works serve to either complement or supplement existing theoretical approaches in implementation science. To this effect, they provide unique insights for theory, practice, and research in implementation science, including insights into a potential "dual-role" for the future implementation researcher—one of advancing implementation science, while working to strengthen implementation practice. Based on these contributions, it could be argued that the selected works provide a starting point for a new research stream that has the potential to occupy a distinct position in the taxonomy of theoretical approaches used in implementation science.

Keywords: evidence-based practice (EBP) implementation, inter-professional knowledge exchange, organizational learning (OL), knowledge sharing networks, professional complex systems (PCS) theory, practice improvement

Correspondence: Pavani Rangachari
Department of Interdisciplinary Health Sciences, College of Allied Health Sciences, Augusta University, 987 St. Sebastian Way, Augusta, GA 30912, USA
Tel +1 (706) 721-2622
Fax +1 (706) 721-6067
Email prangachari@augusta.edu

Background

The formidable challenges of implementing and sustaining evidence-based practices (EBPs) in health-care organizations (HCOs), have led to the rapid development of the field of "implementation science," over the past two decades.[1–4] Implementation science has been defined as "the scientific study of methods to promote the systematic uptake of EBPs into routine practice, to improve the quality

submit your manuscript | www.dovepress.com
DovePress
http://doi.org/10.2147/JHL.S258472

and effectiveness of health services."[5] Implementation studies are known to typically employ mixed-method designs to identify factors that impact uptake of EBPs across multiple levels, including patient, provider, organizational, community, and policy levels.[6] Accordingly, it may be reasonable to expect the field to have a solid grounding in theory. However, as observed by Eccles et al in 2005, less than 10% of early implementation studies provided a theoretical rationale for implementation strategies.[7] Over time however, implementation scholars began to recognize that inconsistent success with EBP implementation across health-care settings was often attributable to limited theoretical foundations.

In recent years therefore, the need to establish theoretical foundations for implementation research, has been widely recognized.[8–10] Correspondingly, the field has witnessed a burst of interest in using theories to understand the mechanisms of successful EBP implementation, to the extent that the field has now accumulated a plethora of theoretical approaches to support implementation research, making it challenging for researchers to select and apply the most appropriate approach.[11,12] To enable the selection of appropriate theoretical approaches in implementation research, Nilsen (2015) put forth a taxonomy to distinguish between different categories of frameworks, models, and theories in the field.[12] To enable effective use of the the taxonomy, Nilsen also provided a distinction between the terms "theories," "models," and "frameworks." Since its publication in 2015, Nilsen's taxonomy has been used widely, as a schema for organizing overviews of theoretical approaches in implementation science.[13–16]

Purpose of This Article

This article leverages Nilsen's taxonomy to gain insight into theoretical approaches used in the field of implementation science. These insights are integrated with findings from recent review articles in the field of implementation science, to identify specific gaps in the literature, with regard to the use of theory. These gaps serve as the primary issue of interest to this article. This article selects two recent exploratory research works (hereafter referred to as "selected works") that serve to provide a starting point for addressing the identified gaps in the literature. The primary purpose of this article is to discuss the theoretical and empirical contributions of the selected works, to gain insight into theoretical and practical implications in implementation science.

Use of Theoretical Approaches in Implementation Science

According to Nilsen's taxonomy, there are three broad aims for using frameworks, models, and theories in implementation science, under which, there are a total of five categories of theoretical approaches.[12]

1. Aim 1: Describing and/or guiding the process of translating research to practice
   - Process models
2. Aim 2: Understanding and explaining "what" influences implementation outcomes
   - Determinant frameworks
   - Classic theories
   - Implementation theories
3. Aim 3: Evaluating implementation
   - Evaluation frameworks

According to Nilsen's taxonomy, Aim 1, has primarily been addressed through "process models," or "how-to-implement" models. Process models facilitate implementation by offering practical guidance with regard to planning and executing implementation endeavors, by highlighting the key aspects that must be considered in implementation practice. Overall, process models serve to describe the process of converting research into practice, rather than to predict the factors influencing implementation outcomes.

Next, according to the taxonomy, Aim 2, has been addressed through "determinant frameworks," "classic theories," and "implementation theories." Among these, determinant frameworks describe general types of determinants that are expected to influence implementation outcomes, e.g., health-care providers' adherence to an EBP. Each determinant type typically consists of several individual facilitators and/or constraints, which are viewed as explanatory variables impacting implementation outcomes (dependent variable). Determinant frameworks do not address the causal mechanisms for how change takes place; as such, "frameworks" should not be considered as "theories." Examples of popular determinant frameworks include, the Consolidated Framework for Implementation Research (CFIR); the Innovation Implementation Framework; and Promoting Action on Research Implementation in Health Services (PARiHS), to name a few.[1,17,18]

Nilsen's taxonomy also discusses how researchers have applied classic theories from fields like organizational theory, sociology, and psychology, to study implementation. These

theories have been termed classic theories to distinguish them from "how-to-implement" models. Classic theories may be viewed as passive relative to "how-to-implement" models, because they describe change mechanisms without ambitions to actually bring about change.[12] As discussed by Nilsen, psychological theories, theories regarding the collective, and organizational-level theories have all been used in implementation science.[19–27] However, Nilsen emphasizes that despite increasing interest in using organizational theory, its actual use in empirical studies of implementation, has so far, been limited.

In addition to classic theories, implementation researchers have developed and adapted several implementation theories, to achieve heightened understanding of specific implementation aspects, e.g., Implementation Climate.[28,29] The adaptation, in turn, has allowed researchers to prioritize and analyze issues related to particular aspects of implementation, thereby improving the relevance of the theory to the particular circumstances at hand. Lastly, according to Nilsen's taxonomy, Aim 3, has been addressed by evaluation frameworks, a category that provides a structure for evaluation of implementation endeavors.[30]

In addition to assisting implementation researchers in selecting appropriate theoretical approaches, Nilsen's taxonomy provides insights into the state of theory in implementation science. Importantly, it helps to understand that the primary thrust of theoretical approaches in implementation science (at least until 2015), has been on understanding "what" factors enable or inhibit implementation success, rather than on explaining "how" implementation success occurs within an HCO. As explained earlier, three of the five categories of theoretical approaches in the taxonomy, have served to address the overarching aim of understanding "what" influences implementation outcomes. Among these, "determinant frameworks," are clearly oriented to understanding "what" factors enable or inhibit implementation success. Similarly, "implementation theories," are focused on developing an enhanced understanding of specific aspects of implementation. On the other hand, "classic theories," particularly, organizational theories, may have maximum potential to provide a holistic understanding of "how" successful EBP implementation occurs within a HCO context. However, as noted by Nilsen, the use of organizational theories in empirical implementation studies, has been limited.[12] The remaining two of the five categories in Nilsen's taxonomy, are process "models" and evaluation "frameworks," rather than "theories," seeking to explain causal mechanisms of implementation.

A key takeaway from the above discussion, is that theoretical approaches used in implementation science (at least until 2015), have been largely deterministic, with emphasis on explaining "the what," vs. "the how" of effective implementation. It would be relevant to note, that the key insights gained from Nilsen's taxonomy, with regard to use of theory in implementation science, are also corroborated by recent review articles in the field. For example, a systematic review of organizational measures associated with innovation implementation, examined 11 bibliographic databases, over the period 1973–2013.[31] Of the 76 studies included, all assessed latent organizational constructs defined by the CFIR. An overwhelming majority (86%) of the studies, were cross-sectional. The review essentially served to highlight several limitations of implementation research, including limited use of organizational theory, wide variation in operational and conceptual definitions of organizational constructs, limited demonstrated reliability or validity of the measures, and lack of standard reporting criteria in implementation research. Another integrative review article examined the EBP implementation literature specific to hospitals and health systems during the period 2007–2017.[32] Of the 50 studies that met the inclusion criteria for review, an overwhelming majority (85%) were cross-sectional studies or case studies that sought to "retrospectively" examine key factors enabling implementation success, using deterministic frameworks like the Innovation Implementation Framework, through surveys or interviews with health-care leaders, following completion of an implementation effort. By comparison however, there were far fewer studies that used organizational theory to "prospectively" examine how implementation of innovation occurs within the context of a HCO.

Gaps in the Implementation Science Literature with Regard to the Use of Theory

The aforementioned review articles, not only point to the proclivity in the existing literature, towards using deterministic frameworks (e.g., CFIR), to understand factors driving implementation success, but they also highlight the overwhelming tendency among implementation studies, to use cross-sectional designs to retrospectively understand "what" factors influence implementation success, as opposed to prospective designs seeking to examine "how" successful implementation of EBPs occurs within the context of an HCO,

through the lens of organizational theory. These gleanings suggest that cross-sectional, retrospective study designs may be more suited to understanding the "what," i.e., what factors drove success, following conclusion of an implementation effort, whereas, prospective study designs may be more appropriate for understanding "how" implementation success occurs, within a HCO context. Supplementing these key insights, are two independent observations made by Nilsen, with regard to the use of classic theories in implementation science: 1) use of organizational theory in empirical implementation studies has been limited; and 2) use of organizational theory in implementation science, has tended to remain passive, i.e., restricted to describing change mechanisms, without ambitions to actually bring about change.[12]

In summary, integrating lessons learned from the above discussion, helps to identify a distinct gap in the implementation science literature, i.e., in using organizational theory to design prospective interventions to both enable EBP implementation (actively promote change) and explain "how" EBP implementation occurs within a HCO context. In recent years, two exploratory research works have used organizational theory to design prospective interventions to enable EBP implementation, and, in the process, gain insight into "how" EBP implementation occurs within the HCO context. By definition therefore, these works are directly relevant in providing a starting point for addressing the aforementioned gap in the implementation science literature. This article seeks to discuss the theoretical underpinnings and empirical contributions of these "selected works," with an eye towards gaining insights into implications for theory, practice, and future research in implementation science.

Theoretical Perspectives

Both selected works discussed in this article, used the theory of "effective knowledge-sharing network structures in professional complex systems," (PCS) developed through an integration of organizational theories, to design yearlong prospective interventions for enabling EBP implementation within the HCO context. While one of the selected works discussed in the article, pertains to the implementation of Central Line Bundle (CLB) practices to prevent Central Line Associated Bloodstream Infections (CLABSIs) within two intensive care units (ICUs) in a health system; the other selected work pertains to the implementation of Meaningful Use practices in Electronic Health Record Medication Reconciliation (EHR MedRec), across outpatient and inpatient medicine units, within a health system.[33–44] Both studies recorded significant successes in EBP implementation, during and beyond the one-year intervention period. Importantly, both studies provided insight into evidence-based management (EBM) strategies for successful EBP implementation. We now discussthe organizational theory foundations in both works, while the subsection after that discusses empirical contributions and EBM strategies, emanating from these works.

Organizational Theory Foundations in the Selected Works

Under the category of "classic theories," the Nilsen taxonomy discusses the relevance of various organizational theories, including complex systems, organizational learning (OL), and social network theories, among others, to implementation science. Both selected works (discussed in this article) used a theory of "effective knowledge sharing network structures in PCSs, borne out of integrating all three aforementioned organizational theories, as the foundation for designing yearlong prospective interventions to promote EBP implementation within the HCO context.[33,34] The organizational theory underpinnings of the theory of "effective knowledge sharing network structures in PCS," are discussed below.

Professional Complex Systems Theoretical Underpinnings

Organizational literature has indicated that an integration of complex systems and professional organizational theories, and can provide useful insights for successful implementation and management of change in professional organizations, such as HCOs.[45,46] To this effect, the term "professional complex systems" has been used to describe professional organizations exhibiting characteristics of complex systems.

According to complex systems theory, the organization is pictured as one indivisible dynamic whole, with interrelated parts, instead of a collection of parts. Correspondingly, complex systems are characterized by patterns of relationships and connections among agents. While individual agents may not be aware of the whole system behavior, the complex system organization emerges from interaction among various system-parts; giving rise to a system that is in essence, self-organizing. The literature has suggested that for the process of self-organization to work in complex systems, managers must create effective mechanisms for knowledge sharing and

learning, to provide a foundation for action. In other words, in a complex system framework, OL is an essential pre-requisite for "organizational change."[47]

In professional organizations, numerous professional subgroups work together to apply their professional expertise and values to resolve complex issues. Hospitals are viewed as a classic example of professional organizations since they contain several professional subgroups (e.g., nurses, physicians, and pharmacists), working together to deliver patient care. The professional is expected to possess specialized knowledge (expertise), gained through substantial training, coupled with a value system that is representative of broader societal values.[48,49]

In professional organizations, learning is complicated by the unique influence of professional expertise and values on professional behavior. While the basis for expertise is dynamic, professional organizations function as preservers of broader societal values, which inhibits their learning.[46,50] While institutional theory helps understand normative limits to action in professional organizations, the theory of "subgoals" sheds light on both normative and cognitive limits to action, faced by professional organizations.[51] According to subgoals theory, each professional subgroup is responsible for performing a set of actions for achieving its goals. These actions in turn, become "subgoals" that are reinforced through communication within subgroups. Correspondingly, the greater the professional identification, the more frequent the communication within subgroups, which in turn, results in the persistence and differentiation of subgoals. When subgoals drive activities, other subgoals, and organizational goals tend to be subjugated in subgroup decisions. The persistence of subgoals in turn, greatly mitigates the potential to perceive cognitive connections across subgoals and between subgoals and organizational goals. As such, when organizations characterized by subgoals are faced with rapid change, the subgoals theory suggests that it may be indispensable for senior managers to intervene to proactively facilitate organization-wide knowledge sharing and learning to create the missing cognitive connections across subgoals and between subgoals and organizational goals.[51]

As discussed previously, a key gleaning from complex systems theory, is that OL is an essential pre-requisite to "organizational change." Correspondingly, the question to be asked from the perspective of managing change and turnaround in PCSs such as HCOs would be: how can OL be best achieved in PCSs?

Organizational Learning Theoretical Underpinnings

This is where the OL literature becomes most relevant to the discussion. OL has been described as the process organizations use to modify their mental models, knowledge, or rules for performance improvement.[52–54] By its nature, OL is viewed as a process for developing new perspectives, and likewise, a source for knowledge creation, or the development of new organizational knowledge. The theory of organizational knowledge creation in turn, views OL as dynamic knowledge creation process involving explicit knowledge and tacit knowledge.[55]

While explicit knowledge can be easily articulated and communicated using language or symbols, tacit knowledge is known to be embedded in practice, and deeply rooted in a specific context. Tacit knowledge is known to contain both technical expertise and mental models that can profoundly influence perceptions of the external world.[56] Organizational knowledge creation in turn, is viewed as a spiral repeated in four phases, including socialization, externalization, combination, and internalization, with the lattermost referring to the translation of explicit knowledge into the organization's collective tacit knowledge, where individuals gather explicit knowledge, to expand their tacit knowledge (e.g., by scrutinizing process documentation). "Collective tacit knowledge," has been described as the most strategically important type of organizational knowledge, and efforts to create it, in turn, have been deemed as most crucial for OL and successful adaptation to a changing external environment.57

Social Network Structure Theoretical Underpinnings

Nahapiet and Ghoshal have utilized the concept of social capital to provide a theory for how organizations can create collective tacit knowledge, which they refer to, as "intellectual capital."[58] According to this theory, social capital facilitates intellectual capital creation, by creating the conditions needed for knowledge exchange and knowledge combination. This theory describes the structural, relational, and cognitive dimensions of social capital.[58] Proponents of the structural dimension of social capital have argued that this dimension may be systematically associated with other conditions necessary for the exchange and combination of knowledge, and that these associations indirectly emanate from the influence of structure on the relational and cognitive dimensions of

social capital. For example, symmetric strong ties associated with affective relationships may motivate individuals to engage in social interaction, and concurrently, dense networks characterized by high levels of interaction, may be conducive to the development of the cognitive dimension of social capital.[59,60]

Not surprisingly therefore, several studies have sought to identify structural properties of networks that may be most effective for the collective tacit knowledge creation.[61–63] Two influential theories of social capital network structure are closure theory and structural holes theory. Closure Theory argues that networks in which everyone is connected through "strong ties" or dense networks, are a key source of social capital.[64,65] As such, closure is identified through the property of network density. On the other hand, the theory of structural holes argues that structural holes which refer to weaker connections among groups, are a key source of social capital.[66,67] According to this theory, "weak ties" separate non-redundant information sources and thus create an opportunity to broker the information flow between people. Structural holes in turn, are identified through the property of network brokerage. Networks that are high in brokerage enable flow of information by bridging and bringing together existing advantages of different groups.

Effective Knowledge Sharing Network Structures in Complex Systems

Recognizing that closure (density) and structural holes (brokerage) would often need to go hand-in-hand, a considerable portion of the social networks literature has sought to address the question of what might be an appropriate mix of structural holes and closure for organizational knowledge creation and collective learning.[59,61,62] Studies that have examined associations between the structure of social networks and knowledge sharing have argued that networks with higher closure (density) relative to structural holes (brokerage), may be more effective for collective tacit knowledge creation or OL in complex systems. For example, Hansen's (1999) study of knowledge exchange across a large electronic engineering firm's subdivisions found that while "weak ties" enabled explicit knowledge exchange, the exchange of tacit knowledge on the other hand, required direct interaction or "strong ties" between two or more groups.[62] On a similar note, in their study of Toyota, Dyer and Nobeoka (2000) found that a highly interconnected network of "strong ties" among Toyota's suppliers was more effective for tacit knowledge exchange, relative to the "weak-tie" network.[61]

Integrating the key tenets of theories of organizational knowledge creation, social network structure, and complex systems therefore, suggests that social networks that are high in density (relative to brokerage), may be more effective for creation of collective tacit knowledge (OL) in complex systems. Based on this discussion, Figure 1 depicts an "effective knowledge sharing network structure in complex systems." Following from the literature, the image depicts a network that is high in closure (density), and low in structural holes (brokerage), across any three given subgroups within an organization.

Effective Knowledge Sharing Network Structures in Professional Complex Systems (PCS)

It would be relevant to note however, that Hansen examined intra-organizational knowledge exchange across divisions having the same standard industrial classification code (SIC), while Dyer and Nobeoka examined knowledge exchange amongst Toyota's automotive part suppliers.[61,62] In both instances therefore, there were no fundamental differences in professional expertise and value systems among subgroups involved in the knowledge exchange process. As such, the question of interest is: Would the network structure shown in Figure 1 also be effective in a PCS context?

Recalling the earlier discussion, subgoals theory has put forth, that in order to effectively manage the change process in PCSs, senior managers need to play an unceasing, proactive role in developing cognitive connections across subgoals and between subgoals and the organizational goal.[51] At the same time, institutional theory suggest that change management in PCSs, should involve the management of professional values. In other words, in order to effect a re-socialization of professional values to be more in line with the changing environment, professionals need to be constantly exposed to changing societal values.[45,46] Therefore, an integration of subgoals and institutional theories suggests that in order to effectively implement and manage change in PCSs, senior managers must play a proactive, ongoing role in coordinating the exchange of tacit knowledge across professional subgroups and continuously exposing professionals to changing societal values.[33,34,45] Senior managers must make proactive, ongoing efforts, owing to the inherent tendency of professional subgroups to revert to within-group communication, due to the presence of professional values. In the absence of such proactive efforts

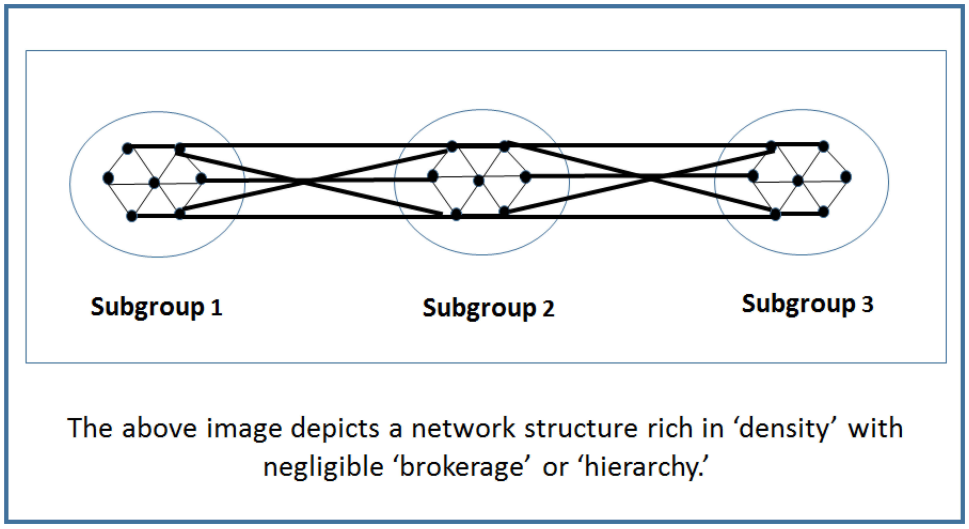

Figure 1 Effective Knowledge Sharing Network Structure in Complex Systems.

from senior managers, subgoals theory suggests professional organizations would fail to adapt to the changing environment, due to fragmentation across subgroups, emanating from the persistence of subgoals. From a structural perspective therefore, the above discussion suggests that the "effective knowledge sharing network structure in PCSs," may be one that is high in brokerage and hierarchy, and low in density across professional subgroups, as depicted in Figure 2.

In summary, from the perspective of managing change associated with implementing new EBPs in HCOs, the theory of "effective knowledge sharing network structures in PCS," suggests that proactive and periodic efforts from senior managers may be necessary to coordinate exchange of tacit knowledge related to EBPs across professional subgroups, to enable collective learning and practice change, needed for success with EBP implementation in HCOs.

Empirical Contributions and EBM Strategies Emanating from Selected Works

In both selected works, based on organizational theory foundations discussed earlier, senior health system administrators,

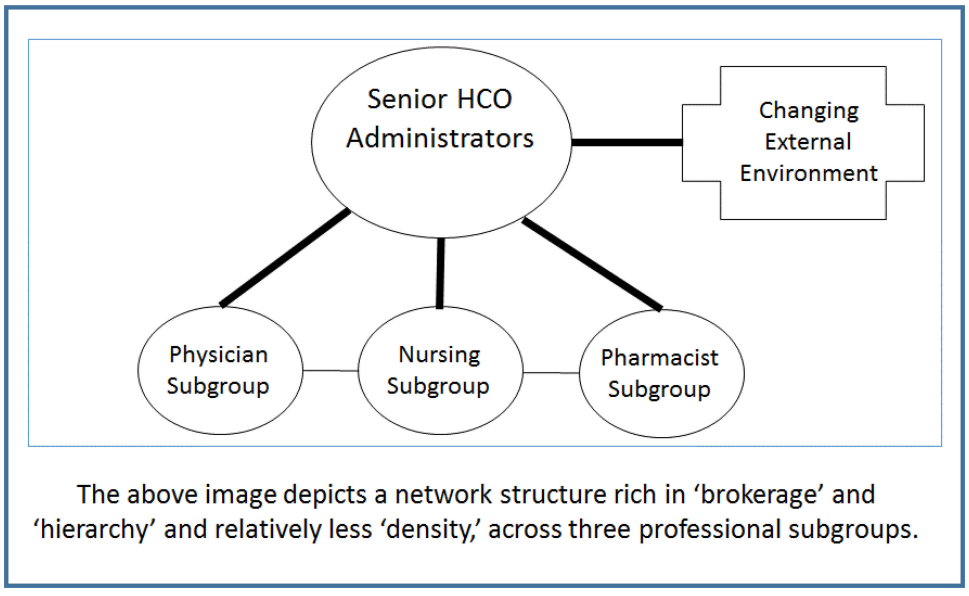

Figure 2 Effective Knowledge Sharing Network Structure in Professional Complex Systems.

conducted proactive, periodic communications related to EBPs, over a one-year period, in an effort to enable exchange of tacit knowledge related to EBPs across professional subgroups within health-care units, to promote collective learning of EBPs, and practice change, i.e., successful EBP implementation at the frontlines of care. It would be relevant to note that in both studies, the Principal Investigator (PI) joined the team of health system administrators to proactively facilitate the exchange of tacit knowledge related to EBPs across professional subgroups, on an ongoing basis, over a one-year period. Correspondingly, the PI wore the hat of health system administrator, within the confines of both implementation projects.

In the CLB study, periodic top-down communications related to CLB practices were conducted by senior administrators over a one-year period, to promote implementation of CLB practices in two ICUs. Concurrently, the study examined: 1) the content and frequency of knowledge exchanged related to the CLB through "communication logs" completed weekly by unit physicians and nurses; and 2) unit outcomes, i.e., implementation of CLB practices at the unit level, as well as central catheter utilization rates and rates of CLABSIs. Both ICUs experienced substantial improvement in outcomes, including increased implementation of CLB practices, and declines that were statistically significant, in both catheter days (utilization) and CLABSI rates. Qualitative analysis of the communication logs revealed that both units experienced a transition from "reactive" communications between nurses (within a professional subgroup), e.g., "wear mask before entering patient room," to "proactive" (risk-reducing) communications across professional subgroups, i.e., between physicians and nurses, e.g., "timely removal of central line catheters following morning round checks," over time, which, in turn, directly correlated with significantly reduced central line catheter days (utilization) and CLABSIs, at the unit level. The analysis also revealed that in the early part of the study, "champions" emerged from within each ICU, to initiate improvements to processes, to promote CLB implementation.[38,39]

Similarly, the EHR MedRec study, involved piloting a Social Knowledge Networking (SKN) system on "EHR MedRec," to allow a health system to progress from "limited use" of EHR MedRec technology, to "meaningful use," through collective learning of Meaningful Use practices. The main component of the SKN system was an information and communication technology platform (Microsoft Yammer), to enable moderated discussions of issues relevant to EHR MedRec among professional subgroups. Over a one-year period, 50 SKN Users (i.e., physicians, nurses, and pharmacists from outpatient and inpatient medicine settings), participated in inter-professional discussion of issues related to EHR MedRec on Yammer, moderated by 5 SKN Moderators (i.e., senior health system administrators).The second component of the SKN system, was five face-to-face Lunch-and-Learn sessions, spread over the one-year period, provide SKN Moderators the opportunity to bring SKN Users together, face-to-face, to discuss key lessons learned from Yammer exchanges. Qualitative analysis techniques were used to examine dynamics of inter-professional knowledge exchange on the SKN system. Concurrently, the study described trends in two measures of meaningful use of EHR MedRec technology, which emerged from knowledge exchange across professional subgroups on the SKN system.[40–44]

In summary, both studies involved implementing a knowledge sharing network structure similar to the one depicted in Figure 2 ("Effective Knowledge Sharing Network Structure in PCS"), with senior administrators playing a proactive and ongoing role in facilitating tacit knowledge exchange related to EBPs (including consequences of gaps in adherence) across professional subgroups, i.e., across physicians and nurses based in ICUs, in the CLB study; and across physicians, nurses and pharmacists based in outpatient and medicine units in the EHR MedRec study. This ongoing facilitation (boundary-spanning) role played by senior administrators to coordinate tacit knowledge exchange related to EBPs across professional subgroups (and connect them to the changing environment of EBPs), served to replicate a knowledge sharing network structure that was rich in "brokerage" and "hierarchy," and relatively less "density" across professional subgroups, as depicted in Figure 2.

The EHR MedRec study found that SKN discussions progressed from "problem statements" to "problem-solving statements," to "IT system education," to "best-practice assertions," to "culture change assertions," to "collective learning (aha) moments," to provide a foundation for change in practices; and that these inter-professional learning dynamics, in turn, were associated with distinct improvement trends in two measures of Meaningful Use of EHR MedRec technology, which emerged from inter-professional discussions on Yammer. One of these measures, for example, was the proportion of encounters (inpatient or outpatient), during which the "External Rx History" was imported (before the encounter ended). This in turn, translates to a Meaningful Use measure of EHR MedRec, because a higher proportion of patient encounters with "External Rx History" imported, is

indicative of better use of the EHR system, to obtain an accurate active medication list for reconciliation with new prescriptions, to serve the ultimate purpose of reducing medication discrepancies, during transitions of care. Overall, the study revealed that an SKN system could be a valuable tool in enabling Meaningful Use of EHR MedRec technology.

In summary, both studies, which leveraged the theory of "effective knowledge sharing network structures in PCS," to promote EBP implementation in HCOs, recorded distinct successes with EBP implementation, assessed in terms of practice improvement (change). Importantly, the prospective and qualitative design of both studies, served to provide substantive insights into "how" successful EBP implementation occurred, through exchange of tacit knowledge and collective inter-professional learning, to facilitate change in practices at the unit (frontline) level. These empirical contributions in turn, serve to not only validate the theory of "effective knowledge sharing network structures in PCS," but also, to reinforce the value of this theory (developed through an integration of classic organizational theories), as a tool for designing prospective interventions for enabling successful EBP implementation in HCOs.

It would be relevant to note that, both selected works were set at the same institution and shared similarities in: 1) conducting an intervention informed by the theory of "effective knowledge sharing network structures in PCS," to enable EBP implementation; and 2) using a prospective, exploratory study design to explain "how" inter-professional learning occurred to enable practice change within the HCO context. However, it would also be important to take note of the substantive differences in organizational context between the two studies. Although both studies took place at the same institution, they were conducted over five years apart, with no overlap among study participants, including practitioners and administrators. The CLB study involved participants from two professional subgroups, physicians and nurses based in two ICUs, while the EHR MedRec study involved participants from three professional subgroups, nurses, physicians, and pharmacists, based in (non-ICU) inpatient and outpatient medicine settings. Similarly, the CLB study involved implementing a simple innovation within two ICUs, while the EHR MedRec study required collaboration with the health IT division and medicine units, to implement a system-level health IT intervention that transcended unit boundaries.

There were additional, more subtle contextual differences to be noted. For example, the CLB study employed paper-based communication logs for physicians and nurses to self-report inter-professional knowledge exchanges relate to the CLB at the unit level. On the other hand, the EHR MedRec study, enabled tracking of inter-professional knowledge exchanges related to MedRec practices on an electronic SKN system. Although the EHR MedRec study had the advantage of electronic tracking inter-professional knowledge exchanges, the CLB study was designed to track improvements in hard outcome measures, such as reduction in both catheter use and infections (CLABSIs), in addition to practice improvements (CLB implementation). The EHR MedRec study was not designed to capture hard outcome measures, owing to the complex nature of the innovation (Meaningful Use of EHR) and the organic approach to piloting the SKN system, which relied on inter-professional discussion to dictate priority areas for practice improvement.

Despite the advantages/disadvantages of one study over the other, both were successful, not only in enabling EBP implementation, but also, in enabling an understanding of "how" inter-professional learning occurred, to enable practice change. As such, both studies served to generate EBM strategies for successful EBP implementation. For example, the CLB study found that during the early part of the study, unit nurses emerged as champions in initiating improvements to processes and offering positive reinforcements for change. This, in turn, served to increase the engagement of physicians, and enable the exchange of tacit knowledge related to new infection prevention tactics across professional subgroups (between nurses and physicians), to enable collective learning of a new way of preventing CLABSIs, i.e., proactive review of central line "need" in patients, and early removal of unnecessary central lines. Similarly, the EHR MedRec study also provided insight into EBM strategies for the creation of champions, and the engagement of clinicians, through a leader-moderated SKN system, i.e., a system enabling proactive periodic top-down communications, to facilitate knowledge exchange across professional subgroups related to EHR MedRec practices. The moderated inter-professional discussion of issues related to EHR MedRec in turn, allowed champions to emerge from among frontline nurses and pharmacists, to advocate for use of best practices in EHR MedRec. These findings pointed to the crucial importance of the emergence of champions within the units, to enable the units to progress towards learning and change. For example,

the CLB study helped identify EBM strategies for the creation of champions, by screening for champions at the unit level. If champions do not already exist, results suggested that they could be created, through proactive periodic communications related to EBPs, by senior managers.

The CLB study also pointed to the importance of engaging physicians with actionable process data, vs aggregate outcomes data. Results showed that process data helps to not only link EBPs to improved outcomes (e.g., removing central lines, helps decrease catheter use and reduce catheter infections), but it also helps highlight negative consequences of gaps in practices for patient outcomes, which, in turn, serves to increase alignment between EBP (innovation) and clinician values. To this effect, the study helped identify EBM strategies for engaging physicians and achieving innovation-values fit, through use of process data in proactive, periodic communications from senior managers. Similarly, in the EHR MedRec study, use of process data (by senior leaders) on the SKN system, to demonstrate meaningful improvements in best practice (EBP) measures emanating from SKN discussions (e.g., higher proportions of importations of External Rx History), served to increase clinician engagement in EBP implementation. Since the EHR MedRec study used a real-time electronic system to track inter-professional communication, it enabled a more comprehensive understanding of the dynamics of inter-professional learning that provided a foundation for changing practices. A key insight gained, was with regard to the sequence of inter-professional discussion, which helped facilitate a shared understanding of the value of EHR MedRec practices in ensuring patient safety, i.e., the answer the question of "why" practices needed to change, before any training in IT of providers to tackle socio-technical issues. Therefore, the EHR MedRec study went a step further, in outlining steps HCOs could take to design a "learning health system," including the synergistic use of IT components (Yammer) and non-IT components (Lunch-and-Learn sessions), to enable collective inter-professional learning of EBPs, and foster the creation of a learning health system.

A key takeaway from the above discussion, is that despite differences in organizational context, both efforts resulted in successful EBP implementation (practice change). This suggests that the theory of "effective knowledge sharing network structures in PCS" could be leveraged to enable EBP implementation across a wide variety of contexts that allow HCO behavior to be viewed through the lens of PCSs. Importantly, additional large-scale, systematic research efforts along these lines, could help to develop a robust foundation of EBM strategies for successful EBP implementation, for application in a variety of HCO contexts.

Discussion

Practice Implications

While deterministic frameworks (discussed under the Nilsen taxonomy), have highlighted the importance of "champions" and "innovation-values fit" as key factors in enabling implementation success ("the what"), the selected works discussed in this article, help to understand how these factors could be attained within a HCO context, through the design of effective knowledge sharing networks across professional subgroups ("the how"). Therefore, the EBM strategies for successful EBP implementation, identified from the selected works, could serve to complement lessons learned from using deterministic frameworks to understand factors driving effective implementation.

Similarly, lessons learned from the selected works discussed in this article, could serve to supplement the contributions of "how-to-implement models" described in the Nilsen taxonomy. Since "how-to implement" models do not provide causal explanations for how practice change occurs in HCOs, they may not be easily translatable across organizational contexts. On the other hand, the selected works used organizational theory to enable EBP implementation and generate EBM strategies based on an understanding of "how" inter-professional learning occurs, when HCOs are viewed through the lens of PCS. This in turn makes the theoretically-informed EBM strategies a useful supplement to "how-to-implement" models for implementation practice.

Theoretical Implications

The Nilsen taxonomy emphasized the limited use of classic theories in empirical implementation studies. It also stressed how even the limited use has been restricted to passive descriptions of change mechanisms, rather than ambitions to actually bring about change. In keeping with this argument, the taxonomy placed use of classic theories under Aim 2 of understanding "what" influences implementation outcomes. On the other hand, the selected works discussed in this article, not only contribute towards addressing the gap in use of classic theories in empirical implementation studies, but they also serve to shed light on how organizational theory could be leveraged to enable EBP implementation and

explain "how" successful EBP implementation occurs in HCOs (rather than passively describing change mechanisms). These contributions of the selected works, and the latter contribution in particular, could arguably provide justification needed for the selected works to occupy a distinct position within the taxonomy on use of theoretical approaches in implementation science.

Going back to Aim 2 of the Nilsen taxonomy, despite limited progress in using classic theories in empirical implementation studies, it would be important to acknowledge the significant work that has been undertaken beyond the selected works discussed in this article, to apply organizational theories to address issues in implementation. For example, one recent discussion article, applied four organizational theories (transaction cost economics, institutional theory, resource dependency theory, and contingency theories), to published descriptions of efforts to implement EBPs for preventing child neglect and abuse.[68] Another recent discussion article focused on the role of "facilitation" in enabling the uptake of scientific knowledge to improve organizational performance. In doing so, it proposed a theoretical home for "facilitation" in OL theory.[69]

The two selected works discussed in this article, serve to complement the aforementioned works, while maintaining their distinctness. For example, the effort to apply four organizational theories (mentioned above), serves as an example of a retrospective analysis of "what" factors enabled successful EBP implementation in the context of child abuse and neglect. On the other hand, the selected works (discussed in this article), used organizational theory to enable EBP implementation and explain "how" successful EBP implementation occurred, thereby serving to complement the retrospective analysis mentioned earlier. Similarly, the selected works, serve to complement the aforementioned efforts to find a home for "facilitation" in the OL literature. The selected works use the theory of "effective knowledge sharing networks in PCS," to enable EBP implementation and explain how successful implementation occurs within an HCO context. As discussed earlier, this theory, which emanates from OL theory, places substantial emphasis on the "facilitation" role played by senior managers in enabling learning and change within the PCS context.

Another substantive contribution of the selected works, is the emphasis they place on real-time researcher–practitioner collaboration in designing and implementing theoretically-informed prospective studies of EBP implementation in HCOs. This, in turn, is a unique feature, which enables these studies to generate practical EBM strategies, while simultaneously contributing to theory-building efforts. The selected works also highlight the potential for success when the implementation researcher plays an ethnographic role, i.e., one of wearing the hat of a senior HCO manager, in conducting proactive communications related to EBPs, within the context of an implementation project. In other words, the selected works provide unique insights into a potential "dual-role" for the future implementation researcher—one of advancing implementation science, while working to strengthen implementation practice.

The limitation of the selected works from the perspective of theory, is that the focus of these exploratory efforts, has largely been on enabling "effective implementation," rather than on ensuring "sustainability of implementation." However, this limitation is consistent with limitations in the current state of implementation science as a whole, given that it is still an emerging stream of literature. From an OL perspective, the theoretical limitation may be understood in terms of a focus on "single-loop learning," as opposed to "double-loop learning." This observation is corroborated even by systematic reviews of the broader OL literature, extending beyond implementation science.[52] This literature has argued that extant OL approaches described in the literature, appear to be suitable to solving short-term problems, which only requires single-loop learning. The limited support for double-loop learning, which requires changing the organizational value system, could be attributed to the challenge of change management, in general.

Nevertheless, taking the selected works discussed in this article to the next level, may require addressing the challenge of "implementation sustainability," For example, the theoretical question to ask might be, "what is the effective knowledge sharing network structure for sustained EBP implementation (rather than just successful implementation)?" In other words, what knowledge sharing network structures would be effective in enabling "double-loop learning," which is needed to change value systems, as opposed to "single-loop learning," which is sufficient for short-term problem solving?

Future Research Implications

Both the practical and theoretical implications discussed earlier, serve to provide insight into future research implications for implementation science. For example, insights into EBM strategies for successful EBP implementation gained from

the selected works (e.g., creation of champions, physician engagement, etc.) could by themselves, serve as springboard for future avenues. On the other hand, the theoretical implications suggest need for large-scale prospective studies on EBP implementation in HCOs, preferably, controlled experiments, to supplement lessons learned from the selected exploratory works discussed in this article. Future efforts must seek to not only validate theory and supplement insights with regard to network structures needed to enable single-loop learning, but also provide insights into network structures that may be most effective in enabling double-loop learning, needed to ensure long-term sustainability of innovation in HCOs. These implications, in turn, point to promising avenues for direct collaboration between researchers and practitioners, in designing and conducting theoretically informed large-scale prospective studies on EBP implementation in HCOs.

IRB Approval

This "Perspectives" article did not involve human subjects research.

Funding

No external funding support was received for this "Perspectives" article.

Disclosure

The author has no conflicts of interest to declare.

References

1. Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implement Sci*. 2009;4:50. doi:10.1186/1748-5908-4-50
2. Grimshaw JM, Eccles MP, Lavis JN, Hill SJ, Squires JE. Knowledge translation of research findings. *Implement Sci*. 2012;7(1):50. doi:10.1186/1748-5908-7-50
3. Grol R, Grimshaw J. From best evidence to best practice: effective implementation of change in patients' care. *Lancet*. 2003;362 (9391):1225–1230. doi:10.1016/S0140-6736(03)14546-1
4. Kristensen N, Nymann C, Konradsen H. Implementing research results in clinical practice- the experiences of healthcare professionals. *BMC Health Serv Res*. 2016;16:48. doi:10.1186/s12913-016-1292-y
5. Eccles MP, Mittman BS. Welcome to implementation science. *Implement Sci*. 2006;1:1. doi:10.1186/1748-5908-1-1
6. Bauer MS, Damschroder L, Hagedorn H, Smith J, Kilbourne AM. An introduction to implementation science for the non-specialist. *BMC Psychol*. 2015;3:32. doi:10.1186/s40359-015-0089-9
7. Eccles M, Grimshaw J, Walker A, Johnston M, Pitts N. Changing the behavior of healthcare professionals: the use of theory in promoting the uptake of research findings. *J Clin Epidemiol*. 2005;58:107–112. doi:10.1016/j.jclinepi.2004.09.002
8. ICEBeRG. Designing theoretically-informed implementation interventions. *Implement Sci*. 2006;1:4. doi:10.1186/1748-5908-1-4
9. Godin G, Bélanger-Gravel A, Eccles M, Grimshaw J. Healthcare professionals' intentions and behaviors: a systematic review of studies based on social cognitive theories. *Implement Sci*. 2008;3:36. doi:10.1186/1748-5908-3-36
10. Rycroft-Malone J, Bucknall T. Theory, frameworks, and models: laying down the groundwork. In: Rycroft-Malone J, Bucknall T, editors. *Models and Frameworks for Implementing Evidence-Based Practice: Linking Evidence to Action*. Oxford: Wiley-Blackwell; 2010:23–50.
11. Mitchell SA, Fisher CA, Hastings CE, Silverman LB, Wallen GR. A thematic analysis of theoretical models for translating science in nursing: mapping the field. *Nurs Outlook*. 2010;58:287–300. doi:10.1016/j.outlook.2010.07.001
12. Nilsen P. Making sense of implementation theories, models and frameworks. *Implement Sci*. 2015;10:53. doi:10.1186/s13012-015-0242-0
13. Birken SA, Powell BJ, Shea CM, et al. Criteria for selecting implementation science theories and frameworks: results from an international survey. *Implement Sci*. 2017;12:124. doi:10.1186/s13012-017-0656-y
14. Kilbourne AM, Goodrich DE, Miake-Lye I, Braganza MZ, Bowersox NW. Quality enhancement research initiative implementation roadmap: toward sustainability of evidence-based practices in a learning health system. *Med Care*. 2019;57:S286–S293. doi:10.1097/MLR.0000000000001144
15. Villalobos Dintrans P, Bossert TJ, Sherry J, Kruk ME. A synthesis of implementation science frameworks and application to global health gaps. *Global Health Res Policy*. 2019;4:25. doi:10.1186/s41256-019-0115-1
16. University of Washington. Theories, models, and frameworks in implementation science; 2017. Available from: https://impsciuw.org/implementation-science/research/frameworks/. Accessed Nov 10, 2019.
17. Helfrich CB, Weiner BJ, McKinney MM. Determinants of implementation effectiveness: adapting a framework for complex innovations. *Med Care Res Rev*. 2007;64(3):279–303. doi:10.1177/1077558707299887
18. Kitson AL, Rycroft-Malone J, Harvey G, McCormack B, Seers K, Titchen A. Evaluating the successful implementation of evidence into practice using the PARiHS framework: theoretical and practical challenges. *Implement Sci*. 2008;3:1. doi:10.1186/1748-5908-3-1
19. Bandura A. *Social Foundations of Thought and Action: A Cognitive Social Theory*. Englewood-Cliffs, NJ: Prentice-Hall; 1986.
20. Parchman ML, Scoglio CM, Schumm P. Understanding the implementation of evidence-based care: a structural network approach. *Implement Sci*. 2011;6:14. doi:10.1186/1748-5908-6-14
21. Cunningham FC, Ranmuthugala G, Plumb J, Georgiou A, Westbrook JI, Braithwaite J. Health professional networks as a vector for improving healthcare quality and safety: a systematic review. *BMJ Qual Saf*. 2011;3:239–249.
22. Orlikowski W. Improvising organizational transformation over time: a situated change perspective. *Inf Syst Res*. 1996;7:63–92. doi:10.1287/isre.7.1.63
23. DiMaggio PJ, Powell WW. *The New Institutionalism and Organizational Analysis*. Chicago, IL: University of Chicago Press; 1991.
24. Scott WR. *Institutions and Organizations*. Thousand Oaks, CA: Sage; 1995.
25. Plsek PE, Greenhalgh T. The challenge of complexity in health care. *Br Med J*. 2001;323:625–628. doi:10.1136/bmj.323.7313.625
26. Waldrop MM. *Complexity: The Emerging Science at the Edge of Order and Chaos*. London: Viking; 1992.
27. Rogers EM. *Diffusion of Innovations*. 5th ed. New York: Free Press; 2003.
28. Weiner BJ, Belden CM, Bergmire DM, Johnston M. The meaning and measurement of implementation climate. *Implement Sci*. 2011;6:78. doi:10.1186/1748-5908-6-78

29. Weiner BJ. A theory of organizational readiness for change. *Implement Sci*. 2009;4:67. doi:10.1186/1748-5908-4-67
30. Glasgow RE, Vogt TM, Boles SM. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. *Am J Public Health*. 1999;89:1322–1327. doi:10.2105/AJPH.89.9.1322
31. Allen JD, Towne SD, Maxwell AE, et al. Measures of organizational characteristics associated with adoption and/or implementation of innovations: a systematic review. *BMC Health Serv Res*. 2017;17(1):591. doi:10.1186/s12913-017-2459-x
32. Rangachari P. Innovation implementation in the context of hospital QI: lessons learned and strategies for success. *Innovation Entrepreneurship Health*. 2018;5:1–14. doi:10.2147/IEH.S151040
33. Rangachari P. Knowledge sharing networks related to hospital quality measurement and reporting. *Health Care Manage Rev*. 2008;33(3):253–263. doi:10.1097/01.HMR.0000324910.26896.91
34. Rangachari P. Knowledge sharing networks in professional complex systems. *J Knowl Manag*. 2009;13(3):132–145. doi:10.1108/13673270910962923
35. Rangachari P. Knowledge sharing and organizational learning in the context of hospital infection prevention. *Qual Manag Health Care*. 2010;19(1):34–45. doi:10.1097/QMH.0b013e3181ccbd1d
36. Rangachari P. Overcoming the unintended adverse consequences of implementing health IT through human resource and knowledge management. *Adv Health Care Manag*. 2010;9:163–194.
37. Rangachari P, Rissing P, Rethemeyer RK. Awareness of evidence-based practices alone does not translate to implementation: insights from implementation research. *Qual Manag Health Care*. 2013;22(2):117–125. doi:10.1097/QMH.0b013e31828bc21d
38. Rangachari P, Madaio M, Rethemeyer RK, et al. The evolution of knowledge exchanges enabling successful practice change in two intensive care units. *Health Care Manag Rev*. 2015;40(1):65–78. doi:10.1097/HMR.0000000000000001
39. Rangachari P, Madaio M, Rethemeyer RK, et al. Cumulative impact of periodic top-down quality improvement communications on infection prevention practices and outcomes in two units. *Health Care Manag Rev*. 2015;40(4):324–336. doi:10.1097/HMR.0000000000000038
40. Rangachari P. Implementing a social knowledge networking (SKN) system to enable meaningful use of an EHR medication reconciliation system: a study protocol. *Risk Manag Healthc Policy*. 2018;11:45–53. doi:10.2147/RMHP.S152313
41. Rangachari P, Dellsperger KC, Rethemeyer R (2019). A health system's pilot experience with using mobile SKN technology to enable meaningful use of EHR MedRec. *2019 American Medical Informatics Association (AMIA) Annual Symposium Proceedings*, pp. 745–754 [Nominee, 2019 AMIA Distinguished Paper Award].
42. Rangachari P, Dellsperger KC, Rethemeyer R. A qualitative study of inter-professional learning related to electronic health record (EHR) medication reconciliation within a social knowledge networking (SKN) system. *J Healthc Leadersh*. 2019;11:23–41. doi:10.2147/JHL.S198951
43. Rangachari P, Dellsperger KC, Rethemeyer R. Network analysis of the structure of inter-professional knowledge exchange related to electronic health record (EHR) medication reconciliation within a social knowledge networking (SKN) system. *J Healthc Leadersh*. 2019;11:87–100. doi:10.2147/JHL.S211109
44. Rangachari P, Dellsperger KC, Fallaw D, et al. A mixed-method study of practitioners' perspectives on issues related to EHR MedRec at a health system. *Qual Manag Health Care*. 2019;28(2):84–95. doi:10.1097/QMH.0000000000000208
45. Anderson A, McDaniel RR. Managing healthcare organizations: where professionalism meets complexity science. *Health Care Manag Rev*. 2000;25(1):83–92. doi:10.1097/00004010-200001000-00010
46. McDaniel RR, Walls ME. Professional organizations stuck in the middle: a complex adaptive systems approach to achieving organizational turnaround. *Adv Appl Bus Strategy*. 1998;5:131–152.
47. Weick KE. The collapse of sensemaking in organizations: the Mann Gulch disaster. *Adm Sci Q*. 1993;38:628–652. doi:10.2307/2393339
48. Weick KE, McDaniel RR. How professional organizations work: implications for school organization and management. In: Sergiovanni TJ, Moore JH, editors. *Schooling for Tomorrow*. Boston: Allyn and Bacon; 1989:330–355.
49. Weick KE. *Sensemaking in Organizations*. Thousand Oaks, CA: Sage Publications; 1995.
50. Benveniste G. *Professionalizing the Organization*. San Francisco, CA: Jossey Bass; 1987.
51. March JG, Simon HA. *Organizations Theory*. John Wiley & Sons Inc; 1958.
52. Basten D, Haamann T. Approaches for organizational learning: a literature review. *SAGE Open*. 2018;2018:1–20.
53. Chiva R, Ghauri P, Alegre J. Organizational learning, innovation and internationalization: a complex system model. *Br J Manag*. 2014;25:687–705. doi:10.1111/1467-8551.12026
54. Cheng H, Niu MS, Niu KH. Industrial cluster involvement, organizational learning, and organizational adaptation: an exploratory study in high technology industrial districts. *J Knowl Manag*. 2014;18:971–990. doi:10.1108/JKM-06-2014-0244
55. Nonaka I. The knowledge creating company. *Harv Bus Rev*. 1991;96–104.
56. Nonaka I. A dynamic theory of organizational knowledge. *Organ Sci*. 1994;5:14–37. doi:10.1287/orsc.5.1.14
57. Spender J. Making knowledge the basis of a dynamic theory of the firm. *Strategic Manag J*. 1996;17:45–62. doi:10.1002/smj.4250171106
58. Nahapiet J, Ghoshal S. Social capital, intellectual capital and organizational advantage. *Acad Manag Rev*. 1998;23(2):242–266. doi:10.5465/amr.1998.533225
59. Krackhardt D. The strength of strong ties. In: Nohria N, Eccles RG, editors. *Networks and Organizations: Structure, Form, and Action*. Boston: Harvard Business School Press; 1992.
60. Boisot M. *Information Space: A Framework for Learning in Organizations, Institutions and Culture*. London: Routeldge; 1995.
61. Dyer JH, Nobeoka K. Creating and maintaining a high performance knowledge sharing network: the Toyota case. *Strategic Manag J*. 2000;21:345–367. doi:10.1002/(SICI)1097-0266(200003)21:3<345::AID-SMJ96>3.0.CO;2-N
62. Hansen MT. The search-transfer problem: the role of weak ties in sharing knowledge across organizational subunits. *Adm Sci Q*. 1999;44(1):82–111. doi:10.2307/2667032
63. Kogut B. The network as knowledge: generative rules and the emergence of structure. *Strategic Manag J*. 2000;21:405–425. doi:10.1002/(SICI)1097-0266(200003)21:3<405::AID-SMJ103>3.0.CO;2-5
64. Coleman JS. Social capital in the creation of human capital. *Am J Sociol*. 1988;94:95–120. doi:10.1086/228943
65. Coleman JS. *Foundations of Social Theory*. Cambridge: Belknap Press; 1990.
66. Burt RS. *Structural Holes: The Social Structure of Competition*. Harvard University Press Cambridge, Mass; 1992.
67. Burt RS. Network structure of social capital. In: Sutton RI, Staw BM, editors. *Research in Organizational Behavior*. Greenwich, CT: JAI Press; 2000:345–423.
68. Birken SA, Bunger AC, Powell BJ, et al. Organizational theory for dissemination and implementation research. *Implement Sci*. 2017;12:62. doi:10.1186/s13012-017-0592-x
69. Berta W, Cranley L, Dearing JW, et al. Why (we think) facilitation works: insights from organizational learning theory. *Implement Sci*. 2015;10:141. doi:10.1186/s13012-015-0323-0