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Research Article

From Research Evidence to "Evidence by Proxy"? Organizational Enactment of Evidence-Based Health Care in Four High-Income Countries

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Abstract: *Drawing on multiple qualitative case studies of evidence-based health care conducted in Sweden, Canada, Australia, and the United Kingdom, the authors systematically explore the composition, circulation, and role of codified knowledge deployed in the organizational enactment of evidence-based practice. The article describes the "chain of codified knowledge," which reflects the institutionalization of evidence-based practice as organizational business as usual, and shows that it is dominated by performance standards, policies and procedures, and locally collected (improvement and audit) data. These interconnected forms of "evidence by proxy," which are informed by research partly or indirectly, enable simplification, selective reinforcement, and contextualization of scientific knowledge. The analysis reveals the dual effects of this codification dynamic on evidence-based practice and highlights the influence of macro-level ideological, historical, and technological factors on the composition and circulation of codified knowledge in the organizational enactment of evidence-based health care in different countries.*

Evidence for Practice

- The evidence-based policy and practice movement encourages the incorporation of evidence from research into decision making.
- Its implementation at the organizational level involves an increasing role for "evidence by proxy," such as performance standards, organizational policies, and local data.
- Different forms of evidence by proxy are interconnected, simplifying scientific knowledge, reinforcing some of its elements, and making it applicable to the local context.
- Frontline practitioners tend to rely on evidence by proxy, which is created, circulated, and analyzed by specialists.
- The composition and circulation of different forms of evidence by proxy differ across countries.

The evidence-based policy and practice movement encourages decision makers at different levels to be concerned with "what works," on the assumption that increased use of research evidence will lead to better outcomes in terms of effectiveness, accountability, and sustainability (Hall and Van Ryzin 2018; Head 2016; Newman, Cherney, and Head 2016; Nutley, Walter, and Davies 2007). In the context of health care, this paradigm-shifting doctrine is based on the premise that clinical practice should integrate professional experience with the best available scientific evidence about the effectiveness of the interventions used (Ferlie et al. 2009; Rousseau and Gunia 2016; Sackett et al. 1996). Research directly informs clinical guidelines, providing actionable recommendations for practice that are developed using rigorous, systematic, and transparent processes to summarize the best available evidence (Harrison 1998; Knaapen 2013; Timmermans and Kolker 2004).

Research has shown, however, that the uptake of clinical guidelines by health-care practitioners remains low as codified "know-what" research evidence has to compete with multiple forms of tacit "know-how" knowledge and skills (Gabbay and le May 2011; McCaughan et al. 2005). At the same time, we know from organization and management theory that the institutionalization of new approaches in day-to-day organizational practices always involves a complex interplay of tacit and codified knowledge (Kislov et al. 2014; Tsoukas and Vladimirou 2001). As evidence-based practice has been widely embraced by health care systems and organizations (Dopson et al. 2003), this study aims to look beyond guidelines, exploring the role of other forms of codified knowledge—that is, knowledge that is formal, systematic, and expressible in text or numbers, making it easy to store, transfer, and use across space and time (Turner et al. 2014)—in the enactment of evidence-based practice.

Using nursing as an example, we describe the *chain of codified knowledge,* which reflects the institutionalization of evidence-based practice as organizational "business as usual," and show that it is dominated by performance standards, organizational policies and procedures, and locally collected data—that is, various forms of "evidence by proxy" that are informed by research only partly or indirectly but are nevertheless perceived as credible evidence. On the one hand, these developments legitimize and mobilize contextual and local forms of knowledge, reinforcing some elements of clinical guidelines and enabling bottom-up improvement. On the other hand, they may lead to the detachment of frontline clinicians from fundamental competencies of evidence-based practice, with the latter becoming a prerogative of experts represented by senior clinicians and designated facilitators.

Shifting the focus of inquiry from top-level policy formulation to its actual enactment, this article addresses the previously identified gap in relation to what happens inside public sector organizations as they incorporate research-based evidence into service delivery (Head 2016) and contributes to our understanding of evidence-based policy and practice as a multilevel and multi-actor phenomenon (Cairney, Oliver, and Wellstead 2016). Comparing and contrasting our empirical findings across four high-income countries influenced by the New Public Management paradigm (Sweden, Canada, Australia, and the United Kingdom), we also address the call for more comparative analyses of how evidence use varies across national boundaries (Head 2016; Mykhalovskiy and Weir 2004) and highlight the influence of macro-level ideological, historical, and technological factors on the composition and circulation of "evidence" in public sector organizations.

The article is organized as follows: The next section presents an overview of how the evidence-based policy and practice movement has evolved over time, reflecting on the expansion of the notion of "evidence," the institutionalization of evidence-based practice, and its spread across professions, sectors, and countries. This leads to the formulation of research gaps and questions for the study. Procedures for data collection and analysis are outlined in the Methods section. This is followed by the empirical section, which is organized around three themes: (1) forms of codified knowledge seen as credible evidence, (2) the perceived impact of codified knowledge on evidence-based practice, and (3) cross-country variability in the composition and circulation of codified knowledge. These themes are developed in the Discussion section, and the concluding section reflects on the contributions, generalizability, and limitations of the study.

Evolution of the Evidence-Based Policy and Practice Movement
Expansion of the Notion of "Evidence"
Analysis of the literature on the evolution of evidence-based policy and practice leads us to a number of observations. First and foremost, there is a tendency toward expanding the notion of "evidence" that is associated with a common criticism of the evidence-based movement as "a restrictive interpretation of the scientific approach to clinical practice" (Fava 2017, 3). There are renewed calls to shift away from hierarchies of research evidence (prioritizing randomized controlled trials and systematic reviews) to methodological pluralism, whereby value is placed on the appropriateness of research to support evidence-informed decision making (Wilson and Sheldon 2019). This is increasingly driven by the need to move beyond "what works" to address questions of how, for whom, and in what settings and contexts (Petticrew 2015). Clinical guidelines aim to translate current best scientific evidence into actionable practical recommendations and are seen as the cornerstone of evidence-based health care (Harrison 1998; Timmermans and Kolker 2004). Following rigorous, systematic, and transparent processes (Knaapen 2013), they summarize the scientific evidence behind the recommendations and explain how the recommendations were derived from the evidence (National Institute for Health and Care Excellence 2018).

However, there is also a growing understanding of the importance of "nonscientific" forms of knowledge in actual "evidence-based" practice, characterized by the existence of competing bodies of knowledge amenable to multiple interpretations (Dopson et al. 2002; Richardson 2017). Many authors highlight the competition between codified knowledge in the form of clinical guidelines and tacit "know-how" knowledge that is generated by collective practice and embodied in practical skills and expertise (Brown and Duguid 2001). In health care, the most frequently mentioned forms of tacit knowledge influencing the implementation of evidence-based practice include stakeholder concerns, practitioner (and patient) judgment, and contextual awareness (Dopson et al. 2003; Mackey and Bassendowski 2017; Rousseau and Gunia 2016; Rycroft-Malone et al. 2004).[1] In the field of public policy, experiential forms of knowledge, such as program management experience and political judgment, are seen as even more important for interpreting and applying scientific evidence (Head 2008).

The theoretical literature on organizational learning emphasizes the interplay, rather than the competition, between codified and tacit knowledge (Kislov, Hodgson, and Boaden 2016). In order to be

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Alison Kitson is the inaugural vice president and executive dean of the College of Nursing and Health Sciences, Flinders University, Adelaide, South Australia. Prior to this appointment, she was dean and head of school at Adelaide Nursing School at the University of Adelaide. Alison has published more than 300 peer-reviewed articles and in 2014 was acknowledged in the Thomson Reuters list of highly cited researchers for her work on knowledge translation.

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implemented, codified research knowledge, which is usually derived from outside an organization, needs to be fed to organizational members, applied in practice, and gradually made tacit (Tsoukas and Vladimirou 2001). On the other hand, to become more readily available to organizational members, tacit components of experience-based knowledge often need to be formalized through codification, with internal organizational processes being made explicit in the form of manuals, protocols, decision support systems, and other written and electronic tools (Kislov 2014). While there is still no consensus about what constitutes "evidence" (Head 2016), it is generally accepted that codified knowledge informs (and is informed by) multiple forms of tacit knowledge and skills (Gabbay and le May 2011; Knaapen 2013; Wood, Ferlie, and Fitzgerald 1998).

Institutionalization of Evidence-Based Practice

Evidence-based practice has entered the mature phase of its life cycle, gradually morphing from an innovative approach to health care delivery into a new orthodoxy widely adopted by health-care organizations and institutionalized in their practices as business as usual (Dopson et al. 2003; Ferlie et al. 2009). It became apparent quite early on that the mere availability of research evidence was insufficient to ensure its uptake in practice (Harvey and Kitson 2015; Jennings and Hall 2012), largely because of the complex system of knowledge boundaries existing between and within the research and practice domains (Kislov 2014). The growing popularity of "decision supports," such as checklists, protocols, and assessment routines, used as "boundary objects" aiming to overcome these knowledge boundaries (Allen 2009) has contributed to the greater standardization of decisions and practices at the organizational level (Rousseau and Gunia 2016). Other approaches synthesize bodies of evidence to provide actionable advice for decision makers, often in the form of structured summaries of research (Crowley and Scott 2017; Newman, Cherney, and Head 2016; Petkovic et al. 2016). At the same time, excessive standardization has the potential to generate professional resistance (Martin et al. 2017) and limit responsiveness to the ever-changing context if it is used without reflection (Kislov et al. 2014).

Theories of implementation highlight the importance of change agents and broader contextual factors in the institutionalization of evidence-based practice (Harvey and Kitson 2015; Hill 2003). There has been growing attention to creating local capacity for engagement with evidence (Ferlie et al. 2009; Kislov et al. 2014), and a new cadre of intermediaries whose remit explicitly involves the implementation of evidence-based practice has emerged, including designated facilitators, boundary spanners, and knowledge brokers (Harvey and Kitson 2015). These intermediaries, who often occupy hybrid roles at the interface of policy, research, and practice (Kislov, Hodgson, and Boaden 2016), are crucial for disseminating, interpreting, and embedding codified knowledge; adapting it to actual organizational practices; and training the implementers (Hill 2003; Martin et al. 2017). Successful facilitation of evidence use is contingent on the facilitators' ability to enable the processes of higher-order, double-loop learning, which involves encouraging staff to change practice by identifying problems and seeking and applying appropriate solutions (Berta et al. 2015). However, negative effects of preoccupation with algorithms and standards on realization of this learning potential in practice have been attested in

a number of recent empirical studies (Kislov, Hodgson, and Boaden 2016; Kislov, Humphreys, and Harvey 2017).

As far as the broader context is concerned, a lot of effort has been put into cataloging multiple macro-, meso-, and micro-level determinants of successful evidence implementation at different stages (Aarons, Hurlburt, and Horwitz 2011). According to Jennings and Hall (2012), the use of evidence in public sector organizations is not only influenced by its relevance and credibility but also depends on the mission and mandates of the organization, its political environment, and its internal characteristics, such as organizational culture, workforce composition, and staff capacity. Variation in these factors underpins significant differences in the degree of evidence utilization that may exist within and across organizations (Hall and Van Ryzin 2018). Facilitators are encouraged to consider contextual determinants when implementing evidence in practice (Harvey and Kitson 2015). At the same time, "context" presents a powerful structural force that can have a significant influence on facilitators, potentially constraining their agency and transforming the evidence-based innovations being implemented (Kislov, Humphreys, and Harvey 2017).

Spread of Evidence-Based Practice across Disciplines and Countries

Although evidence-based practice emerged as a professionally driven movement within medicine, it has now spread to other clinical areas, such as nursing and allied health professions (Mackey and Bassendowski 2017; Mykhalovskiy and Weir 2004; Satterfield et al. 2009), as well to other domains of the public sector, including education, social care, law enforcement, policy making, and management (Ferlie et al. 2016; Nutley, Walter, and Davies 2007). Historical and cultural differences across these domains have led to significant diversity in the development of distinct evidence-based policy and practice arenas (Head 2016). In health care, however, evidence-based medicine remains the normative model against which other applications of evidence are often compared (Wilson and Sheldon 2019). In nursing, for instance, embracing the evidence-based agenda and replicating the medical approach to evidence use have been interpreted as attempts to increase professional legitimacy (Holmes et al. 2006; Mackey and Bassendowski 2017). It has been noted, however, that in addition to developing trial evidence, evidence-based nursing pushes beyond evidence-based medicine in qualitative research and in the integration of patients' experiences into practice decisions (Satterfield et al. 2009).

The global spread of the evidence-based movement is underpinned by its significant synergy and reciprocity with the international ideology of New Public Management. Both of these approaches aim to improve effectiveness by developing and using a rigorous information base to guide decisions (Head 2008; Heinrich 2007; Jennings and Hall 2012). In health care, adherence to evidence-based practice is often promoted and controlled by managerial means, such as transparent measurement of performance against centrally set standards and targets (Ferlie and McGivern 2014; Hasselbladh and Bejerot 2007). The appropriation of the evidence-based movement by the New Public Management agenda is apparent in the development of top-down, formalized, and

prescriptive policy frameworks relying on the disciplinary power of audit and benchmarking, along with the establishment of government agencies responsible for producing clinical guidelines and for commissioning, regulating, and monitoring evidence-based health care (Ferlie et al. 2009). The resulting performance standards, however, have been criticized for failing to reflect the scientific evidence base (Wilson and Sheldon 2019) or follow the rigor inherent in the production of scientific knowledge (Heinrich 2007).

Scholarship informed by the theories of information use has highlighted a number of factors that shape the intersection of evidence-based practice and performance management as results-based and rationality-oriented approaches sharing the same conceptual and ideological underpinnings (Hall 2017). Performance management systems are usually more successful at creating routines for data collection and dissemination than at creating routines for the use of these data (Moynihan and Lavertu 2012). Involvement in performance management routines has little direct effect on actual information use (Moynihan and Lavertu 2012) unless the implementing organization fosters norms promoting active use of data (Moynihan and Pandey 2010), invests in the development of analytic capacity (Allard et al. 2018), and links the performance management system with organizational targets, goals, and priorities (Dimitrijevska-Markoski and French 2019). Finally, by prioritizing structural approaches to learning and relying on formal rules and procedures over the development of learning-oriented organizational cultures (Moynihan and Landuyt 2009), results-based reforms tend to favor narrow process improvement (single-loop learning) rather than an understanding of policy choices and effectiveness (double-loop learning) (Moynihan 2005).

Research Gaps and Questions

While multiple forms of evidence and their interpretations have been identified, previous research has focused predominantly on the variety of tacit forms of knowledge that compete with research evidence or the relative contribution of different types of research to evidence-based practice. Recent contributions show that codified knowledge can inform managerial practice and service improvement by interacting with tacit knowledge and skills at different levels (Ferlie et al. 2016; Turner et al. 2014). However, the composition of codified knowledge involved in the enactment of evidence-based health care, as well as the relationships between its different forms, remains underresearched.

As far as the enactment of evidence-based policy and practice is concerned, extant research tends to be preoccupied with exploring the careers of individual evidence-based innovations (and of specific methods deployed to increase their uptake) in different organizational contexts. Less is known about the organizational structures and processes that enable the local institutionalization of evidence-based practice as business as usual and, particularly, about the contribution of various forms of codified knowledge to this process. Major knowledge gaps remain about what happens inside public sector organizations as they attempt to produce, assess, and incorporate research-based evidence in their service delivery (Head 2016).

Finally, despite the spread of the evidence-based paradigm across different disciplines, most of relevant empirical research about

evidence-based practice is still medically focused, reflecting the perceived dominant role of physicians in health care in general and in the evidence-based movement in particular. It can be argued, however, that a study aiming to explore the enactment of evidence-based practice can gain significant insights by shifting its attention toward other clinical professions, such as nursing. In addition, while the differences in evidence-based practice have been described between primary and hospital care (Fitzgerald et al. 2002), much less is known about the macro-level factors resulting in variations in evidence use across different country-specific institutional contexts (Ferlie et al. 2009; Head 2016).

To address these research gaps, the study was guided by the following research questions: What forms of codified knowledge are seen as credible evidence, and what are the relationships between them? What is the perceived impact of codified knowledge on evidence-based practice? How do the composition and impact of codified knowledge vary across different countries?

Methods

This study emerged from a broader research program exploring leadership and facilitation roles in the implementation of evidence-based practice in nursing across four high-income countries (Sweden, Canada, Australia, and the United Kingdom) (Harvey et al. 2019). These countries were selected because of the similarities in the organization of their tax-based universal health systems and the adoption of New Public Management ideology in the provision and monitoring of public services. Such "replication logic" would aim at the identification of shared trends while still allowing for an exploration of comparative differences (Fitzgerald and Dopson 2009). Within each country case, up to two public health-care organizations were selected using the combination of convenience and purposeful sampling based on the following criteria: (1) self-declared adherence of the organization's senior leadership to the implementation of evidence-based nursing, (2) adequate organizational performance as measured by outcome-based metrics, and (3) broad access to several levels within the organizational hierarchy granted to the research team (table 1).

In total, 55 research participants were purposefully recruited to represent different levels within the administrative hierarchy (executive, middle, and frontline), roles (nursing managers and facilitators of evidence-based practice), and sectors of health care (acute and primary/community services). Semistructured face-to-face or phone interviews (30–60 minutes in duration) conducted in English or Swedish in 2016–17 served as the main method of data collection. Back translation was used to ensure the equivalence of the English and Swedish versions of the interview guide (Peterson 2009). The interviews were supplemented by the elements of critical incident technique (Chell 2004), whereby the respondents were asked to provide concrete examples of implementing evidence-based practice.

The interviews were digitally recorded and transcribed verbatim, Swedish transcripts were (partially) translated into English, and all transcripts were analyzed with the aid of NVivo. Interview analysis was organized in two stages, each of concluding with a two-day face-to-face research team meeting used to collaboratively interpret the emerging accounts. The first stage, focusing on the

Table 1 Research Setting and Sample

	United Kingdom	Australia	Canada	Sweden
Research sites in broader regulatory context				
Organizations involved in the study	1 integrated organization providing acute (1 hospital; 839 beds), primary, and community care	1 organization providing acute (2 hospitals; 498 beds), primary, and community care	2 organizations: • Province-wide provider of acute (106 hospitals*; 8,471 beds) and community care (West) • Publicly funded home care service provider (East)	2 organizations: • County-wide provider of acute (4 hospitals; 720 beds) and primary care • Municipality-wide provider of community care
National regulators of evidence-based practice	Care Quality Commission	Australian Commission of Safety and Quality in Health Care	Accreditation Canada	*Socialstyrelsen* (National Board of Health and Welfare)
Other mechanisms of accreditation and regulation	Locally devised performance assessment and accreditation framework based on the organization's own standards	The organization is part of a broader state health network and of the Best Practice Spotlight Organizations (BPSO) initiative	• Province-wide health-care organization sets its own standards, taking into account national guidelines (West) • The organization is part of the BPSO initiative (East)	National Quality Registries aggregate individualized patient data reported by local health-care organizations and provide comparisons between local and national outcome-based performance
Interviews (55 respondents in total)				
Senior and middle managers	2	1	6	2
Frontline managers	3	3	2	7
Executive facilitators	3	2	1	4
Clinical/frontline facilitators	1	6	5	2
Hybrid manager-facilitator roles	3	2	-	-
Total	**12**	**14**	**14**	**15**
Documents (38 documents analyzed in total)				
Clinical guidelines	1	1	1	1
Organizational policies and procedures	2	5	5	-
Performance standards	2	2	-	-
Templates for capturing local data	4	4	1	9
Total	**9**	**12**	**7**	**10**

*Two hospitals were included in our sample.

construction of detailed country-specific narratives, combined the codes derived from the interview guide with a set of descriptive codes that emerged inductively. At least two coders per country were involved, with a selection of transcripts coded independently and subsequently compared to ensure intercoder reliability. The second stage, led by the first author, used the deductive coding framework informed by the literature and applied across all four data sets. Matrix analysis was deployed to make comparisons across different countries and groups of respondents (Nadin and Cassell 2004). An iterative process of detecting patterns and developing explanations resulted in the articulation of the three main themes described in the following section.

After the interviews were analyzed, it became apparent that an in-depth understanding of the relationships between different forms of codified knowledge would be enhanced through the inclusion of documentary analysis in the research process. An intensive exploration of a limited selection of documents was chosen as an approach most suitable for addressing organizationally relevant research questions of this study and to ensure the manageability of the analysis (Rowlinson 2004).

Key research informants from each of the four sites were asked to provide documents related to the management of pressure ulcers in their organizations. This topic was selected because the management of pressure ulcers is a core responsibility of nurses in all of the research settings studied, and, with high priority internationally, there has been a proliferation of guidelines, protocols, and standards. In total, 38 documents were collected, including clinical guidelines, organizational policies, performance standards, and templates for capturing local data (table 1). Documents in English were independently analyzed by the first and the second author, while documents in Swedish were independently analyzed by the fourth and the ninth author. Particular attention was paid to the types of knowledge (scientific, clinical, and organizational) included as well as the differences in content compared with the original clinical guideline. Cases of analytic discrepancy were referred for arbitration to the last author, with the final analytical summary subsequently discussed and refined at an online research team meeting.

Findings
Forms of Codified Knowledge Seen as Credible Evidence
As shown in table 2, several forms of codified knowledge were referred to by our respondents as the "sources of evidence" used in their organizations. The use of original research was only reported by hybrid clinician-researchers, nurse-educators, and senior clinicians specializing in a particular area of nursing, whereas other respondents often dismissed it as something that "doesn't help

Table 2 Forms of Codified Knowledge in the Enactment of Evidence-Based Practice

Form of Knowledge	Description	Quote
Research articles	A primary source of research evidence that reports and/or reviews the results of original research; assesses its contribution to the body of knowledge, including implications for practice; and is published in a peer-reviewed scholarly journal	*I have tried putting articles regarding current topics in the staff room, for example. . .and then discussing these with the staff. Some are interested but others not. (CF1-S)*
Clinical guidelines	Recommendations summarizing current best practice based on a systematic review of research evidence in a specific clinical area, usually produced by the professional associations or governmental bodies at the national or international level	*If we take NICE guidelines. . . we make sure that, as a consultant group, we look at that together. With guidelines, there are always some risks. . . And so we've discussed what the risks are potentially. And then obviously, we integrate that into our practice. (CN4-UK)*
Policies and procedures	Principles, rules, and protocols formulated or adopted by an organization to ensure that a point of view held by its governing body informs the day-to-day organizational operations and is translated into an outcome compatible with that view	*We have a policy for everything, literally. There's policies for infection control, there's policies for ANTT [aseptic non-touch technique], there's policies for clinical things, there's policies for fire safety, everything that we do in the Trust there is a policy that outlines what we do. (NM2-UK)*
Performance standards	Minimum levels of outcome-based performance used to set expectations for the health care organizations and professionals as well as for consumers and purchasers of health services, typically developed and used in professional certification and organizational accreditation	*We're taking this audit according to the best practice, so this is the national key performance indicators. These are the indicators nationally and they are not indicators for nothing, they have been tested to be the best practice. If you do this you will have better health outcomes, so that's probably what we talk about all the time. (CF3-A)*
National Quality Registries*	Standardized and complete sets of systematically collected individualized data concerning patient problems, health care interventions and outcomes, used to monitor the quality of care	*We also work quite a lot with health care Quality Registries and do a lot of monitoring and improvement work using the results from those registries. (EF2-S)*
Local data	Performance-related data collected in organizations or their units as a result of clinical audit, performance measurement, patient feedback, and project evaluation and typically compared with policies, standards, or registries	*You need to be able to capture data, to be able to measure data in a consistent way against the evidence-based practice and maybe the targets and the goals et cetera, and you need to be able to see that information on a regular and ongoing basis, to not only your leadership team, but to the front line so that they can see whether or not they're actually making a difference or not. (NM4-CE)*

*The use of National Quality Registries as the source of aggregated performance data and outcome-based standards is unique for the Swedish case. This will be further explored in the Discussion.

necessarily with the practical component of things" (NM4-CE).[2] Significant emphasis was placed on performance targets, local data, and, particularly, organizational policies and procedures as opposed to direct use of evidence-based clinical guidelines:

> I would imagine my staff, the way they would probably get the evidence is through our policies and procedures—would be 90 percent of how they get their evidence. (NM1-A)

Figure 1 shows the chain of codified knowledge through which its multiple forms are interconnected. This chain is dominated by top-down knowledge flows, whereby national, regional, and/or organizational standards inform the development of organizational policies and procedures and, through continuous processes of clinical audit and quality improvement, determine which outcome data are routinely collected and analyzed. Another top-down element of the chain is the selection and adaptation of clinical guidelines for the local policies and procedures, which is usually accomplished by selected groups of senior clinicians with a significant contribution from experts specializing in a given clinical area:

> The people who are responsible for writing [the organizational policies and procedures] are mostly dependent on the specialties, so if it's something around insulin administration on the ward . . . the diabetes education nurses along with the endocrinologist would write it. (NM1-A)

In some cases, however, the top-down approach described earlier was complemented by the bottom-up direction of knowledge flows, whereby a perceived practical problem or performance issue triggered the quality improvement interventions (or grassroots-initiated clinical audit), resulting in the development of action plans and change packages that were then incorporated into organizational policies and procedures:

> I see it's going both ways, that there might be something that's important from leadership top down, but then, also that staff identify that needs quality improvement or process improvement, so from a grassroots level, from bottom up. (CF3-CW)

Different forms of codified knowledge tended to be perceived by the respondents as interconnected. Table 3 provides examples of individual links between guidelines, standards, policies, and local data. Their content was unanimously believed to be based on rigorous research evidence:

> Our staff would all be practicing based on evidence by how they're guided through the tools that they use and access all the time. (EM7-CE)

However, the analysis of organizational documents, conducted to complement the interview data, paints a more nuanced picture. Table 4 compares and contrasts the content of clinical guidelines, organizational policies and procedures, performance standards, and templates for capturing local data. In contrast to the interview
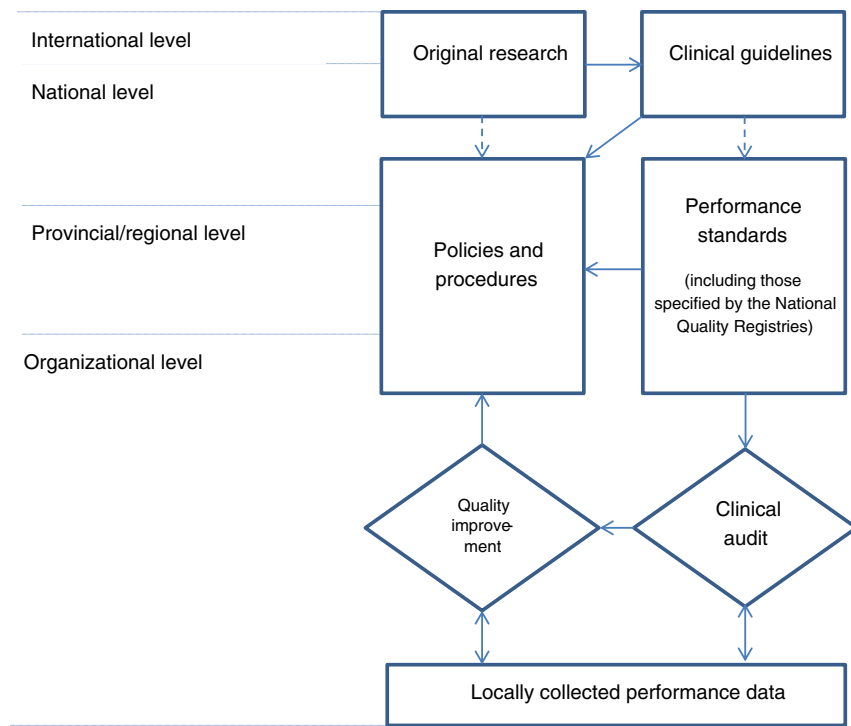
Figure 1   The Chain of Codified Knowledge

data, the documents demonstrate marked differences in relation to their clinical, scientific, and organizational aspects. First, further expansion of the notion of "evidence" is apparent in the growing *incorporation and codification of local, context-specific forms of knowledge* in the organizational policies, procedures, and standards. This expansion is achieved through the following:

- Formalization of local documentation, reporting, and referral procedures
- Complementing the focus on clinical outcomes (e.g., incidence of a condition) with process measures (e.g., evidence of having relevant prevention and monitoring systems in place), which are not necessarily based on research but reflect compliance with local procedures
- Codification of routines for analyzing locally collected data (e.g., application of root cause analysis to learn from actual pressure ulcer cases in the U.K. setting).

Second, as far as the clinical and scientific forms of knowledge are concerned, there is *selectivity of information transmission* from a clinical guideline down the chain of codified knowledge, which involves prioritization of the most frequently encountered clinical variants of the condition, patient populations, or components of the patient journey at the expense of others. For instance, in case of pressure ulcers, standards and policies tend to selectively reinforce those aspects of clinical guidelines that focus on risk assessment and prevention, whereas local treatment procedures receive much less attention. In addition, in contrast to clinical guidelines, the other components of the chain of codified knowledge reduce uncertainty by omitting the references to the strength of underlying scientific evidence and treating all recommendations as "equal," regardless of whether the latter are underpinned by rigorous research (scientific knowledge) or professional consensus (experiential knowledge).

Perceived Impact of Codified Knowledge on Evidence-Based Practice

The tendencies described earlier have a number of important consequences for day-to-day clinical practice. First, the existence of several levels of codification means that there are multiple loci of interaction between codified knowledge and actual practice within organizations at both the senior and frontline levels, including educational events, team meetings, and face-to-face interactions (see table 5 for examples). Unsurprisingly, such emphasis on multiple interconnected sources of codified knowledge often leads to excessive formalization, whereby filling multiple forms to demonstrate compliance could be seen as an unnecessary bureaucratic burden detracting from the actual patient care:

> Sometimes the priorities set by the organization . . . may slightly differ from that that is important for patients or families, in that the time that the [registered nurse] . . . has to spend with the patient, versus filling out documents. (CF3-CW)

> Documentation . . . becomes something that we have to monitor and police to ensure that everybody is doing the same thing. (NM1-CE)

Second, there is a risk of overreliance on local organizational processes and structures related to the appraisal of evidence, production and renewal of local policies and procedures, and their dissemination across the organization:

> I trust the Trust.[3] . . . You have to have faith and assurance in the departments that you are gaining that information from that they are using evidence-based guidelines . . . I wouldn't know for definite unless I asked to look at their research. (NM1-UK)

Table 3 Links between Different Forms of Codified Knowledge in the Enactment of Evidence-Based Practice

Direction of Knowledge Flows	Link	Quote
Top-down	Between standards and policies and procedures	*The national safety and quality health care standards has actually had quite a significant impact on the way that the organization functions because of the accreditation requirements. That was a significant driver for us as an organization to ensure that we actually had in place procedures and guidelines. (EF2-A)*
	Between standards and local data through clinical audit	*If our advanced practice consultant. . . was leading an initiative or doing an audit. . . they would engage our supervisors and our clinical practice coaches locally to make sure that it's implemented and we would. . . have a conference call or reports from them saying how is our region doing against the metrics that were set out. (NM5-CE)*
	Between standards and local data through quality improvement	*[A senior nurse] marries the quality improvement programs into the Nursing Assessment and Accreditation Standards. So she'll have questions such as: have all your staff attended such and such training programs, have they undertaken e-learning modules and if you haven't achieved that then [she] will ask you to write why you've not achieved that. . . so that's followed through. (NM1-UK)*
	Between national quality registries (containing both the national standards and the local data) and policies and procedures	*I am a member of the steering group for knowledge management. . . where we make decisions that are then put into beslutsunderlag [policies and procedures] for the whole organization. . . We have health quality registries. . . and at leadership level we ensure that these are included in our overarching policies. . . Information and results from quality registers are tools to work with and our aim is that they are used, followed up and analyzed. (EM1-S)*
	Between research evidence and policies and procedures	*We would look at any research evidence in relation to specific treatments for specific pain conditions and that information. . . so what I have done is drawn that information together into protocols. . . Protocols are guidelines within the service of what medicines we would prescribe and when. The protocols are written for the team to use. (CN5-UK)*
	Between clinical guidelines and policies and procedures	*If you look through [the organization's] policy and procedure, there's references to [national and provincial clinical guidelines] interwoven throughout it. (CF2-CE)*
Bottom-up	Between local data and policies and procedures through clinical audit	*We were hearing lots about patient delays due to pain. . . So we got some ideas from the literature, we surveyed the staff, we surveyed the patients, and we put action plan in place, based on those three things. (NM3-CW)*
	Between local data and policies and procedures through quality improvement	*We would produce sort of like a change package, based on all the best practice, and that is then disseminated to the whole organization as best way of working, but it's developed from our own staff and our own teams. (EF3-UK)*

[Frontline nurses] know that there's an expectation that they use evidence-based practice, but a lot of the time . . . it tends to be based on rote learning or . . . procedures that dictate the way things are done. (CF2-A)

As a result, frontline staff, who are content with the information created and disseminated by their organization, tend to take its validity and reliability for granted and do not feel the need to access external sources of knowledge or critically question existing ways of doing things:

What doesn't work so well? . . . Not looking externally at other sources of best practice . . . And just doing things one way without information from other sources. (CF3-CW)

A professional should be able to do critical thinking and practice it all the time and being able to challenge current protocols, but I'm not sure whether that is actually what is happening. (CF3-A)

The availability of local data did not always translate into their use; however, analyzing unsatisfactory outcomes and/or comparing

them with aggregated data at the national level (e.g., in the form of National Quality Registries in Sweden) was seen as having a positive effect on learning, especially when facilitated by experts in data analysis and quality improvement:

We use the registry and work together as a team to think critically around what we could have done better or how well we think we do. Every time a patient dies we look at the registry. It is a way of evaluating the care we have given. (NM1-S)

The other thing is . . . providing teams with their data around the particular subject that they're trying to work on because it's not always easily accessible if you leave them to their own devices. They wouldn't necessarily know where to go and get a lot of the data that our electronic systems pump out. (EF4-UK)

Finally, as suggested by the quotation earlier, the dependence of the chain of codified knowledge on the input of professionals with specialist expertise in evidence-based practice, data analysis, and quality improvement can further increase the gulf between the "experts" and the "rank and file":

Table 4 Comparison of Forms of Codified Knowledge

	Clinical Aspects	Scientific Aspects	Organizational Aspects
Clinical guidelines	• All aspects of the patient journey (risk assessment, prevention, and treatment) are usually covered • Recommendations differ depending on different patient groups (e.g., depending on age or coexisting clinical conditions)	Recommendations are usually accompanied by the indication of the "strength" of underlying scientific evidence (e.g., excellent, good, weak, or consensus-based evidence)	As clinical guidelines are produced at the international, national or provincial level, organization-specific routines are usually not specified
Organizational policies and procedures	• Usually focus on one or several elements of the patient journey prioritized by the organization (most often, prevention and risk assessment) • Level of detail in relation to different populations is usually reduced	• Usually reference the original clinical guideline, although not always its most recent version • Recommendations are not accompanied by the indication of the "strength" of underlying research evidence	Contain organization-specific information about specialist staff responsible for managing pressure ulcers; procedures for accessing specialist equipment; and (in the U.K. case) learning-oriented routines deployed to analyze local data
Performance standards	• Usually include a limited number of indicators, most often related to risk assessment and prevention • Data on the incidence of pressure ulcers are available but are not deployed as a formal performance measure	Selection of performance measures is not guided by the strength of underlying research evidence, with many of them underpinned by consensus-based, rather than scientific, evidence	Most indicators are related to process measures (e.g., the existence and upkeep of reporting systems, development of staff competencies, awareness of referral procedures, availability of local data) rather than patient outcomes
Templates for local data collection	• Forms for routine data collection focus on risk assessment; these do not undergo subsequent aggregation • More data (quite extensive in the Swedish case) are collected in cases of actual pressure ulcers; these are used for subsequent aggregation and/or analysis	• Risk assessment is conducted using "validated" tools although there is no reliable evidence to suggest that their use reduces the incidence of pressure ulcers • In Sweden, data from the National Quality Registries are aggregated at the country level and can be treated as a large-scale database for subsequent research	Data are recorded to measure performance against relevant indicators reflecting the organizational processes (e.g., the existence and upkeep of reporting systems, development of staff competencies, awareness of referral procedures, etc.)

Table 5 Loci of Interaction between Codified Knowledge and Actual Practice

Level	Example	Quote
Senior	Board meetings	The other side of it was trying to teach quality improvement. . . probably starting with the board of directors and very senior managers, so trying to get them to understand the concepts of data over time and not just tampering and reacting month on month to what was essentially [natural] variation within the system. So we established the use of **statistical process control charts** at board level. (EF4-UK)
	Senior leadership team meetings	It is partly through management and **reporting of deviations/adverse events** that things come to the surface. These are reported in operations when they happen, but also in the meetings of the Heads of Units where discussions take place to ensure there is learning from these events. (EM2-S)
	Clinical leadership meetings	The other forum that we have. . . is something that we call a team leaders' forum. That's the clinical leaders of nursing, physio, psychology and medics. We meet together which is a business meeting really and it's more of a strategic meeting. We will look at the service and the direction of the service and. . . within that we will look at what the **best evidence is in the way that we deliver our service**. Not just the clinical component of it but what's the right way to be delivering it? (CN5-UK)
Frontline	Multidisciplinary team meetings	[The improvement initiative] was looking at **best evidence**, putting it into practice and then on the whole it's been accepted very well by everyone because if you can provide the evidence most people will say "okay, that's fine; we can follow that." Making sure that all parties within the multi-D team have had some input, that's the biggie. (CF5-A)
	Induction programs	The foundation is obviously their formal education and then the training they would receive upon entering [the organization] in terms of what are the **practice guidelines and protocols** that have been established that would be either organizationally defined or defined through perhaps integrated, you know, regional guidelines. (NM5-CE)
	Education sessions	For each and every single **guideline** you must train at least 15 percent of your staff so I have to train 15 percent in client centred care. (EF1-A)
	Audit and feedback meetings	We do hold follow-up meetings. I ask how they are doing and can you please show me your **figures?** And that is when I get a kind of receipt, because sometimes they can't present figures as they have lost track a bit. (EF1-S)
	Safety huddles	We have safety huddles in the morning. . . which discuss certain aspects of patient care, and it looks at **standards** on the ward to make sure that patient safety is paramount. (NM1-UK)
	Interactions with designated facilitators	We also have a centralized group of people who are clinical in focus and this is mainly for nursing. They're clinical in focus so that staff could call them at any time, day or night, to be able to clarify **policies** and what they can or cannot do. (NM4-CE)
	Bedside handovers	We have bedside handovers as well so we can look at **paperwork**. . . So if I'm taking over the care from another staff member and that hasn't been done you can question why have you not done that, oh you should have maybe documented that differently, oh that's really good you've documented, you know it's about sharing that information and having it out there. (NM1-UK)

I and my closest managerial colleagues use PDSA[4] at a smaller scale . . . I might use it when I bring things out into the field, but it is not something [frontline] staff use on their own. (NM3-S)

[The frontline ward staff] are relying on us being the expert . . . to have done the research. (CF2-UK)

Cross-Country Variability in the Composition and Circulation of Codified Knowledge

First, the cases differ markedly in *the degree of formalization and reliance on evidence by proxy,* with the U.K. and Australian cases providing an extreme example:

From a patient to staff member to ward manager to Exec Board, everybody's aware of those standards and how to maintain them. (EF1-UK)

So everything that we do has a policy and procedure assigned to it. (CF5-A)

By contrast, although references to policies and procedures (*beslutsunderlag*) are quite prominent in the Swedish case, it is generally characterized by a relatively high deployment of clinical guidelines. For example, *vårdhandboken* (the "health care handbook")—a web-based compendium of abridged guidelines that is produced nationally and specifically targets the nursing staff—was often mentioned among the key sources of codified knowledge:

With nurses and other staff it might be appropriate to use the *vårdhandboken* . . . or where there are Swedish guidelines for risk of fall available. (CF1-S)

Second, *the prevalence and variety of designated facilitator roles* (i.e., professionals whose remit explicitly involves the facilitation of evidence-based practice) partaking in the chain of codified knowledge are greater in the Swedish and (particularly) Canadian cases. These are characterized by a multilevel infrastructure of peer-to-peer facilitator roles, operating outside the lines of formal supervision and performance management and represented, for instance, by the virtual (telephone-based and online) "clinical practice teams" and face-to-face "clinical practice coaches" (in East Canada) or the regional and local facilitators (*verksamhetsutvecklare* and *vårdutvecklare,* respectively) in Sweden:

I would really rely on the reports generated by the clinical practice coach to provide a summary of what their observations are, what their interventions are, what gaps in opportunities are observed for individual and group level learning and training. (NM5-CE)

Finally, the *development of the bottom-up knowledge flows* is also variable, with the following quotes exemplifying the marked difference between the U.K. and Australian cases:

Rather than top-down, it's staff looking at the solution that will work on their ward. (EF1-UK)

Unfortunately, even if I want to say from the bottom up it's really from the top down . . . We usually try to bottom up but

then it depends on individual conversion, whereas if it's top down, then it becomes more systematic and . . . you really make a quicker difference. (CF3-A)

In addition to the positive association of quality improvement with the development of bottom-up knowledge flows, apparent in the U.K. case, in which "the quality improvement culture really does stand out" (CN4-UK), another factor influencing the bottom-up/top-down ratio is the level at which the policies and procedures adopted by the organization tend to be produced. Australian and Swedish respondents, for instance, more frequently refer to the direct top-down importation of provincial and regional policies and procedures, which can stifle bottom-up knowledge flows, than their Canadian and (particularly) U.K. counterparts:

[Provincial health authority] have put out some procedures, [regional hospital network] has put out some procedures . . . How about if we want to get another thing, how do we do this? . . . If it's not in the procedure, you're not allowed to do that, so you're really limited as a nurse. (CF3-A)

The work of updating can take a long time and that is why we do not want to create our own routines . . . We'd rather choose a program we know is updated continuously by others. (NM3-S)

Table 6 shows the relative strength of the foregoing themes across the four countries.

Discussion
"Evidence by Proxy" in the Chain of Codified Knowledge
The current stage in the evolution of the evidence-based policy and practice movement is characterized by the expansion of the notion of evidence, the institutionalization of the evidence-based approach as organizational business as usual, and its spread across various public sector domains nationally and internationally. Previous scholarship has highlighted the role that multiple forms of tacit knowledge and skills play in the enactment of evidence-based practice by shaping the uptake of research evidence and clinical guidelines (Dopson et al. 2002; Gabbay and le May 2011; McCaughan et al. 2005). This study highlights another trend in the evolution of the evidence-based approach, which is characterized by the proliferation of various forms of codified knowledge that we refer to as "evidence by proxy." Although these forms of knowledge are informed by research evidence only partly or indirectly, they are nevertheless perceived by practitioners as credible evidence and have a significant impact on the enactment of evidence-based practice in health-care organizations.

Different forms of evidence by proxy are interconnected in the chain of codified knowledge, mutually informing each other and creating multiple interfaces where codified knowledge interacts with actual practice. Although this chain does contain evidence from original research and clinical guidelines, the majority of frontline health care staff are likely to rely on performance standards, organizational policies and procedures, and locally collected data as the most frequently consulted forms of codified knowledge. Concurring with previous observations that the actual use of clinical guidelines in practice may be overestimated (Gabbay and le May

Table 6 Analytic Themes across the Four Countries: Ratings of Comparative Strength

Theme	U.K. Case	Australian Case	Canadian Case	Swedish Case
Reliance on evidence by proxy	+++	+++	++	+
Perceived overformalization	+++	+++	++	++
Development of bottom-up flows of codified knowledge	+++	+	++	+
Influence of regional and provincial policies on organizational processes	+	+++	++	+++
Development of designated facilitator roles to support the implementation of evidence-based practice	++	+	+++	+++
Designated roles with expertise in facilitation involved in the chain of codified knowledge	Quality improvement specialists; data analysts	Clinical nurse educators	Clinical practice team and clinical practice coaches (East Canada); clinical nurse educators, research librarians and knowledge management professionals (West Canada)	Regional and local facilitators; knowledge management professionals

Notes: +=presence of the theme in the data set; ++=strong evidence of theme; +++=very strong evidence of presence. The themes listed here reflect the most pronounced differences among the four country-specific interview data sets and were derived from cross-case data analysis led by the first author. Comparative strength of each theme was initially discussed between the first author and the data analysis lead for each country, resulting in a set of provisional ratings. These were subsequently discussed in the second face-to-face research team meeting, where consensus about the final ratings was achieved by the team members.

2011; McCaughan et al. 2005; Timmermans and Kolker 2004), our study demonstrates that relatively low direct uptake of research evidence is counterbalanced by the corresponding increase in the use of evidence by proxy and the mutually potentiating effect of its multiple interconnected forms. These developments can be interpreted as an organizational response to the triple pressure of adhering to the evidence-based paradigm as a new orthodoxy (Dopson et al. 2003); coping with the increasing volume of research evidence, which has become unmanageable (Greenhalgh, Howick, and Maskrey 2014); and responding to external performance management expectations (Ferlie and McGivern 2014).

While the direction of knowledge flows in the chain of codified knowledge remains predominantly top down, our findings demonstrate its potential to integrate locally collected forms of data, such as patient feedback and project evaluation findings. Through bottom-up channels supported at the organizational level, these data can trigger the processes of quality improvement and clinical audit and eventually lead to the modification of organizational policies and standards, thus enabling bidirectional knowledge flows. Responding to the call to explore how local forms of data contribute to the development of evidence-based health care (Rycroft-Malone et al. 2004), our findings question the purely unilateral model of information gathering and dissemination described by the early commentators on evidence-based health care (Wood, Ferlie, and Fitzgerald 1998). Furthermore, they suggest that it is through the processes of codification that previously tacit knowledge about the local context and context-specific organizational practices gets integrated with scientific knowledge, enabling the large-scale adoption of the latter at the organizational level.

This large-scale adoption, however, comes at a price. The incorporation of context-specific forms of knowledge can also be interpreted as "dilution" of scientific evidence, whereby the latter is simplified in the process of translation and, although its overall indirect uptake may well be reinforced, this reinforcement is highly selective. For instance, local forms of evidence by proxy tend to prioritize certain clinical variants, patient populations, and

elements of the patient journey at the expense of others. Reduction in uncertainty, advocated by some proponents of evidence-informed decision making (Cairney, Oliver, and Wellstead 2016), tends to be achieved here through treating different practical recommendations as "equal" regardless of the "strength" of their underlying scientific base. As the original signal from the research evidence becomes weakened while being transmitted along the chain of codified knowledge, uncertainty about effectiveness of certain methods of prevention and treatment could be lost in the operationalization of the rules of the local context.

Implications for the Enactment of Evidence-Based Policy and Practice

The functioning of the chain of codified knowledge relies on the input of several specialist and hybrid groups. This goes beyond previously described macro-level stratification between the selected elite of international experts responsible for the production of clinical guidelines and the rest of the profession (Dopson et al. 2003; Knaapen 2013; Timmermans and Kolker 2004) and emergence of "gray sciences," such as systematic reviewing or health economics (Ferlie and McGivern 2014). In fact, institutionalization of evidence-based practice involves extending stratification toward the middle of the professional hierarchy as senior clinicians with specialist expertise in a certain area become instrumental for the transformation of clinical guidelines into organizational policies and procedures. It is also accompanied by the growing involvement of groups whose main area of expertise is the implementation of codified knowledge through evidence retrieval (librarians), collection and analysis of local data (quality improvement specialists and data analysts), formal education (clinical educators), and supportive facilitation (designated facilitators).

While it has been suggested that evidence-based health care represents "the displacement of trust in experts by trust in processes, procedures and statistical measurement" (Madden 2012, 2050), our findings show that "trust in experts" is still apparent in the implementation of evidence-based practice, even though its basis might now be shifting from reliance on local experts' clinical

judgment to faith in their ability to retrieve, appraise, synthesize, translate, and apply research evidence. Furthermore, although the evidence-based model, because of its emphasis on procedural transparency, does not in principle preclude the scrutiny of the elites involved in the process of evidence production by the "rank-and-file" clinicians (Knaapen 2013), we found few examples where the chain of codified knowledge was questioned by the frontline or middle management. This may be partly explained by the fact that education, coaching, and facilitation related to the organizational implementation of evidence-based practice tend to focus on clinical issues and/or on the application of the ready-to-use forms of codified knowledge rather than on developing "functional competencies," or skills related to evidence searching and critical appraisal (Rousseau and Gunia 2016, 673).

Given these developments, it should come as no surprise that frontline clinical staff increasingly rely on simplified and unambiguous evidence by proxy created and/or translated by organizational experts. This reliance, however, makes us question the extent to which the institutionalization of evidence-based practice described in this article retains the "conscientious. . . and judicious" approach to evidence use historically seen as a fundamental feature of evidence-based health care (Sackett et al. 1996). Interpreted in this light, our findings concur with previous observations that results-based reforms tend to marginalize the processes of double-loop organizational learning (Kislov, Humphreys, and Harvey 2017; Moynihan 2005; Moynihan and Landuyt 2009), particularly for frontline practitioners.

At the same time, our findings contribute to the broader debate about the use of information in organizations (Moynihan and Lavertu 2012; Moynihan and Pandey 2010) by highlighting that the chain of codified knowledge may offer some opportunities for double-loop learning to an organization as whole. First, in a chain whose components are well aligned, evidence-based policies and standards may provide much-needed focus for meaningful prioritization and use of the locally collected performance data. Second, dependence of the chain of codified knowledge on local data analysis and quality improvement implies organizational investment in analytic capacity, thus increasing the chances that locally collected data will be analyzed and applied in practice (Allard et al. 2018). Finally, there is some evidence of codification and application of organizational learning routines that not only specify how relevant processes and outcomes should be measured and benchmarked but also provide mechanisms for questioning and altering broader organizational practices (Berta et al. 2015).

The Influence of Macro-Level Context on the Chain of Codified Knowledge

Our findings reveal how the organizational enactment of evidence-based practice in general, and the dynamics of knowledge codification in particular, are affected by macro-level context. First, the uptake of evidence by proxy is likely to be more prominent in countries such as Australia and the United Kingdom whose public sectors have historically been more engaged with the New Public Management logics of standardization and performance measurement than in countries such as Sweden that display many features of New Public Management but do not belong to the "core" New Public Management group (Ferlie et al. 2016).

Interestingly, the development of bottom-up elements in the chain of codified knowledge seems to be mostly affected by organizational factors (with the uptake of the quality improvement methodology exercising a positive influence) and the characteristics of the local health care system in which the organization is embedded (with structural complexity exercising a negative influence) rather than by the national uptake of the New Public Management agenda. This is apparent in the U.K. case, in which a significant degree of top-down (and largely centrally driven) codification and standardization coexists with the (local) culture of bottom-up improvement, thus suggesting that structural and cultural approaches to learning can be fruitfully deployed by the same organization (Moynihan and Landuyt 2009).

In addition, the preferred forms of codified knowledge and methods of its implementation may be predetermined by the unique features of historical and technological context. The sophisticated system of designated facilitator roles in Canada, for example, could be the direct consequence of the pioneering role of Canadian health services researchers in working with policy makers to develop and embed the techniques and practices of knowledge mobilization (Cooper and Levin 2010). Similarly, the widespread use of National Quality Registries as evidence by proxy in Sweden can be explained by the unique and long history of governmental support for this "meta-intervention," which is seen as vital for facilitating evidence-based practice (Eldh et al. 2015; Fredriksson et al. 2014). It is also enabled by technological advances, such as the ability to directly extract data from electronic health records and link individual patient data across different registries through the system of personal identification numbers assigned to all permanent residents of Sweden (Feltelius et al. 2017).

Conclusion

By describing the composition and role of evidence by proxy in the chain of codified knowledge, exploring its effects on the organizational enactment of evidence-based practice, and highlighting the similarities and differences across four countries, this study has addressed the call to "produce a more complex understanding of the knowledge mechanics" of evidence-based practice across different health care systems (Mykhalovskiy and Weir 2004, 1062). Our analysis is likely to be applicable to a range of public sector arenas in which the evidence-based policy and practice paradigm has become relatively "settled" (Head 2016, 475) but which are characterized by relative lack of power in their respective social fields and by the relative scarcity of large-scale experiment-based research compared with medicine.

The tendencies described in the article reveal dual effects of codification on evidence-based practice. On the one hand, the legitimization and mobilization of contextual and local knowledge counterbalance the "dogmatic authoritarianism" apparent in the more restrictive interpretations of the evidence-based paradigm (Fava 2017), helping to supplement and contextualize efficacy findings (Crowley and Scott 2017). The chain of codified knowledge brings the evidence-based movement closer to addressing the implementation gap it faces (Dopson et al. 2003) and can enable bottom-up knowledge flows through incorporating clinical audit and quality improvement underpinned by the meaningful analysis of locally collected performance data.

On the other hand, these developments may be achieved through a dilution of the initial scientific evidence base, excessive formalization, and detachment of frontline practitioners from the fundamental competencies of evidence-based practice. There is a risk that overreliance of frontline staff on simplified evidence by proxy might undermine their ability to conscientiously combine the best research evidence with clinical expertise and patient values. Should these tendencies continue, health-care organizations may end up turning into "machine bureaucracies" that operate on an incomplete knowledge base, integrate knowledge only at the top of the hierarchy, and learn predominantly through the slow process of formalization (Lam 2000).

This study is not without limitations. Informed by interviews and documentary data, our analysis has focused on the organizational discourses and routines related to the local enactment of evidence-based policies within organizations rather than the actual practices of individual clinicians providing evidence-based care. Although both nurse managers and facilitators interviewed for this study were strongly connected to clinical practice by directly managing frontline staff and/or retaining a significant hands-on clinical role themselves, our conclusions are limited by the lack of observational data. We are also conscious that our four country cases rely on relatively small samples; therefore, the findings related to cross-country variability should be treated as exploratory until corroborated by further empirical evidence. Although our findings indicate the influence of deeply held beliefs on the perceptions about the credibility of evidence, an exploration of "irrational" shortcuts to evidence, such as emotions, gut feelings, and habits (Cairney, Oliver, and Wellstead 2016, 399), is beyond the scope of this article.

Our findings suggest that there may be two generic archetypes in relation to the preferred ways of maintaining the chain of codified knowledge. The first archetype, represented by the Australian and U.K. cases, is characterized by the emphasis on the disciplinary power of standards and audit with less investment in the development of designated facilitator roles. Conversely, the second archetype, represented by Canada and Sweden, prioritizes the "soft power" of designated facilitator roles with less emphasis on performance standards. Inverse relationship between the reliance on standards and reliance on designated facilitator roles merits further investigation.

This study opens several other avenues for future research. The first is concerned with the vertical dimension in the chain of codified knowledge and could further explore the antecedents, mechanisms, and consequences of bidirectionality apparent in the integration of top-down and bottom-up knowledge flows. The second opportunity is to investigate the horizontal spread of different forms of evidence by proxy, contained in improvement methodologies, policy frameworks, and accreditation schemes across different organizations, sectors, and countries. Finally, as our findings indicate that enactment through codification may have dual effects on higher-order learning, it is imperative to enhance our understanding of how the learning potential inherent in the chain of codified knowledge could be maximized.

Notes
1. It is worth noting that health care practitioners are expected to take clinical guidelines fully into account when exercising their clinical judgment. However, it is also explicitly acknowledged that compliance to clinical guidelines should not override their professional responsibility to make decisions appropriate to the circumstances, needs, and preferences of each individual patient (National Institute for Health and Care Excellence 2018).
2. The following abbreviations are used in this section to refer to research participants: CF, clinical facilitator; CN, consultant nurse; EF, executive facilitator; EM, executive manager; NM, nursing manager; A, Australia; CE, Canada East; CW, Canada West; S, Sweden; UK, United Kingdom.
3. A NHS Trust is a self-governing administrative body within the U.K. National Health Service comprising a hospital or (frequently) a group of neighboring hospitals and providing hospital services, community services, and other aspects of patient care.
4. The PDSA (Plan-Do-Study-Act) cycles are widely used in service improvement and include developing a plan to test the change (Plan), carrying out the test (Do), observing and learning from the consequences (Study), and determining what modifications should be made to the test (Act).

References
Aarons, Gregory A., Michael Hurlburt, and Sarah McCue Horwitz. 2011. Advancing a Conceptual Model of Evidence-Based Practice Implementation in Public Service Sectors. *Administration and Policy in Mental Health and Mental Health Services Research* 38(1): 4–23.

Allard, Scott W., Emily R. Wiegand, Colleen Schlecht, A. Rupa Datta, Robert M. Goerge, and Elizabeth Weigensberg. 2018. State Agencies' Use of Administrative

Data for Improved Practice: Needs, Challenges, and Opportunities. *Public Administration Review* 78(2): 240–50.

Allen, Davina. 2009. From Boundary Concept to Boundary Object: The Practice and Politics of Care Pathway Development. *Social Science and Medicine* 69(3): 354–61.

Berta, Whitney, Lisa Cranley, James W. Dearing, Elizabeth J. Dogherty, Janet E. Squires, and Carole A. Estabrooks. 2015. Why (We Think) Facilitation Works: Insights from Organizational Learning Theory. *Implementation Science* 10: 141.

Brown, John Seely, and Paul Duguid. 2001. Knowledge and Organization: A Social-Practice Perspective. *Organization Science* 12(2): 198–213.

Cairney, Paul, Kathryn Oliver, and Adam Wellstead. 2016. To Bridge the Divide between Evidence and Policy: Reduce Ambiguity as Much as Uncertainty. *Public Administration Review* 76(3): 399–402.

Chell, Elizabeth. 2004. Critical Incident Technique. In *Essential Guide to Qualitative Methods in Organizational Research,* edited by Catherine Cassell and Gillian Symon, 45–60. London: Sage Publications.

Cooper, Amanda, and Ben Levin. 2010. Some Canadian Contributions to Understanding Knowledge Mobilisation. *Evidence & Policy* 6(3): 351–69.

Crowley, Daniel Max, and J. Taylor Scott. 2017. Bringing Rigor to the Use of Evidence in Policy Making: Translating Early Evidence. *Public Administration Review* 77(5): 650–55.

Dimitrijevska-Markoski, Tamara, and P. Edward French. 2019. Determinants of Public Administrators' Use of Performance Information: Evidence from Local Governments in Florida. Public Administration Review. *Published electronically on February* 25. https://doi.org/10.1111/puar.13036.

Dopson, Sue, Louise Fitzgerald, Ewan Ferlie, John Gabbay, and Louise Locock. 2002. No Magic Targets! Changing Clinical Practice to Become More Evidence Based. *Health Care Management Review* 27(3): 35–47.

Dopson, Sue, Louise Locock, John Gabbay, Ewan Ferlie, and Louise Fitzgerald. 2003. Evidence-Based Medicine and the Implementation Gap. *Health* 7(3): 311–30.

Eldh, Ann Catrine, Mio Fredriksson, Sofie Vengberg, Christina Halford, Lars Wallin, Tobias Dahlström, and Ulrika Winblad. 2015. Depicting the Interplay between Organisational Tiers in the Use of a National Quality Registry to Develop Quality of Care in Sweden. *BMC Health Services Research* 15: 519.

Fava, Giovanni A. 2017. Evidence-Based Medicine Was Bound to Fail: A Report to Alvan Feinstein. *Journal of Clinical Epidemiology* 84: 3–7.

Feltelius, Nils, Rolf Gedeborg, Lennart Holm, and Björn Zethelius. 2017. Utility of Registries for Post-Marketing Evaluation of Medicines. A Survey of Swedish Health Care Quality Registries from a Regulatory Perspective. *Upsala Journal of Medical Sciences* 122(2): 136–47.

Ferlie, Ewan, Sue Dopson, Louise Fitzgerald, and Louise Locock. 2009. Renewing Policy to Support Evidence-Based Health Care. *Public Administration* 87(4): 837–52.

Ferlie, Ewan, Jean Ledger, Sue Dopson, Michael D. Fischer, Louise Fitzgerald, Gerry McGivern, and Chris Bennett. 2016. The Political Economy of Management Knowledge: Management Texts in English Healthcare Organizations. *Public Administration* 94(1): 185–203.

Ferlie, Ewan, and Gerry McGivern. 2014. Bringing Anglo-Governmentality into Public Management Scholarship: The Case of Evidence-Based Medicine in U.K. Health Care. *Journal of Public Administration Research and Theory* 24(1): 59–83.

Fitzgerald, Louise, and Sue Dopson. 2009. Comparative Case Study Designs: Their Utility and Development in Organizational Research. In *The Sage Handbook of Organizational Research Methods,* edited by David A. Buchanan and Alan Bryman, 465–83. London: Sage Publications.

Fitzgerald, Louise, Ewan Ferlie, Martin Wood, and Chris Hawkins. 2002. Interlocking Interactions: The Diffusion of Innovations in Health Care. *Human Relations* 55(12): 1429–49.

Fredriksson, Mio, Ann Catrine Eldh, Sofie Vengberg, Tobias Dahlström, Christina Halford, Lars Wallin, and Ulrika Winblad. 2014. Local Politico-Administrative Perspectives on Quality Improvement Based on National Registry Data in Sweden: A Qualitative Study Using the Consolidated Framework for Implementation Research. *Implementation Science* 9: 189.

Gabbay, John, and Andree le May. 2011. *Practice-Based Evidence for Healthcare: Clinical Mindlines*. Oxon: Routledge.

Greenhalgh, Trisha, Jeremy Howick, and Neal Maskrey. 2014. Evidence Based Medicine: A Movement in Crisis? *British Medical Journal* 348: g3725.

Hall, Jeremy L. 2017. Evidence-Based Practice: Challenging the Rational Wisdom. *International Journal of Public Administration* 40(9): 730–43.

Hall, Jeremy L., and Gregg G. Van Ryzin. 2018. A Norm of Evidence and Research in Decision-Making (NERD): Scale Development, Reliability, and Validity. *Public Administration Review*. Published electronically on September 24. https://doi.org/10.1111/puar.12995.

Harrison, Stephen. 1998. The Politics of Evidence-Based Medicine in the United Kingdom. *Policy & Politics* 26(1): 15–31.

Harvey, Gill, Wendy Gifford, Greta Cummings, Janet Kelly, Roman Kislov, Alison Kitson, Lena Pettersson, Lars Wallin, Paul Wilson, and Anna Ehrenberg. 2019. Mobilising Evidence to Improve Nursing Practice: A Qualitative Study of Leadership Roles and Processes in Four Countries. *International Journal of Nursing Studies* 90: 21–30.

Harvey, Gill, and Alison Kitson, eds. 2015. *Implementing Evidence-Based Practice in Healthcare: A Facilitation Guide*. London: Routledge.

Hasselbladh, Hans, and Eva Bejerot. 2007. Webs of Knowledge and Circuits of Communication: Constructing Rationalized Agency in Swedish Health Care. *Organization* 14(2): 175–200.

Head, Brian W. 2008. Three Lenses of Evidence-Based Policy. *Australian Journal of Public Administration* 67(1):1–11.

——— 2016. Toward More "Evidence-Informed" Policy Making? *Public Administration Review* 76(3): 472–84.

Heinrich, Carolyn J. 2007. Evidence-Based Policy and Performance Management: Challenges and Prospects in Two Parallel Movements. *American Review of Public Administration* 37(3): 255–77.

Hill, Heather C. 2003. Understanding Implementation: Street-Level Bureaucrats' Resources for Reform. *Journal of Public Administration Research and Theory* 13(3): 265–82.

Holmes, Dave, Amélie Perron, and Patrick O'Byrne. 2006. Evidence, Virulence, and the Disappearance of Nursing Knowledge: A Critique of the Evidence-Based Dogma. *Worldviews on Evidence-Based Nursing* 3(3): 95–102.

Jennings, Edward T., Jr., and Jeremy L. Hall. 2012. Evidence-Based Practice and the Use of Information in State Agency Decision Making. *Journal of Public Administration Research and Theory* 22(2): 245–66.

Kislov, Roman. 2014. Boundary Discontinuity in a Constellation of Interconnected Practices. *Public Administration* 92(2): 307–23.

Kislov, Roman, Damian Hodgson, and Ruth Boaden. 2016. Professionals as Knowledge Brokers: The Limits of Authority in Healthcare Collaboration. *Public Administration* 94(2): 472–89.

Kislov, Roman, John Humphreys, and Gill Harvey. 2017. How Do Managerial Techniques Evolve over Time? The Distortion of "Facilitation" in Healthcare Service Improvement. *Public Management Review* 19(8): 1165–83.

Kislov, Roman, Heather Waterman, Gill Harvey, and Ruth Boaden. 2014. Rethinking Capacity Building for Knowledge Mobilisation: Developing Multilevel Capabilities in Healthcare Organisations. *Implementation Science* 9: 166.

Knaapen, Loes. 2013. Being "Evidence-Based" in the Absence of Evidence: The Management of Non-Evidence in Guideline Development. *Social Studies of Science* 43(5): 681–706.

Lam, Alice. 2000. Tacit Knowledge, Organizational Learning and Societal Institutions: An Integrated Framework. *Organization Studies* 21(3): 487–513.

Mackey, April, and Sandra Bassendowski. 2017. The History of Evidence-Based Practice in Nursing Education and Practice. *Journal of Professional Nursing* 33(1): 51–55.

Madden, Mary. 2012. Alienating Evidence Based Medicine vs. Innovative Medical Device Marketing: A Report on the Evidence Debate at a Wounds Conference. *Social Science and Medicine* 74(12): 2046–52.

Martin, Graham P., David Kocman, Timothy Stephens, Carol J. Peden, and Rupert M. Pearse. 2017. Pathways to Professionalism? Quality Improvement, Care Pathways, and the Interplay of Standardisation and Clinical Autonomy. *Sociology of Health and Illness* 39(8): 1314–29.

McCaughan, Dorothy, Carl Thompson, Nicky Cullum, Trevor Sheldon, and Pauline Raynor. 2005. Nurse Practitioner and Practice Nurses' Use of Research Information in Clinical Decision Making: Findings from an Exploratory Study. *Family Practice* 22(5): 490–97.

Moynihan, Donald P. 2005. Goal-Based Learning and the Future of Performance Management. *Public Administration Review* 65(2): 203–16.

Moynihan, Donald P., and Noel Landuyt. 2009. How Do Public Organizations Learn? Bridging Cultural and Structural Perspectives. *Public Administration Review* 69(6): 1097–105.

Moynihan, Donald P., and Stéphane Lavertu. 2012. Does Involvement in Performance Management Routines Encourage Performance Information Use? Evaluating GPRA and PART. *Public Administration Review* 72(4): 592–602.

Moynihan, Donald P., and Sanjay K. Pandey. 2010. The Big Question for Performance Management: Why Do Managers Use Performance Information? *Journal of Public Administration Research and Theory* 20(4): 849–66.

Mykhalovskiy, Eric, and Lorna Weir. 2004. The Problem of Evidence-Based Medicine: Directions for Social Science. *Social Science and Medicine* 59(5): 1059–69.

Nadin, Sara, and Catherine Cassell. 2004. Using Data Matrices. In *Essential Guide to Qualitative Methods in Organizational Research,* edited by Catherine Cassell and Gillian Symon, 271–87. London: Sage Publications.

National Institute for Health and Care Excellence. 2018. Developing Nice Guidelines: The Manual. https://www.nice.org.uk/process/pmg20 [accessed April 10, 2019].

Newman, Joshua, Adrian Cherney, and Brian W. Head. 2016. Do Policy Makers Use Academic Research? Reexamining the "Two Communities" Theory of Research Utilization. *Public Administration Review* 76(1): 24–32.

Nutley, Sandra M., Isabel Walter, and Huw T. O. Davies. 2007. *Using Evidence: How Research Can Inform Public Services*. Bristol: Policy Press.

Peterson, Mark F. 2009. Cross-Cultural Comparative Studies and Issues in International Research Collaboration. In *The Sage Handbook of Organizational Research Methods,* edited by David A. Buchanan and Alan Bryman, 328–45. London: Sage Publications.

Petkovic, Jennifer, Vivian Welch, Maria Helena Jacob, Manosila Yoganathan, Ana Patricia Ayala, Heather Cunningham, and Peter Tugwell. 2016. The Effectiveness of Evidence Summaries on Health Policymakers and Health System Managers Use of Evidence from Systematic Reviews: A Systematic Review. *Implementation Science* 11: 162.

Petticrew, Mark. 2015. Time to Rethink the Systematic Review Catechism? Moving from "What Works" to "What Happens." *Systematic Reviews* 4: 36.

Richardson, W. Scott. 2017. The Practice of Evidence-Based Medicine Involves the Care of Whole Persons. *Journal of Clinical Epidemiology* 84: 18–21.

Rousseau, Denise M., and Brian C. Gunia. 2016. Evidence-Based Practice: The Psychology of EBP Implementation. *Annual Review of Psychology* 67: 667–92.

Rowlinson, Michael. 2004. Historical Analysis of Company Documents. In *Essential Guide to Qualitative Methods in Organizational Research,* edited by Catherine Cassell and Gillian Symon, 301–11. London: Sage Publications.

Rycroft-Malone, Jo, Kate Seers, Angie Titchen, Gill Harvey, Alison Kitson, and Brendan McCormack. 2004. What Counts as Evidence in Evidence-Based Practice? *Journal of Advanced Nursing* 47(1): 81–90.

Sackett, David L., William M. C. Rosenberg, J. A. Muir Gray, R. Brian Haynes, and W. Scott Richardson. 1996. Evidence Based Medicine: What It Is and What It Isn't. *British Medical Journal* 312(7023): 71–72.

Satterfield, Jason M., Bonnie Spring, Ross C. Brownson, Edward J. Mullen, Robin P. Newhouse, Barbara B. Walker, and Evelyn P. Whitlock. 2009. Toward a Transdisciplinary Model of Evidence-Based Practice. *Milbank Quarterly* 87(2): 368–90.

Timmermans, Stefan, and Emily S. Kolker. 2004. Evidence-Based Medicine and the Reconfiguration of Medical Knowledge. *Journal of Health and Social Behavior* 45: 177–93.

Tsoukas, Haridimos, and Efi Vladimirou. 2001. What Is Organizational Knowledge? *Journal of Management Studies* 38(7): 973–93.

Turner, Simon, Juliet Higginson, C. Alice Oborne, Rebecca E. Thomas, Angus I. G. Ramsay, and Naomi J. Fulop. 2014. Codifying Knowledge to Improve Patient Safety: A Qualitative Study of Practice-Based Interventions. *Social Science and Medicine* 113: 169–76.

Wilson, Paul, and Trevor A. Sheldon. 2019. Using Evidence in Health and Health Care. In *What Works Now? Evidence Informed Policy and Practice,* edited by Annette Boaz, Huw Davies, Alec Fraser, and Sandra Nutley. Bristol: Policy Press.

Wood, Martin, Ewan Ferlie, and Louise Fitzgerald. 1998. Achieving Clinical Behaviour Change: A Case of Becoming Indeterminate. *Social Science and Medicine* 47(11): 1729–38.