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Knowledge Translation in Healthcare: A review of the literature

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Introduction

The rapidly expanding literature on knowledge in management research, has outlined a number of different knowledge 'processes' such as knowledge sharing, knowledge creation, knowledge exchange and knowledge transfer. A critical issue, often discussed in terms of enabling innovation or competitive advantage, is the need for knowledge embedded within one community or organisational group to become available or known to members in a different community. As conceptualised by the notion of communities of practice (Lave and Wenger 1991, Brown and Duguid 1991, Wenger 1998) knowledge is learned within a social context; individuals who are not familiar with, or members of, a given social context are likely to ascribe a different meaning or understanding to a specified knowledge set. This has led to an elaboration of the 'stickiness' of knowledge (Szulanski, 1996, 2000), in that it 'sticks' within a social community. In an organisational context, this suggests that members who are expert in one knowledge domain are not easily able to make known their expertise to members from a different area of expertise or another organisational sector.

On the other hand, reliance on collaboration between experts to share knowledge and inform practice (e.g. Van der Vegt et al., 2003) is a dominant feature of contemporary work. Conjoining expertise between colleagues from different backgrounds or groups can enable novel ways of distinguishing and connecting ideas (Leonard and Sensiper, 1998). With the historical differentiation of professional tasks, knowledge exchange among different domains of expertise becomes an increasingly salient requirement of social and organizational life. Yet achieving knowledge integration remains difficult (Milliken and Martins, 1996; Newell and Swan, 2000; Rynes et al 2001), and the process of integrating practice and constructing knowledge across disciplinary domains – including those with expertise in research and those expert in practice - remains largely unexplained (Dopson and Fitzgerald, 2005).

This broader issue of using research to inform practice has been the subject of debate since the 1950's, and has been of particular concern within the healthcare field. The gap between knowledge held within healthcare research communities and healthcare practice communities causes a substantial time lag between generating research knowledge and the time this knowledge is used in practice (Lomas 2000, Lomas 2007, Dopson and FitzGerald 2005, Nicolini et al 2007, Kontos and Poland 2009). This phenomenon is not unique to healthcare, but has been noted in numerous fields (Rynes et al 2001). Hence advances in research knowledge can take years to be implemented into, or change, practice. Given the pace of innovation and research in the healthcare field, this 'knowledge gap' has generated significant concern within the healthcare research and policy, and has been the subject of numerous reports (eg Cooksey 2006), editorials and papers (Lomas 2000, 2005).

In this review we start by organising and critically synthesising the literature on knowledge translation in the context of healthcare delivery in particular. As such the knowledge translation gap we focus on is between knowledge developed in the context of research communities and the knowledge held by those in healthcare practice communities as evidenced by their practices; we examine how this literature has evolved over the past 3 decades. This is followed by a section that synthesises key themes from the broader management literature on knowledge sharing and 'transfer' processes. In the penultimate section we focus the relevance of our findings and conclusions from the literature as they related to 'CLAHRCs' more specifically. In the final section we elaborate on areas where we have identified gaps in the literatures reviewed and suggest areas of future research.

Knowledge translation and exchange in healthcare

A number of models and theories have been developed to overcome the barrier of translating knowledge between research and practice (Grol and Grimshaw 1999, Graham et al 2006, Nicolini et al 2007, Kontos and Poland 2009). Early conceptualisations of the knowledge - practice gap frequently used the term 'research utilization' (Weiss 1979). The early knowledge-driven and problem-solving models conceptualise the process as a linear, unidirectional and passive flow of information from research to practice or vice versa (Weiss 1979). The 'knowledge driven model' was used mostly within the natural sciences, including the medical fields. The model assumed that basic research would progress to applied research and would eventually lead to development stages, such as new medicine or technology and then application in the realm of practice (Havelock, 1969, cited in Weiss 1979). Nonetheless, as pointed out by Mosteller (1981), it took 200 years between the time that a clear and convincing cure for scurvy had been found until it was adopted by the British navy; this highlights the difficulty of knowledge 'moving' from research into practice. Thus this passive view of knowledge transfer has become increasingly questioned.

While early models accounted for the various modes of relations between research and practice, they did not consider the role of normative differences in knowledge flow. Two communities model was proposed to highlight the implications of cultural differences among the academics and practitioners for knowledge exchange. The differences in values and cultures among these communities were seen as a major constraint s to knowledge exchange (Caplan, 1979).

Nevertheless, while early knowledge-driven and problem solving models reduced interaction to one-way, linear knowledge transmission anchored in asymmetrical power relation between researchers and decision-makers, a two-communities model largely arrested knowledge exchange in emphasizing the cultural incommensurability of the professional domains. These conceptual contributions thus did not adequately account for the possibility of bridging the gap between research and practice (Jacobson, Butterill, & Goering, 2003).

Whilst the slow uptake of research findings into the domains of health and medical practice has been a concern for a number of decades amongst health communities, the concern intensified during the 90's via the Evidence Based Medicine (EBM) movement. Originating at McMaster University in Canada, EBM sought to maximise efficiency of medical practice by adopting a more rationally ordered means of predicting health outcomes and organizing of service provision. This model of medical practice organises 'knowledge' into levels of rational validity with double blind randomised control trials (RCTs) as the most trustworthy type of explicit medical knowledge based on statistical inference (Sackett and Rosenberg 1995, Sackett et al 2000). The overall intent is to increase the scientific rigor of clinical investigations and treatments as well as increase the utilisation of scientific research in the practices of medical professions (Nutley et al 2003, Secretary of State 1998, Wood et al 1998). This modern rational approach to formalising and disseminating explicit components of medical knowledge sits alongside the narrative structure of medical learning and government policy concern with accountability and efficiency of healthcare provision (Hunter 1995, Light, 2001; Oborn 2008). The predominant emphasis in the EBM portrayal of knowledge transfer was to expect and anticipate that clinical practitioners would initiate the search for knowledge, based on their professional motivation to provide the best possible care.

EBM premises that clinicians explicitly use data from (external) RCTs in the routine decision making of clinical care. In principle this is endorsed by clinicians, but remains problematic in application (Freeman and Sweeney 2001, Dawson et al 1999, Wood et al 1998, Ferlie et al 2005). In addition to the expanding research literature being difficult to access in a timely fashion, gaps in the current understanding of health and disease processes, and the difficulty of interpreting the results of research publications, there remains also the tension of conjoining a knowledge base from a scientific research community with that of clinical communities (Mykhalovskiy and Weir 2004, Wood et al 1998). The importance of communities in developing values (Lave and Wenger 1991), meaning (Wenger 1998) and tacit integration (Polanyi 1968, Oborn and Dawson 2011) highlights the complex knowledge construction processes in this mutual articulation of knowledge across communities (Mykhalovskiy and Weir 2004).

With the persistent gap in research and practice being made evident, despite the concerted effort by the EBM movement to underscore the importance of using evidence to inform ongoing healthcare practice (Schuster et al 1998, Grol 2001), a new set of models emerged that highlighted the importance of interaction between the practice and research communities (Graham et al 2006). This view argued that knowledge needed to be made relevant, as research findings were often conceived of as 'square pegs that needed to be fit into a round hole' (Freeman and Sweeney 2001). Rather than viewing knowledge flow as a linear process, whereby decision makers

would seek out and use knowledge to inform their practice, researchers and those tasked with producing knowledge were encouraged to consider how they could more actively facilitate the use of knowledge outputs. Funding agencies were also starting to demand an element of impact be considered as part of the researcher's role (Lomas 2005, Cooksey 2006). This view of the research to practice gap emphasised the two way nature of knowledge flows and the need for active engagement, rather than passive diffusion. Rather than assessing knowledge flow solely by the efficiency of outcomes, the conceptual focus shifted on the process of interaction and collaboration. Also, while EBM reconciled the volitional variations involved in the problem selection and analysis around the logic of efficiency, the emerging conceptualisations of knowledge exchange considered and reconciled cultural differences in a symmetrical and reciprocal interaction of researchers and practitioners (Lomas, 2000; Baumbusch et al., 2008).

In particular, on-going interaction between researchers and practitioners was identified as critical to knowledge being used in practice. Increasing use of the term knowledge exchange in addition to 'transfer' is also noted in the literature. Mitton et.al (2009) identifies that interactively engaging key leaders or champions is an important factor for successful Knowledge-Transfer and Exchange (KTE). Literature has in addition identified that opportunities for building long term relationships is very important in enabling knowledge exchange activities (Trostle 1999, Bowen 2005). Another term developed into a model for the Canadian health service research foundation was 'knowledge linkage and exchange' (CHSR 2006x). This term and the conceptual model that underpins it, suggests that knowledge generation and use is cyclical; at different stages in the knowledge process, effort needs to expended in linking knowledge with potential users as shown in Figure 1. The linkage and exchange activities could be either seen as the researchers 'pushing' the knowledge out toward decision makers in the practice communities, or as pulling activities, whereby decision makers initiated the linkage process.

The knowledge translation models also emerged as a new way to emphasise how to address the research- practice gap, building centrally on the knowledge exchange models. The central focus is on interactions between researchers and decision-makers in developing and implementing research in practice. Baumbusch et.al. (2008) suggests that knowledge translation has the potential to address the research-practice gap by bringing together researchers, who are typically academically based, and clinically based practitioners in a dynamic process. Rather than emphasising discreet events whereby 'links and knowledge exchange' could occur, this paradigm emphasises knowledge translation as an ongoing process that involved reshaping knowledge and its meaning for various stakeholders. It draws on the notion of knowledge exchange and seeks to extend this conceptualisation.

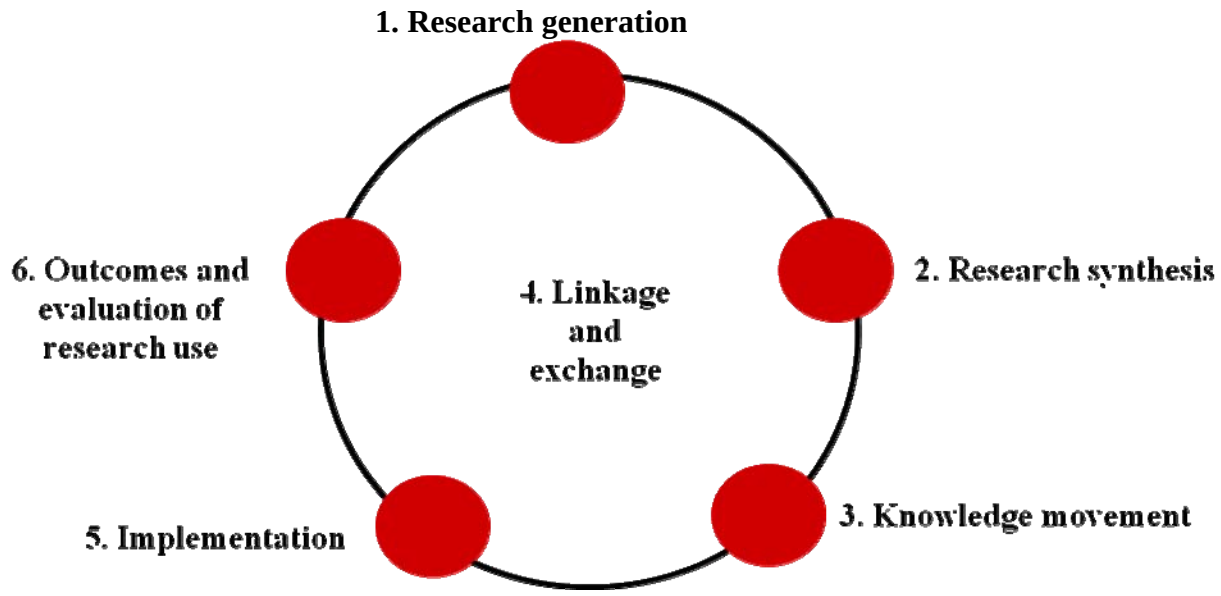

Figure 1. Knowledge linkage and exchange model, CHSRF

The notion of Knowledge Translation was introduced by the Canadian Institutes for Health Research (CIHR) in 2000; the World Health Organization (WHO 2005) adapted the CIHR's definition and defined knowledge translation as "the synthesis, exchange, and application of knowledge by relevant stakeholders to accelerate the benefits of global and local innovation in strengthening health systems and improving people's health." The National Institute on Disability and Rehabilitation Research (NIDRR) has also adopted knowledge translation by developing a working definition in its long-range plan for 2005–2009. NIDRR refers to knowledge translation as "the multidimensional, active process of ensuring that new knowledge gained through the course of research ultimately improves the lives of people with disabilities, and furthers their participation in society" (NIDRR 2005).

CIHR (2004) states that the process of knowledge translation includes knowledge dissemination, communication, technology transfer, ethical context, knowledge management, knowledge utilization, two-way exchange process between researchers and those who apply knowledge, implementation research, technology assessment, synthesis of results with the global context, and development of consensus guidelines. However sophisticated, the guidelines issued by CIHR reflect the intricacies of the body of knowledge management literature as a whole, which in is itself characterized by gaps, problems, unresolved issues, and untested claims and propositions (Foss, 2007, 2009; Grandori, 1997, 2001; Michailova and Foss, 2009). Further the uses of the terms knowledge translation, knowledge exchange and knowledge transfer do not have a consistent application, which adds to the conceptual confusion regarding the frameworks entailed (Graham et al 2006).

In this context, acknowledging the key role of the user in knowledge translation becomes increasingly important; CIHR (2009) defines a knowledge-user as an individual who is likely to be able to use the knowledge generated through research to make informed decisions about health policies, programs and/or practices. (This approach is also termed the knowledge to action process (Graham et al 2006.)) The

knowledge translation (or knowledge to action) approach therefore views the policy process and influencing practice as the same process. The level engagement may also vary depending on the needs of the knowledge user and different implementation strategies might be appropriate at different points in time.

The importance of the user role generating *and* translating knowledge hence calls for a reconsideration of traditional knowledge management models that assume two separate, distinct communities – research producers and potential research users – effectively casting the problem as one of a lack of connect between these two communities. Davies et al (2008) address this gap, by introducing the notions of 'knowledge push' (from researchers to potential users) and 'knowledge pull' (from these users back to the researchers). They emphasize "linkage and exchange that seeks more productive and interactive engagement between the two; while the latter admits to the more iterative and social view of research use outlined above, the baseline assumption of two communities too easily leads to unsophisticated notions of knowledge and knowledge transfer" (Ibid. 190).

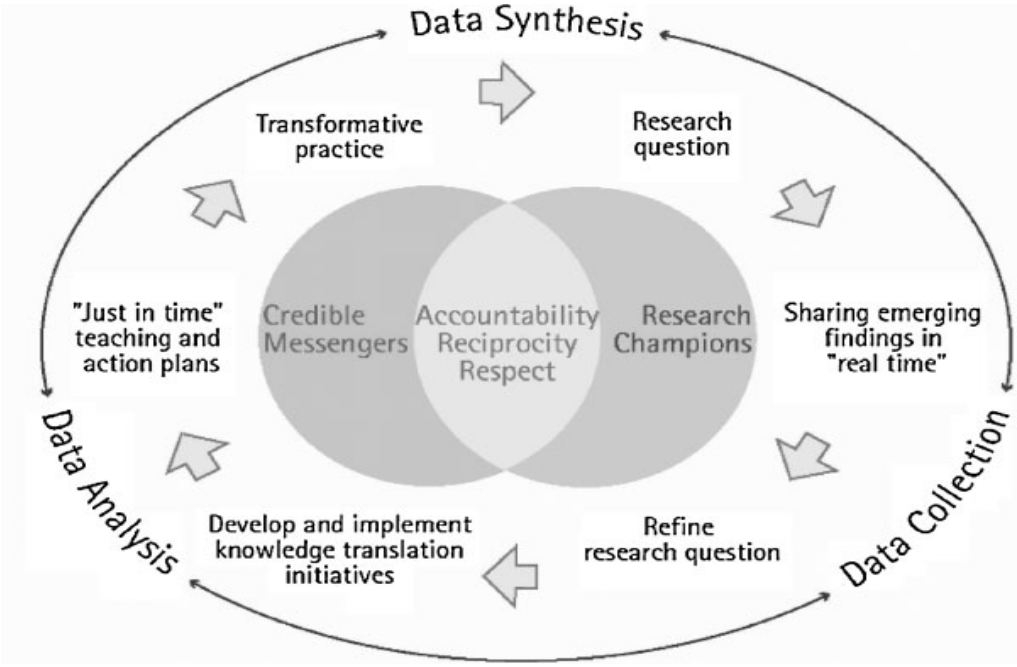

Figure 2. Collaborative Model of Knowledge Translation (Baumbusch et al 2008)

In this light, a "dialogic" conception of Knowledge Translation has been an important step towards recognizing the linkages between the two communities and constitutes a key assumption in Baumbusch et al (2008) "Collaborative Model" of knowledge translation (see Figure 2). The model views knowledge translation as a dialogic, collaborative engagement between researchers and practitioners through which people come to reflect on what they do, and its consequences, and identify what they might do differently by drawing on research based knowledge. It defines accountability, reciprocity and respect for one another's knowledge as important for the knowledge translation process.

In explaining the notion of reciprocity, Baumbusch et al make a passing reference to "a mutual negotiation of meaning and power" (Lather, 1991), however they fall short from accounting for the processes whereby these negotiations can be enacted in practice. Moreover the intricacies of failures to establish common meanings and the rise of conflict over meaning, although crucial in understanding how knowledge is created and legitimated, are absent from their analysis. While the current emphasis on highly collaborative notions of engagement and reciprocal exchange are increasingly common in the health services 'KT' literature, it is interesting to note that models evaluating the 'success' of 'KT programs' continue to focus on more linear and quantitative approaches (Logan and Graham 1998, Kontos and Poland 2009).

Knowledge translation processes in management literature

Knowledge and various aspect of 'knowledge management' have been a rapidly expanding area of study in the field of management. What has been termed the 'knowledge movement' (Foss et al 2006), cuts across a number of separate business and management disciplines, including strategy, international business, network theory, human resource management, information systems and organisation science (Foss 2006, French et al 2009, Alavi and Leidner 2001). For example, knowledge has been deemed critical for developing a firm's competitive advantage (Kogut and Zander 1992, Grant 1996, Spendor 1996), increasing innovation (Nonaka 1994), inter firm alliances and networks (Tsai 2001, Powell 1998, Powell et al 1996), and enabling organisational learning (Argote 1999, Argote et al 2000, Brown and Duguid 2001). 'Knowledge sharing' is considered to be an antecedent or intimately connected with 'knowledge translation' – often used interchangeably with knowledge transfer in this literature (Foss et al 2009). In strategic management literature, the knowledge based view of the firm builds on and extends the resource based view of the firm (Alavi and Leidner 2001; Grant 1996).

As recently elaborated by Dalkir (2007:3) '[k]nowledge management is the deliberate and systematic coordination of an organisation's people, technology, processes, and organizational structure in order to add value through reuse and innovation. This coordination is achieved through creating, sharing, and applying knowledge as well as through feeding the valuable lessons learned and best practices into corporate memory in order to foster continued organizational learning'. This broad remit of knowledge management and the sharing of knowledge amongst organisational field includes developing values, structures and information technology and places emphasis on how *value* can be added.

The knowledge transfer and related knowledge management literature in the broader management field differs from the healthcare services literature on transferring research knowledge into practice in a number of ways. First, a number of analytic concepts and theories have been developed into research streams and applied to the knowledge transfer research, including absorptive capacity, knowledge brokers, boundary spanners, and organisational learning. We summarise the key points from these research streams below.

In a related second vein, the management literature has sought to develop more extensive taxonomies and conceptual definitions of knowledge. For example number scholars have sought to differentiate between knowledge and information (Alavi and

Leidner 2001) and to distinguish between encoded, embrained, embedded and embodied knowledge (Lam 2000). Other conceptulisations of knowledge have distinguished between declarative, procedural and causal knowledge (see Alavi and Leidner 2001 for summary). Health research has largely defined knowledge in levels of hierarchy, based on its strength of inference, or closeness to 'truth'. This has been in response to the traditional medical focus on personal experience as a means of learning about practice (Davies and Nutley 1999).

Third, knowledge transfer is predominantly viewed as a linear process, and also remains largely silent regarding political implications. There are a growing number of management scholars who are critical of this linear view of knowledge transfer, and the objective view of knowledge that underpins it (eg Tsoukas 1996, 2003, Walsham 2001, Barrett and Oborn 2010). Whilst the emphasis is on how new and innovative research ideas are able to spread across an organisation (or unit) there is less assumption in the management literature about whose knowledge is more valued. For example, front line workers may have important knowledge that would benefit senior managers; or customers and suppliers may have important knowledge that would improve firm performance.

Fourth, although the gap between academic research and practice within the management field is widely acknowledged (Rynes et al 2001), most management studies focus on the problem of moving knowledge between (intra) organisational units and between two or more organisations or other units (inter-organisational transfer). While research and R&D more generally is often implicated in the transfer process, the problem is not centred on the research to practice gap, as in healthcare, but exploiting research or ideas in the environment to enable innovation and improve firm performance. Thus the research on knowledge transfer in the management literature generally focus at organisational or field levels of analysis whereas the health services research focuses on individuals or group level practice communities.

Concepts relating centrally to knowledge transfer processes.

Organisational Learning

Organisational learning is broadly concerned with the way organizations use the skills of their workforce to improve performance and focuses on establishing routines and processes for feedback and sharing (Dodgson 1993). By focusing on routines and processes, organisational members are encouraged to integration of activities and understand system interconnections (Senge 1994). In this way, organisational learning seeks to promote a cohesive vision by supporting individual and team learning that is directed at improved performance. Particular encouragement is given to 'double loop' learning, thus learning 'how to learn' (Argis and Schon 1978).

Central to the idea of organisational learning is the need to facilitate knowledge transfer (Argote 1999), though it is widely acknowledged that this is difficult to achieve in practice (Szulanski 1996). This failure to transfer knowledge is a failure of an organisation to learn from the experience of other units in the organisation (Galbraith 1990) or from the experience of other organisations (Argote and Epple 1990). Similarly the notion of knowledge 'hoarding' has been suggested, as a reason for knowledge not to be transferred others, such as if workforce are not incentivised to share within or across organisational groups, or if trust is not developed (Newell et al

2007). In this latter case lack of transfer is a premeditated preference of the individual (or group) to whom the knowledge is known.

Knowledge transfer can be supported by routines that enable personnel movement (Aleida and Kogut 1999), training (Moreland and Myaskovsky 2000), observation (Nonaka 1991), patents and publications (Appleyard 1996), interactions with customers and suppliers (von Hippel 1988), and inter-organisational alliances (Powell, Koput and Smith-Doerr 1996). Empirical studies have found that an 'interconnected organisational form' have performance advantages because they are more able to learn to transfer knowledge across their constituent parts (Argote et al 2000, Powell et al 1996, Baum and Ingram 1998). By focusing on processes, rather than engaging with individuals as does the HSR literature, learning can persist in the face of individual turnover.

Whilst there has been some attempt to synthesise key ideas of organisational learning into the health services literatures (e.g. Davies and Nutley 2000, Nutley et al 2004, Nicolini 2008), their has been minimal integration of these concepts into the knowledge translation or exchange paradigm in health research. Yet Edmondson and Tucker (2003?) highlighted in a study of organisational learning amongst nurses that double loop learning is particularly problematic for hospital based professionals due in part to the separation of clinical and managerial work. In a similar trend, the health literature in this area continues to focus on engaging and targeting clinical communities in new ways, but does not push for a more integrated view of management in this process. Further, concepts such as 'knowledge hoarding' which points to the explicit with holding of knowledge and information have received little attention in health literature. There is perhaps an underlying normative assumption that well meaning clinicians would not purposefully choose to 'hoard' knowledge concerning best practices as this goes against the notion of professionalism. However, with increasing privatisation and competition between providers these more overt forms of resistance to sharing should not be overlooked.

Knowledge spiral and conversion

This subset of the organisational learning literature focuses on individual practices and interaction amongst workers. Nonaka's theory expands Polanyi's notion of tacit knowledge "in a more practical direction" (1994: 16), focusing on the "cognitive and technical elements" of developing new knowledge. He puts forward a "knowledge spiral" model in order to bring together the epistemological and ontological dimensions of knowledge creation; conversion is key through the four stages that he distinguishes: socialization (the process of creating knowledge through shared experience), combination (the process of creating explicit knowledge from explicit knowledge, i.e. by re-categorizing, re-contextualizing etc.), externalization (the conversion of explicit knowledge into tacit) and internalization (the conversion of tacit knowledge into explicit knowledge, resembling the traditional notion of "learning").

Through this "spiral of conversions, Nonaka recognizes the key importance of "sharing" which is manifest in the "interaction between knowledge of experience and rationality" (ibid. 22). These interactions call for a shift of attention to day-to-day organizational practices and their importance in learning and innovation (Brown and Duguid 1991).

Nonaka and Takeuchi (1995: 86) have suggested that knowledge is created through "dialogue and the management of conversations". Tsoukas, in his "dialogical theory of knowledge" (2009b), highlights the importance of productive dialogue in enabling participants "to take a distance from their customary and unreflective ways of understanding and acting, and reconceptualize a situation at hand through conceptual combination, expansion and/or reframing" (Ibid: 13).

The research on organisational learning and knowledge conversion extends the concern of healthcare KT literature with the knowledge generation, appropriation and exchange with a more refined account of knowledge management routines and processes within and across organisations. By focusing on the interactive and dialogical creation of knowledge, these contributions also enrich healthcare KT literature with the more thorough understanding of the processes involved in the transmission of knowledge through interpersonal networks, e.g. linkage and exchange (e.g. Lomas, 2000).

Communities of Practice and the social embeddedness of knowledge

Another area of management literature, which stems from educational anthropology is social learning theories. Rather than cognitivist or linear notions of knowledge, this perspective views knowledge 'transfer' as embedded in a situated social learning process. Brown and Duguid (1991), develop the idea evolving "communities of practice" (CoP) to account for organizational interactions that take place between "fluid and interpretative" groups as opposed to bounded individuals (Ibid. 49; See also Lave and Wenger 1991). An interpretive framework derived from CoP literature points to the localisation of learning as inherent in situated activity, rather than compartmentalised to the mind (Wenger, 1998; Yanow, 2004). Through a virtuous circle of participation, learning and identification, the dynamics of a CoP are regenerative of knowledge in practice (Thompson, 2005) stabilising the practices of the masters.

Participation in a CoP enables learning, and the transformation of social relations and identity (Lave and Wenger, 1991; Wenger, 1998). Lave and Wenger (1991) describe the journey of a novice who gradually gains knowledge in developing practice and identity in the community. Only legitimised persons can engage in this centripetal learning process, and eventually become masters if the learning trajectory enables full participation (Wenger, 1998).

This strand of knowledge management literature points towards further theorizing of contextually embedded and practically enacted notions of knowledge. To this end, a "social learning systems" view of organizations has afforded some insightful analyses of "modes of belonging through which we participate" in structuring these communities of practice, the "social containers of the competences that make up such a system" (Wenger 2000:229). Orlikowski (2002) foregrounds the role of technology, discussing organizational knowledge as an ongoing socially interactive process, where artefacts need to be acknowledged with their mediating role (Barrett and Oborn 2010).

The character of practice based knowing varies between CoPs, so that knowledge from one CoP does not readily fit into the 'lived world' of another group (Yanow,

2004). In fact, several studies have pointed out that multiple communities working to harmonize practice frequently stymie learning (Ferlie et al, 2005; Currie and Suhomlinova, 2006) and produce discord and conflict (Bate, 2000; Gabbay et al 2003; Freed, 1999). Rather than seeking to learn practices from other CoPs, workers placed in multidisciplinary contexts may be more concerned with advocacy and comparison rather than integration (Gherardi and Nicolini, 2002). Wenger (2000) argues that boundary processes between diverse communities of practice are important aspects of their broader organisational environment.

By focusing on socially embedded characteristics of knowledge creation and exchange, these contributions enable researchers involved in healthcare KT field to gain a more nuanced understanding of the processes involved in the joint learning and capacity development as well as constraining and enabling features of social and cultural contexts (Lomas, 2000, 2007). Communities of practice can provide a conceptual lens to Baumbausch et al's (2008) model of collaboration where a focus of integrating two (or more) previously separate CoPs into a new meta community may be part of the endeavour. Examination of changes in identity formation or notions of uneven or peripheral participation may give insight into the 'KT' process.

Boundary objects and knowledge brokers

Of specific interest to healthcare research practice collaboratives is the notion of boundaries, boundary objects and boundary practices, developed by Wenger (1998, 2000). Notably the "bridges" across those boundaries can be of three types: 1- people acting as 'brokers' between communities, 2- artifacts (things, tools, terms, representations, etc.) that serve as what Star and Griesemer (1989) call 'boundary objects', and 3- a variety of interactions among people from different communities of practice (Wenger 2000: 235).

Constantinides and Barrett (2006) offer an illustrative study of how boundary objects influence relations and enacted practices in a healthcare context. Focusing, in specific, on the fact that boundary objects have different meanings in different communities, they show how a telemedicine system can be described as a boundary object in that: "work at different sites (the primary health centre and the district hospital) and with different perspectives (the GP and the cardiologist) was agreed to be conducted autonomously while not necessarily enforcing any commonly shared meanings among participants" (Constantinides and Barrett 2006: 34). A negotiation of power and politics took place and diverse outcomes were observed as a result of coexisting collaborations with resistance; the 'medical collaboration workspace' that was introduced, functioned as a boundary object (Star and Griesemer 1989) that provided different involved stakeholders such as IT and healthcare professionals, with a shared means for the aforementioned negotiation without ultimately enforcing common meanings.

Not all objects designated as to function as such are found to accomplish this intended purpose (Levina and vaast 2005), making it important to examine how objects are actually used in practice to span various boundaries. In a study of software development teams, Barrett and Oborn (2010) also highlight that objects that enable collaboration at an early point of the collaborative process worked to impede and hinder collaboration at later points of software developments. These studies build on earlier work that foregrounds the importance of studying objects in facilitating

knowledge sharing (Bechky 2003, Carlile 2002) as well as the fragile and emergent influence they have in practice.

Knowledge brokering has been specifically discussed in the context of *positioning* within firm boundaries; it has been suggested that while the number of relations across boundaries increases access to relevant 'external' knowledge, "a centralized position within an overall pattern of relationships determines whether such knowledge can be used beneficially" (van Wijk et al 2008: 834). This centralized position is occupied by actors that effectively act as 'knowledge brokers', enabling the exchange of relevant knowledge within the social network (Burt 1992).

High brokerage positions are thought to provide organizational units with an ability to absorb knowledge from others that are otherwise unconnected (Cross et al 1984) and knowledge brokering can hence be of great benefit to knowledge management process, notably when new projects "demand diverse information or expertise that requires more personalization" (Song et al 2008).

However the success of knowledge brokering depends on a series of factors that go beyond 'positioning'. The closeness of relationship between different organizational actors as reflected in 'tie strength' (Hansen 1999) and building of 'trust' (Lane et al 2001) are decisive in effective knowledge transfer. Moreover, the so-called 'stickiness' in the transmission of knowledge between those actors is commonly associated to motivational and cognitive aspects (Szulanski 1996). In this light Szulanski (2000) distinguishes between four types of 'stickiness' through the stages of the knowledge transfer process: initiation stickiness, associated with difficulties experienced prior to the decision to transfer, implementation stickiness, related to difficulties experienced between the decision to transfer and start of actual use, 'ramp-up' stickiness, referring to unexpected problems from the start of the actual use until satisfactory performance obtains, and integration stickiness, related to difficulties experienced after satisfactory performance is achieved.

By highlighting the role of knowledge brokers in the interpretation and transmission of the meanings of boundary objects, e.g. definition of knowledge, research problems etc, this literature provides a more nuanced understanding of the practices of "research champions" and "credible messengers" involved in meaningful translation, mediation and negotiation of knowledge across healthcare researchers and decision-makers (e.g. Baumbusch et al., 2008). As such the positioning of brokers within the broader networks of research and practice may give added insight into current translational processes. In addition, paying more attention to the role of boundary objects could added important insight to current health KT studies. For example, increased insight into whether intended boundary objects actually function as such or whether boundary objects facilitate collaboration without changing the meaning in practice could be important areas to develop.

Absorptive Capacity

Linked to the role of knowledge brokers is the notion of 'absorptive capacity'. Originally introduced by Cohen and Levinthal (1990), 'absorptive capacity' refers to an organisation's ability to recognize, assimilate and apply new external knowledge (Cohen and Levinthal, 1990; Lane et al., 2006; Zahra and George, 2002) and is argued to facilitate both inter-organizational (Lane et al., 2001; Mowery et al., 1996)

and intra- organizational (Gupta and Govindarajan, 2000) knowledge transfer. Cohen and Levinthal (1990) and Tsai (2001) explicitly treat knowledge sharing and transfer as a crucial antecedent to knowledge creation. As summarised by Foss et al (2009) knowledge sharing processes may develop 'absorptive capacity', and other capabilities, and thus enable competitive advantage (Argote and Ingram, 2000; Grant, 1996; Kogut and Zander, 1992; Spender, 1996). Cohen and Levinthal (1990) argued that absorptive capacity in a firm or industry network is related to the amount of overlap between organizational members' knowledge sets (for example connections between researchers, developers and marketing specialists), which may be facilitated by knowledge sharing and transfer processes or initiatives.

The absorptive capacity construct spans multiple levels of analysis and sometimes invokes organisational learning (Huber 1991, Kim 1998). Kim (1998) suggests that absorptive capacity is defined by the capacity to learn and solve problems In another recent definition Mowery and Oxley (1996) absorptive capacity is considered a broad set of skills needed to deal with the tacit component of transferred knowledge and the need to modify this knowledge in the new context. Given the lack of clear meaning and operationalization of the construct, Zahra and George (2002) reconceptualised absorptive capacity as a dynamic capability model that differentiates between potential and realised absorptive capacity. Whilst maintaining the traditional focus on firm performance and innovation, potential absorptive capacity, which they argue has been less frequently examined empirically, involves the acquisition, assimilation and transformation of knowledge. The ability of a firm to recognise two incongruent forms of knowledge and information and then combine them to arrive at a new schema represents their idea of transformational capability (Zahra and George 2002:190). In terms of impact on the firm, this may occur on recognition of how new knowledge may reframe a firm's definition of the industry or overall strategy. Realised absorptive capacity is enabled by a dimension they call exploitation (Zahra and George 2002). Exploitation is generally seen to be based on routines and allow firms to extend and leverage existing competencies into new ones; for example routines that encourage new initiatives.

The organisational research on the absorptive capacity provides the healthcare KT literature with a more nuanced understanding of the mechanisms for the reconciliation of cognitive tensions among stakeholders involved in knowledge appropriation and its creative transformation, e.g. academics, practitioners, politicians etc (Jacobson et al., 2005; Lomas, 2000). Given the inherent complexity of organisational change that is often associated with new treatments or practices associated with health care research, the multi-level and network wide focus of the capabilities model of organisational knowledge transfer can usefully contribute to health services research on KT.

Collaboration and knowledge management processes in healthcare

A key message across the health services and the management literatures is the need to build relationships and collaboration at the organisational, group and individual level. This section draws on literature that informs these broader process of changing behaviour in practice. Specifically we synthesise key literature examining collaborative processes in healthcare contexts and highlight its relevance to newly formed NIHR CLAHRCs. We also highlight unique aspects of the KT process in the healthcare context.

Health services research has acknowledged the importance of active participation of different individuals and groups (stakeholders) in the research process, focusing specifically on the need to shift away from a 'passive participants' view (e.g. Macaulay et al 1999). This view has also been combined with a notion of "expanding recognition of what constitutes expert knowledge" and postulating a "participatory research" model (Green et al 1994). Healthcare policy is "fundamentally a collaborative process" (Paul 2006: 144) and hence managing knowledge in the healthcare environment is like "trying to knit with thousands of strands of knotted wool" (Aldred 2002). The great variety of involved stakeholders, scientific and occupational communities as well as different vocabularies "makes the resulting dissonance almost irresistible" (Nicolini et al 2008). These issues have been discussed in relation to "boundary thinking", notably regarding the role of organizational boundaries such as between clinical practice and academic research (e.g. Bartunek et al 2003) and professional boundaries (e.g. the 'endemic tribalism' of the medical profession in Bate 2000, Oborn and Dawson 2011).

Currie and Suhomlinova (2006) take an institutional they perspective in looking at professional boundaries and how institutional forces in the UK NHS are likely to both foster and inhibit collaboration between different stakeholders. They show that there appears to be some conflict between performance-oriented facets of healthcare policy and the pursuit of "segment boundaries" breakdown. They highlight how the opportunities for integration of academic and clinical research are under threat as a result of normative forces that cause increased divergence in perspective among the different professional groups:

> "Policy aspirations towards the development of a learning organization are not synchronized with existing power arrangements. A professional logic of specialization and hierarchy is dominant, and this remains essentially paternalistic and authoritarian (Bate 2000). In essence, knowledge sharing within arenas where professions interact … merely reflects or reinforces power differentials, with others deferring to the interests of hospital doctors. This has not been supplanted by the more managerial logic that requires sharing of knowledge across boundaries in pursuit of service development."

In a similar vein, considering the healthcare context specificities (namely the complexity and indeterminacy of the "content of clinical practice" as well as the strong professional and collegial groupings) Graham and Currie (2009) suggest that boundaries between professional and managerial ways of organizing healthcare are blurring and that current, top-down, approaches to Knowledge Management (KM) at the NHS might be inappropriate in accounting for this change, it neglects the cultural and institutional framework within which "clinical performance is interpreted and enacted at a local level" (Ferlie et al 2005).

Currie et al (2007) discuss how those more "subtle" processes of negotiation amongst healthcare groups result in partial avoidance and re-appropriation, providing the example of clinicians that seem to establish local clinical knowledge management initiatives that co-exist or even compete with those promoted by managers. They hence also illustrate how the "travel of KM between sectors" (transferring KM ideas from industry to the healthcare sector), "cannot be described by a linear model of

transfer and resistance" (Nicolini et al 2008). More recently there has also been increased pressure for health service managers and non clinical decision makers to engage in 'evidence based practice'; this highlights the tenuous position managers hold, as ideas of knowledge translation and evidence based practice are now being directed back to their own ways of working.

In the UK, the arrival of "Collaborations for Leadership in Applied Health Research and Care" may be used to further illustrate some of these KM-related considerations. The stated mission of the CLAHRCs is "to undertake high-quality applied health research focused on the needs of patients and to support the translation of research evidence into practice in the NHS". Boaden et al (2009), in their assessment of ethical considerations of CLAHRC implementation activity, discuss the importance of guidance from the participants in the processes of knowledge sharing and translation, notably arguing that professional *frameworks are not enough to account for the knowledge experience of all participants.* They suggest there seems to be a lack of clarity regarding what constitutes a formal review and of who is responsible for governance and implementation. They hence call for a new, "shared way" of thinking to address these issues.

Linking back to our discussion of knowledge translation and the treatment of its underlying principles in the healthcare literature, it has been noticed that the aforementioned complexities and peculiarities of the healthcare context effectively set healthcare literature in a type of "isolation". It has been argued that the lack of 'endorsement' of the standard KM discourse in the management field can be explained by the fact that the discussion around healthcare-specific issues is being conducted in ways that are not immediately recognizable by external observers (e.g. Nicolini et al 2008).

Health services studies have mostly dealt with issues of organizational collaboration with reference to notions based on Evidence-based medicine (EBM) and have hence developed knowledge transfer models that often postulate an EBM logic (e.g, Taylor 2009, Fotaki 2005). Notably, raising the importance of involving a diverse set of stakeholders in the KT process is bound to "EBM" principles: "We believe that the concept of knowledge translation will prove to be valuable in promoting the rapid uptake of evidence based knowledge by the public, patients, policy makers, and clinicians" (Davis et al 2003)

An alternative definition that has been used in health services literature can be found in the notion of *knowledge-to-action* (Graham et al 2006). The term action is preferred here as it is considered more generic than practice and "encompasses the use of knowledge by practitioners, policymakers, patients and the public". Graham et al (ibid) have highlighted the lack of clarity in the use of different concepts that appear in the healthcare KM discourse (knowledge transfer, knowledge translation, exchange, utilization, dissemination, diffusion). They hence argue that the CIHR use of knowledge transfer (KT) does not explicitly define what types of interactions among stakeholders constitute the KT process.

However, this project appears to be problematic in so far as it ultimately postulates a "scientific" notion of knowledge transfer that necessarily requires reaching a *consensus of terms* and the "establishment of a common nomenclature". As a number

of Organizational scholars have illustrated, knowledge itself is multifaceted; it is "situated, collective, enacted, distributed and developing, and also public, rhetorical and political" (Asimakou 2009: 89). In this context, consensus-based conceptualizations of KT between the various healthcare actors fail to account for the processes whereby certain types of agreement or dis-agreement ultimately define what becomes accepted as knowledge and legitimized as such (Asimakou 2009). Moreover, a view of knowledge transfer as a process synonymous to knowledge sharing has often assumed *de facto* existence of identical or converging interpretations of events or situations (Walsham and Barrett 2005), which underplays the complexity and ambivalence of situated knowledge in organizational settings.

The concept of *knowledge translation* is commonly discussed by Canada-based medical researchers, who tend to use CIHR definitions when they refer to ensuing policy/practice challenges (e.g. Lang et al 2007). Yet its roots can be traced back to the Nonakian interpretation of tacit knowledge as "knowledge-not-yet-articulated – knowledge awaiting for its "translation" or "conversion" into explicit knowledge", an interpretation that as Tsoukas (2003, 2009) has argued, is erroneous insofar as it considers tacit and explicit knowledge "two ends of a continuum" as opposed to "the two sides of the same coin" (Tsoukas 2003: 15).

It is this tacit side of the coin that has been most widely discussed in the literature, notably regarding problems associated with the tendency of KT models to dismiss idiosyncratic practice as suboptimal, and hence to underestimate the importance of more informal forms of knowledge (Gabbay and le May 2004) embedded in broader organizational structures (Brown and Duguid 2001).

Criticisms of the simplified and unitary conceptualization of 'knowledge translation' in healthcare policy and practice can also been found in the healthcare services literature. Gabbay and le May (2004) argue that clinicians rarely access and use explicit evidence from research or other sources directly, but rather they rely on collectively reinforced and internalised "tacit guidelines", which are informed by "experience", their interactions with each other and with opinion leaders, patients, and pharmaceutical representatives – all sources of largely tacit knowledge. Mediated by organisational demands and constraints, *mindlines* were iteratively negotiated with a variety of key actors, often through a range of informal interactions in fluid "communities of practice," resulting in socially constructed "knowledge in practice" (Gabbay and le May 2004: 1). Drawing on Lam's (2000) terminology, *mindlines* can be perhaps understood as constituting encoded and embedded knowledge.

Furthermore, the process of knowledge translation itself inevitably raises questions pertaining to the role of "language" and discourse. Hardy et al (2005) discuss how individuals engaged in the process of organizational collaboration by means of conversation produce, legitimate and maintain certain forms of knowledge discursively. Hence diverse sets of organizational actors – from different backgrounds – do not simply produce new knowledge (and innovation) as a result of their diversity *per se* (Gray 1989), but new knowledge comes about in formulating different – common and private – discursive constructions (Hardy et al 2005), and in the "contrary experience" that these generate (Shapiro and Weingart 2001).

Future directions

More generally, a range of criticisms has been raised in organization studies and management literature regarding the very ontological and epistemological assumptions of the Nonakian view of 'knowledge' and its residues in healthcare/clinical policy and practice. Gourley (2006) argues that his underlying theory "rests on a unidimensional view of tacit knowledge" that ignores how "tacit knowledge may be at least partially if not wholly inherently tacit" (Ibid. 21). Zhu (2006) develops a thorough critique of Nonaka's use of Giddens (1984) structuration theory, arguing that he reduces Giddens's 'practical-discursive consciousness' into the whether-we-can-tell aspect only, effectively turning out to be "a disconnected and self-contradictory omelette sort" (Zhu 2006: 113), whilst ignoring issues of power and domination.

While key barriers to learning between CoPs have been identified (Carlile, 2002; Ferlie et al 2005), the processes by which learning across CoPs may be facilitated remain poorly understood (Mørk et al 2008; Bechky 2003, Oborn and Dawson 2010). Moreover, the links with "theories of the body" that are integral to notions of patienthood have not been developed in a systematic way in the healthcare knowledge translation literatures. Notably, the fields of medical anthropology & medical sociology can offer valuable insights into the more tacit and subtle facets of knowledge transfer (such as affective and embodied) between doctor-patient and provider-user, which can be integrated into theorizing healthcare policy and practice.

Tsoukas (2003) discusses the crucial role of the body, drawing on the philosophy of Polanyi (1968). He explores the importance of "tacit knowledge" in understanding knowledge practices and makes explicit links to the "somatic" ways that individuals use in connecting with the world, which are characterized by a certain opacity and unspecificity. In the case of healthcare actors, notably patients, embodied knowledge can be acutely important as it takes the form of living with disease, the practices observed in the "reality of bodies" (Mol and Law 2004: 4) as well as the feelings of fear and anxiety that are invoked in this reality (Mol 2008). These perspectives can offer some new possibilities for healthcare services research as they paint a much more 'complete' picture of emergent relationships within knowledge networks.

Regarding the epistemological implications of the KT concepts discussed in the previous sections, the ideas of "shared accountability" (Baumbusch et al 2008) between different stakeholders and the project of "moving toward a global definition" of knowledge transfer, both of which are put forward by the CIHR paradigm, entail the risk of universality. The notion of universality inhabits theories of knowledge transfer that fails to account for specific characters of cooperative relationships in the process (Kogut and Zander 1992) and has been critiqued for "haunting" KM literature by unrealistically ignoring differences between histories, cultures and institutional forces (Zhu 2004). It would hence seem important that future research avoids totalizing, blanket use of knowledge transfer notions, but focuses instead in *better understanding the ways in which different types of 'knowledge' become enacted, negotiated and legitimated in practice*.

Davies et al (2008) argue that the KT terminology itself actually misrepresents the tasks that seeks to support and ultimately prevents social research from having wider

impacts. They argue, in specific, that both the terms “translation” and “transfer” invoke a metaphor of “convergent knowledge” which is parcelled to “grateful recipients” (Davies et al 2008: 189) and effectively veils the associated complexities, contradictions and unpredictability of the ways in which new knowledge is negotiated and accepted (or even refused).

Moreover, identifying the moments of “linkage” and “exchange” can further contribute to the overall goal of use of research in practice. Social ties enable collaborative creation and sharing of ideas (Fliaster & Spies, 2008). Building of social ties (networks) could help to develop mutual understanding and respect for each others agenda – both researchers and decision makers building social capital collaboratively. Incentives have been used to assist in the building of ties; Lomas (2000) for instance, identifies a fund set aside for junior researchers to establish links. In “writing literature” one important way to improve the interactions between the researchers and decision makers is collaborative research (Pittman, 1994). German (2008) explains the importance of collaborative research in social sciences where the research lies within a context that is continually being contested. In designing communities that foster better knowledge exchange German suggests working with the community to establish and monitor conditions that facilitate learning, especially determining objectives, developing strategies, collecting data, measuring success, evaluating and communicating results, and identifying future research.

More generally, future research may have to depart form the underlying assumption that “there is a best practice out there” that can be defined by a process of biomedical research. The need for social interaction in the various KT models is to have input in defining the best research question and engaging ownership of ideas at an early phase. Within this view we therefore have a very broad remit of healthcare practice, which includes mental health (hence large social care involvement), nursing and allied health practice, none of which fall neatly into the medical model of knowledge production. Furthermore, the understanding of knowledge needs to be unpacked more systematically as different aspects of knowledge might require to be translated differently or there might be different knowledge boundaries that need to be accounted for – and multiple strategies for knowledge translation would hence be appropriate in the contexts within which the intervention is being implemented.

Notably, different conceptions of the legitimacy of ‘boundaries’ should go to the “very heart of their professional project, by locating expertise in lengthy professional training and ongoing interaction with other experts—defined relationally” (Foley & Faircloth, 2003). In thinking of ways to account for knowledge-related phenomena in healthcare, future research should pay attention to the collective manner in which scientific knowledge is translated into clinical expertise, especially regarding the differences in institutionalized power that facilitates resistance to policy (Martin et al 2009). In the context of CLAHRCs, knowledge brokering arrangements will need to focus on the research-practice boundary as there is a need for boundary spanning across translational initiatives; CLAHRCs should be considered as emergent and subject to “contestation within and outside their boundaries” to the extent that they represent an institution in the making (Currie et al 2010: 18). Ultimately, in order to accommodate these tendencies, collaborative research will need to shift from linear approaches to analysing policies of partnerships (Dickinson 2010) and take into account the institutional, cultural and power dynamics that are inherent to healthcare

practices. These issues have been thoroughly problematized by considering knowledge transfer as an inherently dialectical and political process (Frost and Egri 1991). Studies that link between innovation and knowledge transfer in the area of multi-party negotiation and continuous re-definition of meanings (Asimakou 2008, 2009) have shed light into how these processes are far from unproblematic.

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