# Dissemination and Enrichment of Knowledge About Normal Birth to Bring About a Change to Society

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The birth of a child is a pivotal time in the life of a mother, her family and society. The health and well-being of a mother and child at birth largely determines the future health and wellness of the entire family (World Health Organization (WHO), 2005). Normal birth has enormous benefits for mothers, neonates, families, and societies. The growing supportive evidence for the promotion of normal birth certainly relies on multidisciplinary collaborations to continue spreading knowledge about the advantages of normal birth and enhancing the understanding of how knowledge about normal birth can change society. Knowledge about normal birth varies among different groups of healthcare professionals, and it would be useful to identify how it is clinically translated to become accessible to other professionals and research teams, consumers, the public, significant decision- or policy makers, the industry, funding bodies, and volunteer health teams.

*Keywords:* normal birth, childbirth, delivery, knowledge transfer, knowledge translation, applied knowledge, healthcare implementation, research implementation, childbirth research, translational science

## Background

In the 21st century, there is an increased international interest in promoting normal birth (Prosser *et al.*, 2018:1). WHO (2018:1) declared that despite much debate and research about normal birth, "the concept of

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'normality' in labor and birth is not standardized or universal", but the aim of improving outcomes for mothers and babies is universal. A vast range of practices have been introduced to start, accelerate, terminate, regulate or monitor the physiological process of labor and transform the practice of "normal birth" to lead to a positive experience (WHO, 2018:1).

The acquisition of knowledge and the nature of knowledge have provoked significant philosophical debate for centuries. Epistemology, the study of knowledge and a branch of philosophy, examines the concept of knowledge. Epistemology of normal birth is essential to examine how it can be used to bring a change to society (Siddiqui, 2005).

However, the Royal College of Midwives (RCM) (2017:1-32) end their campaign for "normal births" and change the way they offer knowledge about childbirth in a move intended to avoid making mothers who opt for medical interventions feel like failures, and launched the "Better Births Initiative". The focus of the Better Births Initiative is to ensure the best birth for all women and provides resources to enable midwives to provide safe care and a positive birth experience for all women and their families.

In other countries, professional organizations emphasize the promotion of normal birth. In Canada, Healthcare Professionals' Associations published a Joint Policy Statement on Normal Birth to support, promote, and protect normal birth for women (Society of Obstetricians and Gynecologists of Canada, Association of Women's Health Obstetric and Neonatal Nurses of Canada, Canadian Association of Midwives, College of Family Physicians of Canada, Society of Rural Physicians of Canada, 2008). In Australia, normal birth guidelines were published in Queensland in 2012 to protect, promote, and support normal birth (Miller *et al*., 2016: 167-175). The Cyprus Midwives committee organized a campaign for the promotion of promoting normal birth in 2016 (Hadjigeorgiou *et al*., 2018), and the Indian midwives launched a campaign about normal birth in 2019. Many countries aim to bring more knowledge about normal birth with their campaigns. This knowledge and a precise working definition for "normal birth" will enable accurate comparisons for women using different services and models of care.

## Definitions of Normal Birth

Definitions of normal birth vary from author to author with no universal agreement (ICM, 2008). Downe, (2008 and Burns (2012:15) define normal birth as a purely physiological process in which the woman remains at the center of care and, as such, is in control. Normal birth occurs in an environment that enables choice and empowerment for the woman without interventions (Anderson, 2003). The term "normal birth" in academic literature and health policy has more generally come to refer to birth without, or with only limited, clinical intervention (Prosser *et al*., 2018).

WHO stated that normal birth is spontaneous in onset, low-risk at the start of labor and remaining so throughout labor and birth. The infant is born spontaneously in the vertex position between 37 and 42 completed weeks of pregnancy, and after the birth, both the mother and baby are in good condition (WHO, 2018).

ICM supports that normal birth is a unique dynamic process in fetal and maternal and psychosocial contexts. Normal birth is where the woman commences, continues, and completes labor with the infant being born spontaneously at term, in the vertex position, without any surgical, medical, or pharmaceutical intervention (ICM, 2018).

The Canadian joint policy statement's definition closely follows that of the WHO: A normal birth is

spontaneous in onset, is low-risk at the start of labor, and remains so throughout labor and birth. The infant is born spontaneously in vertex position between 37 and 42 completed weeks of pregnancy. They added that normal birth includes the opportunity for skin-to-skin holding and breastfeeding in the first hour after birth.

The positive and essential element for "normal birth'' contained in the statements is the strong endorsement and promotion of psychological and social aspects of labor and birth, including respectful care, antenatal education, labor support, informed choice and consent, supportive environment, no pharmacological methods of pain relief, evidence-based information and practice, avoidance of routine interventions, mother-baby togetherness, availability of midwives for one-to-one care, and choice of birth place including home birth.

Birth place and models of perinatal care are closely related to knowledge and promotion of normal birth. Women's experiences of choosing or deciding where to give birth are influenced by whether they have the appropriate knowledge and received the necessary information about available birth place choices (Hadjigeorgiou *et al*., 2018). Women in many countries can give birth to Unit (OU) or a midwife-led unit (Coxon *et al*., 2014). Women who wish to give birth in an OU were direct in expressing their choice. Still, although women considering birth in a setting other than a hospital OU were sometimes well-supported, they also encountered obstacles. They described needing to "counter the negativity" surrounding home birth or birth in midwife-led settings (Smythe *et al*., 2016).

The reasons for the low support for non-OU birth settings are unclear (Coxon *et al*., 2014). However, socio-demographic characteristics may contribute to this; women who planned home birth were more likely than those who planned OU birth to be white, older, speak fluent English and live in a more affluent area (Hodnett *et al*., 2007, 2011, 2012).

The value of midwifery research to create evidence-based knowledge of normal birth is essential. Evidence proposes that midwives should provide women with holistic care to support normal birth and to authenticate the value of midwifery knowledge. Holistic care creates a positive birth environment for all involved, birthing women and their babies. Midwives need to use their knowledge to create an environment that provides the mothers and babies with a sense of security on all levels. Holistic birth care accentuates the holistic focus of a midwife's knowledge. It does not separate their knowledge as midwives from the knowledge gained from their interaction with the birthing woman, as an objectivist or medical model does (Hodnett *et al*., 2007, 2011, 2012).

A review on diverse and innovative ways to implement and enhance effective academic-community collaborations in addressing the specific challenges of promoting normal childbirth is valuable. Evidence of barriers and facilitators of knowledge dissemination and implementation strategies can facilitate normal birth. However, although health professionals know better, they do not always necessarily act as they have to.

## The Barriers in the Promotion of Normal Birth Are Multifactorial

### Barriers in the Promotion of Normal Birth

Many factors act as barriers to the promotion of normal birth. Still, the most important is the medical model of care, fear to give birth, and women's inability to trust their innate ability to give birth. All these factors are closely related to knowledge about physiology.

### The Medical Model and Knowledge

The most significant barrier in promoting normal birth is the medicalization of birth, and Foucault (1976) gave an excellent explanation on knowledge and medical model. He uses the concept of power and knowledge to explain the growth of authoritative knowledge and the dominant discourse associated with medicine. With their authoritative knowledge, obstetricians view pregnancy and labor as risky events requiring care and medical intervention for the safety of mothers and babies (Hadjigeorgiou *et al.*, 2018).

In both midwife-led care and obstetrician-led care, the health and safety of mothers and babies are of utmost importance (WHO, 2018). However, the midwifery model views pregnancy as a pure vital positive experience with different emotional, social, cultural, and primarily spiritual meanings and dimensions (Clews, 2013). If birth is a positive experience, it develops a sense of empowerment and high self-confidence in women, reinforcing the bonding between parents and babies. If a woman does not give birth in a positive environment, she is at risk of not experiencing the benefits of normal birth. Furthermore, pregnancy leads to the birth of a child and results in a kind of metamorphosis for the woman concerned, as she becomes a mother. Therefore, the positive experience of becoming a mother is of utmost importance (WHO, 2018).

Women's preferences for different birth options, particularly for hospital vs non-hospital settings, are shaped by their pre-existing values, beliefs, and experience, and not all women are open to all birth settings (Coxon *et al.*, 2014). Many women mention fear to give birth, which is another factor that can inhibit normal birth.

**Fear to Give Birth**

Women's fear of labor and birth is (Larkin, Begley, & Devane, 2009) and is an important reason for the increasing number of requests for and rates of Caesarean Section (CS) in Europe, Australia, and the USA (D'Alton & Hehir, 2015; OECD, 2017). The women's experiences of fear of childbirth are interpreted through the metaphor "being at a point of no return". Due to fear of childbirth, some women have poor self-confidence and doubts about their capacity to give birth (Nilsson, Bondas, & Lundgren, 2010).

In the study of Ramvi and Tangerud (2011), the fear for childbirth was relieved once women gained the necessary information and became involved in the birth process through receiving information/knowledge and guidance from midwives about what was going to happen and to trust themselves. Health professionals may present single or group psychoeducation sessions or "therapeutic conversations" in pregnancy, to improve women's self-efficacy and reduce the number of requests for caesarean sectionsCSs (Striebich et al., 2018). Women who had a good conversation with their midwife, experienced good support regarding their fear of childbirth and increased their self-esteem (Lyberg & Severinsson, 2010). However, qualified midwives need more in-depth knowledge of the fear of childbirth (de Vries *et al.*, 2018).

## Facilitators in the Promotion of Normal Birth

The main factor facilitating normal birth is the Midwifery model and information about the benefits of normal birth.

**Midwifery Model and Knowledge**

"Keeping birth normal" is an area of the ICM strategy associated with women's health, midwives' education and practice, and existing health care systems (ICM, 2018). The Royal College of Midwives (RCM) (2018) points out that a midwife has a role in guiding women in making well-versed decisions that are acceptable clinically and personally. Interpersonal relationships promote steadiness in the woman and trust in

the support person, facilitating interactions with support persons.

The midwifery model of care offers women a more positive experience of care with fewer interventions (Hodnett *et al*., 2007), and the costs of intrapartum care are also lower (National Audit Office, 2013). Midwifery research on normal birth is essential for midwives to provide women with evidence-based and holistic care to support normal birth and authenticate the value of midwifery knowledge. Holistic care creates a positive birth environment for all involved - birthing women and their babies. Midwives need to use their knowledge to create such an environment and provide women and their babies with security on all levels. Holistic birth care accentuates the holistic focus of a midwife's knowledge. It does not separate their scientific knowledge as a midwife from the knowledge gained from their interaction with the woman, as an objectivist or medical model does (Lane, 2002).

Midwives view the safeguarding and promotion of normal birth as central to their role (Hodnett *et al*., 2007, 2011). They define normal birth along a continuum that is related to the context of their practice. Hospital culture is considered an inhibitor of practices that promote normal birth. Therefore, midwives should consciously employ strategies that promote normal birth in both home and hospital settings. Midwifery education and research should focus on developing strategies that support midwives in this endeavour. Active one-to-one continuous midwifery support for all women during established labor affects both women's experiences and facilitates normal birth (Lunda *et al*., 2018).

**Knowledge About Birth Begins From the Genesis of Humanity**

From time immemorial, the human mind has asked questions about him own self, about birth and the world around us. Those among the inquiring minds who understood the whys and wherefores, and could see beyond their contemporaries, used to share with those close to them in the community. As humanity evolved, philosophers and scientists started to teach their understanding and answer some of the tormenting existential questions. However, the questions "Who am I?" and "Why do I exist?" remain unanswered. These are questions showed thought processes to non-philosophers, and the answers can relieve human internal existential stress. Over the years, women's intuitive personal knowledge is affected by authoritative knowledge from some obstetricians (Savage, 2006). Inventors translated knowledge gained during the past centuries into inventions, tools, and appliances which made human life more manageable and relieved human physical stress related to the human-environment or cosmos interaction. However, a lot ofmuch work still needs to be done to release the emotional, mental, and spiritual stress present from conception to death.

## The Main Concepts: Knowledge, Learning, Knowledge Transfer

Visiting the main concepts involved in knowledge transfer can possibly disclose the answers to what might initially facilitate knowledge itself, then disseminate it and finally lead to the implementation ofimplementing knowledge into practice to benefit human beings.

Over the centuries, there has been a lot of disagreement over the different types of knowledge (Byers, 2016). Thus, if knowledge is viewed from a philosophical viewpoint, arguments supersede fact, and there are different variousdescriptions of what knowledge is or is not. Knowledge can be defined as the fact or condition of knowing something with familiarity or gained through experience or association (Merriam-Webster online Dictionary, Siddiqui, 2005). Philosophers of science, such as Kuhn (1970) and Polanyi (1958), observe that "knowing that" and "knowing how" are two different kinds of knowledge. They state that some practical

knowledge may elude scientific formulations of "knowing that" and that "knowing how" may challenge or extend a theory (Hetherington, 2006). Benner (1982) suggested knowledge embedded in clinical expertise is central to the advancement of clinical practice. Byers (2016) agrees and mentions that knowledge claims appear to be descriptions of behavioral dispositions rather than cognitive, brain, or other mental content descriptions.

The various types of knowledge such as *a priori*, *posteriori*, *explicit*, or *tacit are transferred* - through personal experience or without such experience but through libraries and databases, through consistent and extensive relationships or contact through education, or by using logic and reflection (Gemma, 2018). Furthermore, people gain knowledge either "by doing" and being involved in it or by more conservative forms of learning (Halder & Mahato, 2013).

What finally becomes personal knowledge is "recognition of a new pattern through processing by the human being" (Sweeney, 1994, p.1) which presupposes the human being moved from the point of ignorance or simply not knowing to a new position of knowing. The process that bridges the two positions of not knowing and knowing may consist of any combination of human and environmental interaction, "rational intuiting", appraisal, active comprehension and personal judgement; all departing from the current conceptual framework.

On an academic level, new knowledge is created through research. This new knowledge needs to be synthesized and translated to a user friendly-format before it must be disseminated to those that need to implement it (McDonald *et al*., 2002, 2012).

## Dissemination and Implementation

What happens once knowledge has been createdobtained? Being the "knowledge" producers, scientists progress to the next stage of their mission - dissemination. The sharing with the community was the basis of what we now call dissemination. The first inventors, tool-makers and technique-developers provided the basis for what we now call implementation.

Sharing with those near, either neighbours or family members, friends and the rest of the community took the forms of showing, telling, teaching, drawing, child-rearing…, which was the dissemination tools of the time. Socrates was the wisest living person of his time because he realized and admitted his own ignorance. Socrates conducted his research for knowledge through a method of dialogue he called intellectual midwifery (Tomin, 1987; Siddiqui, 2005).

Homeric wisdom was handed down from generation to generation using verses and language rhythms. Stories of wisdom were narrated around the fires. With the advent of writing – people at a distance could learn about the material and non-material cosmic understanding of bright minds. Books, not only handwritten but printed, spread the knowledge in all directions. Then, libraries started to become full, not only of papyrus rolls but also of printed editions. For many centuries knowledge was kept secret, only handed down from father to son, and religious order to religious order, as knowledge has always been a potent weapon in the hands of those in power.

As Lowry (1979) and Richardson (n1998) claim, "churchmen feared that print would encourage ordinary lay people to study religious texts for themselves rather than to rely on what the authorities told them". Due to the diligent works of monks, artists and calligraphers, knowledge accumulated, and those who wished to learn had more options - either by becoming a disciple and learn from the masters orf a specific master or spend hours in one of the well-known libraries of the times. Later, they could simply read a book from the local bookshop when bookshops became parts of our lives or simply read a book from the local bookshop when

bookshops started to become parts of our life. Books became cheaper; schooling was not the privilege of only the fortunate, and journals opened up to communities other than the strictly academic. Technology made things even more accessible. The Internet brought knowledge beyond borders and facilitated dissemination at a fraction of the cost to the big community of knowledge users. Every time a new possibility appeared, it was the novel way of knowledge transfer and remained so until it was outdated by the next.

As Burke (2001; 2009, p.3) puts it, "it seems to be inevitable in human affairs that every solution to a problem sooner or later generates more problems of its own". As the Swedish geographer Torsten Hägerstrand suggested, the process of innovation always has a negative and a positive aspect, a "destructive side" as well as a creative side. He calls the destructive side "denovation" as opposed to "innovation" (Hagerstrand, 1988).

Thus, although the modern terms of dissemination and implementation or translation are a little older than a decade, the challenge that it is supposed to remedy is centuries old. Throughout human history, we observe that there are always small numbers of those who know or understand more while very little of this knowledge—if any - reaches the entire population to serve their needs. Thus, there has always been a "huge gap" or a "time delay" between "what we know" and what we do in our lives or our work settings and how fast we introduce this knowledge into our everyday experiences. Even though *Knowledge Translation* or other such terms mainly refer to health, the same stands true of other disciplines or professions, but let's examine the main concepts and their content a little more carefully.

Dissemination is the act of spreading the knowledge gained widely so that those who can benefit from this information, new understanding, wisdom or knowledge become aware of it and know what they need to do. Implementation is conceptualized as a planned and deliberately initiated effort to turn the knowledge gained into an intervention that will finally bring it into practice (Yano *et al*., 2012; Pfadenhauer *et al*., 2015). The concept of implementation presents largely consensual definitions and relatively well-defined boundaries, while distinguishing features, preconditions, and outcomes are not yet fully articulated (Goh, 2002). In contrast, definitions of context vary widely, and boundaries with neighbouring concepts, such as setting and environment, are blurred; the characteristics, preconditions, and outcomes are ill-defined.

The term "Knowledge Translation (KT)" is defined by the Canadian Institutes of Health Research (CIHR) as "a dynamic and iterative process that includes synthesis, dissemination, exchange and ethically-sound application of knowledge to improve the health of Canadians, provide more effective health services and products and strengthen the health care system" (CIHR, n.d.). In 2005, the WHO adapted the initial CIHR KT definition and said that Knowledge Translation is "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".

Since then, we have seen other definitions, such as the one introduced by the National Center for the Dissemination of Disability Research (NCDDR) in 2005 and then re-published in 2007 by Pimjai Sudsawad 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" (NCDDR, 2018). In 2006, Graham *et al*. came up with 29 different terms adopted by different various shealth researchers to describe the same process: knowledge transfer, knowledge mobilization, knowledge exchange, implementation, translational research, technology assessment, knowledge utilization, knowledge management, and more (Graham *et al.,* 2006).

**Barriers and Facilitators Diffusion of Innovations in Health**

During the contemplation years (the 1990s-2000), the barriers and facilitators to the diffusion of innovations in health were studied. However, unfortunately, despite the almost two decades that passed, the initial barriers are still present (Rees, 2011), only to witness more added to the list. Barriers to research dissemination are often caused by the perceptions of research evidence by practitioners. This can include several reasons, among which we can focus on the following:

A. Practitioners lack a clear idea of where to access relevant, tailored information to suit their needs, how to distinguish the quality of evidence sources, and how to ultimately use it (Greenhalgh *et al*., 2007). Findings may also be ambiguous and lack precise estimates of intended effects.

B. The organizational culture is how an organization makes decisions and how the information flows within the organization are also of vital importance. Different organizations show different abilities to interact with research evidence ranging from low to high levels of research or evidence-appraisal skills, either to assess research evidence or to balance it against competing sources of influence (Lavis *et al*., 2003) among practitioners. The higher the skills, the easier the dissemination of the knowledge and faster the implementation.

C. The perceived cost and timelines of research can influence the use of research evidence. Given the short time periods that many practitioners have to make decisions, the research could be considered too expensive, too time-consuming, or too much of a luxury to have real practical value.

D. Information overload can also hinder knowledge translation. Practitioners, program managers, and implementers may become overwhelmed by the sheer number of information sources; or become persuaded by other influences (e.g., lobbyists or other interest groups who haveith financial resources, abilities, or insider knowledge on advancing a particular agenda).

E. To the above list, new challenges have already been added. In an era of meta-truth, it is more and more difficult to distinguish the true from the fake research findings. Almost every minute, there is some news about new research done somewhere on the planet. Sometimes, this new research may disseminate findings in contrast to similar research findings in another part of the planet. In today's world, we need to develop critical thinking skills and be very careful to screen and spot biased research findings propagating fake information only to serve the interests of the funders or the sponsoring organizations behind the research, especially when the marketing and communication campaigns that back the efforts and intentions are excellent. *The quantity is large, but the quality is not necessarily good*. Chaos and disbelief are the resulting side-effects.

F. The paradox is speed and no-wish to embrace. Moreover, although technology, information, and new data flood the world, both virtual and digital, people seem to have developed a kind of inertia or resistance to change (Yilmaz & Kılıçoğlu, 2013). They seem to live the routine of the hamster spinning fast but going nowhere, as they are not open to embracing the new, update their understanding, learn better ways, and improve their service. Speed is the menu of the day; reflection on quality is an issue for idealists and utopians. In the era of Twitter, we disseminate short, catchy slogans. In addition, before we come to the completion of implementation, it has become outdated, so why bother? Impressions are important, and those good at seduction strategies and techniques manage to get titles, funds, and awards.

G. Global inequalities also contribute to the slow implementation of new evidence. While maternality and infant mortality rates have somewhat reduced in the developed world, Asia and Africa still bleed and die, as if there are humans of different value, children of a minor God. If decision-makers could act wisely, it goes

without saying that the role death plays on the birth scene, and generally in health, could change (Kunst & Houweling, 2001; Ronsmans & Graham, 2006).

H. The need for health technicians is larger than the need for health advancement minds and hearts. As the need for people to just be able to perform duties and do the job is massive, the education of those involved in health is shorter. Education is presented as short training modules based on the ABCs of what is, allowing no or very little time for reflection, maturation, problem-solving, and creativity. It seems that the educational institutions ask for numbers of students, not necessarily bright minds. If we are not wise enough, the repetition of routine tasks will soon bring us to a dead end. This is especially important as we move into a meta-human era when robots already perform surgeries, diagnose, serve, and deliver babies (Sinclair, 2010). More is needed in human birth and health care beyond the technical algorithms, the libraries of data, and the exact interventions.

According to the estimates, there is a time lag of 17 years between the time knowledge is generated and the time it is used in actual practice (Hanney *et al.*, 2015). This time lag is very problematic in the field of childbirth as, during this period, a vast number of babies will already have been born under conditions that will have a lifelong diminishing impact on their health and personal and professional well-being. According to the Ecology Global Network (2020) statistics, globally, approximately 360,000 babies are born every day; 131.4 million babies are born every year, totalling an unbelievable number of 2,233,800,000 babies born in the 17 years until the knowledge we have today will be implemented. This means that 25% of the global human population today (7,580,898,051(Ecology Global Network (2020)) will suffer the harmful consequences of what is not enhanced in daily childbirth practice even though we already know that if adopted, it could add life to years and years to life.

The question is, "can we afford it?" not only in terms of health economics but also in terms of civilization, peace, and human development. Politicians and health care decision-makers need to reconsider their processes, practices, and policies to better serve better those they are responsible for should serve. At the same time, researchers in the field of health need to understand how health organizations make healthcare decisions and how health professionals (or politicians or entrepreneurs or businesses) offer products or services to reduce the time lag between the time we gain the new knowledge and the time we put this new knowledge into practice.

**Facilitators of Research Evidence Uptake**

Facilitators leading to broader adoption of the research evidence may include: researchers reframing practice issues to align with the existing evidence base (Layde *et al.*, 2012); creating targeted messaging (e.g., policy briefs, press releases) and emphasizing the role that research evidence can play in contributing to better programs or improved interventions (Graham & Logan, 2004). We can also communicate research evidence more effectively by framing them into compelling stories.

We should strengthen the capacity of practitioners to demand research evidence that responds to and supports their needs; and to access, assess, adapt, and apply research evidence in their daily work. Researchers should also collaborate with practitioners to generate essential information, encourage active sharing, and identify pressing priorities (Layde *et al.*, 2012). Furthermore, researchers should pursue personal contact with practitioners and develop trust. This trust built from personal relationships can be a vital ingredient connecting the worlds of research and ongoing implementation processes.

Shared platforms for learning and decision-making among stakeholders remain to be developed. This could facilitate the pilot of implementation projects to assess the feasibility of an intervention and the emergence of agencies to undertake operations research, leading to higher visibility of policy to benefit the children's survival and their thriving.

**Frameworks and Models**

Although these two terms may, in particular cases, be interchangeable, in scientific disciplines, they are clearly distinct. As the word "framework" implies, it is the "frame", i.e., a system of rules, ideas, or beliefs used to plan how a set of operations can perform so that decisions can be made. In contrast, in scientific disciplines, a model is used to gain insights into a given phenomenon before it is actually built. Models are important in that they provide ideas into a given phenomenon, especially when practical experience related to it is not within our reach or when a practical experimental setup is not easily realizable (Jacobson, Butterill, & Goering, 2003). Thus, the model can be seen as the framework together with the set of definite operations.

Both frameworks and models are relevant in KT.

Models offer to the health professional practical ways to use new knowledge gained.

There are two main kinds of frameworks: frameworks that are focused on the interaction between the creator and the user (user-context framework) and frameworks that include contextual factors (context-focused framework). Interactive models of Knowledge Translation (KT) are about raising knowledge users' awareness of research findings and facilitating the use of those findings, and emphasize the personal nature of the process, facilitating the use of those findings, and emphasising the process's nature. Furthermore, they support that when the knowledge creator and the knowledge user know each other's needs, preferences, objectives, and circumstances well—a reality that is *not* the usual phenomenon—then implementation is more straightforward (Kitson, Harvey, & McCormack, 1998). On the other hand, Context-Focused Frameworks are used to understand the contextual factors that could play important roles in the success or failure of the knowledge translation effort and should be taken into considerationconsidered in all stages of the KT process. An effective framework should take into account both aspects.

Table 1 outlines the most important frameworks, currently in use and Table 2 outlines the most important modelscurrently in usenow in use.

Table 1

*Most important frameworks currently in use*

| Frameworks | |
|---|---|
| The Interaction-Focused Framework (in general) | Through suggested questions, it guides the creator to better understand the dynamics within each domainunderstand the dynamics within each domain better and raise awareness of the type of information needed for the knowledge translation process (Jacobson *et al*., 2003). |
| The Context-Focused Framework (in general) | It helps us understand the contextual factors that play a significant role in the success or failure of the knowledge translation effort. |
| The Knowledge-to-Action (KTA) Process Framework | The KTA Framework emphasizes the collaboration between the knowledge producers and knowledge users throughout the complex and dynamic KTA process, which appears in a dyad of phases (knowledge creation and action) with no definite boundaries between the two components (creator and actor) and among their individual phases which may occur sequentially or simultaneously. The phases of knowledge creation are three: (1) knowledge inquiry, (2) knowledge synthesis, and (3) knowledge tools/products. In addition, the action cycle represents the activities needed for knowledge application (Graham *et al*., 2006). |
| Promoting Action on Research Implementation in Health | It describes the implementation of research in practice, which is a function of the interplay of three core elements: (1) the level and nature of the evidence to be used, (2) the context or |

| Services (PARIHS) Framework | environment in which the research is to be placed, and (3) the method by which the research implementation process is to be facilitated. The PARIHS specifies three key themes under context as (1) culture, (2) leadership, and (3) evaluation. PARIHS does not discuss elements or factors related to the knowledge creation process, although creation is also an essential part of knowledge translation (Kitson *et al.*, 1998; Rycroft-Maline, 2019). |
|---|---|

Table 1 to be continued

| The Cochrane Knowledge Translation Framework | It highlights key areas of focus for Cochrane's KT work and the major audiences it should be serving: consumers and the public, practitioners, policy-makers and healthcare managers, researchers, and research funders. It demonstrates the breadth and depth of the activities that would enable Cochrane with a distribution leadership model to become a KT-centered organizationto become a KT-centred organisation with a distribution leadership model. |
|---|---|
| The Integrative Framework | It aims to address one of the main challenges in knowledge management and knowledge transfer, that which is transferring knowledge from one part of the organization to another, organizing, creating, capturing, or distributing knowledge and ensuring its availability for future users. It supports that effective knowledge transfer depends on the trust level among all on different levels and asks for leaders to be open and the whole organization to cultivate a true culture of co-operation and collaboration that seeks to attainseeking continuous improvement.<br>The main factors of the suggested integrative framework are: (1) leadership, (2) problem solving/seeking behaviors, (3) organizational structure, (4) support structures, (5) knowledge recipients, (6) absorptive and retentive capacities, (7) types of knowledge (Goh, 2002). |
| Interactive Systems Framework for Dissemination and Implementation (ISF) | The ISF identifies three key systems necessary for bridging research and practice, which include the Synthesis and Translation System, the Support System, and the Delivery System. The ISF recognizes the need to synthesize evidence and package the information to better meet the needs of target audiencesmeet target audiences' needs better. The ISF also recognizes the top-down approach to implementation is sub-optimal, as implementation efforts require partnerships (Thigpen *et al.*, 2012). |

Other frameworks

| The RE-AIM Framework | It includes the dimensions of reach, efficacy, adoption, implementation, and maintenance to rate one-on-one counselling interventions and health system policies. It helps program planners to make decisions regarding implementing and funding health services based on multiple dimensions, rather than only considering efficacy in randomized clinical trials (Gaglio *et al.*, 2013). |
|---|---|
| L.E.A.D. Framework | It stresses the importance of addressing the multilevel and dynamic complexity of real-world contexts. It focuses on four factors, that is (1) locate evidence, (2) evaluate it, (3) assemble it, (4) inform decisions (Kumanyika *et al.*, 2012). |
| CIHR Model of Knowledge Translation | It is based on a research cycle that identifies six opportunities within the research process at which the interactions, communications, and partnerships that will help facilitate KT could occur (Tetroe, 2007). |
| The Ottawa Model of Research Use (OMRU) | The OMRU relies on the process of assessing, monitoring, and evaluating each element before, during, and after the decision to implement an innovation (Logan *et al.,* 1998). |
| The Coordinated Implementation Model | It outlines some of the additional and largely unexploited routes through which research information could influence clinical practice. It supports that the researcher must work together with community interest groups, administrators, public policy-makers, and clinical policy-makers as users, either as individuals or groups, can also strongly influence practitioners' decisions (Lomas, 1993). |
| The Stetler Model of Research Utilization | It is a prescriptive approach designed to facilitate safe and effective use of research findings with nurses. It provides procedures to help guide practitioners through all steps in the research use process while considering the practical (utilization-focused) aspects of clinical decisions (Stetler, 1976; 2001). |
| Conner's Conceptual Model for Research-Utilization Evaluation | As early as 1980, Conner offered research utilization evaluation, with the emphasis on four general aspects that are important for the evaluator to consider: (1) goals, (2) inputs, (3) processes, and (4) outcomes (Conner, 1981; Huberman, 1987). |
| The Need to Knowledge (NtK) Model | It bridges researchers and product developers, guiding from the initial stage, namely that of defining the problem and solution to significant decision making, exploratory work that validates the innovative aspects of the solution and its relevant value to the target market, followed by the assessment of the whole idea from the market, business and technical perspective aiming to see the viability of the project which can then and continue to the |

|  | development phase or the termination of it if there is no value seen. It helps both researchers and developers understand all steps involved in a new product or service (Flagg *et al*., 2013). |
| --- | --- |
| The Evidence Evidence-Based Public Health (EBPH) Model | EBPH models help ensure that resources in public health are spent appropriately (Bownson *et al*., 1999). |
| The Tehran University of Medical Studies (TUMS) Knowledge Translation Cycle | The Tehran University of Medical Studies (TUMS) Knowledge Translation Cycle analyzes the current situation of an organization and designs further interventions on the transfer and utilization of research knowledge. It consists of: (1) push side (knowledge creation), (2) knowledge transfer, (3) pull side (research utilization), (4) question transfer (Majdzadeh *et al*., 2008). |

Rogers' *Diffusion of Innovations Theory* (Rogers, 1962; Dearing & Cox, 2018) has been studied for over 40 years and has cast light on how we can transfer knowledge into clinical practice. According to the scholars studying or using Rogers five-stage process, namely knowledge, persuasion, decision, implementation, and confirmation, the adoption of research evidence in the healthcare field is influenced by various characteristics and strategies needed to respond to the factors behind the characteristics presented. Since then, more theories appeared, Roadmap Initiatives, Clinical and Translational Science Awards established, not to mention the social network thinking power in the diffusion, dissemination, and implementation fields. However, the gap between what we know and what is actually adopted in practice is enormous.

The many decades of top-down processes resulted in very slow transformatory transformative interventions in the way our children are born. Nowadays, there is a tendency to reach a point that top-down and bottom-up will meet. Users take responsibility for the knowledge gained and try to get access to the evidence that provides answers to their needs, moving away from being the passive, powerless recipients of what evidence-based knowledge other organizational group systems decide to offer them (de Jonge, Stuij, Eijke, & Westerman, 2014). Researchers work with interest groups and human rights and/or childbirth activists promoting natural birth and respect to both parents and babies being born. This collaboration can make a significant difference to stop the C-section high rates, obstetric violence incidents, over-medicalization of birth, and unnecessary interventions starting even before conception, all the way through gestation, at birth and afterwards. Perhaps the new era of bridging both ends – bottom-up and top-down, together with an educational system that emphasizes developing critical thinking and skills to distinguish true from false, will lead to a better childbirth scene.

## Midwives & Childbirth Knowledge Transfer

Midwives can become precious practitioners for transforming health in our world and promoting peace and human civilization (Davis-Floyd & Davis, 1996). They are present at the most crucial period of human experience, during pregnancy and birth (Fahy & Hastie, 2008). Most midwives show sensitivity towards life and (un)born babies and become agents of change for the better, for evolution. Most of them also demonstrate a robust feminist ethic of care, as they value the body, psyche, and individuality of the woman giving birth. This is because the knowledge the midwives use is fundamentally women-led, something which has been rendered asunder in an obstetric context (Davis-Floyd, 1992).

Midwives use a variety ofvarious discourses to construct their own knowledge, but as knowledge is a social construction, and because of the medicalization of birth, midwifery knowledge and skills supporting normal birth are in decline. The knowledge owned by obstetricians is perceived as so-called "authoritative knowledge" in this social and cultural context, which means that it is taken as the only correct and viable practice, while. In contrast, other systems of knowledge owned by women themselves or by those of other professions, such as midwives or doulas, are often considered dubious and incorrect (Ruiz-Berdún &

Martín-Alcaide, 2018). The anthropology of childbirth asks in this regard what led to a certain specific type of knowledge being established as authoritative. This is where anthropological studies overlap with historical studies not only in obstetrics but midwifery as well. Such research shows that the path towards the victory of modern obstetrics over the realm of birthing was not the same everywhere, nor was it straightforward or simple.

Researchers and scientists use the medicalization concept in this context. It refers to a process when an originally social phenomenon is re-defined as a medical 'problem' which is then described using medical terminology and treated as a medical condition that needs to be managed and controlled by health professionals (Browner & Press, 1996; Perdiguero & Ruiz-Berdún, 2014). This medicalized knowledge includes information from women's own prenatal care providers, other biomedical authorities, books, and other written materials. Childbirth was long considered a natural part of women's physiology and life cycle; however, after it was re-conceptualized into a medical problem that needed to be managed medically, it was moved to a hospital setting where doctors could perform their work in an environment equipped with advanced technology (Davis-Floyd, 1992). Jordan (1992) argues that women often "willingly submit themselves to the authority of the medical view" because of how authoritative knowledge is constructed and maintained by social structures and the cultural valuing of such systems.

Midwives play an essential role in society (RCM, 2017, 2018). They need to approach every pregnant or birthing mother/ partner and every (un)born or 'being born' child with cleansed hearts and hands. If they act from this cleansed space, they are capable of seeing what needs to be seen and facilitate the healthy processes that take placecan see what needs to be seen and facilitate the healthy processes in clinics or places of practice. Then, challenges like high infertility rates leading to IVF techniques and artificial conception solutions, surrogacy, gene editing, intrauterine micro-surgery, overuse of ultrasound and medical examinations, cesarean deliveries, maternal and infant mortality, stillbirths, NICU care, prematurity etc., which ask for serious changes as we know the lifelong impact of these primal experiences on the human being born (Turner, Turner, & Gouni, 2018; Gouni, Sekulic, & Topalidou, 2016), can be addressed in a different way that promotes health.

## An Example From COST Action IS1405

The COST Action IS1405 research project "Building Intrapartum Research Through Health—An Interdisciplinary Whole-System Approach to Understanding and Contextualising Physiological Labor and Birth (BIRTH)" was approved by the Committee of Senior Officials (CSO) on 14-05-2014 and ended on 09-12-2018 and bears the MoU reference COST 049/14.

COST Action IS1405 developed a sustainable, multidisciplinary network of over 120 individuals across 34 countries in the EU and beyond, including South Africa, Australia, Israel, and Chile. The network developed through regular meetings, workshops, training schools, and over 40 country-to-country exchange visits. It included a high percentage of female (85%) and early-stage researchers (60%) and 15 countries targeted by the COST inclusiveness policy.

According to the Final Achievement Report (on the website of the COST Action), these are the main results, which were obtained due to the diligent work of the researchers and the understanding of how the knowledge gained could best reach the various interest groups of professionals, stakeholders, politicians, and users that come from different backgrounds.

## The Knowledge Gained

Among the knowledge gained during the research are the followings:

1. Physiological labor onset and birth is least likely to be associated with autoimmune/non-communicable disease for five-year-olds when compared with those who experience labor induction and/or instrumental or surgical birth. The analysis of children up to the age of 15 born in this cohort is currently in progress.

2. The traumatization of birthing mothers (Olza *et al.*, 2018) because they experienced traumatic labor is associated with pPost-traumatic stress disorder (PTSD) and haunts these mothers in their later life, impacting their subsequent birthing decisions.

3. Medical interventions during labor have a detrimental impact on the natural secretion of oxytocin which has consequences for breastfeeding and attachment.

4. The hygiene hypothesis was studied concerning intrapartum events, and the associations with longer-term non-communicable diseases were made clear.

5. The effects of dissonance between dominant cultural, social expectations, and marginalized groups, such as migrant women, were made clear.

6. Organizational characteristics, contexts, cultures, and economic costs of variation in rates of interventions in childbirth were studied and published.

7. We can actually monitor fetal movement and witness emotions using thermal imaging.

## Discussion

There has been increasing international interest in promoting knowledge about normal birth and progression towards less medicalised models of care. There is a growing awareness of the impact of our prenatal and perinatal experience on the quality of life we will enjoy after birth and the quality of relationships we will create in our childhood and adult years (Gouni *et al.*, 2016). The atmosphere of the environment we are born or give birth in and the type of birth we experience influence the rest of our lives. We also know how fragile human consciousness—human minds and emotions—is at this vulnerable life stage, birth. Childbirth - from conception to weaning holds the keys to every human being who will become in this world.

Today, sufficient research evidence exists concerning methods, ways, and strategies for an enhanced humanity. It is up to each individual to take necessary action to adopt the practices that best serve our needs on individual, professional, and organizational levels. It is time to move our attention to empowering systems and individuals to undertake theresponsibility they haveir responsibility as parts of the systems they belong to and do what they had promised to do when they swore the Hippocratic Oath to serve human health and well-being.

Overcoming the fear for change which is behind resistance to change, can be the first step. It should be part of our professional education to go through personal or group therapy (Al Mazrouei, Al Faisal, Hussein, El Sawaf, & Wasfy, 2015) and resolve our unresolved prenatal, or perinatal wounds triggered at the birth scene with every newborn baby and every birthing mother. We can then overcome PTSD before starting working with other people as medical practitioners, midwives, therapists, or educators. Healing birthing trauma will best serve the interests of individual and organizational structures to help humanity to survive. Working with ourselves is not a luxury service and, when adopted, will contribute to an increase in positive health indicators statistics. Working with values and cultures and empowerment actions is a decision that will best serve the interests of individual and organizational structures. We cannot afford to wait for another 17 years to see it implemented (Smith & Wilkins, 2018).

Innovative knowledge transfer should begin early with transformation childbirth programs to work with

children at school, teenagers, young adults, pregnant couples, parents, and grandparents. Transformative educational material, not only in the form of books and articles but also games, mobile and web apps, videos, songs, films and theatrical plays, cartoon characters, online courses, fun activities etc., should be developed to promote health at a primordial stage or at as early a stage as possible (Gouni *et al.*, 2016).

Implementation can involve tailoring to a particular context and customizing either the model or the organizational context to accommodate it (Yano *et al.*, 2012). The increasing application of empiric lessons from implementation and dissemination research to health care delivery promises to address the failure to bring proven interventions to scale. Selection of the initial implementation areas require consideration of such organizational characteristics of the recipients as the culture, management support and communication, shared goals and co-operation, leadership, systems and training, data and decision support, staffing and incentives, and expectations of sustainability (Layde *et al.*, 2012).

## Conclusion

Action now is the most urgent imperative in the evolutionary destiny of humanity. It is time to focus our attention on empowering systems and health professionals, and individuals with the knowledge to undertake responsibilities to fulfil their commitments to improve women's birth experiences and future generations.

Despite increasing interest in normal birth, actual rates remain low, and research for facilitating this is minimal. Models of care with a more natural philosophy of birth, to support the desired promotion of normal birth, care providers and women, must be used, and a. All must be made aware of existing evidence of how care and treatment-related factors influence normal birth outcomes. Pragmatic evaluation research is needed onfor how policies related to facilitating factors affect women's experience of normal birth.

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## Appendix A

**The Knowledge-to-Action (KTA) Process Framework**

The Knowledge-to-Action (KTA) Process (Figure 1, below). This model adopts the term "Action" instead of "practice" as action can include a wider scope of users, such as stakeholders, practitioners, policy-makers, patients, and the public (Graham *et al*., 2006). It consists of three phases: (1) knowledge inquiry, (2) knowledge synthesis, and (3) knowledge tools/products. The action cycle, often, starts with a person or a group that has stumbled on a challenge or problem and then gets engaged into providing the relevant solution. Following the steps as indicated in the action cycle figure below, the individual or the group may find themselves repeat the cycle as quite often one phase can be influenced by another.
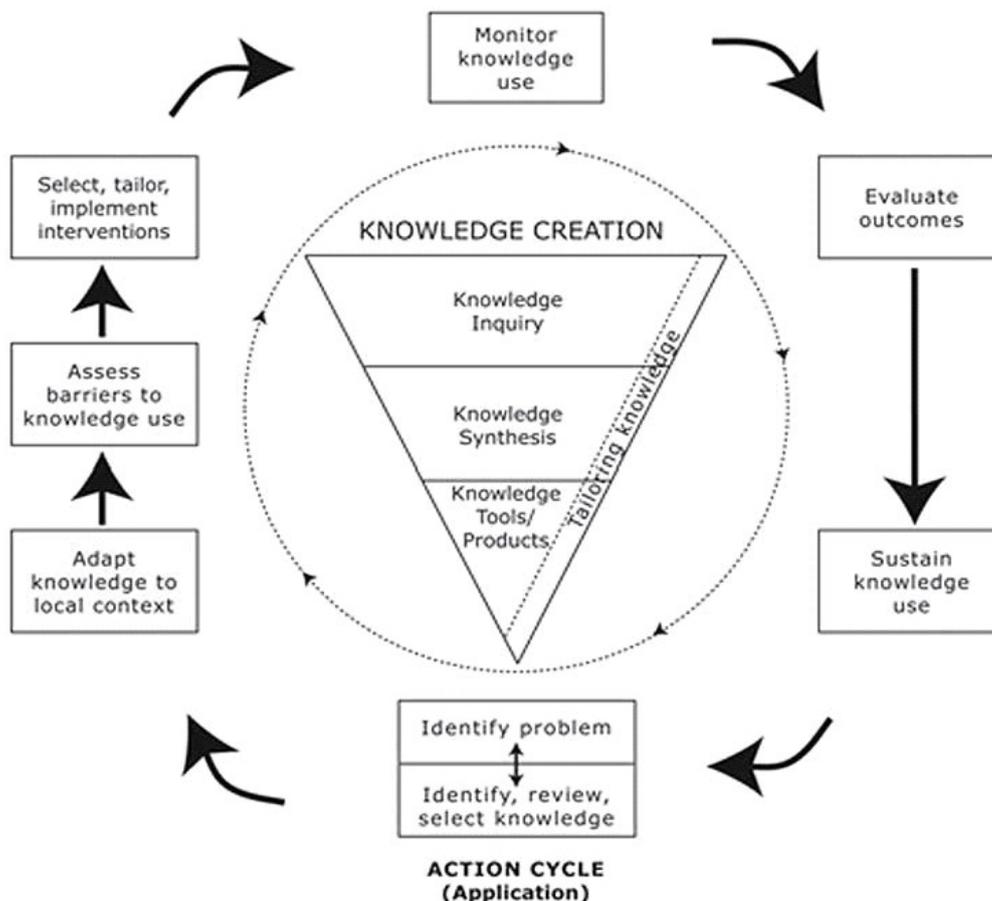
*Figure 1.* The knowledge-to-action process.

**Promoting Action on Research Implementation in Health Services (PARIHS) Framework**

It is relevant for Public Health practitioners who can determine the most appropriate facilitation method to change practice.

The specific framework (Figure 2 below) focuses on three key factors for KT:

(1) evidence (E), (2) context (C), and (3) facilitation (F).

Evidence describes the combination of research, clinical expertise, and patient preferences.

Context describes the forces at work which give the physical environment a character and a feel. The three underlying main forces at work are the dominant culture, the quality of human relationships, and the leadership model that exists in the organization/ environment as well as the monitoring of systems and services or measurement.

Facilitation refers to the kind of support that is available to facilitate the change of attitudes, habits, skills, ways of thinking and working. It depends on the quality of the role of local opinion leaders and facilitators and their leading styles.

The way the framework works can be summarized by the equation:

$$SI = f(E, C, F),$$

Where SI stands for Successful Implementation and f stands for function of. That is that successful implementation depends on the function of the three factors, evidence, context, and facilitation. The higher the rating on each factor, the more successful implementation results we'll get. The rating is based on a scale from low to high.
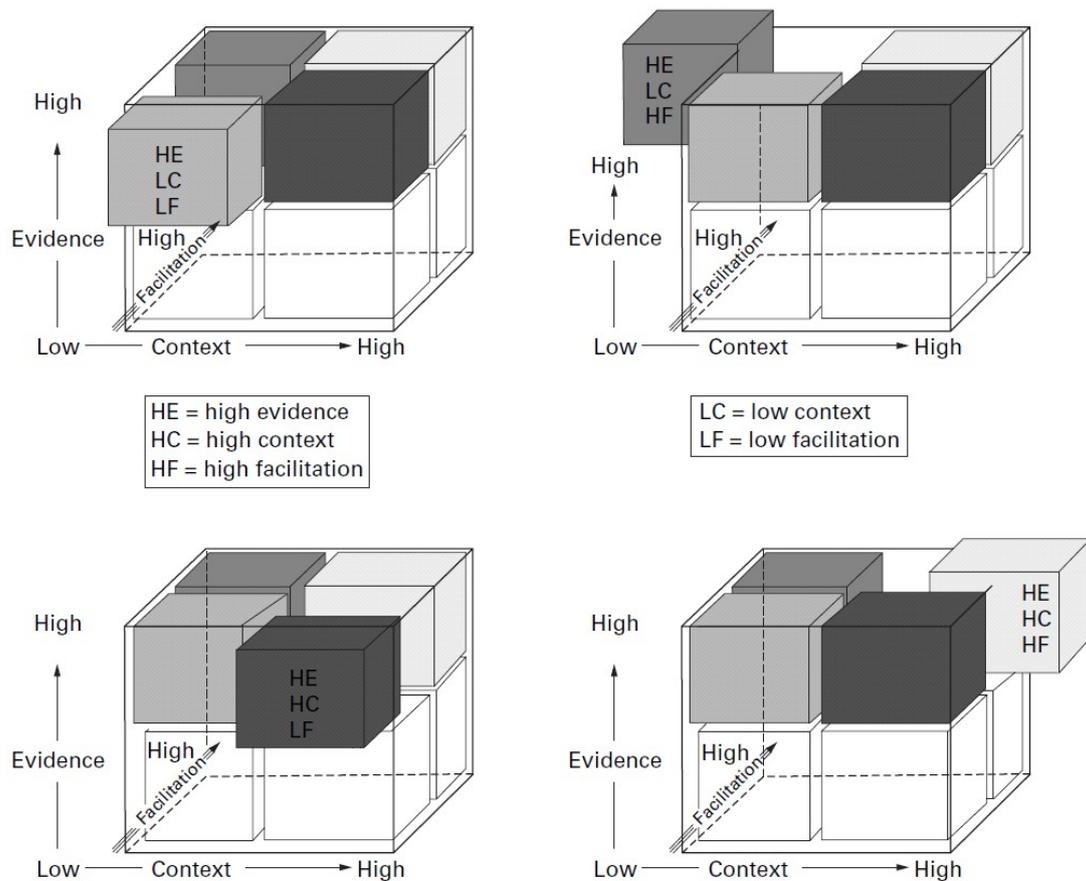
*Figure 2.* A three-dimensional matrix in which evidence, context, and facilitation can either be expected to influence the outcome in a positive way (high ranking) or in a negative way (low ranking) (retrieved from Kitson, Harvey, & McCormack, 1998, "Enabling the Implementation of Evidence Based Practice: A Conceptual Framework", *Quality in Health Care, 7*, 149-158. doi:10.1136/qshc.7.3.149).

**The Cochrane Knowledge Translation Framework**

This KT Framework elaborates on Strategy to 2020's fundamental commitment to the dissemination, use and impact of Cochrane evidence. It highlights key areas of focus for Cochrane's KT work as well as the major audiences it should be serving, that is consumers and the public, practitioners, policy-makers and healthcare managers, researchers and research funders. It demonstrates the breadth and depth of the activities that would enable Cochrane with a distribution leadership model to become a KT-centered organization and it describes six key themes as a framework for organizing thinking and activity around KT. These themes map broadly to the Goals and Objectives of the Strategy to 2020 (Figure 3). They are:

1. Prioritization and co-production of Cochrane reviews, so that the reviews produced meet the needs of the users;

2. Packaging, push, and support to implementation, to make sure that users receive and can act on the knowledge generated;

3. Facilitating pull, to grow the users' capacity to find and use Cochrane reviews;

4. Exchange, to engage with users to support their evidence-based decision-making;

5. Improving climate, advocating for evidence-informed health decision-making and;

6. Sustainable KT processes, building a sustainable infrastructure for KT.
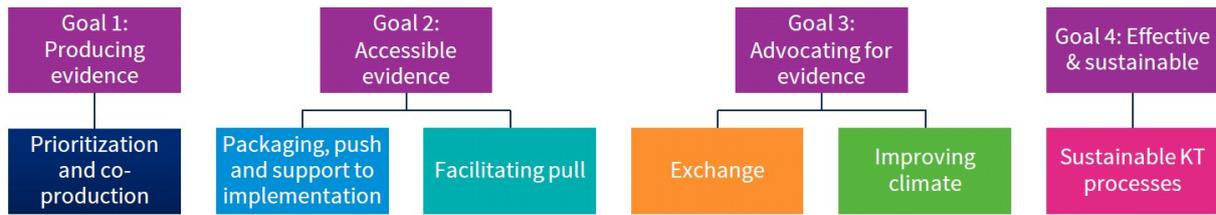
*Strategy to 2020 Goals mapped against the KT Framework themes*

*Figure 3.* e Cochrane Knowledge Translation Framework.

**The Integrative Framework**

Proposed by Goh (2002), the framework (Figure 4) aims to address one of the main challenges in knowledge management and knowledge transfer, that is transferring knowledge from one part of the organization to another, organizing, creating, capturing, or distributing knowledge and ensuring its availability for future users. It focuses on both hard and soft factors that influence knowledge transfer. The main factors of the suggested integrative framework are: (1) leadership, (2) problem solving/seeking behaviors, (3) organizational structure, (4) support structures, (5) knowledge recipients, (6) absorptive and retentive capacities, (7) types of knowledge.

According to the framework, effective knowledge transfer depends on the trust level among all on different levels which asks for leaders to be open and the whole organization to cultivate a true culture of co-operation and collaboration that seeks to attain continuous improvement and learning, encourages information exchange and healthy communication removing any barriers that may block free info/ communication flow, adopts technology systems and adequate trainings to enhance skills and competences and provides rewards on criteria like successful knowledge sharing, co-operation, teamwork etc. The seven factors introduced by the integrative framework can be a valuable quality assessment tool for an organization.
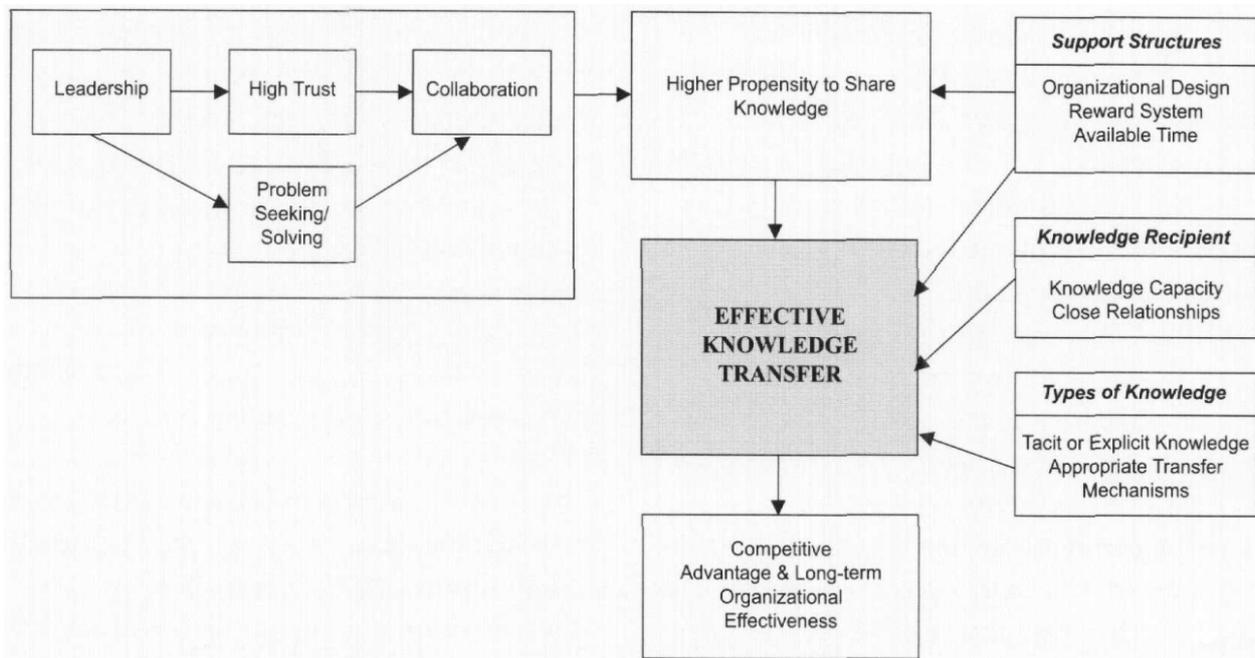


*Figure 4.* The Integrative Framework.
(retrieved from Goh, 2002, "Managing Effective Knowledge Transfer: An Integrative Framework and Some Practice Implications", *Journal of Knowledge Management, 6*, 1; ABI/INFORM Global, p. 23).

**Interactive Systems Framework for Dissemination and Implementation (ISF)**

The framework provides a heuristic for understanding the needs, barriers, and resources of the different systems, as well as a structure for summarizing existing research and for illuminating priority areas for new research and action.

The ISF identifies three key systems necessary for bridging research and practice, which include the Synthesis and Translation System, the Support System, and the Delivery System. The ISF recognizes the need to synthesize evidence and package the information in order to better meet the needs of target audiences. The ISF also recognizes the top-down approach to implementation is sub-optimal, as implementation efforts require partnerships.

**The RE-AIM Framework**

The RE-AIM Framework is used as a method of systematically considering the strengths and weaknesses of chronic illness management interventions in order to guide program planning. It includes the dimensions of reach, efficacy, adoption, implementation, and maintenance to rate one-on-one counseling interventions, group sessions, interactive computer-mediated interventions, telephone calls, mail interventions, and health system policies. It helps program planners to make decisions regarding implementing and funding health services based on multiple dimensions, rather than only considering efficacy in randomized clinical trials.

**L.E.A.D. Framework**

The L.E.A.D. Framework takes a systems perspective to evidence based public health. It stresses the importance of addressing the multilevel and dynamic complexity of real world contexts. Introduced by Kumanyika *et al*. in 2012; it focuses on four factors, that is (1) locate evidence, (2) evaluate it, (3) assemble it, (4) inform decisions.

**APPENDIX 2**

**Models of Knowledge Translation Are Very Communicative**

**The Guide to Knowledge Translation Planning at CIHR: KT Model**

In 2005, the CIHR proposed a global KT model (Figure 1). It is based on a research cycle that identifies six opportunities within the research process:

- KT1: Defining research questions and methodologies;
- KT2: Conducting research (as in the case of participatory research);
- KT3: Publishing research findings in plain language and accessible formats;
- KT4: Placing research findings in the context of other knowledge and sociocultural norms;
- KT5: Making decisions and taking action informed by research findings;
- KT6: Influencing subsequent rounds of research based on the impacts of knowledge use.
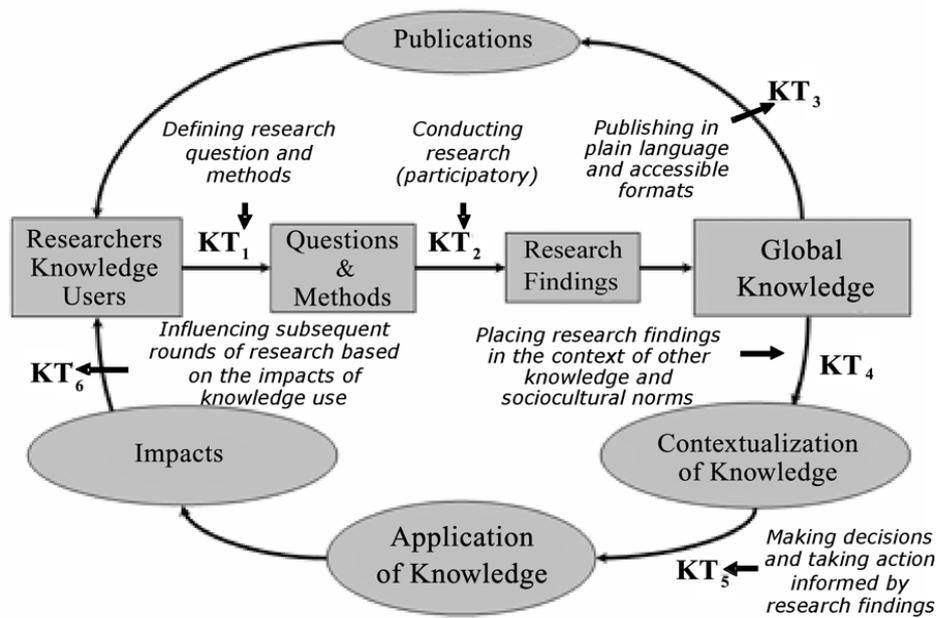
*Figure 1*. KT Model.

(Source: Canadian Institutes of Health Research Knowledge Translation [KT] within the Research Cycle Chart. Ottawa: Canadian Institutes of Health Research, 2007

**The Ottawa Model of Research Use**

The Ottawa Model of Research Use (OMRU) (Figure 2) includes six elements:

1. Evidence-based innovation;

2. Potential adopters;

3. The practice environment;

4. Implementation of interventions;

5. Adoption of the innovation;

6. Outcomes resulting from implementation;

7. Monitoring;

8. Evaluation.
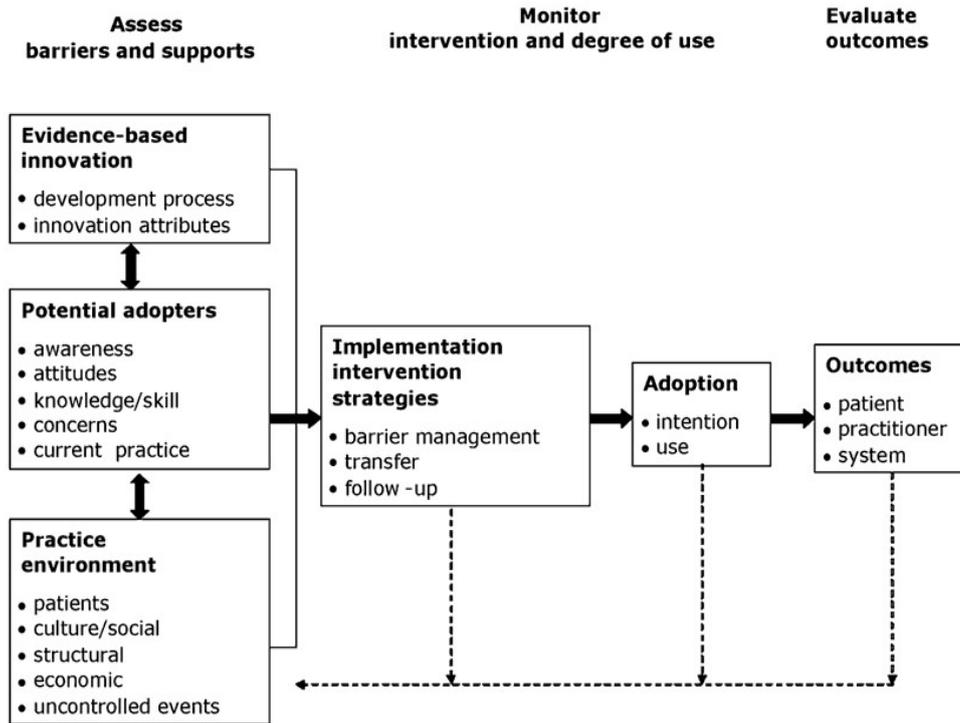
*Figure 2.* The Revised Ottawa Model of Research Use (Graham & Logan, 2004)

Source: Macdonald, T. (2012). Exploring knowledge translation models for clinical nurse educators with a focus on the Ottawa model for research use. (Semantic scholar)

**The Coordinated Implementation Model**
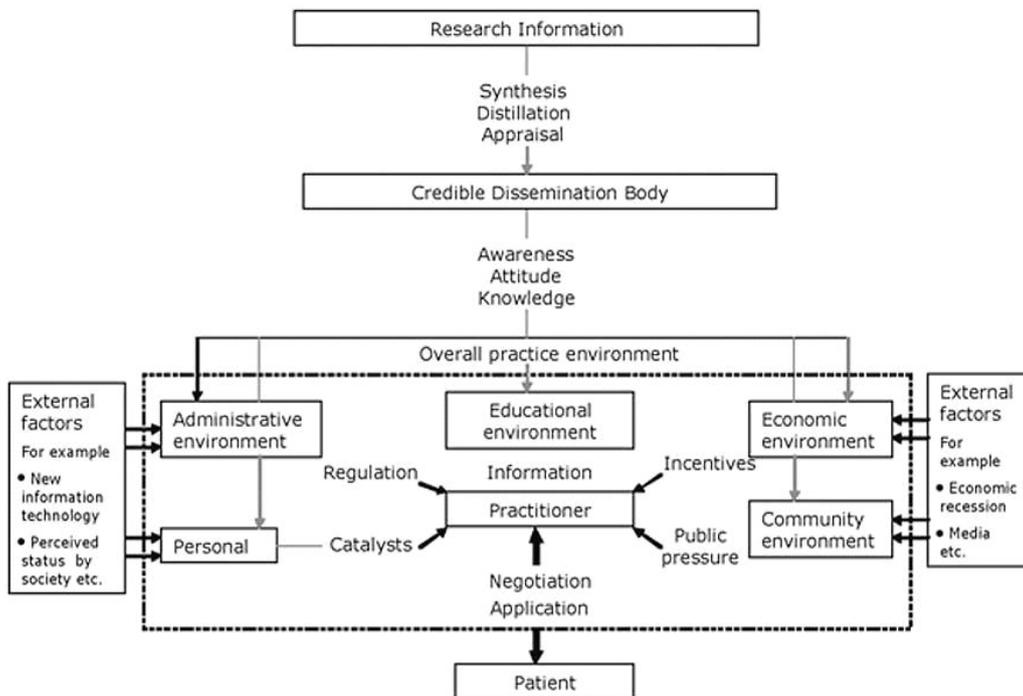


*Figure 3.* The Coordinated Implementation Model

(Source: Sudsawad, P. (2007). Knowledge translation: Introduction to models, strategies, and measures. Austin, TX: Southwest Educational Development Laboratory, National Center for the Dissemination of Disability Research)

**The Stetler Model of Research Utilization**
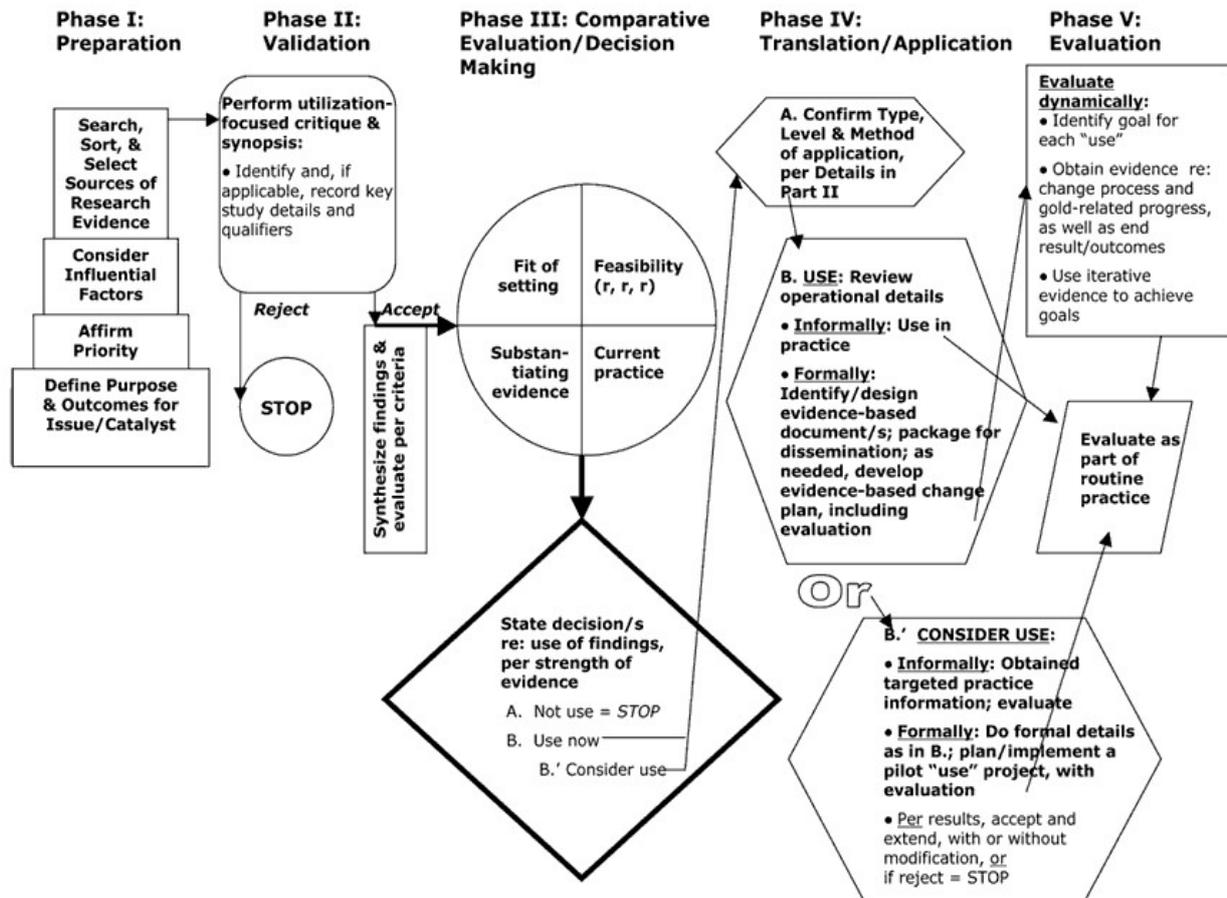


*Figure 4.* The Stetler Model of ResearchUtilization.
(Source: Sudsawad, P. (2007). Knowledge translation: Introduction to models, strategies, and measures. Austin, TX: Southwest Educational Development Laboratory, National Center for the Dissemination of Disability Research)

**Conner's Conceptual Model for Research-Utilization Evaluation**
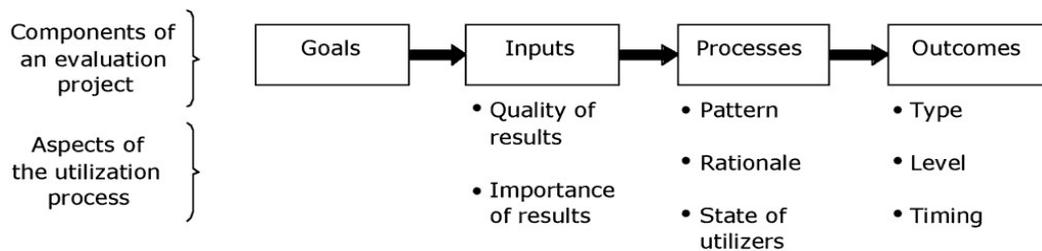


*Figure 5.* Conner's Conceptual Model for Research-Utilization Evaluation.
(Source: Sudsawad, P. (2007). Knowledge translation: Introduction to models, strategies, and measures. Austin, TX: Southwest Educational Development Laboratory, National Center for the Dissemination of Disability Research)

**The Need to Knowledge (NtK) Model**

The model was designed to bridge researchers and product developers. It guides from the initial stage, that of defining the problem and solution to significant decision making, exploratory work that validates the innovative aspects of the solution and its relevant value to the target market followed by the assessment of the whole idea from the market, business and technical

perspective aiming to see the viability of the project which can then continue to the development phase or the termination of it if there is no value seen. At Stage 3 of the model, a transdisciplinary team with the necessary research expertise gets together to fill in the knowledge gaps, employ knowledge translation techniques using the KTA model, and communicate the research findings via multiple forms of media and if everything goes well, the implementation plans, partner agreements, funding schemes, patent or intellectual property strategies or all needed activities follow to create the prototype which is thoroughly benchmarked for functionality before it goes to the next stage of manufacture, marketing, and sales or distribution. Thus, the NtK model helps both researchers and developers understand all steps involved in a new product or service.

### Need to Knowledge (NtK) Model for Technological Innovations

| Phases | Stages and Gates |
|---|---|
| **Discovery (Research)** | **Stage 1:** Define Problem & Solution |
| | **Gate 1:** Idea Screen |
| | **Stage 2:** Scoping |
| | **Gate 2:** Feasibility Screen |
| | **Stage 3:** Conduct Research and Generate Discoveries ➞ Discovery Output! |
| | **Gate 3:** Begin Invention Phase? |
| **Invention (Development)** | **Stage 4:** Build Business Case and Plan for Development |
| | **Gate 4:** Implement Development Plan? |
| | **Stage 5:** Implement Development Plan |
| | **Gate 5:** Go to Beta Testing? |
| | **Stage 6:** Testing and Validation ➞ Invention Output! |
| | **Gate 6:** Go to Production Planning? |
| **Innovation (Production)** | **Stage 7:** Plan and Prepare for Production |
| | **Gate 7:** Go to Launch? |
| | **Stage 8:** Launch Device or Service ➞ Innovation Output! |
| | **Gate 8:** Post Production Assessment? |
| | **Stage 9:** Post-Launch Review |
| | **Gate 9:** Continue Production? |

*Figure 6.* NtK Model phases, stages, gates and outputs.

(Source: Flagg, J.L., Lane, J.P. & Lockett, M.M. Need to Knowledge (NtK) Model: an evidence-based framework for generating technological innovations with socio-economic impacts. Implementation Sci 8, 21 (2013). https://doi.org/10.1186/1748-5908-8-21)

**Evidence-Based Public Health (EBPH) Model**

First introduced by Brownson, Gurney, and Land (1999), the EBPH model help ensure that resources in public health are spent appropriately. This model builds on the success of Evidence-Based Medicine (EBM). It enables public health researchers work together in a multidisciplinary context and try to provide solutions to increasingly complex, global public health challenges and equip practitioners with support that can make their contribution even better.

## Steps in the EBPH Process

1) Formulating a clear question from a public health problem;
2) **Searching the literature;**
3) Appraising the evidence;
4) Selecting the best evidence for a public health decision;
5) Linking evidence with public health experience, knowledge, practice, and the community's values and preferences;
6) Implementing findings in public health practice and programs;
7) Evaluating results.

*Figure 7.* EBPH Model.

Source: Jenicek, M., & Stachenko, S. (2003). Evidence-based public health, community medicine, preventive care. Medical science monitor: international medical journal of experimental and clinical research, 9(2), SR1–SR7.

**The Tehran University of Medical Studies (TUMS) Knowledge Translation Cycle**

Introduced by Majdzadeh *et al*. (2008), the cycle consists of: (1) push side (knowledge creation), (2) knowledge transfer, (3) pull side (research utilization), (4) question transfer.

As a model, the TUMS knowledge translation cycle should enable organization and evaluation of attempts to analyze the current situation and design further interventions for the transfer and utilization of research knowledge.
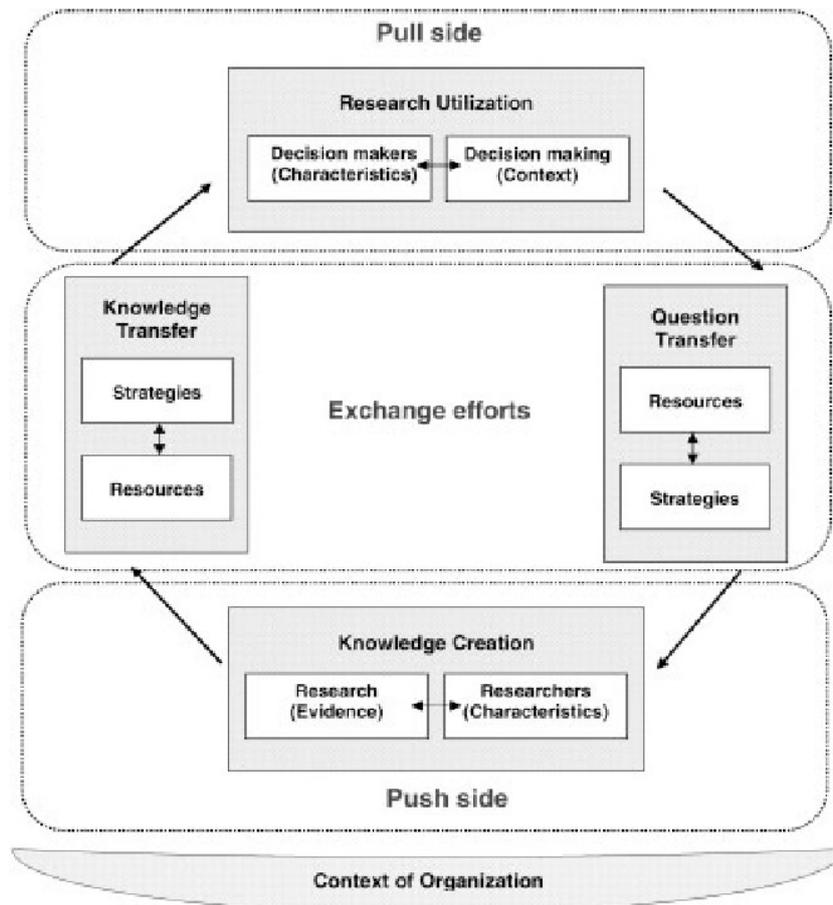
*Figure 8.* The Tehran University of Medical Sciences Knowledge Translation Cycle.

(Source: Majdzadeh, R., Sadighi, J., Nejat, S., Mahani, A.S., & Gholami, J. (2008). Knowledge translation for research utilization: Design of a knowledge translation model at Tehran University of Medical Sciences. Journal of Continuing Education in the Health Professions, 28, 270–277).