

## Knowledge translation in health care: a concept analysis

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### Abstract

**Background:** Although knowledge translation is one of the most widely used concepts in health and medical literature, there is a sense of ambiguity and confusion over its definition. The aim of this paper is to clarify the characteristics of KT. This will assist the theoretical development of it and shape its implementation into the health care system

**Methods:** Walker and Avant's framework was used to analyze the concept and the related literature published between 2000 and 2010 was reviewed. A total of 112 papers were analyzed.

**Results:** Review of the literature showed that "KT is a process" and "implementing refined knowledge into a participatory context through a set of challenging activities" are the characteristics of KT. Moreover, to occur successfully, KT needs some necessary antecedents like an integrated source of knowledge, a receptive context, and preparedness. The main consequence of successful process is a change in four fields of healthcare, i.e. quality of patient care, professional practice, health system, and community. In addition, this study revealed some empirical referents which are helpful to evaluate the process.

**Conclusion:** By aiming to portray a clear picture of KT, we highlighted its attributes, antecedents, consequences and empirical referents. Identifying the characteristics of this concept may resolve the existing ambiguities in its definition and boundaries thereby facilitate distinction from similar concepts. In addition, these findings can be used as a knowledge infrastructure for developing the KT-related models, theories, or tools.

**Keywords:** Knowledge translation, Concept analysis, Walker and Avant, Healthcare system.

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### Introduction

Knowledge translation (KT) is a concept first used in 2000 by the Canadian Institute of Health Research (CIHR) (1-7) to address the gap between research knowledge and its application in clinical practice in health (1, 2, 4, 5). Since that time, use of the term has grown dramatically, with a tenfold increase revealed by a search of Medline from 1990-

2006 (8). Although KT is widely used, there is a plethora of other terms that have been used interchangeably in the literature [e.g. knowledge transfer, research utilization, evidence implementation] (5, 9-16).

The use of the term KT varies in different disciplines and field of research. For example, for those working in basic research field, KT means providing knowledge for

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clinical trials, whereas for those in applied research fields it refers the use of knowledge for conducting the clinical trials and creating guidelines (4, 12, 13). Geographical variation of the term also exists. for instance, in the UK and Europe, the terms 'implementation science' and 'research utilization' are commonly used, while American researchers prefer to use 'dissemination and diffusion', 'research use', 'knowledge transfer and uptake'. 'Knowledge transfer and exchange' and 'knowledge translation' are common in Canada (4, 13, 17).

In addition to variable terminology, there is little consensus about what KT is, and what it is not (8). Ambiguity and disagreement over KT definitions necessitate answering the question "What is KT?" to further developing KT research. Concept analysis is an approach to offer a clearer understanding of a concept when consensus is lacking (18,19).

The aim of this paper is to report the findings of a concept analysis of KT, which will assist the theoretical development of the concept and clarification of its characteristics.

## Methods

We used Walker and Avant's (2005) approach to concept analysis, which is commonly used by nursing and health researchers (20). In this approach, complex concepts are broken down into the basic elements and their internal construction is revealed (18,19). There are eight iterative steps to the method including: Selecting a concept, Determining the purposes of analysis, Identifying all uses of the concept, Determining the defining attributes, Identifying a model case, Identifying additional cases, Identifying antecedents and consequences, and Defining empirical referents (19). This approach is primarily focused on a literature review to clarify the concepts (18,19).

In this study the review was started on September 2010. The various combinations of 16 words; Knowledge, research, evi-

dence, translation, transfer, broker, exchange, diffusion, utilization, mobilization, dissemination, integration, uptake, implementation, action, and practice; formed our search terms.

The search terms were applied to a search of the title, abstract and keywords of the papers published since 2000 and indexed in international databases (Medline, Embase, Scopus, Web of Science, Ebsco and CINAHAL), local resources (Iranmedex, SID, Magiran and Irandoc) and the websites of relevant organizations like CIHR. In addition, we searched the reference lists of the selected papers.

Based on inclusion criteria, papers were: i) from health, medicine, and nursing field; ii) in English or Persian (Farsi) language; iii) the product of quantitative, qualitative or mixed method studies; iv) peer-reviewed articles and the report of relevant organizations.

After removing the duplicate papers, a total of 11,146 references remained. These were further reduced to 269 papers through screening the papers for relevance in three steps: title screening, abstract screening, and full text screening. Eligible papers were read in depth, and coded. This stage started through a purposive sampling, beginning with well-known author's papers on KT. A thematic analysis was conducted to identify attributes, antecedents and consequences of KT (steps 4- 7). Reading and coding was carried out and saturation was achieved after reviewing 112 papers (The point at which no new codes emerged). The extracted codes were merged separately and the attributes, antecedents, and consequences of the KT were defined subsequently. Identified attributes were considered when defining cases (steps 5, 6) and establishing empirical referents of KT (step 8).

### *Step 1: selection of a concept*

We selected KT because it has become one of the most common concerns in health related fields while there is some degree of confusion and inconsistency around its def-

inition (1, 3, 5, 6, 9, 21-25).

### **Step 2: The purpose of analysis**

This study is the first stage of a larger study conducted to develop a model of KT for clinical setting. Since, the first step in designing a model is highlighting the structural features and underpinning knowledge about the concept of interest (26), we began with identifying the characteristics of KT through the concept analysis.

## **Results**

### **Step 3: Identifying all uses of the concept**

KT refers to any process that contributes to integration of evidence-based information into the practices of health professionals to improve the healthcare outcomes and maximize the potential of the healthcare system (1,6). This term is also used in other fields (9) such as geography (27), social work (28,29), and education, particularly relating to medical or health education (30,31).

The CIHR's definition of KT is the most cited definition (7,32): "A dynamic and iterative process that includes the synthesis, dissemination, exchange and ethically sound application of knowledge to improve health, provide more effective health services and products, and strengthen the health care system" (24).

According to the CIHR, there are two different types of knowledge translation: End of Grant and Integrated (24). In the former approach, researchers design a plan for disseminating and transferring their research findings such as presentation in seminars or publishing in peer-reviewed journals. They also use the summary of findings for stakeholders; interactive meeting with patients, practitioners, and/or policymakers; media and knowledge brokers (24,33). However, in the integrated approach, stakeholders or potential users of knowledge are involved in the research process, from defining the research question to interpretation and implementation of the findings (33,34).

### **Step 4: Identifying the defining attributes**

Defining attributes are characteristics that are used repeatedly in the literature to define or describe the concept and help to differentiate the concept of interest from similar concepts (19). Among the defining attributes of KT extracted from the literature "*Being process*" was the most frequent.

In much of the reviewed literature, KT has been conceptualized as a process that commences with creating and converting knowledge to an applicable package. Then, through a set of strategies and activities, it is applied to inform the practice of health care practitioners and policymakers and ultimately improves health outcomes. It means this process includes some essential elements; knowledge, activities [applied strategies during the process], output and the context in which the process occurs. The defining attributes of these elements have been given below [Italicized items]:

**4.1. Refined knowledge as an essential element of KT process:** Based on literature, knowledge is the main element of the KT process which originates from research and non-research sources. This knowledge may be new or previously available, but unknown or not utilized (19). According to the literature, defining attributes of the knowledge are "*relevant, meaningful, robust, mature* (supported by a body of knowledge), *tailored, timely* and *applicable*" (Table 1).

KT evolved to provide health professionals and policymakers with a relevant and easy to understand body of knowledge. During this process, knowledge, skills and experience of users is combined with context knowledge and health research findings. This integrated knowledge is evaluated for validity and robustness and translated to a simple and meaningful message which has been adjusted with user's needs and context.

Considering the users' needs along with involving them into the KT process will increase the possibility of access to the

knowledge in real time.

Since during the KT process, the prepared knowledge is evaluated, simplified and converted to a "ready package" to use in practice, it can be said that the critical attribute of this knowledge, is being refined.

#### 4.2. *KT process as a challenging activity:*

In KT process, activities mean all strategies and actions conducted to implement knowledge into action. The literature review identified seven defining attributes of these activities: being *dynamic, evaluation-based, user-oriented, context-based, purposeful/ planned, comprehensive, complex, multi-dimensional, ongoing/iterative, lengthy and ethical* (Table 1).

KT is a dynamic process involving a permanent interaction with the context and users. To preserve the dynamism, ongoing evaluation of current and finalized activities and getting feedback from the context is required. Since each context has its own unique features with particular facilitators or inhibitors, applying strategy and content consistent with context is essential.

Moreover, continuous interaction with potential users and setting the activities based on their needs is critical because different groups of people participate in the process. These groups include knowledge producers, knowledge facilitators, and knowledge users from different levels such as patients, health care practitioners, managers, decision makers, and policymakers.

Applying a unique strategy, facilitating interaction among groups, and convincing them to practice and make a decision based on the evidence on the one hand, and continuous evaluation to support the sustainability of located changes and desired outcomes on the other hand make the process *challenging*. In this way, keeping the process congruent with legal frameworks, ethical principles and social norms and values is critical too.

**4.3. *Efficient change as the output of KT process:*** Change in target groups and systems are the most cited output of KT pro-

cess in the literature. This change can occur in quality of clinical practice and policy making.

The defining attributes of the output (change) are: *cost-effective, clinically effective, and on-time* (Table 1). In fact, these attributes show the capacity of KT process to create effective and ethical changes in clinical setting without wasting resources and time.

It means that KT process causes *efficient changes*, because it can improve health outcome, reduce the adverse effects of care and the length of stay at hospital, and finally decrease the financial burden on patients, health system, and community.

**4.4. *Participatory context in which the process occurs:*** Context is an environment in which healthcare practice occurs and evidence is implemented to influence and change the individual's practice (35-37). According to the literature, defining attributes of context in which the process occurs include "*being social, interactive, dialogue-based, multidisciplinary and collaborative*" (Table 1).

The Health care system is a social setting and implementing knowledge in it needs a relationship-based approach. KT is a social process intending to facilitate the exchange of knowledge and understanding between researchers and practitioners/ policymakers at individual or organizational levels. It takes place in a complex context of interaction between knowledge users and producers. Regular meetings and open discussion not only facilitates the sharing of the knowledge and experiences but helps to build a trust-based relationship. Having an ongoing relation provides practitioners with a real-time access to evidence and ensures researchers that the generated knowledge is relevant and applicable.

In this interconnected network, people from different disciplines with different levels of thinking collaborate. They participate in all steps of the process from knowledge production to knowledge application. Based on intended impact, they can

Table 1. Attributes of knowledge translation

	Main Theme	Subthemes and sources
Process	Refined knowledge	Relevant [34, 35, 37, 42, 58-60] Meaningful [49, 51, 58, 61, 62] Robust [14, 22, 25, 37, 42, 48, 57, 61, 63, 64] Mature [4, 13, 25, 34, 37, 42, 44, 64] Tailored [9, 33, 37, 42, 44, 45, 60, 65, 66] Timely [49, 67-70] Applicable [25, 44, 48, 58, 66, 68, 71]
		Dynamic [3, 4, 6, 9, 11, 22, 35, 43, 48, 49, 63, 69, 72, 73] Evaluation- Based [21, 23, 35, 37, 48, 51, 60, 63, 74, 75] User- Oriented [1, 4, 7, 9, 22, 48, 49, 57, 58, 60, 61, 63, 66, 67, 74] Context- Based [7, 9, 35, 37, 46, 48, 49, 63, 66, 74-79] Purposeful/ Planned [3, 9, 21, 55, 56, 58, 59, 63, 70] Comprehensive[1, 4, 7, 9, 15, 16, 21, 22, 40, 43, 53, 57, 59, 73, 74, 76, 79-81] Complex [15, 22, 35, 37, 43, 46, 58, 63, 74, 81-85] Ongoing/Iterative [9, 17, 35, 49, 83] Ethical [3, 11, 24, 59, 60, 64, 86] Multidimensional [17, 22, 37, 42, 43, 49, 77, 87-90] Lengthy: [3, 32, 48, 68, 77, 91]
	Activities: Challenging	Out Put: Cost Effective [4, 55, 60, 64, 68, 69, 73, 92] Efficient Clinically Effective [1, 9, 14, 17, 22, 46, 55, 57, 60, 63, 76, 82, 93, 94] change On -Time [49, 55, 67, 94]
		Social [5, 13, 21, 35, 40, 46, 49, 53, 59, 66, 73, 75, 95, 96] Interactive [5, 9, 13, 17, 37, 43, 46, 49, 53, 59, 66, 79, 97] Dialogue- Based [22, 35, 49, 59, 68, 89, 90, 98-101] Participatory Multidisciplinary [1, 9, 22, 43, 51, 85] Collaborative [4, 9, 12, 39, 43, 45, 46, 49, 58, 59, 74, 79, 93, 97]

be a specialist in informatics, patient education, organizational learning, social marketing, continuous quality improvement, and other related disciplines. Then it can be concluded that *KT occurs in a participatory context*.

#### Step 5: Identifying model case

A model case is a pragmatic example of the concept which includes all defining attributes of the concept. It can be a real instance, retrieved from the literature or constructed by analyst (18, 19, 38). We introduce a real case with all defining attributes of KT process. It is a *collaborative project* between the University of Adelaide, School of Nursing and the Royal Adelaide Hospital in South Australia, The prevention and reduction of weight loss in acute care patients [PROWL] (39). This case has all defining attributes of KT.

#### Step 6: Identifying additional cases

Introducing additional cases, borderline, related and contrary, is another way to gain deeper insight about the concept. They may provide examples of what the concept is

not and help us to differentiate that from related or similar concepts (18, 19). We shaped the scenarios based on the authors' experiences (Fig. 1).

#### Step 7: Identifying Antecedents and Consequences

Identifying antecedents and consequences are important steps in the analysis of a concept because they can refine the concept's attributes and highlight the common social context of applying the concept (19).

**7.1. Antecedents:** Antecedents are those events and circumstances which happen before occurrence of the concept and may be associated with the occurrence or necessary condition for its occurrence (19,38). Following thematic analysis of the literature, three key themes were identified as antecedents of KT process: *an integrated source of knowledge, a receptive context, and preparedness* (Table 2). It means that prior to attempt to implement knowledge to action, providing a body of knowledge, having receptive context and preparing the requirements are necessary. It may also



**Borderline case:** A group of clinical researchers specified the problem of weight loss in acute care patients and conducted a systematic review to find an effective intervention to prevent and reduce the incidence of the problem. The findings of the study were published in a peer-reviewed journal. One issue of the journal was sent to acute care hospitals. The hospital directors of nursing sent a copy of the article to the related wards for studying and using the findings in care of patients.

**Related case:** A study was undertaken on the effectiveness of a multidimensional intervention to prevent and reduce the weight loss in acute care patients by a Non-English researcher. After analyzing the data and concluding the results, findings were translated and published in an English peer-reviewed journal.

**Contrary case:** The director of nursing informed the hospital executive of increased risk of weight loss and decline in nutritional status of hospitalized elder patients. A response from the executive arrives in the form of a memorandum one day later. On that letter, the nursing staffs were advised to pay attention to nutritional status of patients and implement some dictated strategies to address the problem. The director of nursing forwarded the memorandum to the wards for studying and using the findings in care of patients.

Fig. 1. Additional cases

mean that the success of the process is significantly related to the occurrence of these conditions.

#### 7.1.1. The integrated source of knowledge: Integrated source of knowledge

indicates applying a combination of four knowledge sources: *explicit knowledge (mainly research), practice, context, patients/clients* (Table 2). It means that the knowledge used in the KT process should be provided from these different sources.

Table 2. Antecedences of knowledge translation

	Main Theme	Subthemes and sources
Integrated Source Of Knowledge	Explicit knowledge	Research findings (qualitative, quantitative)[4, 5, 21, 24, 25, 35-37, 44, 49, 56, 63, 70, 75, 79, 85, 88, 89, 96, 102, 103] Scientific knowledge [4, 10, 21, 23, 45, 46, 82, 97] Other disciplines [4, 10, 21, 23, 45, 46, 82, 97]
	Implicit knowledge	
	Practice	Professional knowledge and preferences[10, 21, 25, 33, 35, 37, 42, 49, 59, 73, 75, 82, 85, 88-90, 104] Decision/policy makers' knowledge[10, 17, 24, 25, 33, 49, 61, 86, 93]
	Context	local knowledge[10, 25, 35-37, 42, 56, 75, 85, 90, 94] Contextual Scientific knowledge[21, 94]
	Patient/client	Patient knowledge/exp.[35, 37, 42, 90, 104] Patient preference/choice[25, 35, 37, 42, 70, 75, 85, 89, 90, 94] Patients values[42, 105]
Receptive Context	Collaborative Atmosphere	Networking [17, 37, 58, 68, 75, 84, 98, 106] User engagement [9, 17, 24, 25, 34, 36, 40, 45, 49, 56, 60, 66, 71, 74, 86, 89, 97, 105, 107] Peer- Group Support [46, 48, 59, 62, 69, 98, 108, 109] Other Disciplines Support [14, 37, 46, 59, 62, 68, 75, 96] Interactive Relationship [6, 13, 15, 17, 22, 35, 37, 40, 46, 51, 53, 58, 59, 61, 62, 66, 67, 73, 75, 85, 86, 91, 95, 96, 100, 101, 104, 110, 111] Dialogue [40, 90, 91, 98, 103] Partnership [21, 25, 35-37, 43, 56, 59, 63, 67, 68, 75, 79, 85, 89-91, 95, 97, 101, 103, 109-114] Early and ongoing contact [6, 21, 25, 37, 40, 67, 86, 91, 95, 98, 110, 115]
	Change Acceptance	Motivation[8, 14, 37, 51, 75, 101, 103, 108, 116] Incentive/ reinforcement [17, 37, 75, 90, 98, 103] Positive Attitude [36, 37, 68, 75, 91, 96, 98, 102, 103, 106] Supportive context [29, 35-37, 56, 75, 85] Positive culture[36, 37, 56, 75, 91, 106, 108] Research based thinking [14, 51, 78, 101, 109, 117] Community/ social acceptance[17, 80, 86] Consistent With Values And Beliefs [14, 37, 48, 67, 69, 70, 75, 91, 96, 98, 110] Common language [68, 91, 103] Trust [6, 14, 17, 37, 50, 51, 59, 67, 75, 82, 86, 91, 96, 102, 103]

Table 2. Antecedences of knowledge translation (continued)

Receptive Context	Supportive Leadership	Positive Organizational Culture [25, 35-37, 44, 46, 48, 49, 67, 73-75, 85, 86, 91, 95, 96, 98, 100-102, 104, 106, 108, 116, 118] Learning organization [35, 90, 98, 102, 103, 106] Managerial Support [35, 37, 46, 49, 56, 62, 75, 85, 96, 98, 100, 101, 103, 104, 106, 108, 109, 118] Legal/ political support [14, 16, 17, 25, 40, 44, 48, 51, 74, 86, 100, 101, 103, 118] Authority To Change [15, 16, 22, 49, 62, 67, 75, 86, 89, 100, 104-106, 108, 109, 114]
	Evaluation System	Users' Identification [36, 49, 51, 78, 79, 86, 103] Ongoing Monitoring [25, 35, 37, 56, 58, 75, 85, 90, 98, 102, 103, 105, 119] Barriers and Facilitators' Assessment [22, 23, 25, 35-37, 46, 48, 51, 56, 67, 74, 75, 81, 104, 119] Need Assessment [16, 25, 35-37, 46, 49, 51, 56, 57, 67, 73, 75, 81, 101, 103, 120]
Preparedness	Designing a plan	Thoughtful Plan [67, 95, 101, 103, 116] Proper Intervention [17, 56, 74, 89, 95, 103, 104] Collaborative strategy [4, 23, 34, 44, 58, 60, 121] Comprehensive Approach [35, 58, 72, 78, 118, 121]
	Preparing infrastructures	Human Resources [48, 51, 53, 101] Time[53, 62, 83, 100, 106, 108, 109, 120] Budget [6, 8, 9, 21, 40, 48, 49, 51, 60, 71, 78, 83, 86, 103, 108] Modification in structures [36, 56, 85] Educational facilities [4, 17, 24, 31, 33, 45, 60, 63, 101, 120, 122, 123] Facilitation Access Audiences[6, 49, 51, 58, 59, 61, 62, 66, 68, 93, 95, 103, 123, 124] Facilitating Access To evidence [17, 37, 51, 55, 62, 75, 91, 96, 98, 101-103, 108]
	Capacity Building	Training [17, 42, 68, 83, 90, 91, 98, 102, 103, 105, 108] Awareness [12, 14, 17, 51, 78, 85, 90, 105-107, 109] Opportunity to experience [39, 69, 78]
	Engaging facilitators	Researchers/ academic staff [35, 68, 86, 98] Opinion Leaders/champions [15, 17, 35, 51, 89] Experts[10, 35, 49, 51, 68, 98] Change agents [37, 56, 89, 98, 99] Brokers[17, 68, 93, 95, 98, 99]

There are several reasons which confirm that using multiple sources of knowledge to address the health system issues increases the chance of implementing knowledge to practice. First, the complicated nature of health care system issues requires the use of a rich and mature source of knowledge to cover all aspects of issues. Second, studies revealed that health practitioners and policy makers have no interest to use pure research findings and tend to use contextual knowledge. Finally the integration of different resource of knowledge will compensate for the shortcoming of using a single resource.

**7.1.2. Receptive context:** A receptive context has been developed based on the integration of four subthemes: *conductive culture, supportive leadership and evaluation system* (Table 2) and refers to an environment which has enough readiness and will-

ingness to change .

According to the literature, any change in health care system requires a comprehensive involvement of the organization in terms of conductive culture, using supportive leadership styles and effective evaluation system. In addition, practitioners should have a strong tendency to change, accept the necessity of that change, and work as a team to establish it.

Developing a collaboration network in health system including key individuals with different type of skills, experience and knowledge i.e. managers, physicians and other clinicians, promotes the system potential to induce the change. Moreover, peers and other staff support can be a force to persuade decision makers to adopt the change.

Furthermore, authority and lack of concern about ethical and legal issues play a critical role in occurrence of knowledge-

based change in professional behavior. The most frequent cited strategy in the literature for these issues is organizational support. Supportive organizations are going to accept and facilitate the change by valuing and acknowledging people's ideas and behaviors. Meanwhile, managers/leaders play a significant role in transforming organizations to a receptive one by following a supportive and responsive manner of leadership. It gives the staff power and authority to change and encourages them to be creative and do the things in a different way.

In addition, establishing an evaluation system to identify the contextual barriers and facilitators before starting the activities and giving an on-going feedback during the process are other effective factors that increase the probability of success and sustainability of outcomes. Review of the literature showed that interventions that are based on an on-going evaluation and feedback are more successful than others.

**7.1.3. Preparedness:** Preparedness means arranging necessary elements [individual and organizational] and requirements and readiness for commencing the KT process. In this study, preparedness means *designing a plan, preparing infrastructures, building capacity and engaging facilitators* (Table 2).

Access to the change-based outcomes will not be attained without purposeful efforts for persuading users to apply evidence into their practice and policy making. Based on studies, success in implementing knowledge into practice depends on access to appropriate infrastructures. These include well-equipped libraries and data-banks, and designed structures to facilitate interaction between knowledge producers and users such as research centers in clinical settings, incubator centers, science and technology parks, and community-based research centers. In addition, allocating an inclusive budget, assigning a specific time in work places for research activities, reading and interpreting relevant research findings and engaging a number of expert peo-

ple in clinical setting to train practitioners can facilitate implementing new knowledge or ideas in daily practice.

Enabling practitioners in conducting research or evaluating research findings and applying evidence in their own decisions and practices are of the important prerequisites of success that will be implemented by engaging facilitators.

According to the literature, facilitators are expert people with specific skills and defined tasks and roles to enable individual and organizations about understanding the context, specify the needed knowledge, prepare the infrastructures, and then try to make a change. They can facilitate the exchange of knowledge between researchers and practitioners. Researchers and academic individuals, expert people [managers, decision makers, clinical instructors and specialists and health system practitioners], brokers, opinion leaders, champions and change agents can undertake the role of facilitator.

**7.2. Consequences:** Consequences are those events which take place as the outcomes or results of concept occurrence (18, 19).

### **Health improvement**

As the review shows, a change in quality of care, professional practice, health care systems, and community are the main outcomes of the KT process as identified in the literature (Table 3).

Undoubtedly, KT is the most comprehensive approach to applying knowledge to action because it addresses all influential fields on health. KT attempts to promote the health professions by growing the awareness and professional behavior of practitioners, and tries to improve the quality of care and patient outcomes by integrating knowledge into caring. In addition, it plans to improve the health System through improving the organizational efficacy and informing policies and decisions. Ultimately, at community level, a successful KT process can cause a facilitated access to



Table 3. Consequences of knowledge translation

	Main Theme	Subthemes and sources
Health Improvement	Change in Patient Care	Improve Clients/Patient Out Come [3, 22, 111]
		Improve Health Outcome [1, 5, 55, 68, 80, 92]
		Improve Quality Of Care [5, 11, 13, 14, 33, 37, 47, 68, 69, 73]
		Preventing Negative Outcomes For Clients [13, 14, 60, 73, 92]
	Change in Practice	Change Professional Practice/Behavior [1, 4, 9, 32, 46, 58, 61, 63, 94, 123, 125]
		Strengthen The Discipline /Profession [14, 101, 108]
		Encouraging Team Working [4, 8, 35-37, 56, 75, 85, 89, 93]
		Research/ Evidence Based Practice [1, 11-14, 22, 33, 46, 55, 61, 63, 79, 111, 123]
	Change in Health System	Informed Decision Making [4, 47, 57, 61]
		Strengthening The Health System [6, 9, 11, 14, 22, 33]
		Improve Health System Efficacy [5, 9, 13, 22, 55]
		Informed Policy Making [6, 12, 23, 60, 61, 76, 93, 113]
	Change in Community	Improve Equity [48, 73, 74, 82, 86]
		Improve Quality Of Life [3, 14, 22, 25, 35, 48, 57]
		Reduce Poverty [48, 74, 78]
		Return Investment [15, 48, 57, 68, 82, 86, 92, 111]
		Reduce Cost [37, 48, 65, 69, 73, 74, 92, 103]
		Resource Management [5, 69, 74]
		Improve Public Health [1, 13, 21, 22, 48, 59, 60, 74]

health services, cost reduction, equity in resource allocation, poverty reduction, and improvement in quality of life. In fact the final consequence of all these changes is health improvement.

Based on identified attributes, antecedents, and consequences we proposed a synthesized definition of KT that is described below.

*“KT is a process in which through a set of challenging activities a body of knowledge is refined and implemented in a participatory context and led to efficient changes in quality of patient care, professional practice, healthcare system and community. Expected changes will happen when the knowledge is gathered from multiple resources, the context is receptive, and the system is prepared.”*

#### Step 8: Defining Empirical Referents

Empirical referents are indicators that show the occurrence of the concept by their existence (19, 38). In fact defining attributes of the concepts of interest can play the role of empirical referents to show occurrence of them. In our study, “being process”, “using refined knowledge”, “applying challenging activities”, and “producing efficient change”, have been defined as empirical referents of the KT. These indicators can be used to develop checklist or

tools which would be able to show the occurrence of the KT process.

#### Discussion

Based on the findings, the defining attributes of KT are: using refined knowledge; applying dynamic, comprehensive, evaluation based, user- oriented, context based and on-time activities; occurrence in a multidisciplinary, social, interactive, collaborative and dialogue- based context; and leading to cost effective, timely and clinically effective output. These defining attributes help us to differentiate KT from similar concepts. Although several terms are used interchangeably to address getting knowledge into action and have some overlaps and similarities with KT, there are some important differences between them.

First, many of the concepts related to moving knowledge to action focus on production or application of the knowledge and the main source of knowledge in these approaches is scientific knowledge or research findings (5, 9, 40), while KT process not only covers all steps between creation and application of the knowledge but uses various research and non-research sources (5, 25, 41, 42). In addition, the KT process begins with knowledge creation and then the knowledge is integrated, refined and converted to a package consistent with con-

text characteristics and user's needs (13, 33, 36, 43, 44) while in most approaches like knowledge transfer, activities are started after delivering the scientific knowledge and it is shifted to audiences without any changes (43, 45).

Second, KT is an all-inclusive process involving knowledge producers, knowledge users and context or organization in which the knowledge is applied (9, 22, 36), while other concepts such as evidence based practice and knowledge diffusion are focused on just one or two of these issues (5, 33, 46). Furthermore, the extent of activities and diversity of audiences in the KT process make it more comprehensive than others (4, 9, 33, 43). KT has an overarching structure encompassing other concepts so that, many of them like continuing medical education and continuing professional development can be considered as a strategy used during the process (1, 22, 46, 47).

Third, successful KT depends on the engagement of knowledge users and the application of knowledge to inform health decisions. Specific focus of KT on interaction, users' engagement, improving health outcomes and using knowledge not only differentiates that from other similar concepts, but these criteria can be used as an indicators of the process (9).

The fourth attribute of KT which makes it stand out from similar concepts is related to the manner by which the knowledge is transferred and the level of users' involvement. KT intends to bridge the gap between knowing and doing by applying a dynamic approach, ongoing interaction with users and involving a multidisciplinary team consists of all stakeholders (1, 9, 13, 24, 48) while, in most approaches, applying a linear, inactive and one-sided method without involving the users (5, 49) is prominent. Studies show that the one-way relations and passive flow of information are responsible for the lack of change or minimal variation in practitioners' practice (50, 51).

Fifth, KT is an evaluation-based process. It means the whole process is influenced by evaluation. It is started before commencing

the process to identify the contexts barriers and facilitators, followed by evaluating the validity and relevance of the knowledge. The next step is continuous monitoring of the activities, evaluating the outcomes and the sustainability of occurred changes by taking ongoing feedback from the context and users. These steps are repeated in each cycle of iterative process of KT. This attribute is not seen in other approaches (2, 52-54).

Sixth, KT is a process focused primarily on health and is able to improve health outcomes and system competencies. In addition, the final outcome of that is cost effective because it is related to individuals' health outcomes, based on the best available knowledge; and consistent with the user's needs, characteristics of context and available resources (1, 5, 6, 22, 24, 55). In fact, it aims to achieve the greatest possible benefits along with saving the time and resources.

KT is a multidimensional and complex process needing various antecedents to happen successfully including; an integrated source of knowledge, a receptive context, and preparedness. Based on literature, providing these antecedents as a rigid guideline will not be successful because the effectiveness of applied strategies varies in different contexts (46, 56). It is recommended to apply the strategies which are more in line with context characteristics and desired change and combine those to address different aspects of the system (5, 35, 46, 57).

According to the results, if all mentioned antecedents are provided and KT process run successfully, it will lead to a set of positive changes and consequences in different fields of the health: in quality of patient care, professional practice, health system, and community. In fact, change in community as a macro consequence of successful KT is the outcome of sustained changes in other fields. This shows that unlike other concepts of getting knowledge to practice, KT influences all related fields of health: individual, system, and community.

The final result of this study was a synthesized definition of KT. Although there are several definitions of KT (22), our definition is different from previous definition in some ways. For instance, it explicitly refers to the attributes, antecedents, and consequences of the process and then it is applicable for those who intend to evaluate the process. In fact, it is an operational definition for KT. It has been constructed based on the literature in health, medicine and nursing and therefore, has a broader view and applicability for all these disciplines.

The most important difference between our definition and others is related to the source of knowledge. In previous definitions, research findings, mainly, randomized controlled trials were considered as only valid source of knowledge, while the review of the literature show that the best knowledge to be implemented in practice is that has been obtained from multiple sources. In fact, an integrated source of knowledge consist of research findings, practitioners' experience and skill, patients' preference and context knowledge, is necessary to address the complex issues of health system.

Now by achieving clear understanding about characteristics and antecedents of KT we are able to design a theoretical framework for health care setting. To test the framework, the identified consequences and defined empirical referents would be helpful.

## Conclusion

KT is a process in which through a set of challenging activities a body of knowledge is refined and implemented into a participatory context. It needs a set of antecedents which are elements that relate to the nature of the knowledge, all of the factors that relate to where that knowledge is going to be implemented and then they relate to how it will be done. If all of those are prepared, its consequence is change in four fields: individual experience of the patient, the way practitioners' practice, the system and if

these changes are to be sustained there will be change issues around equity, resource management, and cost. These are the broader impact of knowledge translation process in community.

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## Conflict of interests

The authors declare that they have no conflict of interests.

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