Université de Montréal

Barriers of Evidence Based Policy Making in Iran's Health System

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Sommaire

La formation des sociétés fondées sur la connaissance, le progrès de la technologie de communications et un meilleur échange d'informations au niveau mondial permet une meilleure utilisation des connaissances produites lors des décisions prises dans le système de santé. Dans des pays en voie de développement, quelques études sont menées sur des obstacles qui empêchent la prise des décisions fondées sur des preuves (PDFDP) alors que des études similaires dans le monde développé sont vraiment rares.

L'Iran est le pays qui a connu la plus forte croissance dans les publications scientifiques au cours de ces dernières années, mais la question qui se pose est la suivante : quels sont les obstacles qui empêchent l'utilisation de ces connaissances de même que celle des données mondiales? Cette étude embrasse trois articles consécutifs. Le but du premier article a été de trouver un modèle pour évaluer l'état de l'utilisation des connaissances dans ces circonstances en Iran à l'aide d'un examen vaste et systématique des sources suivie par une étude qualitative basée sur la méthode de la Grounded Theory. Ensuite au cours du deuxième et troisième article, les obstacles aux décisions fondées sur des preuves en Iran, sont étudiés en interrogeant les directeurs, les décideurs du secteur de la santé et les chercheurs qui travaillent à produire des preuves scientifiques pour la PDFDP en Iran.

Après avoir examiné les modèles disponibles existants et la réalisation d'une étude les deux autres articles qui évaluent les obstacles à «pull» et «push» pour des PDFDP dans le pays.

En Iran, en tant que pays en développement, les problèmes se situent dans toutes les étapes du processus de production, de partage et d'utilisation de la preuve dans la prise de décision du système de santé. Les obstacles qui existent à la prise de décision fondée sur des preuves sont divers et cela aux différents niveaux; les solutions multi-dimensionnelles sont nécessaires pour renforcer l'impact de preuves scientifiques sur les prises de décision. Ces solutions devraient entraîner des changements dans la culture et le milieu de la prise de décision afin de valoriser la prise de décisions fondées sur des preuves. Les critères de sélection des gestionnaires et leur nomination inappropriée ainsi que leurs remplaçants rapides et les différences de paiement dans les secteurs public et privé peuvent affaiblir la PDFDP de deux façons : d'une part en influant sur la motivation des décideurs et d'autre part en détruisant la continuité du programme. De même, tandis que la sélection et le remplacement des chercheurs n'est pas comme ceux des gestionnaires, il n'y a aucun critère pour encourager ces deux groupes à soutenir le processus décisionnel fondés sur des preuves dans le secteur de la santé et les changements ultérieurs. La sélection et la promotion des décideurs politiques devraient être basées sur leur performance en matière de la PDFDP et les efforts des universitaires doivent être comptés lors de leurs promotions personnelles et celles du rang de leur institution.

Les attitudes et les capacités des décideurs et des chercheurs devraient être encouragés en leur donnant assez de pouvoir et d'habiliter dans les différentes étapes du cycle de décision. Cette étude a révélé que les gestionnaires n'ont pas suffisamment accès à la fois aux preuves nationales et internationales.

Réduire l'écart qui sépare les chercheurs des décideurs est une étape cruciale qui doit être réalisée en favorisant la communication réciproque. Cette question est très importante étant donné que l'utilisation des connaissances ne peut être renforcée que par l'étroite collaboration entre les décideurs politiques et le secteur de la recherche. Dans ce but des programmes à long terme doivent être conçus ; la création des réseaux de chercheurs et de décideurs pour le choix du sujet de recherche, le classement des priorités, et le fait de renforcer la confiance réciproque entre les chercheurs et les décideurs politiques semblent être efficace.

Summary

The establishment of knowledge based societies, the advancements of communication technologies and the better exchange of information at global level allows better utilization of produced knowledge in the health system's decision makings. Some studies have been conducted on the barriers to development of evidence-based decision-making (EBDM) in developed countries, but similar studies in developing are very rare.

Iran is a country that has had the greatest growth in its scientific publications in recent years, but the question was what barriers are there to the utilization of this knowledge and also of global evidence. This study consists of three consecutive papers. The purpose of the first paper study was to find a model for assessing the status of knowledge utilization in Iran's circumstances through an extensive systematic review followed by a qualitative study of grounded theory nature. Then, in the second and third papers the barriers to evidence based decision making in Iran asked through the qualitative study on the health sector's directors and policy makers and also the researchers working to produce scientific evidence for EBDM.

Upon reviewing the available existing models and conducting a qualitative study the first paper came out entitled 'Design of a Knowledge Translation Model' as the framework of two other papers that assess the push and pull side barriers of EBDM in Iran.

As a developing country, in Iran the problems lie in all the stages of the process of producing, sharing and using evidence in health system decision making. There are various barriers to evidence-based decision making at different levels,

and multi-dimensional solutions are required to strengthen the impact of scientific evidence on decision makings. These solutions should result in changes in culture and the decision making environment's value system for the purpose of valuing evidence-based decision making. Unsuitable selection and appointment criteria of managers, their rapid replacements and payment differences in public and private sectors can weaken EBDM through two channels, one is through affecting decision makers' incentives and the other is by destroying program continuity. In the similar situation, while selection and replacement of researchers is not same as the managers, there is no criterion for encouraging them to support decision making in the health sector and subsequent changes. The selection and promotion of policy makers should be based on their performance regarding EBDM and the efforts of academicians for strengthening EBDM should be accounted in their personal promotion and institutional ranks.

The attitudes and capabilities of both decision makers and researchers should be promoted through their empowerment regarding different components of the decision making cycle. The study revealed that the managers do not have enough access to both domestic and international evidence.

Shortening the gap between researchers and decision makers is a crucial milestone which should be dealt through providing communications between the two sides. This issue is very crucial since the utilization of knowledge can be strengthened only with the close cooperation of policy makers and the research sector, and long-term programs need to be designed with this objective. Establishing networks for researchers and decision makers in choosing the

research topic, priority setting, and building trust among researchers and policy

makers seem effective.

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List of acronyms and abbreviations

CDSR: Cochrane Database of Systematic Reviews

CDMR: Cochrane Database of Methodology Reviews

CHSRF: Canadian Health Service Research Foundation

DARE: Database of Abstracts on Reviews of Effects

EBDM: Evidence Based Decision Making

FGD: Focus Group Discussion

HSR: Health Services Research

IRANDOC: Iranian Information and Documentation Center

KT: Knowledge Translation

MOHME: Ministry of Health and Medical Education

NIS: National Innovation System

R&D: Research and Development

SID: Scientific Information Database

TUMS: Tehran University of Medical Sciences

Introduction

After the Islamic revolution in 1979, significant measures have been taken to improve Iran's health care system. One of these measures was the integration of medical and health education into health services forming a new Ministry of Health and Medical Education (MOHME). Integration was done initially to increase medical admissions. There are 40 medical universities in the country which are responsible for the healthcare and management of 30 provinces (some big provinces like Tehran have more than one university). Each university has deputies of health (usually public health and curative affairs are separate), education, research, student affairs and logistic services. The same university is in charge of the health network.

The health research system is part and parcel of the National Innovation System (NIS). According to a study carried out on Iran NIS, the most significant weaknesses in the system have been identified as: lack of integrity between its components, lack of clarity in macro policies of science, unspecific priorities at the national level, and not taking intellectual properties into account. According to studies done less than ten percent of health research funds in Iran are provided by the private sector and the rest are provided publicly. This has led to defective research incentives and lack of appropriate use of capacities.

There are essential questions regarding barriers of evidence-informed decision making in Iran's health system. Considering the present structure of MOHME which gives an opportunity for researchers and policy-makers to have close collaboration, what are the barriers? These barriers could be seen from two sides of a coin. The first one is push side and the other is pull side of the knowledge cycle. As it will be presented in the forthcoming papers, the push side means those measures that should be treated by researchers and / or knowledge producers. On the other hand, the pull side is those are related to the decision-makers part of the knowledge cycle.

The main objective of this thesis is scrutinizing barriers of Evidence-Based Decision-Making (EBDM) according to two aforementioned categories of push and pull sides.

Literature review on the concepts of knowledge transfer and translation

Knowledge translation has been brought up in the past decade, but filling the gap between research and policy dates back to the mid-twentieth century. At that time, social scientists who tried to strengthen the utilization of research in policy making gradually focused on the process of decision making. On the other hand, decision makers too showed enthusiasm toward obtaining research based information. Carol Weiss was among the first to work on the subject. Her paper on research utilization is still fully referable [1].

Since then, many individuals and organizations have tried to define the original concepts of this subject. An overall review of the available matter shows that different individuals and organizations have named similar concepts differently.

The process of linking 'research' to 'action' has been mentioned in different texts under different terminologies such as 'knowledge utilization', 'knowledge dissemination', 'knowledge brokering', 'knowledge transfer' and 'knowledge exchange'. Although some use these words as equals there are differences among them that should be taken into account.

'Knowledge translation' and 'knowledge transfer' are clearly different from each other. 'Knowledge transfer' is a linear process in which the idea of 'research' is first created, then performed, and later on the results are handed over to the users. The unilateral nature of 'knowledge transfer' has been criticized. Recent studies have shown that such strategies cannot have a profound effect on strengthening acceptance and application of new research results. Acquiring knowledge by users alone does not guarantee its utilization [2]. Some believe that knowledge transfer methods in organizations can include researchers' replacements, education, observation, communications, technology transfer and/or products in the form of their technical knowledge transfer, action methods and instructions, scientific books and journals, interaction with customers, interaction with producers and all kinds of inter-organizational relations [3-5]

Generally speaking, the difference between 'knowledge transfer' and 'knowledge translation' comes from the notion that the passive dissemination of knowledge does not guarantee its active application. Lomas has studied passive dissemination and has concluded that practically such an approach will not result in a change in health service providers' performance [6].

In conformity with his opinion, Rich has also stated that neither the timeliness nor relativity of knowledge, nor the obvious/exact nature of the subject and its presentation to suitable consumers in a practical and usable form can guarantee its utilization [7].

Following the above challenges, 'knowledge translation' came to being, which guarantees mutual contact and interaction between researchers and knowledge users. In spite of the definitions presented below, at times 'knowledge transfer' and 'knowledge translation' are used interchangeably.

Argote and Ingram believe that 'knowledge transfer' is a process through which the experience gained by a group of individuals or sector of an organization influence other individuals or sector of that organization [3]. According to these researchers, and also Bröchner, the apparent effect of knowledge transfer is the change created in the level of awareness and performance of receivers/end-users, and this change can be considered as the assessment criteria of knowledge transfer [8].

Vito believes that knowledge transfer increases the organizations' ability to compete, and gives them the opportunity to coordinate themselves with changes and innovations more rapidly [4]. This researcher believes the knowledge transfer process has a functional nature and that it includes the stages of information attainment and awareness, dissemination of information, giving meaning to information, organizational memory and retrieval of information and awareness.

The Canadian Health Service Research Foundation (CHSRF) has presented a framework for knowledge transfer as a section of knowledge translation.

Knowledge transfer is a process that mobilizes information from the source to the research users [9]. It includes a series of activities as follows:

- Encouraging researchers and decision makers to cooperate in determining questions, needs and finding their answers
- Provision of resources (such as journals, workshops, sites)
- Setting up systems for dissemination of research results
- Encouraging the utilization of research results (evidence) for application in health services.

The Canadian Institute of Health Research believes that knowledge translation is the exchange, synthesis and application of research findings through a complex system of communications between researchers and knowledge users. In other words, knowledge translation hastens the 'knowledge cycle' for converting knowledge into action [9]. The knowledge cycle is shown in figure 1. Here knowledge translation is present in six points of the cycle. This figure shows that knowledge translation is a collection of various activities present in the entire cycle.

In complementing the Canadian Institute of Health Research's definition, Davis defines knowledge translation as the activities reducing the distance between evidence and function. These activities hasten the utilization of 'evidence-based knowledge' by people, patients, policy makers and physicians [10].

Lenfant believes that knowledge translation is a process that transfers knowledge from uselessness to action, and presents it to physicians and patients as relevant knowledge. In other words, knowledge translation is the application of what we already know [11].

Knowledge Translation (KT) within the Research Cycle
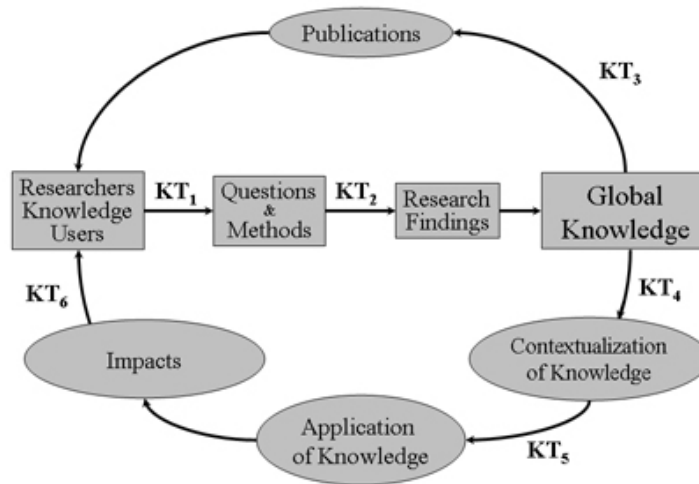
KT1: Defining research questions and methodologies;
KT2: Conducting research (as in the case of participatory research);
KT3: Publishing research findings in plain language and accessible formats;
KT4: Placing research findings into the context of other knowledge and socio-cultural norms;
KT5: Making decisions and taking action informed by research findings; and
KT6: Influencing subsequent rounds of research based on the impacts of knowledge use.

Fig. 1- the stages of research transfer in the knowledge translation cycle

Source: Adapted from Canadian Institute of Health Research (2006). About Knowledge Translation. http://www.cihr-irsc.gc.ca/e/29418.html [Last access: January 20, 2010].

There are various concepts of knowledge transfer in the field of nursing too. These include opinion leaders, facilitators, champions, and changing agents. There are no precise definitions of these concepts and at times they are used interchangeably in different papers. The only thing common among these conceptual frameworks is the timely access to relevant research that can result in change in performance and decision making. In conceptual frameworks opinion leaders and champions are in fact individuals responsible for creating person to person communications and discussions. However, in the conceptual frameworks of 'changing agents' and 'facilitators', more official interventions like trained and skilled individuals and organizations are responsible for the transfer [12].

Knowledge translation models

Different models have been put forth in the field of knowledge translation and transfer. These models differ with respect to their definitions and emphasis on various aspects, and most authors believe that because of the complex and lengthy nature of the knowledge transfer process, programmers should be highly aware, innovative and committed for selecting and utilizing each of these models [13, 14].

Even though for many decades different theories have been designed and presented for 'knowledge translation', it must be kept in mind that each theory and model can be used and referred to at a specific time and circumstance. Environments in the health sector have their own complexities, so recognizing the circumstances and conditions for selecting an appropriate theory for succeeding in knowledge transfer is very important [15].

This chapter presents the world's most important models of 'knowledge translation' in short. The relevant papers need to be studied if each model is to be examined in detail. Some of these models only have a theoretical framework, and their practical application and effects have not been explained by their authors. It is worth mentioning here that these model makers' perspectives have greatly helped the authors in designing a model for research organizations under the title 'Research-Based Knowledge Translation Model'.

Following are the main 'knowledge translation' models presented in the world:

The Weiss model and Hanney et al's model [1, 16]

Weiss and Hanney have mentioned common discussions on the methods and models of research utilization by decision makers [1, 16]. Weiss has offered a good guide on the various meanings of 'research utilization' and has defined it as the 'utilization of social science research in the public policy making domain'. Hanney's model is also on research utilization in policy making, therefore he has used similar concepts in his model.

From Weiss and Hanney's points of view, 'Research utilization in policy making' models can be classified into three main groups: rational models, incremental models and political models.

- **Rational models**

The rational models of policy making are based on this notion that policy makers identify problems, then collect and review data relevant to various possible solutions, examine the consequences of each of the solutions, and eventually choose a solution most suitable to their goals. Rational models include:

1- Knowledge-driven model

This model has many titles, including the classic/purist/knowledge-driven model.

In this model, research is described as a process of linear nature in which research directly results in knowledge production. In this model, research results are presented to the policy makers in the final stage and as the final product of research [1, 17].

Here the findings of new research ends up in new policies and applications and the existence of knowledge in itself is followed by its utilization.

2- Problem-solving model

In this model too, research is of linear nature, the difference being, that, here the individual or organization that should utilize the research results specifies the field of research it-self, and its goal is to find answers to existing problems in the policy making arena [16]. So the decision makers identify the problem, specify the research topic and ask the researcher to identify and evaluate the solutions. They therefore order the research and eventually the results will be for solving the same problems.

Porter et al believe that this model is more promising than current policies, because research is based on an existing problem in the policy arena [18].

- **Incremental models**

Policy making has long been known as a complex process. This process covers scientific knowledge and other multiple factors such as interests/concerns, values, and circumstances positioned inside organizations, and individual ambitions. The followers of this doctrine give more importance to interests/concerns in policy making. In other words, they will do the job through whatever way possible.

Incremental models include:

1- Interactive model

This model has also been addressed as the 'Social interaction model' in social debates. Here, instead of the linear movement from research to decisions, it is made up of a series of mutual communications between researcher and policy maker. This way ensures us that the two groups have become familiar with each other's circumstances and needs. In this model, researchers and policy makers have interaction at various stages of research, and each side can sense the other's difficulties. The main stages in which interaction should take place between researchers and policy makers are determination of priorities, ordering the research, and dissemination of research results [16].

2- Enlightening model

This model is addressed with other titles such as the 'Percolation' or 'Limestone' model. Here the research results are gradually entered into the policy domain [17]. Also, what are transferred are not the results of a specific research project, but the overall and resultant concepts and theoretical visions of multiple studies that can result in policy change[1]. Therefore, based on this

model, with the gradual 'seepage' of perspectives, theories, opinions and impressions, the possibility of a research being utilized is raised.

- **Political models**

1- Political models

In this model, policy makers take advantage of research for justifying or supporting their performance or opinions. Therefore, policy makers have already taken their stand with regards to the benefits and opinions, and utilization of research is merely for the purpose of supporting their own stance.

2- Tactical model

Research clients are in fact politicians who utilize research not because of its content, but because of being under pressure for taking a certain measure [19].

Therefore, in this model, research is utilized at a time when pressure is exerted for implementing a topic, and policy makers respond to the pressure by announcing that they've ordered the execution of a research study. In certain circumstances this model may be eyed pessimistically as a tactical move to delay decisions, but in many conditions the research procedure prepares a valuable ventilating atmosphere for the political system, and reduces the possibility of irrational policy makings.

Hanney et al's model [16, 20, 21]

Other than the 'methods and models of knowledge utilization by decision makers' Hanney et al have presented another model that is shown in figure 2.
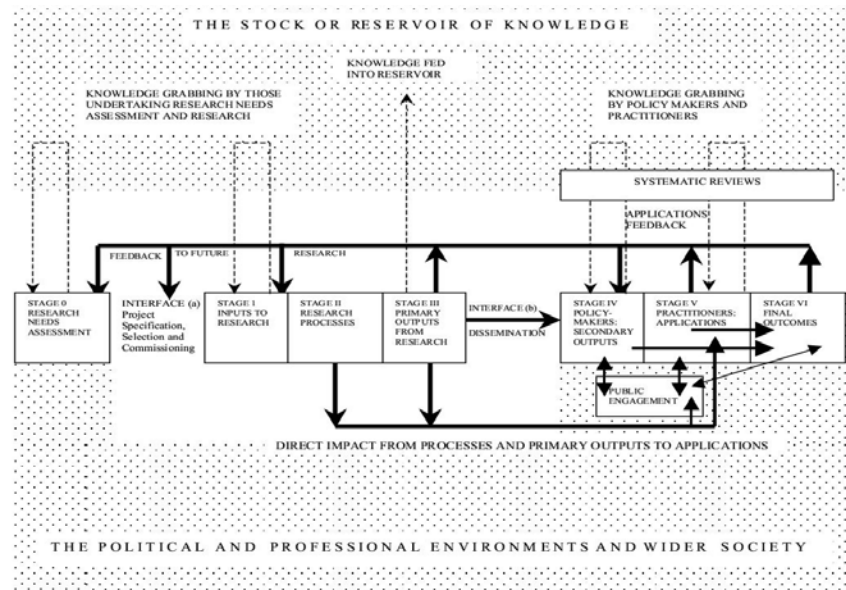
Fig. 2- Different stages of research production and transfer to the decision making arena

Source: Adapted from Hanney, S.R., Gonzales-Block, M.A., Buxton, M.J. and Kogan, M. (2003) «The Utilisation of Health Research in Policy-Making: Concepts, Examples and Methods of Assessment» Health Research Policy and Systems, 1:2.

In this model, the entry of research results to the management arena and their utilization in decision making consists of the following stages: the research system's input, the research process, the primary outcomes of research, the secondary outputs of research, application of research by individuals practically involved in the field and lastly the final outcomes.

This collection/set is often offered as a linear process (whose components occur one after the other), but can in fact involve feedback routes (chain-like), or in some cases some components must not be executed.

This model shows that primary outputs are publications and secondary outputs could be considered as research based policies. So policies are differentiated from primary outputs. Here all types of policy making and research models

intercept with each other. Therefore, knowing policy making and research models and their consistency with each other should be taken into consideration. Generally speaking, there is no accurate point in common between the main characteristics of policy making and research result utilization models and these two groups cannot be paired together.

Knowledge utilization models [1, 22, 23]

Some researchers have common perspectives toward the different models of 'knowledge utilization'. Here we discuss four main models. These four include the Science push model, Demand pull model, Dissemination model and the Interaction model.

1- Science push model

The basic assumption for this model is that the need of decision-makers will compel the use of research. The highly quality knowledge will be collected and used by them. This is basically the same as the knowledge driven model. Also, these aspects are important in determining the rate of utilization of any knowledge: 1) issues related to the content of research: complexity, observabiltiy or examination through testing trials, validity and applicability. 2) Type of research: such as basic and / or applied.

This model has two important drawbacks: 1) If a certain individual and / or an organization does not specifically take the responsibility of transferring knowledge, in many instances the knowledge will not be transferred. 2) The information resulting from research is raw in most cases, and is therefore not utilizable in policy making. These drawbacks led to the formation of the 'Demand pull model'.

2- Demand pull model

This model is actually the same as the 'problem-solving' model which we referred to before [1, 22, 24]. In this model too knowledge transfer is in essence

a linear process. The supporters of this model believe that knowledge utilization improves when and if research authorities contemplate on knowledge users' needs, rather than focusing on their own interests and curiosities. In these scientists view, the point that remains unnoticed/hidden is that in many instances even the findings of research that are applied for specific matters are in contrast to the respective organization, and are practically ignored and neglected.

On this basis, another demand pull model has been suggested that's been called 'organizational benefits'. Accordingly, the determinant factors of knowledge application in each organization are the internal regulations and norms of that organization. If the research results are in line with the organization's goals and interests, it will be applied by it too.

The drawbacks attributed to this model are: 1) it has a uni-dimensional perspective toward the university and sees it as a tool, and has neglected the fact that different types of knowledge have different applications. 2) It over-emphasizes the users' interests. 3) It has ignored interactions between researchers and knowledge users, which is an important factor in promoting the application of knowledge.

3- Dissemination model

This model is based on the principle that knowledge transfer is achieved mainly when it has a clear plan and structure (though knowledge transfer has occurred in the absence of a clear plan too). In this perspective, the determinants of knowledge utilization are the content and the efforts made for dissemination of the topic. The major drawback of this model lies in the fact that, practically, knowledge users are neither involved in choosing the knowledge transferred, not in its production.

4- Interaction model

This model was proposed to overcome the previous model's drawbacks and is founded on the principle that the application of knowledge is a set of nonsystematic/irregular and unplanned interactions between knowledge producers and users [22, 25, 26].

The previous models have considered knowledge transfer as an unilateral process between knowledge users and producers, and none have been practically efficient in strengthening knowledge transfer.

Even scientific journals haven't made much progress in this field, because their format and content are not synchronous with users' characteristics[27, 28]. In other words, simply receiving knowledge will not necessarily result in its application by the potential user. Generally speaking, the main factor preventing knowledge application is the absence of interactions between researchers and managers. In the interaction model, the determinant factors of knowledge utilization are: research outputs, users' organizational interests, efforts are made to disseminate knowledge and mechanisms are meant to create links between knowledge producers and users.

Some of the supporters of this theory believe that knowledge producers and users are two separate communities with different cultures and languages. These differences do not allow effective communications to develop and the result of such a condition is that knowledge is not applied the way it should be [7, 28-30].

Lavis et al's model-2006 [31]

In his paper, John Lavis has suggested a framework for assessing knowledge transfer at national level. He has suggested four main sections for this framework which includes public environment, knowledge production process, knowledge transfer facilitation models and assessment [31].

John Lavis has presented four different models for 'knowledge transfer facilitation models'. These models are very similar to the models previously discussed.

Figure 3 shows graphics for these four models. The first model is the 'Push effort model'. Here the result users do not know which message to focus on. The second model is the 'user efforts model' in which research users seek a quick response for their decision making. Here too, researchers and brokers participate in utilization of research results. Researchers and research users design the research question together and do systematic reviews together to find the answers. The fourth model is the 'Integration efforts model'. This model includes the above three models.
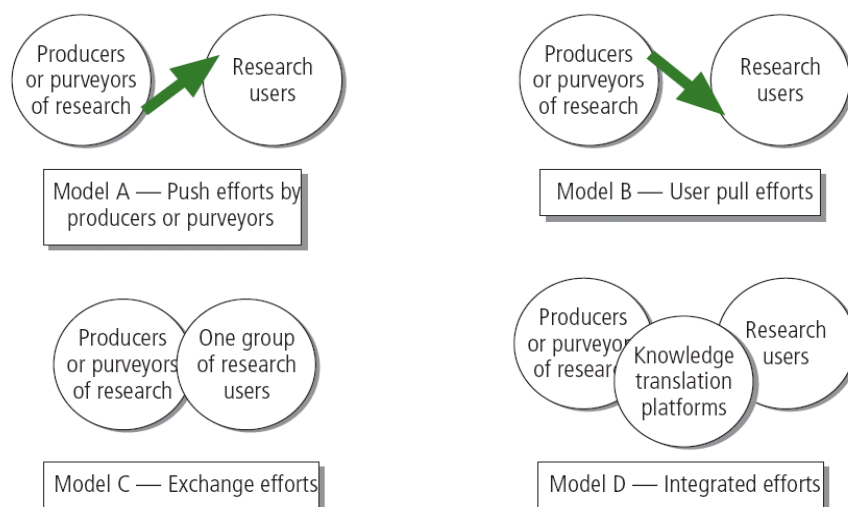
Fig. 3- Knowledge transfer facilitator models (models suggested by Lavis)

Source: Adapted from Lavis, J.N., Lomas, J., Hamid, M., Sewankambo, N.K. (2006) «Assessing county level efforts to link research to action», Bulletin of World Health Organization, 84:620-628.

The above models are not efficient in all conditions. Therefore the simultaneous use of these four is more valuable. Eventually, Lavis states that some of the

components suggested are not research-based and need further deliberation in the future.

⬛ *Lavis model-2003 [32]*

Lavis et al have classified the different methods of research utilization as follows:

1- Instrumental: in this model research comes into action directly and specifically: e.g. for solving a specific problem.

2- Conceptual: a more generalized and indirect form of enlightenment.

3- Symbolic: to justify a stand taken or job done that is not related to research findings (political use) or avoiding action with the excuse that research is still ongoing (tactical use).

Lavis et al's model (2003) is very much similar to Nutley et al's model (2003) [40]. Lavis' believes the criteria for determining the efficiency of research is to assess the influence of its findings on the decision making process, not just to consider its final effect on health or socio-economic issues.

⬛ *Lavis et al's model 2002-2003 [32, 33]*

Although Lavis believes his studies revolve around knowledge transfer, his work is mainly on the discussions related to knowledge transfer strategies. Other than the previous model that shows the different methods of research utilization Lavis et al have presented another model for showing the different aspects of message transfer. They have outlined five key factors in transferring the message to planners:

1- Message: what is the message?

Practical messages are more beneficial than research reports or study results. Research in the field of decision making in management and policy has shown us that what is effective in decision making is the 'the message-driven idea', not 'raw data presented in reports'.

2- To whom: Who are the target audiences?

In the message transfer the type of decision and environment in which the decision is made should be taken into account (the role of the political and organizational factors should not be ignored). While choosing the target audiences it must be as to who can apply the research results, who can influence these individuals and which target audiences should be chosen.

3- By whom: Who is the messenger?

Here the important issue is the validity and reputation of the messenger.

4- How is the transfer process?

Nowadays, most experts believe that inactive/passive mechanisms are not very effective and procedures that guarantee the interaction of individuals are better. In the long run bilateral exchanges can create desirable cultural changes.

5- Evaluation: (what effect does knowledge transfer have?)

Assessing the success rate of any innovative measure depends on the access to that goal. The following 'goals' can be evaluated in this regard:

- Establishment of a procedure
- Achievement of an intermediate outcome like change in the level of awareness, knowledge and perspective
- Achievement of a practical outcome like deciding to take up a specific action.

🖼 *Knott and Wildavsky's model [34]*

The different stages of knowledge utilization explained in this model are still used to explain how research evidence is applied in policies. In this perspective, research is not applied at once, but through a multi-staged process. These stages are:

1- Transmission: research results are conveyed to the persons involved in that specialty.

2- Cognition: findings are studied and understood.

3- Reference: stakeholders refer to these findings in their discussions.

4- Effort: efforts are made to recognize these findings.

5- Influence: research results influence decisions and choices

6- Application: stakeholders practically apply the findings.

🖼 *Landry et al's model [2]*

Using the Knott and Wildavsky's model, Landry et al showed which factors cause researchers progress in applying research and suggested four models for the application of research:

1- Technological: this model is based on the 'pushing forward' principle: delivering research results in its utilization.

2- Economic: this model is based on the 'pulling' principle and its determinant factor is research users' needs.

3- Institutional dissemination: there are two determinant factors here: accepting research products for fulfilling stakeholders' needs and efforts made in dissemination of material.

4- Social interaction: the principle here is continuous interaction between researchers and research users; these interactions are present throughout the production procedures, transfer and application of knowledge.

Logan and Graham's model or the Ottawa model [35]

The 'Ottawa Model of Research Use' (OMRU) is a model for dissemination and utilization of knowledge and management of research findings which consists of 6 components in three main sections (assessment, monitoring, and
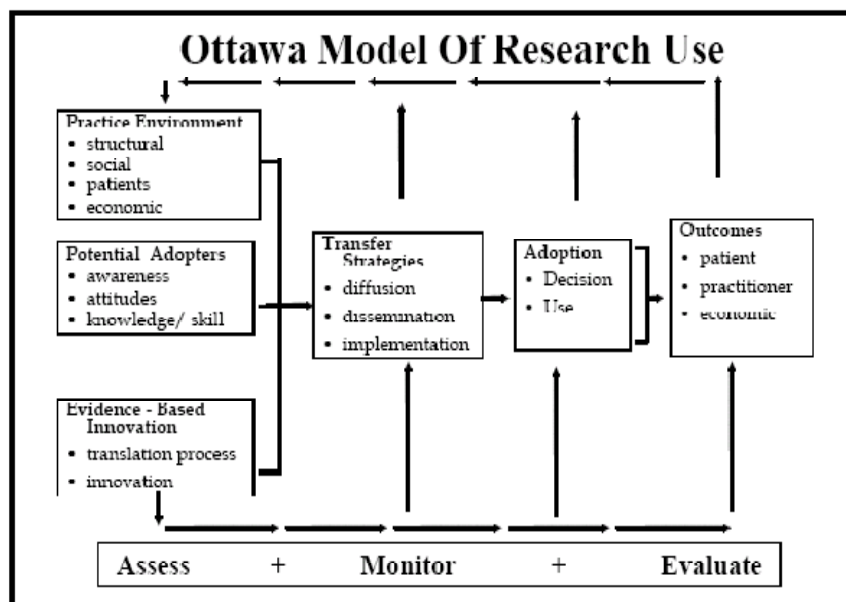
evaluation). This model has been illustrated in figure 4.

Fig. 4- Model of Research Use and Management of Research Findings (Ottawa Model)

Source: Adapted from Logan, J., and Graham, L. D. (1998) «Toward a comprehensive interdisciplinary model of health care research use», Science Communication, 20(2): 227-246.

The six components of this model are:

- Practice environment
- Potential adopters
- Evidence-based innovation
- Research transfer strategies
- Evidence of adoption
- Outcomes

The first four components of this model make up a suitable framework for identifying the barriers to knowledge transfer in the policy making arena [36-38].

Canadian Health Service Research Foundation model [13]

This model was presented by the Canadian Health Service Research Foundation. It is in fact a kind of evidence-based decision making. The model is illustrated in the figure 5.
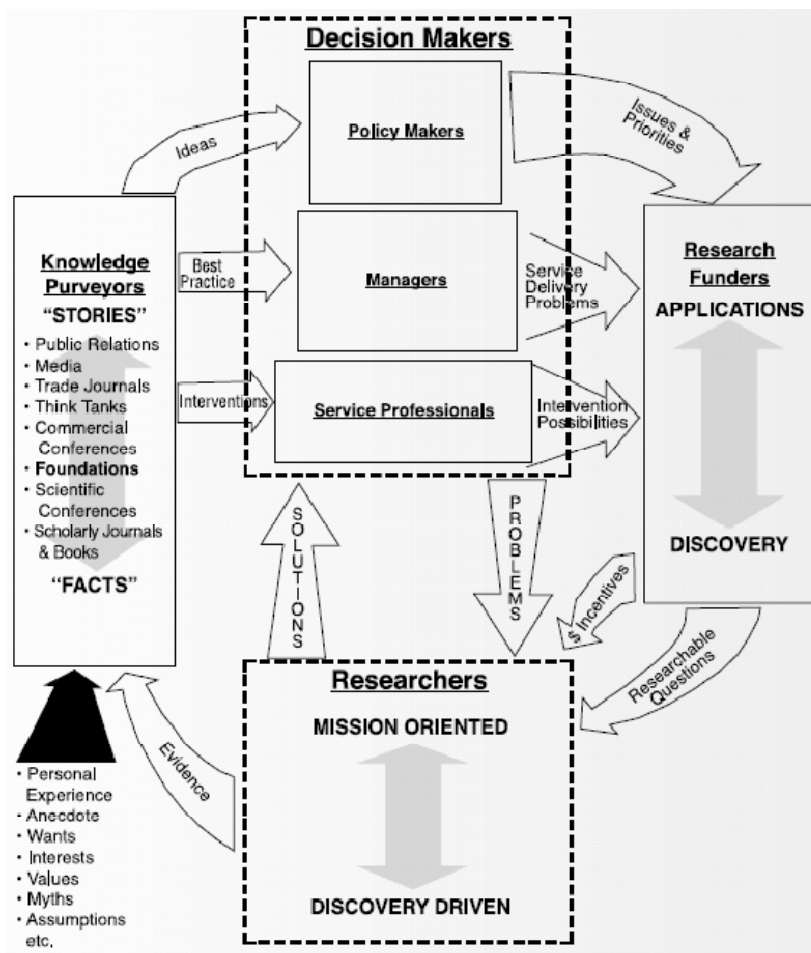
Fig. 5- The Canadian Health Service Research Foundation model

Source: Adapted from CHSRF: Canadian Health Service Research Foundation (2000) Health services research and evidence based decision making. Annual report of Canadian Health Service Research Foundation. www.chsrf.ca/knowledge_transfer/pdf/EBDM_e.pdf [January 20, 2010].

The model shows that direct contact between researchers and decision makers only exists in the private sector (like the R & D structures which the private sector have alongside their own structures). Such direct contact is not easily possible in the health system. In such conditions, Researchers do applied and health-based research diffusely and decision makers (policy makers, manager, specialists) rarely have 'researchable questions'. To solve this problem, this model has foreseen specific communication structures between researchers and

decision makers. In the health sector, these structures include four groups (researchers, decision makers, research funders or financial providers, and knowledge purveyors). In this model, research funders act as the connection between decision makers and researchers. These funders consult with decision makers to identify the priorities and convert them into research questions and transfer them to researchers. On the other hand, researchers' research results are usually in the form of 'facts' and decision makers can seldom utilize them in such form. Communications with decision makers are mostly through myths, personal experiences and anecdotes, and facts should be transformed into these types. That is why a section entitled 'knowledge purveyors' was suggested in this model. Their job is to screen and assess researchers' direct results and to prepare the appropriate research message for the appropriate target audience.

Davis et al's model [10]

Here knowledge transfer is considered as a multi-faceted process which is focused on the health messages and behavior change, and the interventions performed are effective through three ways:

a) Preparing grounds for change through increasing knowledge and skills

b) Making change possible through favorable conditions in the active arena

c) Strengthening and stabilizing changes created

It has been said that in this model (whose designers say is still theoretical and that has not been put to test) knowledge transfer is a continuous range that includes doing the intervention, becoming aware, reaching a consensus on accepting and being committed to utilization of findings.

🖼 *Jacobson et al's model [39]*

These authors have invented a general framework that can be used by researchers and others involved in knowledge dissemination in different circumstances and can familiarize them more with their users. This framework includes five frameworks:

1- The user group: the conditions controlling this group include the form of the organization, the decision making routine, access to information and their utilization (goals and incentives).

2- The issue: the characteristics of the 'research topic' fall in this domain.

3- The research: this domain explains how much the research conducted was according to the users' interests and goals.

4- The researcher-user relationship: this domain includes facilitation of cooperation among researchers and knowledge users right from the beginning.

5- The dissemination strategies: strategies may include increasing awareness, communications and interactions (while taking into account the previous four domains, researchers must keep in mind which strategies are more efficient).

🖼 *Nutley et al's model [40]*

Upon introducing certain changes in Weiss' classification, research utilization has been divided into four main types by these authors:

1- Instrumental: the decision making process is directly nurtured by research. This type is used less than the other types, and occurs mainly when the findings are not so special and their acceptance strengthens the current status or when many changes are not required.

2- Conceptual: research changes decision makers' perception of a specific situation, even though it may not result in a policy change.

3- Mobilization of support: research is used as an instrument to convince people and win their support.

4- Wider influence: research has an influence beyond centers and events under study (e.g. through affecting the principles ruling over politics and beliefs).

🖳 *The PARIHS model [41]*

The 'Promoting Action on Research Implementation in Health Systems'(PARIHS) model actually covers the mutual interactions present in research-based practices. Estabrooks has also explained the factors affecting knowledge utilization with the help of this model (Estabrooks 2005).

In this model, success in implementation depends on three key factors; evidence, context, and facilitation.

Evidence: it is the experience gained from research, clinical experience, and patient preferences.

Context: includes components such as culture, leadership, and measurement.

Facilitation: includes characteristics, role, and style. This model is illustrated in figure 6.

Each of these elements has a range (from weak to strong). If any of these is inclined towards 'high' the process of research application will be practically more possible. So the evidence must be strong and consistent with patients' needs/experiences and experts' opinion, and should be used in its own place (strong evidence). The context and circumstances are ready for change when the culture of an organization welcomes change and has a strong leadership and evaluation system (strong context). The main challenge is to move toward the right side of the range- the 'strong' end. A sample of the ranges named is shown in figure 7 [42].
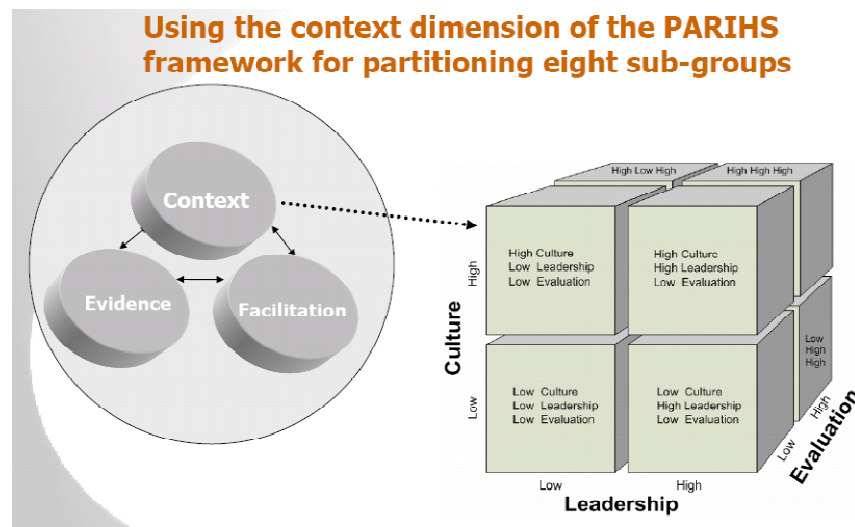
Fig. 6- Components of the PARIHS model

Source: Adapted from Estabrooks C.A. (2005) Research Utilization: and it's (many) determinants. www.nursing.ualberta.ca/kusp/ku/aus_estabrooks.ppt [Last access: Nov 9, 2007].

A   Evidence

Research

Low   High

Anecdotal evidence   Randomised controlled trials
Descriptive information   Systematic reviews
                                             Evidence-based guidelines

Clinical experience

Low   High

Expert opinion divided   High levels of consensus
Several "camps"   Consistency of view

Patient preferences

Low   High

Patients not involved   Partnerships

B   Context

Culture

Low   High

Task driven   Learning organisation
Low regard for individuals   Patient centred
Low morale   Valuing people
Little or no continuing education   Continuing education

Leadership

Low   High

Diffuse roles   Clear roles
Lack of team roles   Effective team work
Poor organisation or management   Effective organisational
of services   structure
Poor leadership   Clear leadership

Measurement

Low   High

Absence of: Internal measures used routinely
  Audit and feedback   Audit or feedback used routinely
  Peer review   Peer review
  External audit   External measures
  Performance review
  of junior staff

C   Facilitation

Characteristics

Low   High

          Respect   Respect
          Empathy   Empathy
          Authenticity   Authenticity
          Credibility   Credibility

Role

Low   High

Lack of clarity around: Access
  Access   Authority
  Authority   Change agenda
  Position in organisation   successfully
  Change agenda   negotiated

Style

Low   High

Inflexible   Range and flexibility
Sporadic   of style
Infrequent   Consistent and
Inappropriate   appropriate presence
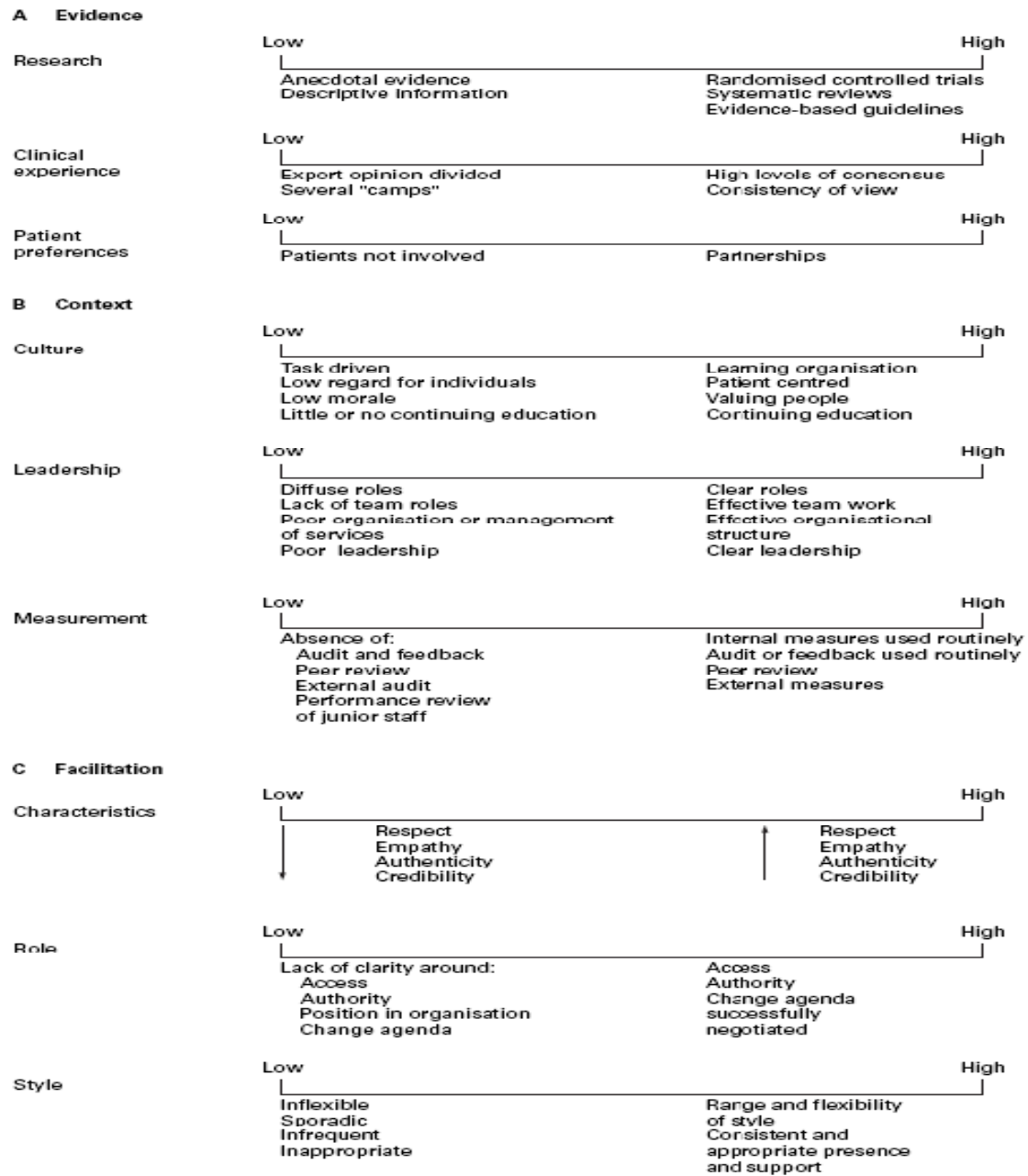   and support

Fig. 7- Ranges on evidence, context, and facilitation (PARIHS model)

Source: Adapted from Kitson, A., Harvey, G., and McCormack, B. (1998) «Enabling the implementation of evidence based practice: a conceptual framework», Quality in Health Care, 7:149-158

🖼 *The Canadian Institute of Health Research model [9]*

The Canadian Institute of Health Research model is made up of seven bilateral stages. This model is illustrated in figure 8.

Fig. 8- The knowledge cycle (the Canadian Institute of Health Research model)

Source: Adapted from CIHR: Canadian Institute of Health Research (2006). About Knowledge Translation. http://www.cihr-irsc.gc.ca/e/29418.html [January 20, 2010].

These seven stages are as follows:

- Research priority setting
- Research
- Knowledge priority setting
- Knowledge synthesis
- Knowledge distribution and application
- Use
- Evaluation of uptake

🖳 *Štrach and Everett's model [43]*

Štrach and Everett were two Japanese researchers who presented their model for promoting organizational knowledge. Their model consists of two main sections or 'facilitation factors' and 'knowledge flows'. 'Facilitation factors' are special circumstances which strengthen or weaken the knowledge flow, and in this specific model these factors are: knowledge transfer channels, motivation to transfer knowledge, and ability to transfer knowledge in special situations.

'Knowledge flows' evaluate the rate of knowledge transfer in temporal and spatial aspects. It is expected that a volume of knowledge and awareness is transferred from the main organization to its sub-divisional units, so some of the knowledge is transferred to the subdivisions and finally a certain volume of knowledge is also sent from the subdivisions to the main organization. This
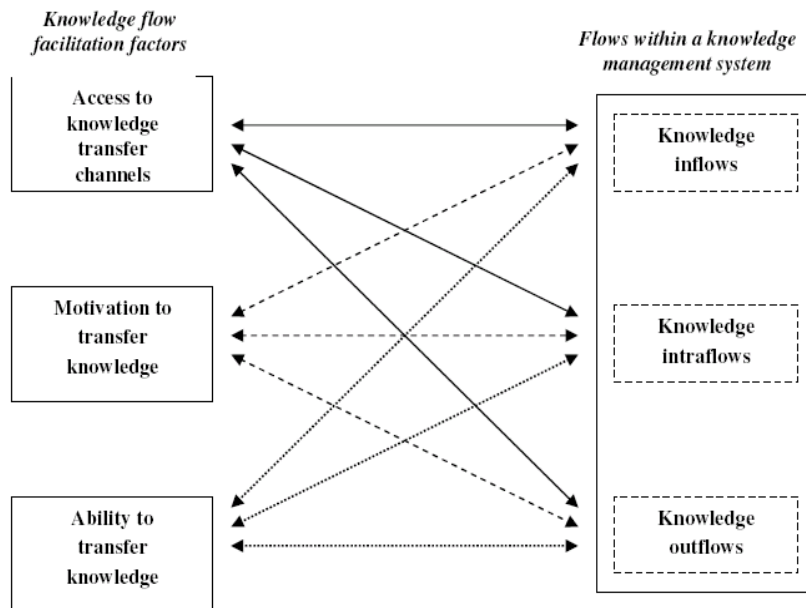
model is shown in figure 9.

Fig. 9-'Facilitation factors' and 'Knowledge flows'

Source: Adapted from Štrach, P., Everett, A.M. (2006) «Knowledge transfer within Japanese multinationals: building a theory», Journal of Knowledge Management, 10(1):55-68.

The National Institute on Disability and Rehabilitation Research model [44]

The American 'National Institute on Disability and Rehabilitation Research' model says that in order to achieve 'knowledge transfer', which actually prepares grounds for 'knowledge utilization' five main elements are necessary. These main components affect the success rate of efforts made to utilize research:

- **Source:** where has the research information come from?
- **Content:** what is the research information about?
- **Context:** what connection does research information have with other information and products?
- **Medium:** how can we access research information?
- **User:** how can we use these findings?

Here 'decision makers' have been called 'users'. The communicative model of factors affecting knowledge utilization is illustrated in figure 10.
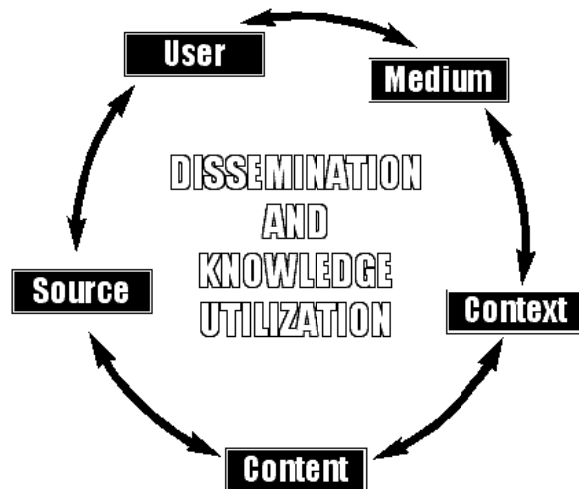

Fig. 10- The communicative model of factors affecting knowledge utilization

Source: Adapted from NIDRR: National Institute on Disability and Rehabilitation Research. The Research Utilization Support and Help (RUSH) Project. (2006) Research Utilization Fosters Movement from Innovation into Practice. Available at: www.researchutilization.org/learnru/welcome2ru/ [Last access: January 20, 2010].

The details of this model have been listed in the following table:

Components: Users' questions	Determinant characteristics of applying research results
Source: Where has the research come from?	• Researchers and research organizations' qualification • The validity of researchers' experiences • The validity of researchers' incentives • The importance these individuals give to users' opinions and application of research results • These individuals' connections with other trustworthy sources • Individuals' attention to application and utilization of

	research
Content: What is the research about?	• The validity of methods used in R & D • The validity of results • Completeness and extensiveness of research results • Relevancy to potential users' work domain and its usability • Expressing research capacities in user-friendly language • Appropriate cost-effectiveness • Design and methodology of research • Relation between research results and previous knowledge or existent products • Competition between existent knowledge or products with new findings
Context: What connection does research have with other matters?	• Relation between research results and previous knowledge or existent products • Competitive knowledge or products • Overall economic status
Medium: How can we access research and its results?	• Physical capacities to access users • Access to research results at the appropriate time • Consistency with users demands • Trustworthiness • Validity • Appropriate cost-effectiveness • Clarity and attractiveness of the information package
User: How can we use research findings?	• Relevancy to current needs • Users' willingness to change or try new findings • Consideration of information sources as valuable and

	trustworthy
	• The form and weight of research information required
	• Knowledge dissemination channels that are preferable
	• Ability to use and benefit from information or products

The first message from the present literature review is scarcity of knowledge about EBDM in context of the developing countries. Most of the researches have been done on developed countries and they hardly can be generalized on developing countries. Of course, this scarcity is not only applicable on applied knowledge about EBDM of developing countries but also models for better understanding of EBDM in this context.

Upon reviewing the available models, we found why these models cannot suffice in analyzing EBDM in Iran. The application of these models in developing countries is questionable, because their economies are not knowledge-based yet, and hence they still do not have NIS. The other characteristic that is specifically Iran's is the presence of the MOHME which is a combination of health services and education and research that may require special attention in comparison to the other developing countries.

Therefore, to study the barriers of evidence-based policy-making in Iran, we were forced to come up with a model that takes the different aspects of push and pull, and also Iran's context into consideration and use it as the grounds of our study. For this purpose, the first study was designed to achieve a model on the basis of which we could follow our work. The first article was therefore on the 'Design of a Knowledge Translation Model' which was the prelude to the next article that is a combination of two papers from both the push and the pull sides of assessing the barriers of evidence based policy making in Iran.

The next two manuscripts were based on this framework and it could be considered one of the main advantages of the present study since it is based on a model which was adopted for the specific context of Iran.

The common methodology for all of the manuscripts is qualitative study. They conducted in two different times. In the first one, the objective was accounting different variables affecting decision making and using items for a Grounded Theory methodology for building a new model of knowledge translation. The first study was accomplished by extensive search for literatures for reviewing different items affecting KT.

The purpose of second and third papers was identification of barriers of EBDM. Therefore, the while the data gathering methods were FGD and in-depth interview, the methodology in both cases was phenomenology. Beside qualitative design, a qualitative data gathering was considered for these two manuscripts. A self-administered questionnaire was developed for this part of the study. The questionnaire includes demographic information, reasons about choosing research topic, the extent of collaboration between researchers and decision makers at various levels of executing the research, and their KT activities. The purpose was triangulation of qualitative and quantitative parts by the mix methodology. Unfortunately, the study samples response rates were not enough to fulfill the requirements of the quantitative part of the pull side barriers of the study. Therefore, while the methodology of push side barriers is a mix method of quantitative and qualitative approaches, the study on pull side barriers stands only on qualitative methodology.

As a remark, the second and third paper has separate chance to be reviewed and published. Therefore, I have explained methods in both of them. It somehow might be seen as repetition but on the other hand they are unpublished works, at time of writing this manuscript, it is inevitable to keep them as much as possible similar to the papers that I will submit for purpose of review and publication.

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First Paper.

Knowledge Translation for Research Utilization: Design of a Knowledge Translation Model

Abstract

Introduction: The present study aimed to generate a model that would provide a conceptual framework for linking disparate components of a knowledge translation cycle. A theoretical model of such would enable the organization and evaluation of attempts to analyze current conditions and to design interventions on the transfer and utilization of research knowledge.

Methods: This research, performed in 2006-2007 at the Tehran University of Medical Sciences, utilized two distinct methodologies: a narrative review to identify existing knowledge transfer models and frameworks, and focus group discussions to determine the views and opinions of researchers and decision-makers regarding barriers to knowledge translation within the health system.

Results: These two methodologies provided the input for designing a "Knowledge Translation Cycle" with five domains: Knowledge Creation, Knowledge Transfer, Research Utilization, Question Transfer, and the Context of Organization. Within each domain except Context of Organization, the model includes two elements.

Discussion: In general, this model offers a theoretical basis for identifying the basic requirements and linking mechanisms for the translation of knowledge for research utilization.

Keywords: Knowledge translation; Research utilization; Knowledge creation; University

Introduction

The importance of using research in health care decision making at the individual and organization level has been increasingly recognized in both industrialized and developing countries, although the latter face additional challenges to knowledge application due to their more limited resources [1].

The limited success of dissemination strategies to increase the use of research evidence in decision-making suggests that transforming research into practice is a demanding task, requiring intellectual rigor and discipline, as well as creativity, skill, and organizational savvy and endurance [2].

Paying attention to creative methods, transfer and application of knowledge is important [3]. Research and evidence, however, can have an immense impact on policy and practice, resulting in tangible positive outcomes. In the field of health care, for example, successful incorporation of evidence into practice can save millions of lives [4]. Many models or frameworks of knowledge translation exist, both as knowledge transfer and research utilization approaches [5-14]. Although these models or frameworks vary in their descriptions and emphasis, most authors agree that knowledge translation is a complex and lengthy process [7, 15].

The effect of research on the health system has become more important in Iran. At present, however, we cannot clearly match research activities with the needs of the health sector. The present study aimed to generate a model for knowledge translation in knowledge creation units, or organizations doing research. Since knowledge translation is one of the programs of the Deputy of Research, Tehran University of the Medical Sciences (TUMS), this study was

performed at the institution. Based on the model, a framework was developed for identifying current conditions, and for organizing and evaluating interventions needed in knowledge translation for research utilization in the university.

Methods

This study used two sets of methods. The first was a narrative review to identify and evaluate the various models and frameworks presented in the field of knowledge translation. Literature sources in English and Farsi were searched using CDSR, DARE, CDMR, Medline, CHRF, SID, IRANDOC, Google and Yahoo search engines. In addition, reference lists were reviewed to identify books regarded as essential in the field. All papers and reports that gave sufficient detail describing the various concepts were included in the review. In all, 650 articles and reports from 1970 to 2006 were reviewed.

The second set of methods consisted of focus group discussions, which sought to gather the views and opinions of 23 researchers and decision makers (10 researchers of medical universities, 5 managers of research institutes, 5 policy makers of ministry of health and 3 journal chief editors, in 3 groups) with respect to influential factors and barriers to research-based knowledge translation in the health system. The literature provided evidences for develop the focus group discussion guide. The interview schedule revolved around the four main axes of barriers and strategies for improving approaches to knowledge translation. Main axes were research (evidence), decision makers, knowledge transfer activities and context (environment) of knowledge transfer.

Data from the focus groups was analyzed, drawing out common themes and patterns in a thematic framework analysis.

Finally, using from the literature review and the focus group discussions, we generated a model entitled the Tehran University of Medical Sciences Knowledge Translation Cycle.

Results

1) Review of Studies

Knowledge translation and knowledge transfer are concepts that differ from one another. While some use these terms interchangeably, the latter refers to a linear process through which research is conducted, followed by transfer of the research results to the end-users. The unidirectional nature of knowledge transfer has been criticized and recent studies have demonstrated that such strategies "have not proven to be effective in encouraging the adoption and implementation of research results. The mere reception of knowledge by the potential user does not imply its use [16].

In examining the passive dissemination of consensus recommendations, knowledge transfer alone resulted in few or no behavioral changes by healthcare providers [4]. In addition, "merely because information was timely, relevant, objective, and disseminated to the right people in usable form did not guarantee its use" [17]. Knowledge translation, which guarantees a mutual and collaborative contact between researchers and users of knowledge, was discovered, in part, because of these limitations.

The factors affecting knowledge transfer and translation in organizations are important. Information technology is an influential factor that supports the knowledge processes to a much greater extent than previously. The increased capability and dispersion of technology have increased the opportunities for collaboration by researchers separated by both time and space and for the creation of jointly constructed interpretations and meaning among individuals [18]. Four types of technology must be considered: databases, decision support tools and artificial intelligence, groupware including e-mail and video conferencing, and web technology (e.g. intranets, extranets and the Internet) [19].

Cultural factors also are important for knowledge transfer [20-22]. The most common cultural factors inhibiting effective knowledge transfer are lack of trust; different cultural backgrounds, vocabularies, and frames of reference; lack of time and meeting places; narrow ideas of productive work; inappropriate incentive schemes that do not motivate sharing but rather focus on individuals; and lack of absorptive capacity in recipients [23].

Predictors of the uptake of research by organizations are users' adaptation of research, users' acquisition efforts, links between researchers and users, and users' organizational contexts [24]. Both researchers and decision-makers mention the quality of research as influential in promoting its use in policy [25].

Data on predictors (individual determinants) of research use can be assorted into six categories: beliefs and attitudes, involvement in research activities, information seeking, education, professional characteristics and other

socioeconomic factors [26]. Values and attitudes can have a great influence on the extent of knowledge utilization [27-29].

Among the factors that can lead individuals and academic units not to give priority to knowledge transfer are the value placed on traditional academic output (e.g., publications in peer-reviewed journals, presentations at disciplinary conferences, receipt of research grants from federal agencies), in combination with the limited number of hours in a day. The low priority means that few researchers receive training in or have experience of knowledge transfer, and that little money is available to cover the monetary costs associated with transfer-related activities [30]. Finally, confidentiality concerns and editorial policies may hinder researchers' ability to share research in a timely manner [31-34].

These organizational barriers originate in the particular history of the university as a setting for knowledge production. Following World War II, a new research economy emerged in the United States increased their funding for university-based programmatic research, particularly in scientific and technical fields [35]. In the latter part of the twentieth century, that balance was shifted by new information technologies and globalization, such that the university is no longer the primary site of knowledge production, having been challenged by a range of new knowledge producers [36]. The consequences of this competition include an emphasis on the development of new funding alliances involving the university, the state, and private industry, as well as calls for increased accountability of the university to the public [37].

Lynton and Elman [38] argue that "universities must realize that the effective attainment of their scholarly mission calls for a complex and interactive process with their constituencies…to facilitate this new kind of work, universities must make structural and organizational changes that promote three kinds of activities: communication between the producers of knowledge and the users of knowledge, brokering and negotiation of knowledge transfer arrangements, and the delivery of knowledge".

2) Results of Focus Group Discussions

There were four main themes and a number of sub-themes identified by the focus group participants. The results of focus group discussion sessions are summarized in Tables 1-4. The topics of these sessions were barriers and proposed strategies for improvement of knowledge translation, with the results assorted into four main themes: 'university context', 'knowledge creation', knowledge transfer' and 'research utilization'. We used these themes and sub-themes to design the model.

3) Designing the model of 'knowledge translation'

Using evidence from the literature review and data from the focus group discussions, we designed a model entitled the 'knowledge translation cycle' (Figure 1).

This model includes 5 main domains: 1) knowledge creation, 2) knowledge transfer, 3) research utilization, 4) question transfer, and 5) context of organization.

The first four domains have mutual relationships with each other. These four domains and their relationships are based on the fifth domain, context of organization, which indicates the leadership system, policies, values and culture present in the organization, Tehran University of Medical Sciences in this model. (See Figure1) All domains derive from focus group discussions and evidences of literature reviews.

We also developed some elements for each domain with the purpose of organizing factors listed in each domain. Each of these domains, apart from context of organization, consists of two elements: knowledge creation consists of characteristics of researchers and research; knowledge transfer consists of resources and strategies; research utilization consists of characteristics of decision makers and context of decision making; and question transfer consists of resources and strategies.

The knowledge creation domain in the knowledge translation cycle starts with the researchers themselves, placing it on the "Push side" of the model. The domains 'knowledge transfer' and 'question transfer' are part of "Exchange efforts". The 'knowledge utilization' domain is on the "Pull side" of the model.

Within each domain, the model includes a series of determinant factors. This model helps us organizing our knowledge about the relation between domains and position of determinant factors, and recognizes the needed interventions. The determinant factors in each of the domains of this model have been defined as:

3.1) Knowledge Creation

The following factors derived mainly from sub-themes in Table 2 and the evidence gathered through our review study.

a) Characteristics of Researchers

These include educational level, work record, knowledge, beliefs and attitudes (e.g. trusting others' research and/or the possibility of losing research ideas), motivation and interest, skills and familiarity with the research methods, communication skills, adequate time and familiarity with the target audience.

b) Research

These include the type of research, relevance to user needs, solidarity and accretion of research (in response to needs), appropriate infrastructure of knowledge transfer for proposals, research prioritization (in response to needs), being up-to-date (in response to needs), quality of research, and facilities for the use of equipment necessary for research.

3.2) Knowledge Transfer

The factors listed in this domain derived from sub-themes in Table 3 and the evidences gathered through our review study.

a) Resources

These include financial investments, equipment and material, scientific journals, media, scientific committees, data bases, communication networks (between individuals and between organizations), regulations and individuals (like knowledge brokers).

b) Strategies

- Provision of executive facilities and financial resources for the better presentation of research results

- Promotion of information and technology management (for allowing electronic and non-electronic access to information banks, journals, theses, research project reports, characteristics of researchers and research groups, etc.)

- Creation of communication networks (at the individual and organization level) and arranging access to these networks

- Definition of the structure of actionable messages to knowledge transfer (using the messages when publishing articles, compiling project reports, and presenting research results to decision makers)

- Preparation of 'knowledge translation' guidelines for researchers and decision makers and making them accessible

- Facilitation of interactions between researchers and decision making organizations or organizations such as the mass media

- Formulation of training courses and scientific committees for researchers and decision makers to promote their skills in 'knowledge translation' and to create a common language among them

- Education of knowledge brokers (skilled in transmission of results to decision makers)

- Promotion of the publication management of scientific journals to provide up-to-date and qualitative research results

- Organization of the research required for promotion of the knowledge translation cycle

3.3) Research Utilization

The following factors are derived mainly from sub-themes in Table 4 and the evidences gathered through our review study.

a) Characteristics of Decision- Makers

These include educational level, work record, beliefs and attitudes (including attitude toward the necessity for research evidence and trusting of research results), technical skills for utilization (appraise and apply the research results), familiarity and trust in researchers and research results, and accessibility to relevant research.

b) Context of Decision Making

These include regulations and legislation, financial support sources, official structures, political and cultural conditions, organizational complexity, decision-making processes, other evidence (e.g. pertinence of decision making to using research and non-research evidence), and the requirement for quick responses.

3.4) Question Transfer

Using the concept of research funder as defined in the model of Canadian Health Service Research Foundation [48], we created a main domain (question transfer). The following factors are extracted from sub-themes in Table 3 and the evidences gathered through our review study.

a) Resources

These include funding organizations, organizations related to research management (e.g. in the university, ministry of health and other public and private organizations)

b) Strategies

- Creation of access to information banks of the professional characteristics of researchers and research centers and of the professional characteristics and research needs of decision makers

- Formulation of a university's research priorities in regard to decision makers' needs

- Creation of trust between researchers and decision makers

- Creation of interactions between researchers and decision makers (in the process of defining and performing research)

- Creation of access to research grants

3.5) Context of Organization

The following factors derive mainly from sub-themes in Table 1 and some evidences gathered through our review study.

- Development of standards in the health system for presenting appropriate frameworks of knowledge translation and making them practical

- Absorption of the required resources for supporting activities related to knowledge management and knowledge translation

- Preparation of a cultural context in the research sector of the university for the knowledge translation cycle

- Political and executive support of knowledge translation activities

- Selection of academic members who possess high scientific and research capabilities (absorbing skilled forces)

- Legislation and regulations necessary to facilitate the knowledge translation cycle in the university

Discussion and conclusions

Many studies present conceptual frameworks or models for knowledge translation, knowledge transfer and research utilization. These models represent the necessary principles and the mediating loops from 'knowledge creation' to 'knowledge utilization'.

Table 5 summarizes several of these models and conceptual frameworks, which are presented according to year in the Table [7, 8, 12, 13, 14, 16, 39 - 52]. Comparing the TUMS model with other knowledge translation models, it seems that more focused on the "pull side" of the knowledge translation circle. The TUMS model resembles the Graham model [7] and the CHSR Foundation model [48] considers simultaneously the push side (knowledge creation) and pull side (research utilization) of knowledge translation cycle.

The model presented in this article (TUMS model) has been designed from an organizational perspective and can be effective in representing the programs and strategies needed for knowledge translation in an organization.

This model was generated from a review of literature and from focus group data. Therefore, the value of a model such as the TUMS model generated and designed is data collected within the system, not just within an individual country. Such models can facilitate the transfer of knowledge between researchers in various disciplines (e.g. clinicians and public health professionals) and a broad range of decision-makers (e.g. clinicians, policy-makers, and researchers), in spite of the existing cultural differences. In addition, this model can help in the design and execution of appropriate interventions in this field, and there should be organizational capacity building strategies for implementation knowledge translation cycle; and these strategies are dependent upon the social and cultural context of individual countries.

This study is affected by a number of limitations. First, what is presented here is only a "recommended" model. The effectiveness of the model cannot be proved unless its implementation can facilitate the transfer of research knowledge to decision makers and give them a better understanding of the existing problems, eventually leading to evidence-based decisions. Second, as we believe that knowledge translation models must be dynamic, modifications might be required in the models' various determinant factors to reflect changing cultural, social, and economic circumstances. This provides the rationale for constant monitoring of these models with regard to their efficacy.

In the authors' experience, following strategies can make knowledge translation more effective in universities: (1) Defining and setting up a system to assess the knowledge translation cycle; (2) Implementation and use of information technology; (3) Identification and encouragement of face to face

interactions between researchers and decision-makers; (4) Exchanging

knowledgeable individuals among centers; (5) Creating mutual trust, a common

language and culture for the creation of organizational knowledge; (6) Using

important motivational tools in the university; (7) Using multi-dimensional

methods for knowledge transfer: Universities depend primarily on the passive

dissemination of knowledge, such as through publications and by changing

individual behavior. Passive diffusion of knowledge, however, is not sufficient

to guarantee its adoption into practice [53].

The TUMS model will help us identify the barriers and facilitators of

knowledge translation in our university and, accordingly, design strategies to

improve the current situation. One of the first applications of the model could

be in designing tools for assessment of the present status of knowledge

translation exchange.

The knowledge translation process has been described as consisting of

multiple stages designed to identify research gaps and plan for evidence-based

implementation [54-56]. The multi-phase nature of this process suggests the

necessity to develop a framework or model for knowing the parts involved in

this process and the necessary activities to be undertaken. Also, models are

representative concepts for necessary interventions and the application of these

models requires programming with respect to each component. No doubt, the

suggested knowledge translation cycle for the university, like all other models,

will need modification following its implementation.

Acknowledgments

Lessons for Practice

1- The multi-phase nature of the knowledge translation process suggests the necessity to develop a framework or model for knowing the parts involved in this process.

2 - Such models can facilitate the transfer of knowledge between researchers in various disciplines and a broad range of decision-makers.

3 - This model can help in the design and execution of appropriate interventions in this field.

4 - This type of theoretical model would enable the organization and evaluation of attempts to analyze the current situation and design further interventions on the transfer and utilization of research knowledge.

5- Most models have focused on only one domain of knowledge translation. There are not many examples where both research utilization and knowledge creation have been incorporated into the model.

6- The issue of designing models to promote knowledge translation has so far received scant attention in developing countries. The TUMS model represents the first such model designed in this part of the world.

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Table 1. Barriers and Proposed Strategies for Improvement in the University Context

Barriers	Strategies
▪ The necessary interactions between medical and non-medical universities are undefined. ▪ The appropriate interactions between universities and industry are undefined ▪ Absence of an evaluative system of research-based knowledge ▪ Absence of appropriate lobbies for absorbing research investments ▪ Effect of the international political atmosphere on the absorbance of research projects ▪ Presence of a bureaucratic system ▪ Absence of appropriate laws for preserving individuals' intellectual rights ▪ Cultural barriers and absence of favorable conditions such as the culture of study ▪ Political barriers to the publication of certain research results ▪ Low educational level for training researchers ▪ Choosing academic members without consideration of required skills	▪ Defining responsible structures for knowledge transfer activities in the university ▪ Evaluation of research-based knowledge translation activities at the university level and defining necessary standards for evaluation ▪ Monitoring of quality of knowledge translation activities ▪ Promoting the culture of interactions between producers and users of research ▪ Setting rules for motivating and compelling researchers to interact with users while performing the research ▪ Fitting knowledge transfer activities of academic members into the university's evaluation system ▪ Compilation and clarification of rules for respecting individuals' intellectual rights ▪ Absorbing capable human resources into the university

Table 2. Barriers and Proposed Strategies for Improvement of Knowledge Creation

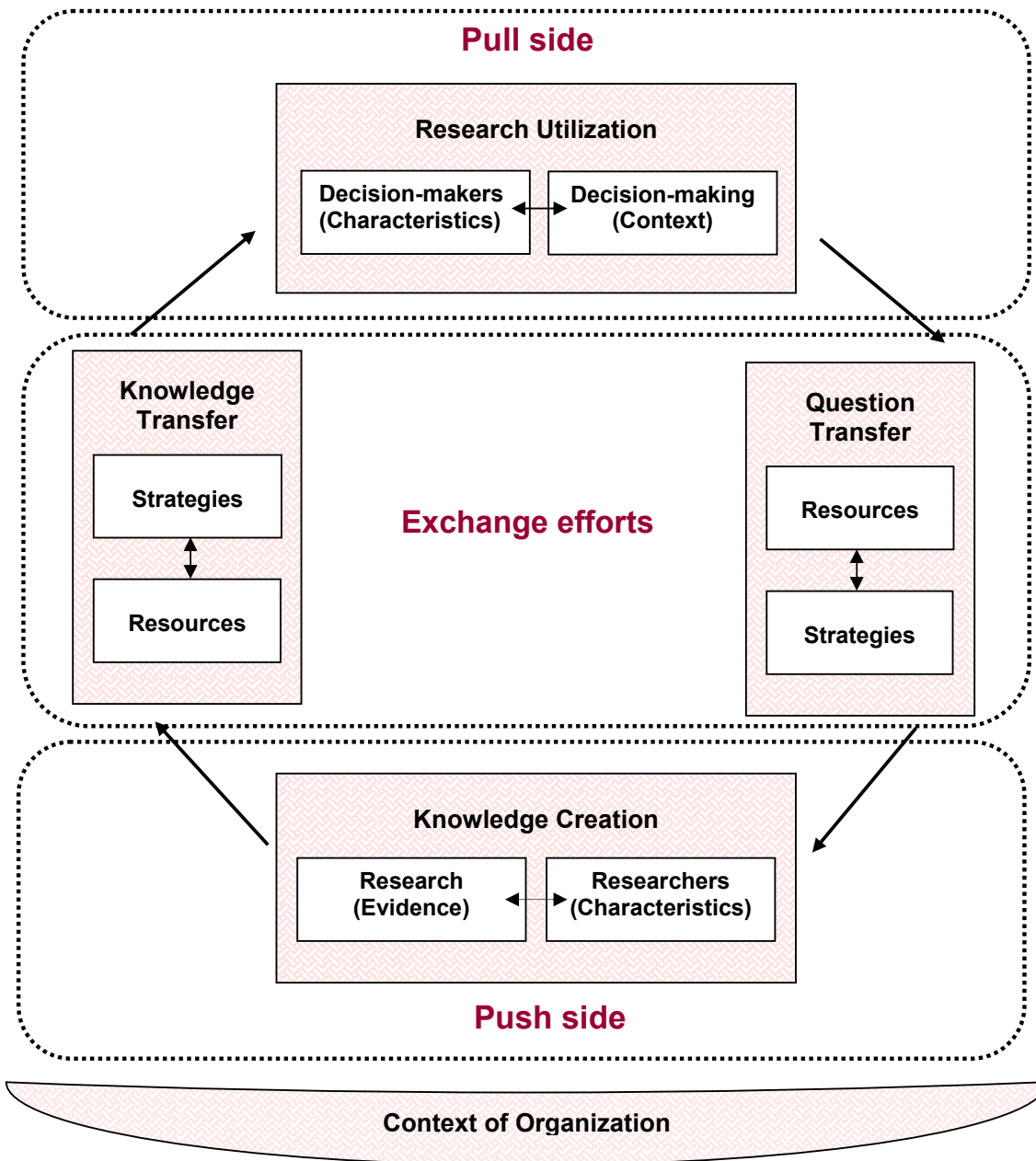| Barriers	Strategies

▪ Researchers' unawareness of the necessity of knowledge transfer
 	
▪ Researchers do not perceive there to be a need for knowledge transfer'
 	
▪ Inadequate skills of researchers in research
 	
▪ Lack of researchers' familiarity with knowledge transfer methods
 	
▪ Research not in accordance with users' needs and priorities
 	
▪ Inadequate time for dissemination and transfer of research results
 	
▪ Lack of researchers' familiarity with target audiences
 	
▪ Absence of mutual trust
 	
▪ Most studies are descriptive and repetitive
 	
▪ Some researchers are dispersed and lack solidarity
 	
▪ Lack of academic motivation for researchers (e.g. professional promotion or gaining degrees)
	▪ Education of researchers in necessary skills
	   o Topic choosing skills based on users need
	   o Researching skills
	   o Group work skills
	   o Communication skills
	   o Preparation of messages from research results
	   o Designing of systematic reviews
	   o Familiarization with knowledge translation techniques
	
	▪ Fitting the topic of 'knowledge translation' into the academic education of the university
	
	▪ Carrying out necessary research studies in the field of 'knowledge translation'
	
	▪ Education of individuals with knowledge translation skills to help the research team

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Table 3. Barriers and Proposed Strategies for Improvement of Knowledge Transfer

Barriers	Strategies
▪ Absence of a interactions between knowledge producers and users ▪ Problems existing in the substructure of knowledge translation, such as absence of an appropriate information bank to provide access to research results ▪ Absence of appropriate information banks for provision of thesis results and reports on research projects ▪ Absence of research priorities based on users' needs ▪ Absence of a proper grant system ▪ Inappropriateness of the message conveyed (e.g. lack of use by the knowledge producer of a style and language appropriate to the knowledge user) ▪ Publication of results through inappropriate channels (e.g. journals research users do not read) ▪ Permanency of the chief editor council and implementation of its specific ideas ▪ Low number of reviewers in each subject ▪ High number of journals and inability to read them ▪ Research result publications are not up-to-date	▪ Defining a custodian of research result transfer activities in the university through creation of a new structure or optimization of present structures ▪ Designing information banks of research results such as theses and research project reports for facilitation of access to research results ▪ Promoting information technology ▪ Designing structures for facilitation of access to research audiences ▪ Research and identification of effective modalities of knowledge transfer for various audiences ▪ Education and promotion of information marketing and defining indicators for their assessment ▪ Valuing and scoring joint research by producers and users ▪ Valuing and scoring knowledge transfer activities ▪ Encouraging knowledge transfer activities by academic members ▪ Showing appreciation for research in the field of knowledge transfer through prizes and awards ▪ Defining necessary standards for messages that result from research ▪ Changing the format of proposals and adding a 'transfer of results' section to them ▪ Absorbing users by announcing the capabilities of colleges ▪ Creating a connecting system between managers allowing them to inform each other of research activities and needs ▪ Classification of journals and publications to facilitate the utilization of research results on a specific topic Teaching skills to article and project referees

Table 4. Barriers and Proposed Strategies for Improvement of Knowledge

Utilization

Barriers	Strategies
▪ Lack of attention to research evidence in decision making	▪ Convincing decision makers to utilize messages and research results in their decision making
▪ Lack of need for research felt by decision makers	▪ Absorbing users through announcing the capabilities of researchers and colleges
▪ Lack of user trust of research results	▪ Selecting competent managers and decision makers
▪ Lack of user access to research results	
▪ Inappropriateness of research language for users	▪ Teaching skills on how to utilize research results in decision making Identification and announcement of needs and priorities by users and policy makers
▪ Lack of policy makers' skills in analysis and use of research results	
▪ Decision-makers need fast responses but researchers lack urgency in transferring research findings to them	▪ Compilation of long-term programs for utilization of research in decision making
▪ Limitations of budgets and laws for requesting research	▪ Management of required resources in utilization of research results
▪ Absence of long-term programs and lack of dedication of managers to these programs, including early replacement of managers	▪ Simplifying processes through trust, control and costs in the field of decision making ▪ Strengthening interdisciplinary, intercollegiate, domestic and regional relations
▪ Absence of appropriate office structures for requesting research	▪ Involving users in all steps of research
▪ Limited number of users	▪ Enlightenment in the field of conflicts of interest and legislating the relative laws
▪ Lack of users' participation in the research process	
▪ Conflict of interest among researchers and users	

Pull side

Research Utilization

| Decision-makers (Characteristics) | ↔ | Decision-making (Context) |

Knowledge Transfer

Strategies

↕

Resources

Exchange efforts

Question Transfer

Resources

↕

Strategies

Knowledge Creation

| Research (Evidence) | ↔ | Researchers (Characteristics) |

Push side

Context of Organization

Figure 1. The Tehran University of Medical Sciences Knowledge Translation Cycle

Table 5. Models or Conceptual Frameworks of Knowledge Translation, Knowledge Transfer and Research Utilization

Author (year)	Ref.	Description
(Weiss 1979; Yin and Moore 1988; Kline and Rosenberg 1986)	39, 40, 41	Models of knowledge utilization: - The science push model - The demand pull model - The dissemination model - The interaction model
(Weiss 1979; Hanney et al. 2003)	39, 13	Models of research utilization in policy development fall into three categories: Rational Models 1. Knowledge-Driven Model: The existence of knowledge is seen to lead directly to its use. 2. Problem-Solving Model: direct application of results to solve a problem identified by the 'user'. Instrumentalist models 1. Interactive Model: policy-makers seek information from a variety of sources. 2. Enlightenment Model: concepts and theoretical perspectives that social science research has engendered permeate the policy-making process. Political models 1. Political Model: constellations of interests or opinions predetermine the positions of policy makers, and research is used as ammunition to support these positions. 2. Tactical Model: research is not used for its content; rather the fact that it is being performed is cited by policy makers when pressed to take action on a particular issue.
(Knott and Wildavsky 1980)	14	The stages of knowledge utilization are: 1. Transmission – results transmitted to practitioners and professionals. 2. Cognition – findings read and understood. 3. Reference – findings cited as a reference by stakeholders. 4. Effort – efforts made to adopt results. 5. Influence – results influence choices and decisions. 6. Application – search led to applications by stakeholders.
(Logan and Graham 1998)	8	The Ottawa Model of Research Use (OMRU) is a logic model approach for planning dissemination and knowledge utilization and for managing results. It features six primary elements and requires attention to a continuous assessment, monitoring, and evaluation process. The six elements are: - Practice environment - Potential adopters of the evidence - Evidence-based innovation

		- Research transfer strategies - Evidence of adoption - Health-related and other outcomes
(CHSRF 2000)	48	This model illustrates the links between 4 main groups: Decision Makers, Researchers, Research Funders, and Knowledge Purveyors.
(Landry, Lamari , and Amara 2001)	16	Four models of research utilization are: 1. Technological – push model where supply is the major determinant of uptake. 2. Economic – pull model, where the needs and context of users is the major determinant. 3. Institutional dissemination – adaptation of research products to meet the needs of stakeholders and the dissemination efforts. 4. Social interaction – favor sustained interactions between researchers and research users, at all stages of knowledge production, dissemination, and utilization.
(Davis, et al. 2003)	12	Knowledge translation is regarded as a holistic concept focusing on health outcomes and changes in behavior, and interventions are seen to function in three ways: 1. To predispose to change by increasing knowledge or skills; 2. To enable the change by promoting conducive conditions in the practice and elsewhere; 3. To reinforce the change, once it is made.
(Hanney, Packwood, and Buxton 2000; Hanney et al. 2003)	45, 13	The framework consists of two elements: a categorization of the potential benefits of using research in health policy formation, and a description of the stages involved in the utilization of research in policymaking. The stages include the inputs to research, the research process, primary outputs from research, secondary outputs from research, practitioners' application of research and final outcomes.
(Nutley, Walter, and Davies 2003)	42	Four main types of research utilization: 1. Instrumental: research feeding directly into decision-making 2. Conceptual: change in decision-makers' understanding of a situation. 3. Mobilization of support: research as an instrument of persuasion. 4. Wider influence: beyond the institutions and events being studied.
(Lavis et al. 2003)	43	Different ways in which research can be used: 1. Instrumental: when research is acted upon in specific and direct ways, i.e. to solve the problem at hand. 2. Conceptual: more general and indirect form of enlightenment. 3. Symbolic: to justify a position or course of action taken for reasons that have nothing to do with the research findings, or with the performance of research used to justify inaction on other fronts.

(Jacobson, Butterill, and Goering 2003)	49	This framework is to be used by researchers and other disseminators to increase their familiarity with the intended user group(s). The framework consists of five domains: 1. The user group – context within which the group operates, decision-making practices, access to and use of information. 2. The issue – its characteristics have an impact on the user group and on the knowledge transfer process. 3. The research – look at what is available, user preferences, and relevance and congruence of the research to users. 4. The researcher–user relationship – early engagement is key to facilitating knowledge transfer. 5. The dissemination strategies – awareness, communication and interaction. Researchers need to consider what strategies will be most effective in light of the other four domains.
(Lavis et al. 2002; 2003)	43, 52	Determinants that should guide knowledge translation efforts: - What should be transferred to decision makers (the message)? - To whom should research knowledge be transferred (the target audience)? - By whom should research knowledge be transferred (the messenger)? - How should research knowledge be transferred? - With what effect should research knowledge be transferred (evaluation)?
(Rycrojt-Malone 2004)	47	The Promoting Action on Research Implementation in Health Services (PARIHS) framework presents research implementation as a function of the relationships among "evidence", "context", and "facilitation".
(NIDRR 2006)	44	There are five common core elements: 1. Source – Where does the research information come from? 2. Content – What is the research information about? 3. Context – How does the research information relate to existing knowledge or products? 4. Medium – How can I get the research information? 5. User – How can I benefit from this research information?
(Lavis et al. 2006)	46	Models for linking efforts to action: - Push efforts by producers or purveyors - User pull efforts - Exchange efforts - Integrated efforts

(CIHR 2006)	50	The Canadian Institute of Health Research conceptualizes knowledge translation as an acceleration of the Knowledge Cycle Model, which consists of seven bilateral stages: • Research priority setting • Research • Knowledge priority setting • Knowledge synthesis • Knowledge distribution and application • Use • Evaluation of uptake
(Štrach and Everett 2006)	51	This general model incorporates two principal dimensions: facilitating factors and knowledge flows.

(Graham et al. 2006)	7	The KTA process (Knowledge to Action) is divided into two concepts: knowledge creation and action, with each concept comprised of categories.
		
		A: Knowledge creation:
		    1. Knowledge inquiry
		    2. Knowledge synthesis
		    3. Knowledge tools / product
		
		B: Action cycle (application):
		    - Identify problem
		    - Identify, review, select knowledge
		    - Adapt knowledge to local context
		    - Assess barriers to Knowledge use
		    - Select, tailor, implement in intervention
		    - Monitor knowledge use
		    - Evaluation outcomes
		    - Sustain Knowledge use

Second Paper

Evidence Based Decision Making In Iran:

The Push Side Barriers

Abstract

Background

Limited resources in developing countries have emphasized the importance of research knowledge translation. In this study we have attempted to examine and find the knowledge translation barriers on the knowledge production side.

Methods

Both qualitative and quantitative approaches were used. In the quantitative section, a questionnaire was sent to the corresponding authors of the articles published in 2006 which were completed by 88 researchers. In the qualitative section 13 in-depth interviews and 6 focus group discussions were held with managers and policy makers, clinical and health service providers, and researchers.

Results

In 39.8% of cases the research topic had been chosen on demand of other organizations' requests and/or needs assessment, but 18.2% were solely personally interested in the topic. 23.9% of the authors had no interaction whatsoever with the target audience. Lack of expectation toward creating change in the target audience, researchers' incentives, scarcity of trust among researchers and decision makers, absence of a predefined mechanism for delivery of research results and inappropriate research priorities were among the most important findings of the qualitative section.

Conclusion

Knowledge translation can be strengthened only with the cooperation of policy makers at macro and meso level and the research sector, and long-term programs need to be designed with this objective. Establishing networks for researchers and decision makers in choosing the research topic, priority setting, and building trust among researchers and policy makers seem effective.

Keywords: Knowledge, Evidence-based practice, Utilization, Research

Background:

Nowadays an increasing focus is being laid on evidence-based practice and policy making and utilization of research knowledge by health systems [1, 2]. "Knowledge translation (KT) is a process that can provide suitable research background to decision makers and potentially influence all activities including 'knowledge production', 'knowledge transfer', and 'knowledge utilization'. In other words, KT is the production, exchange, sound and ethical application of knowledge which leads to more effective production and health delivery system in a complex system of interactions between health researchers and users" [3]. The World Health Report on Knowledge for Better Health in 2004 clearly pointed out the gap between production and utilization of health knowledge and advised strengthening the strategy of knowledge translation [4]. It states that in spite of the availability of knowledge showing the usefulness of these interventions, it is yet only half the solution; the other half that leads to health improvement is how these interventions are implemented. Four years have passed since then but in the Minister's Summit in 2008 again it was concluded that: "*to promote knowledge translation and exchange through the application of effective and safe interventions, evidence-informed policies, policy-informed research, and publication and effective dissemination of research results, including to the public, taking into consideration the diversity of languages and advances in information technology*" are necessary[5]. This is a difficult and

challenging job on which there is little evidence on its method, improvement and facilitation [2].

Knowledge translation activities can be classified into three groups: activities related to knowledge produced by researchers (push), utilization of knowledge by decision makers (pull), and the interaction between them (exchange) [6]. In recent years certain steps have been taken to strengthen KT in Iran. Four steps may be highlighted among important measures taken in the research sector (or in other words 'Push') recently. Firstly, committees supporting health services research have been established with the collaboration of various responsible sectors in research, education, service delivery, and other sectors outside the health system (such as municipality and education sectors). Secondly, research projects whose results can be applied are valued in the university's and research centers' annual external evaluation. Also, as of the beginning of 2009, "changes following research" have been considered as a criterion for academic members' promotion. Finally, 10 KT workshops were held in 2007 and 2008 in Iran for the research authorities of medical science universities [7]. These interventions are an indication of the increasing focus being laid on the subject of utilization of research findings. Though observing the effects of these interventions may require much more time.

Translation of research findings in Iran is important for three reasons: firstly, scientific publications have considerably increased in the field of medicine in recent years. Iran has had the greatest scientific development in the Middle East from the early 90's [8]. The number of articles published in ISI journals between 1997 and 2001 has also doubled [9]. Secondly, the context of the Ministry of Health in Iran is relatively unique; in 1985 medical education was integrated into health services, which led to the establishment of a new ministry called MOHME [10]. Potentially, this structure should be able to reduce certain barriers to KT because of reducing the gap between researchers and decision makers. Evidence however shows that there is yet a long way to go in using the capacities of KT [11], and little collaboration exists between researchers and stakeholders [12]. Thirdly, as a developing country, Iran should be able to

safeguard its research resources, particularly now that the world economic crisis has gained international significance.

The current study has been conducted with the objective of identifying the existent barriers to KT in Iran. To our best knowledge there is yet no evidence on the matter in developing countries.

Methods:

This is a mixed method study which consists of two quantitative and qualitative sections; the current status of KT in the research sector was examined through the quantitative approach, and the reasons were investigated more deeply through the qualitative approach.

Quantitative section:

To assess researchers' KT activities, a questionnaire was prepared and completed by them. To select the researchers under study, first, the articles published on the subjects of the Health Ministry's important programs including 'diabetes', 'maternal care', and 'tuberculosis' in the year 2006 were systematically searched. The articles were from studies conducted on Iranian populations. The search was performed in international databases like 'Embase and Pubmed' and Iranian databases—Iranpsych, Iranmedex, and Scientific Information Database 'SID' (a brief description of these databases has been presented in 'Annex 1'). The titles and abstracts of the articles found in the abovementioned databases were studied independently by two physicians. Basic science articles, case reports, case series, letters, brief reports and communications were excluded from the study. Then, the contacts of the corresponding and/or first author (in case the corresponding author was unclear) were found and the questionnaire was mailed to them. In case of non response, three follow up letters were sent to them. In addition to inquiring about researchers' demographic information, they were asked about the reason of choosing their research topic, the extent of collaboration they had with decision makers at various levels of executing the research, and their KT activities.

Qualitative section:

The purposeful sampling method was used. The participants of the study consisted of MOHME and its related headquarters' managers and policy makers, research managers and policy makers, clinical service providers, and researchers. These are summarized in table 1. In-depth interviews were used to

collect information from managers and policy makers, and Focus Group Discussions were used for researchers, each of which took 1-1.5 hours long. The interviews and FGDs were performed by the study group. Notes were taken by a note taker and all the sessions were voice-recorded (consent for voice-recording was obtained beforehand). The interview guides included questions on the barriers of knowledge translation in Iran and their reasons and solutions. The numbers of interviews and focus group discussions conducted have been presented in table 1. Thematic approach was used to analyze the data.

Table 1 - Groups under Qualitative Study for Examining Barriers to Knowledge Translation

Sub-group's characteristics	Groups or individuals interviewed	Method of data collection
Managers and policy makers in MOHME and or related organizations	Ex-minister of MOHME, Advisor to the Minister of MOHME, Director General of MOHME, MOHME expert, Directors of MOHME's Offices	8 In-Depth Interviews
Research Managers and policy makers in MOHME	MOHME's Deputy of Research and Technology, medical university chancellors and deputies of research affairs, research center directors	5 In-Depth Interviews
Healthcare and service providers	Clinicians delivering healthcare in specialized hospitals, managers and health service providers	3 Focus Group Discussions

Researchers in units under MOHME's authority	Faculty Board members and basic science, health and clinical researchers in Universities of Medical Sciences and the Health Ministry's Headquarters	3 Focus Group Discussions

Ethical considerations

This project was approved by the Ethics Committee of Tehran University of Medical Sciences which functions in compliance with the Helsinki declaration. Participants were briefed on the objectives of the study and verbal consent was obtained from them at the beginning.

Results:

Quantitative section

Data collection tool:

The content of the questionnaire was provided by literature review and expert opinion. The pilot was conducted to assess feasibility, face validity and reliability. Twenty researchers completed the researcher's questionnaire twice at 10-14 days intervals to evaluate the reliability of the questions from two aspects, repeatability and internal consistency. Intra-cluster correlation that was used as a repeatability indicator was 0.72. As the internal consistency indicator Cronbach's alpha was 0.76.

Population under study

The questionnaire was distributed among 107 researchers in 9 cities. On the whole, 88 questionnaires were completed by the researchers. In spite of three instances of follow-up, 19 of them did not complete the questionnaire. The response rate was 82% hence. Males constituted 60.2% of the participants. The mean age of the participants was 45.5 years with 7.1 SD (min-max: 31-66 years). Only 7 (7.8%) were not faculty members, and among professional ranks were associate professors (36 persons, 40.9%), assistant professors (29, 33%), professors (9, 10.2%), and instructors (7, 7.8%) respectively. The mean professional record was 11.8 years (SD=7.1).

Stakeholders' collaboration in research:

Regarding the method of choosing the research topic, 39.8% had chosen their topics on the basis of other organizations' requests and/or needs assessment. These individuals had chosen one of these options: "this project was required by other organizations (other than our own organization) and/or non-governmental centers (such as pharmaceutical and equipment companies) and was conducted on their demand", "I chose this topic upon reviewing managers and policy makers' needs" and/or "I chose this topic upon reviewing clinicians' needs in

decision making". Needless to mention that aside of the aforementioned options, they could choose the personal interest options too. Personal interest alone was the reason of choosing the research topic in 18.2% of cases.

Where collaboration in the other stages of research were concerned (including design, execution, data analysis, report preparation, article writing and/or dissemination of results) 23.9% of the authors had no interaction whatsoever with the target audience (illustrated in table 2). The highest interaction rates were seen in the design of the study and execution of the project that was mentioned by 40.9% and 39.8% of the authors respectively.

Table 2 - Collaboration of research users at different stages of research after choosing the topic

	N=88	Percent
Design	36	40.9
Execution of the project	35	39.8
Analysis and interpretation of research results	19	21.6
Preparation of reports	20	22.7
Dissemination of research results	33	37.5
No collaboration	21	23.9

Attempting to transfer research knowledge to target audience groups:

Researchers were asked to specify the main target audiences of their research and whether they had attempted to transfer their results to them? Table 3 shows that target audiences were mostly service providers, managers and policy makers and finally people or patients respectively. The least attempt made to transfer research results to target audiences and in this case managers and policy makers was 44.4%.

Table 3 - Researchers' attempt to transfer the results of their research to the target audience (n=88)

	Main target audience	Percentage of main target audiences the researcher had attempted to transfer the research results to
	N	N (%)
People or patients	61	32 (52.5)
Health managers and policy- makers	63	28 (44.4)
Service providers (clinical, laboratory, health, etc)	75	46 (86.7)
None	4	NA

NA: Not Applicable

Knowledge translation activities:

The frequency of each of the KT activities (other than article publication) performed by researchers has been illustrated in table 4. Since the population under study were chosen on the basis of their articles published and their first activity was publication it has not been mentioned in the table. Presenting research results in conferences and seminars was the most frequent act (74.8%),

followed by delivering reports to users (45.5%), and preparing content appropriate to users (31.8%), posting the results on websites (27.2%), and presenting results to media (9.1%) respectively.

Table 4 – Frequency of knowledge transfer activities carried out by the researchers under study

	Activity*	Not necessary	The circumstances were not favourable	It wasn't my duty	I've done it †	No-response
		N	N	N	N	N
		%	%	%	%	%
1	Presenting research results in domestic or international conferences, seminars, and meetings	3 / 3.4	10 / 11.4	0	69 / 78.4	6 / 6.8
2	Sending the report (complete or summary) of the research project to users	6 / 6.8	17 / 19.3	17 / 19.3	40 / 45.5	8 / 9.1
3	Mailing or emailing articles, reports, or summaries for stakeholders with or without their request	19 / 21.6	20 / 22.7	9 / 10.2	32 / 36.4	8 / 9.1
4	Provision and sending texts compatible with users' language (such as simple writings for patients or special texts for managers or functional reports for clinical or lab colleagues or for industrial fellows or for the academicians)	17 / 19.3	18 / 20.5	11 / 12.5	28 / 31.8	14 / 15.9
5	Posting the results on the website	9 / 10.2	30 / 34.1	14 / 15.9	24 / 27.2	11 / 12.5

| 6 | Presenting results to reporters, radio and TV for dissemination in the media and participation in interviews or printing research results in non-scientific publications (such as journals or newspapers in which the general public is interested) | 23 | 39 | 7 | 8 | 11 |
| | | 26.1 | 44.3 | 8 | 9.1 | 12.5 |

*The most frequent method of knowledge transfer in the population under study was publication of articles; since the samples were chosen from the authors of articles it has not been mentioned in the table.

† The table's sequence has been set on the basis of this column's frequency

Qualitative section:

Table 5 includes the categories obtained (C), including researchers' characteristics, research, research management and human resources management, and their relevant subcategories (S) which are mentioned with the same numberings below. Some of the participants' statements that are reflective of their own thoughts have been shown in italics in the text.

Table 5- Knowledge Translation Barriers identified in the Qualitative Section of the Study

Category	Subcategory
1. Researchers' characteristics	1. Lack of awareness of knowledge translation
	2. Lack of cooperation among researchers because of mistrust
	3. Method of choosing the research topic
	4. Lack of expectation toward creating change in the target audience
	5. Lack of communication between researcher and decision maker
2. Research	1. Scarcity of applied and beneficial research
	2. Poor quality of research
	3. Lack of delivery of results to target audiences
3. Human resources management	1. Inappropriate promotion criteria for researchers
	2. Shortage of human resources and difficulties in employment
4. Research management	1. Illogical presentation of research priorities
	2. Absence of a predefined mechanism for delivery of research results

C1. Researchers' characteristics

S1. Lack of awareness of knowledge translation

In many participants' opinions, one of the most important barriers was their lack of awareness of KT concepts, its tools and necessity.

"Most researchers don't think of the study's target audiences and production of scientific evidence that would lead to behavior change in them from the start. Nor do they think of disseminating the results in a comprehensible form to the target audiences at the end of the study either; they have not been trained for it."

S2. Lack of cooperation among researchers because of mistrust

Another barrier mentioned was weakness of team work in research. When research is not done as team work, not only does the quality of research decline, but it leads to repetition of research as well.

"...researchers don't approve of each other. We should have specific research networks in different fields."

To improve this situation, building trust and observing professional ethics is particularly important. Ignoring participants' intellectual property rights in research projects creates an atmosphere of mistrust among researchers and research experts.

S3. Method of choosing the research topic

Among other factors that lead to repetitive research and eventually weakening of KT is choosing research topics on the basis of journals' scope. This eventually distances the researcher from the community's research needs.

"By repeating others' studies we want to explain what they have done; we don't want to solve any problem"

"Selection of the research topic is incorrect. It is repetitive and is done with the intention of publishing an article, not creating change"

S4. Lack of expectation toward creating change in the target audience:

Participants believed that researchers do not expect to create change in the target audiences; hence this matter influences their incentives of producing effective scientific evidence. However, one reason behind this condition is lack of dissemination and improper presentation of results to target audiences.

S5. Lack of communication between researcher and decision maker:

Weak communications between researchers and decision makers were among other factors mentioned by decision makers. Some participants complained of ignoring ethics in article authorship and saw it as a distancing factor between researchers and decision makers. This held true in two occasions: not writing the names of individuals who had played important roles in the study (Ghost authors), and writing names of individuals merely because they had managerial posts in the organization and who allowed using the information on the condition of mentioning their names as authors (Guest authors). The participants also mentioned lack of trust as the reason of poor collaboration between researchers and decision makers.

C2. Research

S1. Scarcity of applied and beneficial research:

Scarcity of functional research is evident in two forms. First is the issue of research; a small percentage of research projects are based on needs. The second point is the grade of evidence produced. The number of knowledge-

synthesizing research (such as systematic review and clinical guidelines) is not sufficient.

S2. Poor quality of research

According to some participants the poor quality of research is among weakening factors of KT.

"Seminar material, domestic articles and those accessible to us are not of acceptable quality"

S3. Lack of delivery of results to target audiences

Uncertainty regarding the target audiences of research projects and articles prevents scientific evidence from reaching its target audience directly. On the other hand the article/report will not be written in a manner comprehensible to the target audience. Decision makers also believed that research results are not delivered to them.

"We don't even have access to articles that have been published, let alone those (research results) that haven't been published"

C3. Human resources management

S1. Inappropriate promotion criteria for researchers

Among the barriers mentioned repeatedly by most participants as an important factor in the national research system was faculty members' inappropriate promotion criteria.

"Doing research for pay and promotion doesn't allow the researcher to focus on a specific topic or let him follow a series of research on a certain topic, and eventually he/she does not have any plan from the beginning of the project"

"We do research for promotion, rewards, obtaining a PhD degree or specialty"

S2. Shortage of human resources and difficulties in employment

Production and utilization of scientific evidence required for health policy making becomes difficult when there are shortage of human resources conducting research relevant to the health system's policy making.

C4. Research management

S1. Illogical presentation of research priorities:

One barrier mentioned by most researchers was the problems related to research priorities. While the existing research priorities do not meet the country's current and future needs, eventually researchers are expected to set their research topics on the basis of these priorities. And sometimes the research priorities are not desirable or relevant to the researcher.

"If a research is not based on priority then we become sinners"

S2. Absence of a predefined mechanism for delivery of research results:

Participants believed neither the researcher alone can deliver his research findings to the target audience nor can the policy maker access all relevant research on his own. So there should be organizational and human capacity building for KT. "Lack of awareness of knowledge translation" too is the result of the research management's performance. Participants believed that insufficient propagation of KT was among infrastructural barriers that call for particular attention. Some were of the belief that absence of a predefined mechanism for transferring research findings to target audiences is a major barrier. On the other hand, refusing to support KT funds in research projects lowers researchers' inclinations toward such activities.

Discussion:

This study aimed at describing the KT status in the health knowledge producing sector (quantitative section), and to identify the background factors leading to it (qualitative section). The barriers identified cover a wide range of factors, starting from choosing the research topic to utilization of research by decision makers.

The discussion has been written in the sequence of findings in the quantitative section, and the qualitative section's results have been simultaneously included. To represent qualitative results summarized in table 5, 'C' has been used in lieu of category, and 'S' has been used in lieu of subcategory.

Choosing the research topic:

The quantitative section's results showed that only 39.8% of researchers had chosen their topics on the basis of other organizations, managers, policy makers, and clinical service providers' requests and/or needs assessment. On the other hand, in 18.2% personal interest was the only reason. In the qualitative section too the participants pointed out the incorrect method of choosing the research topic, and recognized it as a result of the existence of problems in research priority setting. One of the factors stated in C4S1 was absence of a proper system directing research toward priorities and actual needs. Lack of cooperation among researchers because of mistrust (C1S2) was another factor mentioned. Building trust and establishing research networks as the basis for objective and systematic work on research topics is therefore a recommendation.

In the researchers' promotion criteria too, production of knowledge that results in articles is valuable, and less focus has been laid on the consequences of research (C3S1). However, unless Health Services Research (HSR) findings do not lead to activity and change in developing countries research will remain inefficient[13]. Encouraging researchers who strive to find different ways of disseminating research findings will also be effective in this respect [14].

Recently in Iran, certain changes have been introduced in faculty members' promotion criteria in which 'change following research' has been granted scores. Apart from the fact that the topic is new and that it needs time for it to take effect, focusing on the efficiency of these scores in comparison to article writing scores is necessary. Creating change seems however more difficult than research conduction and article writing.

Another aspect of the issue of 'Scarcity of applied and beneficial research' (C2S1) is the capability of research in meeting current demands and the scientific level of evidence produced that will lead to decision making. Evidence also shows that systematic reviews and other knowledge synthesis methods strengthen interactions between researchers and users [15, 16]. In this study too, the low production of knowledge synthesizing studies such as systematic reviews and clinical guidelines, and poor quality of research were mentioned as the KT barriers. A study conducted on participants of systematic review workshops in Iran revealed that the first influential factor on conduction of systematic reviews was policy makers willingness to use the results of such studies [17]. Therefore it seems helpful to establish networks between researchers and policy makers and to have them notify researchers of the need for systematic reviews.

Decision makers and researchers' interaction at various stages of research:

Table 2 illustrates research activities followed upon choosing the research topic. According to the table 23.9% of authors have no interaction with target audiences at all. The figure is a considerable one, and represents the little cooperation taking place between researchers and research result users. This is in spite the fact that collaboration at all stages of data collection, analysis and synthesis between researchers and decision makers -like practitioners- strengthen knowledge utilization, and is the main foundation of interactive KT methods [18]. Elsewhere in another study, collaborative research has been deemed necessary in the 'research to policy' cycle. Here, establishment of a 'Virtual Health Policy Network' has been advised, and has been stated that the

network should consist of the following expertise: health system research, health policies and regulations, ethics, organizational and behavioral psychology, knowledge transfer, non-health factors influencing health, qualitative methods, health economics, adult education and sociology. The presence of policy makers at higher levels of this network can be very effective [19].

Researchers' aim is for science to prosper. In the research world, the aim is to publish articles, acquire patents and professorship, whereas for the policy maker, the aim is people and policy practice. The researcher looks for loopholes in knowledge and submerges in them, while the policy maker sees problems in a large scale, and wants macro solutions [20]. So an intervention for increasing cooperation between these two is not a simple and pre-defined procedure. In fact, interventions should be directed toward creating a mutualistic relationship between researchers and policy makers, i.e. both should benefit from their interaction [20]. The subcategory 'Lack of communication between researcher and decision maker' (C1S5) also highlights this matter, and points out the reasons as researchers lack of consideration of target audiences needs, and lack of trust between these two groups. Perhaps, the poor quality of research (C2S1) it-self is among the reasons of this mistrust. The other form of mistrust is lack of observing ethics in dissemination of research results. The effect of this matter is shown when researchers are not willing to give their research results to target audiences easily before their paper is published, and since publication is a lengthy procedure, information doesn't reach decision makers in good time.

Attempting to transfer knowledge to target audience groups:

'Lack of delivery of results to target audiences' (C2S3) is shown in table 3 too. This table shows that in cases where the main target audiences –according to the researcher- are 'people or patients' or 'managers and policy makers', only half of them have attempted to transfer their research message to them. Taking into account the qualitative section's findings, there may be more fundamental problems in researchers' characteristics that lead to this; basically, there is 'lack

of expectation toward creating change in the target audience'. This alone will affect the researcher's incentive for producing effective scientific evidence (C1S4).

Dissemination of research results:

The methods of transferring research findings have been illustrated in table 4. While drawing this table, the "I've done it" column was considered as the main response, and the sequence of the rows (that are KT activities) have been set on this basis. KT activities can be classified into active and passive strategies. Passive strategies are: "delivery of the project report or its summary to users; preparing articles and publishing reports in domestic and international peer-reviewed journals; displaying results on a website; posting or e-mailing articles or reports and/or their summaries for stakeholders without their request; and presenting the results in domestic or international conferences and seminars, and/or publishing research results in newspapers. The 'active' strategies are preparation and delivery of content in plain language; holding briefings with stakeholders for presentation of research results; and presenting results to the media and participation in interviews" [21].

Lomas demonstrates that passive strategies are more directed toward changing awareness, while active strategies are more directed toward changing behavior [22]. The interesting point in table 4 is that among the six activities in this table, the more frequent activities are related to passive strategies and the two less frequent activities are active strategies. This finding demonstrates the same issue mentioned in the interpretation of table 3 regarding researchers' lack of willingness toward transferring knowledge to target audiences. A study conducted in Tehran University of Medical Sciences showed that passive strategies were the most frequent activities performed by its researchers [9], which was similar to other developed countries [23].

The important point in table 4 is the association between the "I've done it" and "The circumstances were not favorable" columns, where except for one case are

inversely related to each other. The sequence obtained proposes this hypothesis that perhaps part of KT strategies is dependent on circumstances and facilities, and favorable conditions such as financial support should be made available. In analyzing the weaknesses present in research management 'Absence of a *predefined* mechanism for delivery of research results' (C4S2) was put forth. One of these barriers is the shortage of manpower, both in knowledge producing and decision making organizations that lead to a decline in the quality of tasks performed (C3S2). One solution would be to consider 'knowledge brokers' in these settings. Knowledge brokers' efficiency in different settings and defining their necessary characteristics and activities requires further studies yet. However they can prove helpful by creating a mutual understanding of researchers and decision makers' aims and culture, identifying users' problems and questions on research results, facilitating access, evaluation, interpretation and translation of research evidence to decisions and policies, and eventually integrating the best available evidence into decisions [24]. In any case, awareness of KT methods and strengthening of incentives is necessary for accomplishment of KT behaviors in researchers. According to the participants too, insufficient propagation of the KT culture is among the infrastructural barriers (C1S1).

While interpreting the quantitative results of this study two important points must be kept in mind. Firstly, basic science articles, case reports, letters etc were excluded, and more applied articles were the grounds of the questions asked. Secondly, the results of our study seem to be more optimistic than real. The first reason is that the questionnaire was completed by the researchers themselves (though as aforementioned, the reliability of the data collection tool was >70% and acceptable), and due to social desirability their preferences is more optimistic than real. The other is the 18% non-response rate. This rate may depict their inattention to the subject or inadequate time spent on responding; these same individuals may have less interaction with decision makers or practice KT.

Presence of the qualitative section alongside the quantitative section allows a better understanding of the problems identified in the latter and offers a complete outlook for designing interventions. Also, purposeful sampling of different stakeholder groups of researchers and decision makers from macro, meso and micro levels in the qualitative section allowed different aspects of the subject to come in view, and it seems to have avoided unilateral judgment.

With their impression of the role of knowledge in socio-economic development, different countries should expand their research institutes and higher educations' infrastructure according to their aims of knowledge utilization. On this path, cooperation between the university and other organizations (such as ministry of health, industry, executive organizations, public and private sector) become valuable. To strengthen this cooperation, the most important step is to create an interactive atmosphere between research result users and knowledge producers (researchers). That is why knowledge utilization models emphasize that knowledge users should play a role in the research process. One of the interventions proposed for filling the gap between researchers and policy makers is to expose policy makers to the research process [25]. In a country like Iran where there is an integrative structure between universities and executive health bodies we would expect to see more of this interaction, but our quantitative and qualitative results show otherwise. This shows the need for specific interventions to activate the potential benefits of this integration. In recent years, certain steps have been taken to client-orient research in Iran too. Among these are regulations in the country's 'Five Year Economic, Social and Cultural Plan' which state that if applied research projects have clients willing to provide 40% of its funds, then the remainder will be payable from public funds to allow these projects to be conducted in universities and research centers [26].

The other aspect focused upon in this study is the adaptation of a known range of factors in the study with the 'Knowledge Translation Model of Tehran University of Medical Sciences'. This model was designed on the grounds of a review and qualitative study, and introduces all factors that can somehow affect

KT. The differentiating characteristic of this model is its ability to adapt to knowledge producing organizations [27]. So by adapting the findings of this study to the model it may be concluded that this model is a practical framework for analyzing the status of KT in research organizations.

What is evident in our findings is that barriers exist at all levels of choosing the research topic, research network establishments and researchers' awareness and incentive for disseminating results. Among effective interventions that are recommended are: correct and logical research priority setting, implementing effective changes in researchers' promotion criteria, focusing on knowledge-synthesizing research such as systematic reviews, training human resources and knowledge brokers, allocation of funds to the KT process, and teaching KT. High quality research, setting of explicit authorship regulations and their observation can prove effective in building trust between policy makers and researchers. Ethical issues also seem highly important in knowledge transfer.

Knowledge transfer cannot be strengthened by carrying out interventions in the 'Push' side alone and without the cooperation of policy makers at macro and meso level, and long-term programs need to be designed with this objective. Taking into account the integrated scientific and executive structure in the country, it appears that direct investments in establishing networks for researchers and decision makers at macro level would be effective. Also, similar networks in choosing the research topic, priority setting, and building trust among researchers and policy makers seem helpful too.

Acknowledgements

Competing interests

The authors declare that they have no competing interests.

Appendix 1

A-'Iranpsych' was run in March 2004 by the National Medical Research Center. This database is a site specifically devoted to mental health studies' published materials related to the Iranian population and /or researches conducted in Iran in domestic and international journals and conference proceedings. (http://iranpsych.tumc.ac.ir)

B- 'Scientific information database' (SID) has been established by 'Jahad-e-Daneshgahi', a non-profit and non-governmental organization in August 2004. It covers a wide range of subjects including health, humanities, social sciences, engineering, agriculture and basic sciences. SID offers both Persian and English articles. (www.sid.ir)

C- 'Iranian database of medical articles' (Iranmedex) was run in June 2004 by a private sector. Health related articles from Iranian journals in both Persian and English were covered by this database. (www.iranmedex.com)

D- 'Magiran' is a database of the country's publications launched by 'Aftab' Software Co. (a private company)

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Third paper.

Evidence Based Decision Making In Iran:

The Pull Side Barriers

Abstract

Background: Health research funds may drop following economic crises, and this is more likely in developing countries with limited financial resources, the consequences of which may be direr. So what should be done to decide on the basis of scientific evidence to prevent wastage of human and financial resources, and how should we conduct research useful to policy makers with these limited resources? The current study was designed to identify barriers to evidence based decision making in health policy making in Iran and to suggest effective and useful interventions accordingly.

Methods: The participants were purposefully selected. In-depth interviews and focus group discussions were used to collect data and theoretical framework was used to analyze them.

Results: The barriers mentioned were classified into three main themes: decision makers' characteristics, the decision making environment and the research system. Each theme consisted of further relevant subthemes.

Conclusion: There are various barriers to evidence-based decision making at different levels, and multi-dimensional solutions are required to strengthen the impact of scientific evidence on decision makings. These solutions should result in changes in culture and the decision making environment's value system for the purpose of valuing evidence-based decision making, attitudes, incentives and capabilities of decision makers; and also to strengthen the country's research system for increasing communications with health policy makers.

Keywords: Evidence based, decision making, utilization, Iran

Introduction:

Every year multiple studies are conducted in the field of health. The essential question is how much have these studies improved health and health equity in the society? This matter becomes more important in countries that have limited financial resources. In WHO's 2004 'Knowledge For Better Health' report this issue was raised as the main health research concern. It states that in spite of the availability of knowledge showing the usefulness of these interventions, it is yet only half the solution; the other half that leads to health improvement is how these interventions are implemented in the society [1]. The World Bank has also estimated that in order to achieve the health-related goals of the 'Millennium Development Goals' an annual supply of 20-25 billion dollars is required, and that is if decision makings in the health domain are effective and evidence based [2].

In 1984 medical education was integrated into health services and led to the establishment of a new ministry entitled MOHME in Iran that had a new context too [3,3]. Potentially, this structure should've been able to reduce some of the barriers to evidence based decision making (EBDM) that is the reason behind the gap between research and decision making. Evidence however shows that there is still a long way in utilizing knowledge translation ideally[4]. In recent years certain interventions have been undertaken to strengthen evidence-based decision making in Iran, including the widespread call for applied research proposals, allocation of 2% of medical universities funds to health service research [5], capacity building for production of systematic reviews and practice guidelines [6], and running a Health Technology Assessment Unit in MOHME [7]. All these interventions are witness to the policy making organizations determination to direct Iran's health system in the EBDM direction. The question now is, considering the positive steps taken so far, what other steps should be taken to improve the status of EBDM?

One of the most important steps in identifying the solutions required to promote the status of EBDM is to identify its barriers in decision making organizations.

Numerous studies worldwide have been conducted for this purpose, but since the decision making environments are different for countries, the current study was designed to specify factors influencing and interventions for promoting EBDM through identifying EBDM barriers in the health domain and at national level in Iran as an example of developing countries.

A quantitative study was designed for this purpose. In this section, a collection of questions revolving around the access rate and rate of study of scientific evidence, attitude towards the EBDM status and its barriers, and individuals' performance in decision makings were inquired. The results of this study show that the study subjects response rate is low (the results of the quantitative study have been mentioned in short in appendix 1), and its analysis revealed that a qualitative study is a better option for discovering barriers. So this qualitative study was conducted with the purpose of identifying knowledge utilization barriers in EBDM.

Methods:

The objective of this study was to identify the EBDM barriers in the 'knowledge users' (Pull) side from knowledge producers and users perspective. Two issues were considered while defining the subgroups of the population under study: the position of the individuals under study (central-peripheral), activity in the research system (research policy makers and managers Vs researchers), or activity outside the research system (health policy makers and managers Vs service providers). The subgroups under study have been introduced in table 1. In the researchers' section, the faculty members of two universities were studied: a big university (having multiple complementary fields, educational and research performance at national level), and the other peripheral (in-charge of education and research in more general programs, and at the same time provision of service to the provincial population). For the purpose of data collection, Focus Group Discussion (FGD) was used for

researchers and health service providers, and in-depth interviews were held with policy makers and managers. FGDs and Interviews were conducted up to saturation.

Data analysis

All the FGDs and interviews were taken down by a note-taker. They were also voice-recorded and documented. Thematic framework was used for qualitative data analysis. All the documented in-depth interviews and FGDs were reviewed by two members of the study group separately, and in case of a disagreement the group would make the final decision of choosing the theme. The main themes were extracted as such, and the final conclusion was arrived at.

Ethical considerations

The proposal of this project was presented to the Vice Chancellor of Research in Tehran University of Medical Sciences, and has gained the ethical approval of its ethical committee which is in line with the Helsinki Declaration. After explaining the objectives of the study, verbal consent was obtained from the participants at the beginning of each session. They were also told the voice-recording could be stopped at any time they deemed it necessary.

Results:

Thirteen in-depth interviews and six FGDs were held. All participants agreed to participate in the study. The barriers of EBDM –as stated by the participants- were classified into three themes of 'decision makers' characteristics, the decision making environment, and the research system'.

Decision Makers' Characteristics

Some of the participants believed that absence of a proper attitude toward the importance of EBDM, and limited awareness and knowledge of managers and policy makers toward the methods of knowledge utilization in policy making have shaken EBDM. According to one of them "managers and decision makers can't believe the advantages EBDM may have".

According to another participant's opinion some managers execute a program based on their personal interest, and are so sure of their idea and work that they fail to see any scientific evidence that is against their own idea. One participant said "everybody follows what he suggests himself", and "everywhere is filled with VIPs; they only accept their own research. Many of these policy makers are researchers and come from the university. Research funds are hence directed towards them".

On the other hand, the access rate to domestic evidence and awareness of researchers' abilities is neither desirable nor acceptable. In this context, one of the participants said "We can't go after researchers, because if we start looking for them and what they can do we'd automatically miss out on our own work".

Also, policy makers' preference in using international evidence has also contributed to the gap between domestic researchers and decision makers. According to the participants this preference is the result of lack of self-belief in domestically produced scientific evidence and their unsuitable quality.

 Another barrier emphasized by most of participants was the absence of appropriate criteria in selection and appointment of managers and their rapid replacements. The importance of these barriers in weakening EBDM and utilization of available resources is evident in the following statements:

"The university's educational programs don't prepare the managers for their tasks. They only give them a general background", "managers aren't supposed to become managers through trial and error, and then make us pay for it", "at times the outcomes of trainings become fruitless with the managers repetitive and continuous replacements" and "every day a new group arrives".

Some of the participants were of the belief that factors influencing policy makers and managers incentives had an important role in utilization of evidence in decision makings. Some were of the opinion that the difference between the payment system in the public and private sectors has led to lower incentives in the public sector, and decision makers become more involved in the private sector. Among the other factors that lead to a decline in the incentive of utilizing scientific evidence is absence of rewarding and punishment systems for managers and policy makers that do or do not move in the direction of using scientific evidence.

The Decision Making Environment

Some of the participants believed that EBDM has not been incorporated as a value yet. According to one of the participants "if decisions are made in the absence of knowledge that is required for that particular task or decision, and there is no punishment or reward for it, then deciding without knowledge may remain a faultless action till the end of time".

Some believed that lack of extensiveness of an open and holistic outlook in policy making, and lack of attention to national macro plans (such as the five-year long-term programs) are among the important barriers to EBDM. Keeping this point in mind, one participant stated "you can easily translate industrial research you conduct into a marketable product or money. But it is not like this

in health; we invest now and expect to see the results 20 years later. Most policy makers don't accept this kind of work; they say plant something we will be able to reap two years from now. Our vision is limited; we cannot see the future well".

There are other problems that prevent EBDM in cases where the benefits of investing are clear and definite. Regarding the pharmaceutical industry, the participants mentioned the following reasons for weakening of knowledge utilization in this section: dependency of the production sector on the import sector, the role of multinational drug companies, lack of conduction of in-depth research in the drug and biologic substance production sector due to lack of domestic support, and diminishing of incentives in technical knowledge production resulting from absence of circumstances allowing change at national level. One participant added "there are weak communications between research centers and pharmaceutical and medical equipment industries because most of our drugs are generic, our industry is not creative, and is mostly copied. These industries feel no need for innovation in them".

The other barrier to EBDM is that decisions are influenced by non-technical issues. One participant said "for example imagine a place that doesn't need a CT scan in the hospital, that small city or province's Member of Parliament exerts much pressure on the policy maker to build a CT scan in the city hospital, in a town less populated than 10000".

Some believed that the practice environment that should follow the policies does not have the ability to implement the programs. According to one participant "we have to make suggestions at the policy making level, the environment that should follow the policies and implement our programs does not have the executive power to do so". By stating that "if policy makers act more realistically, executives can follow that policy more successfully too, because the policy is a real one. But when policy making is not realistic, then the executives' will be constrained too" another participant highlighted the importance of EBDM in the health system on the execution of decisions.

Elsewhere, the participants claimed that lack of influence of EBDM to budget allocation will prevent EBDM from flourishing; and that allocation of funds to plans that have not been programmed on the basis of scientific evidence will weaken EBDM. They also went to say the current service delivery system had not been designed to support innovations. In this regard, one participant added "if the task is so new that it can change the system, there will be resistance as a result of conventionalism, and at the moment, this is the main barrier to many of our activities".

The problem of dependency of plans and decisions on individuals, individual-oriented managements instead of being system-oriented, and changing plans with change of managers were mentioned as important reasons for not using scientific evidence in decision making. Not taking advantage of consultants and think tanks were also mentioned as reasons of slowing down EBDM.

Participants also believed that since many decisions were made at national and macro level, and required coordination among various sectors, lack of communication between decision making organizations' subgroups further weaken EBDM.

The Research System

One of the barriers mentioned again and again by participants was the need to prioritize health needs and health research. They emphasized that health research priorities should be identified on the basis of scientific principles and in a systematic way, and that researchers should become aware of them on a regular basis. According to one participant "the ministry of health announces some things in general. It is natural for researchers to find their topics on their own, that they move in their own direction and with their own information. But if there is a source to announce the country's health research priorities accurately and correctly, naturally our researchers will also move on those lines and preserve its scientific track". One of the programs' managers described the lack of announcement of research priorities by decision making organizations as

follows: "my experience of what is happening in our center is that people do not announce the priorities they think are important, especially ever since public employees' promotion system changed, and research was considered as a score. Now that people in the decision making organizations can't give ideas themselves, they say that we have the difficulty of the job, then someone prop and prim comes along who will take the idea and fill his résumé with it at the end of the day. By the end of the year he's got 10-12 articles published, then what? The person will not announce the real priority because he hopes to do it himself".

Shortage of funds for research and production of evidence applicable for decision makers such as 'Health Technology Assessment' and 'Policy brief' were also mentioned as factors preventing EBDM development. Participants believed that adequate resources were required to conduct high-quality research and make decisions based on their evidence to arrange human resources management and provide appropriate instruments for research.

One of the infrastructural barriers is the lack of communication between knowledge producers and users; because in the absence of effective and regular communication, removal of barriers in these two sectors will not improve EBDM. The reasons behind weak communications between researchers and policy makers were described as follows: the impact of undesirable past experiences, users' lack of trust in the university's capabilities in meeting their needs, researchers and policy makers lack of awareness of each others' abilities and needs, absence of a common language between the health ministry's policy makers and researchers, the health ministry's lack of cooperation in giving researchers information they need, the distance between researchers and the executive sector (e.g. absence of a research unit in health networks), and the need for rapid decisions whose research cannot be done rapidly .

Discussion:

In this study we examined the barriers to EBDM from the researchers and decision makers' perspective. The barriers mentioned were classified into three main themes: decision makers' characteristics, the decision making environment and the research system. The result of this study has been illustrated in figure 1. This figure shows the themes and subthemes of this study, their interaction with each other, and other determinant factors. The purpose of this figure is to illustrate the multiplicity of determinant factors on EBDM. In fact, a proper and logical connection needs to be maintained between scientific evidence, policy making and practice to have an ideal EBDM process. Our observation in this study was that when there isn't correct and effective communication between these three domains certain decisions will be made that do not reach the point of execution.

Certain barriers can play roles in the decision making environment. The first and foremost of these is the evaluation system; to what extent it gives importance to EBDM and strengthens it. In fact, if EBDM is to become incorporated as a value in the policy making systems, then the organizations evaluation system should be in accordance with it. The time duration the decision makers need for EBDM and implementation will also be affected by it. A qualitative study conducted in UK on the problems of EBDM shows that one of these problems is the shortage of time required for decision making [8]. This shortage of time occurs due to shortage of program performance evaluation periods, and practically leads to EBDM only in short-term topics [9]. So the decision making environment can be considered influential in the employees' attitude and incentives toward EBDM. The other finding of our study is that the decision making environment affects the type and implementation of 'Continuous Professional Education', and can eventually affect individuals' awareness too. Another section of the educational system (other than 'Continuous Professional Education') is concerned with official academic programs. According to the current study the content and quality of these courses can affect the decision makers' awareness and ability.

Unsuitable selection and appointment criteria of managers, their rapid replacements and payment differences in public and private sectors can weaken EBDM through two channels, one is through affecting decision makers' incentives and the other is by destroying program continuity. Studies show that by affecting individuals' incentives and their replacement rate, structural changes weaken EBDM [10].

Other important barriers introduced in this study (which has been less focused on in the past) are that research questions are not based on needs and that the quality of research is low. Need based research increase the chance of their being implemented, and if the quality of scientific evidence produced is trustworthy (which is the outcome of the research system's performance), it will directly affect the utilization of domestic evidence and decision makers' collaboration with researchers. This is in fact a further emphasis on the significance of a country's research system in achieving an ideal level of EBDM. That is why knowledge translation models such as the 'Ottawa Knowledge Translation Model' [11,12] that have been mentioned as suitable models for evaluating the status of knowledge translation in developing countries [12] do not completely comply with the findings of this study. Conversely, the 'Tehran University of Medical Sciences' Knowledge Translation Model' that is the result of a review and qualitative study is more compliant with our study. The latter has a section concerned with the question and quality of research [13]. The difference between this model and the Ottawa model is that the latter examines the barriers and solutions of knowledge translation from the time of scientific evidence production; whereas this study shows that the source and method of scientific evidence production themselves need further focus and intervention.

Finally, decision makers' access to domestic and international evidence will inevitably affect their utilization.

The findings of two review studies that have examined the barriers to EBDM in policy making and health management are compliant with the current study.

The first study that was conducted in 2002 and had reviewed 24 studies mentioned the following as barriers to EBDM: absence of direct communication between researcher and policy maker, absence of relevant and timely research, lack of trust between researcher and policy maker, disputes over power and financial resources, low-quality research, lack of political stability and rapid replacements of policy makers [14]. The barriers identified by the 2007 systematic review study were: determinant factors at personal level (lack of experience and capacity of evidence utilization, lack of mutual trust, and negative attitude toward change), determinant factors at organizational level (non-supportive culture, incentives stronger than EBDM, inappropriate reward systems for researchers, and rapid replacement of persons), communicative factors (poor selection of messenger, high volume of data, unsuitable scientific language for policy makers, and absence of an actionable message), and time-related factors (timing differences between researcher and policy maker and limited time for decision making) [15].

Another study conducted in South Africa examined the determinant factors of EBDM in maternal healthcare. This study identified similar factors such as 'active communication between policy maker and researcher, quality of research, access to research at the right time, political environment, organizational bureaucracy and its flexibility toward change, presence of a 'functioning policy network' including the researcher, policy maker and bureaucrats, and finally a positive attitude toward knowledge translation in the system' [16].

On the whole, gaps are seen in two major stages of translating research to action, which are: translation of clinical and basic research to ideas and products, and translating ideas and products to practice. Many examples can be found in which in spite of adequate evidence and research in a particular field, no impact is made on the community's health (such as lack of change in the obesity trend in spite of numerous basic and clinical studies in this field and introduction of various weight reducing drugs and diets) [17]. This matter holds true in health policy makings too. An example is the study conducted with the

purpose of inspecting decision makers' knowledge and attitude on the usefulness of HSR projects in implementing the 'National Drug Policy' in Laos. Though 95% of decision makers had evaluated the HSR results presented to them in past seminars as beneficial, and had received their documented reports that same year, only a few of them were aware of the existence of those studies. This shows that the second gap i.e. changing practice on the basis of evidence is a complex issue and demands intelligent and multidimensional interventions [18].

Taking into account the barriers identified in the study, many solutions can be suggested to strengthen EBDM. In order to foster EBDM in the health sector, knowledge producing and using organizations should have a multidimensional approach in their decision making and management procedures to come closer to an evidence-based system. Bernard Choi has outlined six general steps in filling the gap between policy makers and researchers in his study in 2008: presenting scientific evidence to policy makers, informing researchers of policy making procedures, presenting policy making content to researchers, informing policy makers of research procedures, presence of knowledge brokers for exchanging scientific and policy making content between policy makers and researchers, and organizational knowledge management [19]. These interventions may seem too generalized at first sight, but can be applied as a general framework for designing necessary interventions for promoting EBDM.

One of the solutions is training decision makers. Decision makers need to be trained to be able to understand the information, interpret and apply them. They also need to have a holistic and comprehensive perspective if the evidence produced is to support their decision makings. They should be able to describe the events and foresee through the evidence, therefore the determinant factors of the events need to be clear to them in the evidence [20]. Elsewhere in another study published in 2008 the necessity of collaborative research in the research to policy cycle in non-communicable diseases has been highlighted [21].

Another solution which is one of the most important in the knowledge users' section in Iran is to change the decision making culture at managerial and policy making level. Therefore those interventions are required that aim to empower, create regulations and promote the culture of adhering to existent organizational plans, and reduce dependency on personal decisions. Eventually, in addition to making the executed plans' objectives available, considerable savings will be made in financial and human resources. Indeed, essential to this success is EBDM and their documentations for the policy makers and managers to come.

One of the recommended interventions that demands thorough cooperation between knowledge producers and users is health research priority setting in the country that should be done in a scientific, regular and collaborative manner.

The question now is, do we need 'knowledge brokers'? Should knowledge brokers be individuals in the current setting, or do we need new structures? Where should they be positioned, in knowledge producing organizations, or knowledge using organizations? A number of injury policy makers were interviewed in a qualitative study conducted in British Columbia; there it was mentioned that the validness of the person transmitting the knowledge is important in the impact of the research findings [20]. A country's health research system should specify the research priorities required by decision making organizations, convert it to a research question and deliver it to the researchers. On the other hand, the knowledge produced through research should be presented to user organizations in a proper and usable manner. Actually, a broker is required to create effective communications between health policies, health system and health research [22]. In a model presented by the Canadian Health Services Research Foundation in 2000 research grant securing bodies were introduced as brokers for transmitting the research question from the decision making organization to researchers, but no specific body was introduced for delivering the research results to decision making organization[23]. In countries like Iran where 94-97% of research funds are provided by the government [24] it is expected that the research system play a

more active role as the knowledge broker between knowledge producers and users.

The most significant reason behind the gap between knowledge producers and users is their lack of trust toward each other. Hence clarification of their needs and capabilities can help remove the atmosphere of mistrust between them. What is inevitable is that the collaboration between researcher and policy maker has its own complexities. Bernard Choi et al state that researchers and policy makers have 'different objectives, different attitudes toward information, different languages, different time constraints and different professional promotion paths'. They have also suggested solutions for increasing collaboration between the two, namely, reward systems for collaboration between researchers and policy makers, and the use of knowledge brokers [25]. The impact of absence of such collaboration will lower their cooperation in research conduction. This issue was scrutinized in the quantitative study performed in the biggest medical university in Iran; the results showed that the level of collaboration was not desirable [26].

Scientific evidence can be used in different steps of the procedures related to health policy makings. The health policy making procedure consists of the following steps: agenda setting, specification of probable solutions, examining the advantages and disadvantages (policy formulation), implementation, and finally evaluation [15,27], all of which require scientific evidence for decision making. On the other hand, it must not be forgotten that knowledge development in the field of EBDM at policy making level is not at the same level of its development at clinical level, and all its dimensions have not been recognized yet [28].

What is apparent anyhow, is that multiple interventions need to be carried out in knowledge producing and using organizations to increase EBDM, and that we will not achieve its goals by intervening in one sector alone [29].

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Appendix A:

Objective: the quantitative study was designed with the objective of identifying existent barriers in utilization of knowledge in the health system's decision makings.

Methodology: the participants consisted of the three national committee members of diabetes mellitus, tuberculosis and maternal care programs, each of which are in charge of planning one of these programs. Committees consist of a number of specialized individuals who examine the decisions made in MOHME in each health topic.

A self-administered questionnaire was used to collect data. It consisted of four main sections: demographic data, questions on the access rate and rate of studying scientific evidence, attitude toward the current status and existent barriers of utilizing evidence in decision making, and their practice in decision making. To design the questions on 'attitude' a literature review was performed for relevant questionnaires, and was designed with some guidance from the 'Research Utilization Barriers Questionnaire for Nursing' [30] and studies in the field of knowledge translation barriers conducted by the study group [13].

To study individuals practice in committees, the article abstracts of studies performed on an Iranian population in 2006 and on the three aforementioned topics were sent to the managers in charge of the three programs. Questions regarding the level of awareness and/or collaboration in the study were added following each abstract. Pubmed, Medline, Embase, Iranpsych, Iranmedex, Magiran and Scientific Information Database (SID) were systematically searched to find the abstracts. Basic sciences and irrelevant articles, case reports, case series, letters and brief reports were excluded from the extracted articles. Only abstracts of articles freely available online were used.

Results: twenty six questionnaires were sent to the committee members, 17 of which were completed and returned. The response rates of the three diabetes,

tuberculosis and maternal care committees were 40%, 57.1% and 100% respectively. The overall response rate was 65.4%.

On an average, individuals spent 15% of their time on research in the past 2 years.

Access rate to data bases: three (17.6%) persons had no access to the introductory briefings of research results with researchers, 2 (11.8%) had no access to domestic study results, and 1 (5.9%) had no access to domestic article abstracts. Studying international article abstracts, websites, and full texts were the most commonly used sources of information; 71% reviewed these sources once a month or more frequently. The least commonly used sources of information were domestic articles and websites (12% reviewed these sources once a month or more frequently), and participating in introductory briefings of research results with researchers (5.9% took part in these briefings once a month or more frequently) [table 2].

Attitude toward the current status: In the knowledge using section the following main barriers were identified: managers' lack of support for implementation of research, lack of incentives for changing methods of decision making, absence of individuals capable of reviewing and collecting evidence in decision making organizations, inadequate access to research results, and inadequate time for reviewing research. In the knowledge producing section the following were recognized as the main barriers: researchers fail to announce their research results, researchers do not use effective methods of delivering their findings to policy makers, research topics are not chosen on the basis of the country's needs, poor quality of research, research results are not applicable in the decision making atmosphere, and presentation of inconsistent research results. The mean, standard deviation, minimum and maximum scores, and numbers of responses to each question have been briefly described in table 3.

Level of awareness & collaboration: At the end of the questionnaire the committee members' level of awareness of articles published and their

collaboration in relevant studies were examined as a sign of evidence based practice in decision making. Out of 183 articles in all three programs, in 68 cases (37.1%) at least one person from the committee was aware of the published article. In 54 cases (29.5%) at least one person from the committee was aware of the research result or its implementation. At least one person from the committee had somehow collaborated in 14 cases (7.6%) (meaning he/she had ordered the study, financially supported it, been consulted prior to the study, or participated in its design, implementation, analysis and interpretation of results, preparation of the final report or dissemination of its results).

Competing interests:

The Authors declare that they have no conflict of interest.

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Health Research system:
- Health research s priority setting
- research funds

Evidence

Practice

Executive field of decisions:
The service delivery system's flexibility

Decision making environment

- Independence of plans from indivisualss

- Existence of consultants and a think tank
- the impact of non-technical issues
- the process of allocation of funds

- organization's evaluation system
- an open & macro outlook
- intersectoral coordination

Policy

Decision makers' characteristics

Policy makers and managers' educational system

- the ability to use evidence based policy making
- attitude toward evidence based policy making

- policy makers' appointment criteria
- the speed of managers' replacement
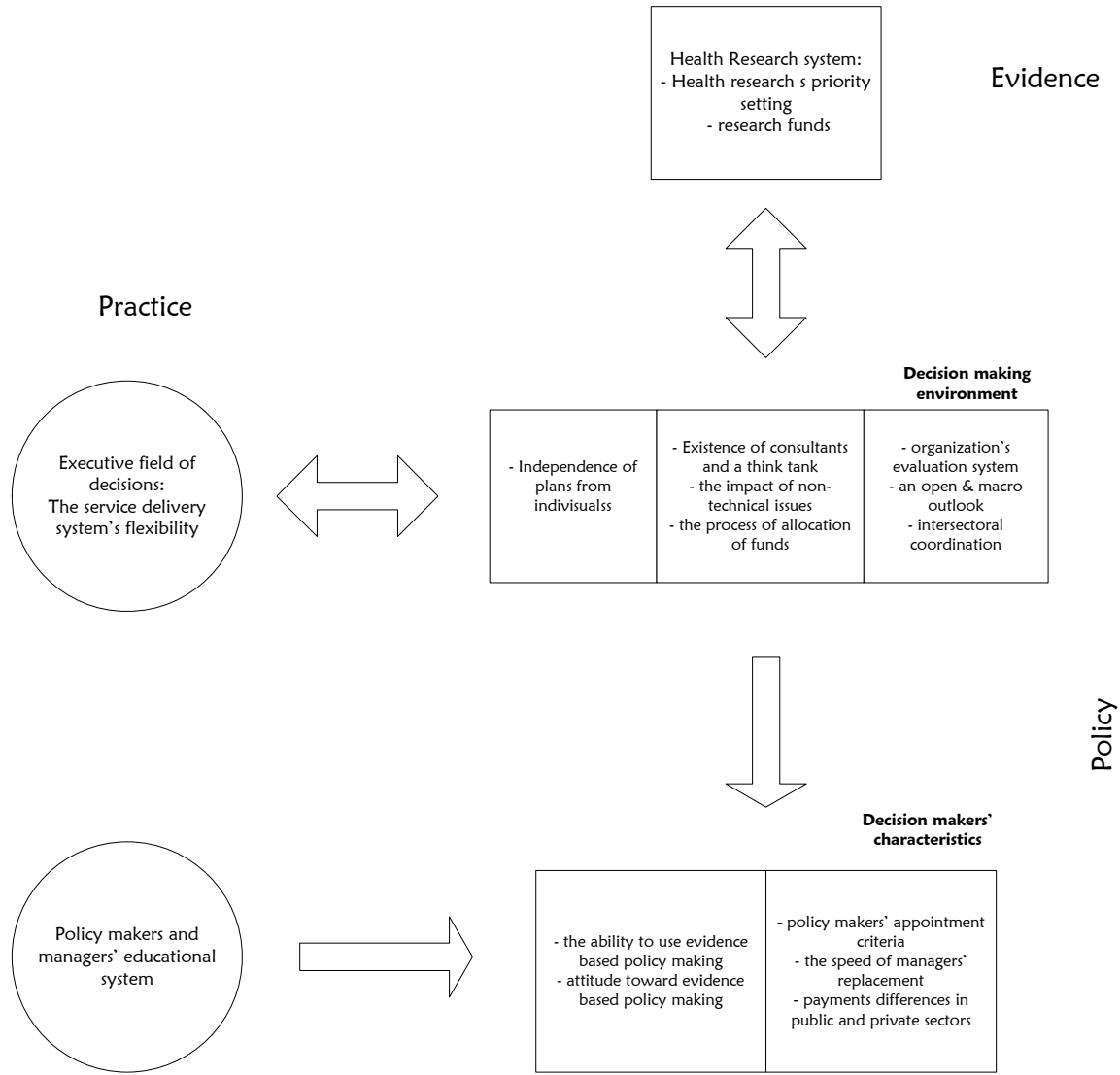- payments differences in public and private sectors

Figure 1: Conceptual model of Evidence Based Policy Making in Health Sciences in Iran

Table 1- Groups Under Qualitative Study for Examining Barriers to and Solutions of Knowledge Translation in Clinical and Health System Research Studies

Sub-group's characteristics	Groups or individuals interviewed	Method of data collection
Managers and policy makers in MOHME and related organizations	Ex-minister of MOHME, Advisor to the Minister of MOHME, Director General of MOHME, MOHME expert, Directors of MOHME's Offices	8 In-Depth Interviews
Research Managers and policy makers in MOHME	MOHME's Deputy of Research and Technology, medical university chancellors and deputies of research affairs, research center directors	5 In-Depth Interviews
Healthcare and service providers	Clinicians delivering healthcare in specialized hospitals, managers and health service providers	3 Focus Group Discussions
Researchers in units under MOHME's authority	Faculty Board members and basic science, health and clinical researchers in Universities of Medical Sciences and the Health Ministry's Headquarters	3 Focus Group Discussions

Table 2- Individuals' Access Rate To & Review of Scientific Evidence

Row	Sources of information	Have no access	Have not used in the past 6 months	Less than once a month	Once a month	Once a week	Every day	No response
1	Full texts of international articles	0	0	2 (11.8%)	2 (11.8%)	5 (29.4%)	4 (23.5%)	4 (23.5%)
2	Abstracts of international articles	0	0	0	1 (5.9%)	5 (29.4%)	7 (41.2%)	4 (23.5%)
3	Full texts of domestic articles	0	7 (41.2%)	4 (23.5%)	0	2 (11.8%)	0	4 (23.5%)
4	Abstracts of domestic articles	1 (5.9%)	5 (29.4%)	4 (23.5%)	2 (11.8%)	1 (5.9%)	0	4 (23.5%)
5	Participation in introductory briefings of research result by researchers	3 (17.6%)	7 (41.2%)	1 (5.9%)	1 (5.95)	0	0	5 (29.4%)
6	Review domestic studies' reports	2 (11.8%)	5 (29.4%)	3 (17.6%)	2 (11.8%)	0	1 (5.9%)	4 (23.5%)

7	Internet (domestic websites)	0	9 (52.9%)	1 (5.9%)	1 (5.9%)	1 (5.95)	0	5 (29.4%)
8	Internet (international websites)	0	1 (5.95)	0	0	5 (29.4%)	7 (41.2%)	4 (23.5%)
9	Articles presented in forums and seminars	0	2 (11.8%)	7 (41.2%)	2 (11.8%)	1 (5.9%)	0	5 (29.4%)
10	Other sources	0	0	2 (11.8%)	1 (5.9%)	0	0	14 (82.4%)

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Table 3- Questions Related to Individuals' Attitude toward Utilization of
Evidence in Decision Making

Row	Individuals' Attitude	Mean score	Standard deviation	Minimum score	Maximum score	No. of responses
1	Research topics are chosen on the basis of the country's needs	1.8	0.6	1	3	10
2	Adequate access to research results that are useful in decision making is not available.	3.9	1.1	2	5	10
3	Research results reach decision makers fast and at the right time	2.4	1.6	1	5	9
4	Researchers inform committee members of their research results	1.6	1.1	1	4	10
5	Individuals capable of reviewing and gathering relevant research findings are not available in the decision making framework	3.9	1.2	2	5	10
6	Communications between this committee and research and academic centers and organizations is such that we can take advantage of their capabilities for production or collection of evidence	2.5	1.5	1	5	10
7	Because of their low quality, research results are not trustworthy	3.8	1.0	2	5	10
8	Different studies report	3.9	0.3	3	4	10

	inconsistent findings, so they cannot be utilized					
9	The existent research results are not applicable and adaptable to decision making setting of the committees	3.4	1.4	1	5	9
10	The necessity of utilizing research results in decision making is completely felt	4.1	1.1	2	5	9
11	The current circumstance do not allow adequate time for reviewing relevant research	3.2	1.5	1	5	9
12	Research results are presented in the form of statistical tests, and these cannot be used by decision makers	2.6	1.2	1	4	9
13	Most researchers use effective methods of delivering their findings to decision and policy makers	1.6	1.0	1	4	9
14	Adequate resources are available for applying research results	2.4	1.2	1	4	9
15	Managers support the implementation of research results	1.6	0.7	1	3	9
16	Generally speaking, circumstances are such that there is no willingness to change the methods of decision making	3.9	1.3	1	5	9
17	National committee members can scientifically appraise and evaluate research projects	4.3	0.5	4	5	9

Final summing up

Barriers to EBDM are a sub-group of the main problems of stewardship in the health system. The health sector review in Iran showed that strengthening of stewardship is a priority. The lack of coordination with other sectors in dealing with non-communicable diseases and social determinants of health are highlighted examples of failures in inter-sectoral collaboration. Decentralisation and improvement of leadership and managerial skills are examples of needed improvements within the health sector. On the other hand, stewardship in the health sector cannot be considered independent. This is why, in the fourth long-term plan for 2005-09, improvement of governance was a target for all ministries: '… aiming at elimination of imperfect and deficient effectiveness, organizationally inefficient and incomprehensive conflicts, centralization, parallel works; and to use modern technologies and efficient methods aiming at renovation, suitability, merging and reorganizing in form of a solid, efficient and sufficient, effective and decentralized system...'.

Therefore, interventions for improving EBDM must be defined within the context of strengthening stewardship of the whole health system. In this situation interventions in EBDM such as presenting scientific evidence to policy-makers, informing researchers of policymaking procedures, presenting policymaking content to researchers, informing policy-makers of research procedures, presence of knowledge brokers for exchanging scientific and policymaking content between policy-makers and researchers, and organisational knowledge management might be effective.

The first and foremost of direct interventions is the valuing system and to what extent it gives importance to EBDM and strengthens it. In fact, if EBDM is to become incorporated as a value in the policymaking system, then the organisation's evaluation system should be in accordance with it. Another solution which is one of the most important in the knowledge users' section in Iran is to change the decision-making culture at managerial and policymaking level. Therefore interventions are required that aim to empower people, create

regulations and promote the culture of adhering to existing organisational plans, reducing dependence on personal decisions.

The second approach should be to change the content and quality of 'continuous professional education' and official academic programmes which can affect decision-makers' awareness and ability. Decision-makers need to be trained to understand, interpret and apply information. They should be able to describe the events and foresee through the evidence, and therefore the determinant factors of events need to be clear to them. This is in agreement with the actions proposed by the health sector review in terms of improving managerial skills for better stewardship in the health system.

The most significant reason for the gap between knowledge producers and users is their lack of trust toward each other. Hence clarification of their needs and capabilities could help to remedy this. What is inevitable is that the collaboration between researcher and policy-maker has its own complexities. The researchers and policy-makers have 'different objectives, different attitudes toward information, different languages, different time constraints and different professional promotion paths'. The absence of collaboration will affect cooperation in research. This issue was scrutinised in the quantitative study performed in the biggest medical university in Iran; the results showed that the level of collaboration was not what it should be.

Other important requirements are doing research based on need and improving the quality of research. Need-based research increases the chance of its being implemented; one of the recommended interventions that demands thorough cooperation between knowledge producers and users is priority setting of research that should be done in a rigorous, systematic and participatory manner. If the quality of scientific evidence produced is trustworthy (which is the outcome of the research system's performance), it will directly affect the utilisation of domestic evidence and decision-makers' collaboration with researchers. This is in fact a further illustration of the significance of a country's research system in achieving an ideal level of EBDM.

What is apparent is that multiple interventions need to be carried out beyond one of the knowledge producing and or using organizations to increase EBDM, and that we will not achieve our goals by intervening in one sector alone. The barriers to EBDM should be considered secondary to the stewardship of the health system, which should have priority.

In final conclusion, good governance and EBDM are very closely related. The improvement of one is not possible without the improvement of the other. Strengthening EBDM cannot be done solely within decision-making organisations; knowledge production organisations should be involved as well by increasing the quality of research and transfer methods. Systematic connection between producers and users of evidence is necessary for improving EBDM.

As a developing country, in Iran the problems lie in all the stages of the process of producing, sharing and using evidence in health system decision making. There are various barriers to EBDM at different levels, and multi-dimensional solutions are required to strengthen the impact of scientific evidence on decision makings. These solutions should result in changes in culture and the decision making environment's value system for the purpose of valuing evidence-based decision making. Unsuitable selection and appointment criteria of managers, their rapid replacements and payment differences in public and private sectors can weaken EBDM through two channels, one is through affecting decision makers' incentives and the other is by destroying program continuity. In the similar situation, while selection and replacement of researchers is not the same as mangers, but there is no criteria for encouraging them to support decision making in the health sector and subsequent changes. The selection and promotion of policy makers should be based on their performance regarding evidence based decision making and the efforts of academicians should be valued in their personal promotion and their institutional ranks.

The attitudes and capabilities of both decision makers and researchers should be promoted through their empowerment regarding different components of the

decision making cycle. Suppose the study revealed that the managers do not have enough access to domestic and international evidence. This could be for knowledge brokers to provide their role, but with ambiguous qualifications and not having formal training on one hand and shortage in recruitment of human resources on the other, the study subjects did not give any clues about their necessities.

Shortening the gap between two universes is a crucial milestone which should be dealt with through different ways and through providing communications between the two. The latter issue is very crucial since the utilization of knowledge can be strengthened only with the close cooperation of policy makers at macro and meso level and the research sector, and long-term programs need to be designed with this objective. Establishing networks for researchers and decision makers in choosing the research topic, priority setting, and building trust among researchers and policy makers seem effective.