



Research's Practice and Barriers of Knowledge Translation in Iran

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Abstract

Background: Knowledge Translation is a process that includes synthesis, dissemination, exchange and application of knowledge to improve the health, services and products. In this study we have attempted to examine the knowledge translation practice and its perceived barriers on the universalities and research institutes (research sector) in Iran.

Methods: Both qualitative and quantitative approaches were used. In the quantitative section, a questionnaire had prepared for this study was completed by 88 authors country wide from randomly selected papers. 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: Twenty four percent of the authors had no interaction whatsoever with the target audience. Lack of expectation toward creating change in the target audience, researchers' incentives, low level 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 barriers identified in the qualitative section.

Conclusion: Translation of research findings into some concrete outputs which can affect health of people is not in mandate of researchers and subsequently they are not prepared for this as well. Based on the barriers identified, it seems that the following interventions are necessary: cooperation among policy makers at macro and meso (organizational) level and the research sector; establishing networks for researchers and decision makers in choosing the research topic, priority setting, and building trust among researchers and policy makers.

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

Introduction

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. Six 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 addition to these strategies, there are climate (7) and contextual factors (8) which heavily influence the success of utilization of research knowledge at national and or organizational levels. A qualitative study in Iran showed that despite previous claims that link between researchers and decision makers should be counted at the factor for successful KT (9) the stewardship of the health system is more crucial (10).

In more than a decade certain steps have been taken to strengthen evidence-based decision making and KT in Iran (11). 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, at least 10 KT workshops were held from 2007 to 2008 in Iran for the research author-

ities of medical science universities (12). 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.

It is a while that the role of organizational factors such as policies, strategies, structures and value system have been recognized as determinants of KT in the research institutes (13). This is a well-known issue in developed countries and efforts have been done for improving the situation such as providing awards and encouraging researchers for KT activities (14).

KT status usually has been assessed from the perspective of decision (policy) maker organizations. This has been done in Iran (15, 10) and also at the regional level in Middle East (16). From research institutions angle, a tool was developed for self-assessment of KT (17) and it has been used for reviewing Iranian universities (18). This tool is looking for infrastructure of the research institutes and scrutinize the intra-organizational aspects of KT rather status of research policy at macro level (17), the point which the present study aimed to cover.

There are important facts that can affect KT in Iran. Firstly, scientific publications have considerably increased in the field of health in recent years. Iran has had the greatest scientific production in the Middle East from the early 90's (19). The number of articles published in ISI journals between 1997 and 2001 has also doubled (20), this can be considered as the main facilitator of KT. Secondly, in 1985 medical education was integrated into health services, which led to the establishment of a new ministry called 'Ministry of Health and Medical Education' (MOHME) . Potentially, this structure should be able to reduce certain barriers to KT because of reducing the gap between researchers and decision makers (21). Translation of research findings in Iran is important for three reasons: Evidence however shows that there is yet a long way to go in using the capacities of KT (22), and little collaboration exists between researchers and stakeholders (23). Thirdly, as a developing country, Iran should be able to safeguard its research resources, particu-

larly now that the world economic crisis has gained international significance. Strengthening KT will help utilize research better and allocate resources to research more appropriately and on more solid grounds.

The current study has been conducted (a) to describe the existent KT practice in Iran's health research sector and (b) to identify its perceived barriers. To our best knowledge there is yet no evidence focusing on the push side barriers 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, which was the first objective of the study, and was examined through the quantitative approach. The second objective of the study which wants to identify reasons was investigated deeply through the qualitative approach.

Quantitative section

To assess researchers' KT activities, a questionnaire was prepared and completed by them. In this questionnaire, identifying the target audiences, collaborating with them throughout the stages of research -from choosing the topic to actively following the implementation of research findings, preparation and delivery of the content of research findings- were considered as KT activities. To select the researchers under study, first, the articles published on the subjects of the Ministry of Health and Medical Education's important public health programs including 'diabetes', 'maternal care', and 'tuberculosis' 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'. 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 107 researchers in 9 cities. 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. The content of the questionnaire was provided by literature review and expert opinion. This questionnaire had been assessed for reliability and face validity in another study previously performed by the research team (23).

Qualitative section

The purposive 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 (FGDs) were used for researchers, each of which took 1-1.5 hours long. The number of participants in each FGD was between 6-8 persons. The interviews and FGDs were performed by two members of the research team who were expert in qualitative approaches and were familiar with KT. The guide for discussions and interviews of the qualitative section included questions on the situation of KT in Iran and its barriers, and solutions. This guide was developed based on a conceptual framework which was developed by the research team and was published elsewhere (24). This framework has shown that it can identify KT strengths and weaknesses and suggest interventions (17). In this model, the status of KT in various parts including transferring the question, knowledge production, knowledge transfer, research use and finally the context of the organization are taken into consideration (24).

The interviews and FGDs were continued until there were no new themes in the interviews and

data was considered as saturated (25). Notes were taken by a note taker and all the sessions were voice-recorded (consent for voice-recording was obtained beforehand). Thematic approach was used to analyze the data. Two members of the research team independently reviewed the interviews and extracted the themes as the subcategories and then compared them as the reliability of the analysis. Agreement between them was 88 percent. While mixing the two sections of the study an effort was made to clarify the patterns that cre-

ated convergence for the data obtained from the qualitative and quantitative sections. For this the results of the quantitative and qualitative studies were compared with each other, and the fields which explained KT practices (resulting from the quantitative section) based on the reasons (from the qualitative section) were clarified. So, analysis of qualitative and quantitative parts of the study had been done separately and they were mixed in the interpretation phase, which is reflected in the conclusion as following.

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

Results

Quantitative section

Population under study

On the whole, among the 107 distributed questionnaires 88 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% of the participants. The mean age of the participants was 45.5 years with 7.1 SD (min-max: 31-66 years). Only 7 (8%) were not faculty members, and among professional ranks were associate professors (36 persons, 41%), assistant professors (29, 33%), professors (9, 10%), and instructors (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, 40% had chosen their topics on the basis of other organizations' requests and/or needs assessment. These individuals had option to choose one the following options: "this project was required by other organizations (other than our own organization) and/or non-governmental bodies (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% of cases. ‘Collaboration’ in research is defined as the steps taken by researchers and research users together, throughout the research project, i.e. from the time the idea of the research is chosen, to the time the results are disseminated and possibly implemented. Through collaboration the chances of utilizing research results are raised (26).

Where collaboration in the other stages of research were concerned (including design, execution, data analysis, report preparation, article writing and/or dissemination of results) 24% of the authors had no interaction whatsoever with the target audience (Table 2). While, basic science studies and case reports etc. had been excluded and we would expect researchers to have had collaboration in the rest of the studies. The highest interaction rates were seen in the design of the study and execution of the project that was mentioned by 41% and 40% of the authors respectively.

Transferring 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 to transfer research results to target audiences and in this case managers and policy makers was 44%.

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 activity (75%), followed by delivering reports to users (45%), and preparing content appropriate to users (32%), posting the results on websites (27%), and presenting results to media (9%) respectively.

Qualitative section

Table 5 includes the categories obtained (C), including barriers in researchers’ characteristics, research conduction, research management and human resources management, and their relevant subcategories (S) which are mentioned with the same numberings. Some of the participants’ statements that are reflective of their own thoughts have been shown in italics in the text. The type of participant/interviewee has been mentioned in parentheses at the end of each quotation.

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

Design	n=88	Percent
	36	41
Execution of the project	35	40
Analysis and interpretation of research results	19	22
Preparation of reports	20	23
Dissemination of research results	33	37
No collaboration	21	24

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

Characteristics	Main target audience n	Percentage of main target audiences the researcher had attempted to transfer the research results to n (%)
People or patients	61	32 (52)
Health managers and policy-makers	63	28 (44)
Service providers (clinical, laboratory, health, etc)	75	46 (61)
None	4	NA

NA: Not Applicable

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

Activity*	Did Not seem 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	10	0	69	6
	3	11		78	7
2 Sending the report (complete or summary) of the research project to users	6	17	17	40	8
	7	19	19	45	9
3 Mailing or emailing articles, reports, or summaries for stakeholders with or without their request	19	20	9	32	8
	22	23	10	36	9
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	18	11	28	14
	19	20	12	32	16
5 Posting the results on the website	9	30	14	24	11
	10	34	16	27	12
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	44	8	9	12

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

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

Table 5: Knowledge translation barriers identified in the qualitative section of the study

Category	Subcategory
1. Barriers in Researchers' abilities	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. Barriers in research conduction	1. Scarcity of applied and beneficial research
	2. Poor quality of research
	3. Lack of delivery of results to target audiences
3. Barriers in human resources management	1. Inappropriate promotion criteria for researchers
	2. Shortage of human resources and difficulties in employment
4. Barriers in research management	1. Illogical setting of research priorities
	2. Absence of a predefined mechanism for delivery of research results

C1. Barriers in Researchers' abilities

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; they have not been trained for it.”(Research manager)

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 various fields.”(Researcher)

In our research, especially those that are multi-sectorial, a chain should be formed, but there are certain hidden barriers, the first of which is 'not knowing each other', 'not trusting each other', and then the special links that need to be created.(Researcher).

We don't use our own research much; we don't trust each other or even ourselves.(Researcher).

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.

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”(service provider)

“Selection of the research topic is incorrect. It is repetitive and is done with the intention of publishing an article, not creating change”(policy maker)

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, and writing names of individuals merely because they had managerial positions in the organization and who allowed using the information on the condition of authorship. The participants also mentioned lack of trust as the reason of poor collaboration between researchers and decision makers.

C2. Barriers in research conduction

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”(service provider)

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 were 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”(policy maker).

C3. Barriers in 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"(researcher)

"We do research for promotion, rewards, obtaining a PhD degree or specialty" (researcher manager)

S2. Shortage of human resources and difficulties in employment

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

C4. Barriers in research management

S1. Illogical setting of research priorities:

One barrier mentioned by most researchers was the difficulty associated with 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" (researcher)

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 knowledge exchange. "Lack of awareness of KT" 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 research sector (quantitative section), and to identify the background factors leading to it (qualitative section). In short, lack of familiarity with KT and methods of delivery and choosing the research topic that were concerned with various factors such as 'priority setting, absence of a link between researcher and policy maker, and inappropriate promotion criteria' were identified as the barriers to KT at the time of the study.

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. (Please note that decision makers and policy makers have been used synonymously throughout the discussion.)

Familiarity with knowledge translation

Many participants believed that their lack of awareness of KT concepts was one of the most important barriers to KT (C1S1). Like any other novel idea that is in its prime, a lack of awareness toward its concepts prevents it from being practiced and implemented. In Iran, similar to other developing countries, KT is a relevantly new term that is specifically being propagated by a limited number of researchers in the country (12, 27). Studies elsewhere also show that lack of familiarity with KT impedes its proper practice (14). Therefore, creating awareness on KT and incorporating as an integral part of the research system seems necessary to promote utilization of research findings particularly in developing countries that face resource constraints.

Three kinds of interventions were experiences in developed countries including providing guidelines and toolkits for KT (27), educational programs (28, 29) and consultative services (30).

Delivery of research results to target audiences

The delivery of research results (C2S3) is affected by a number of issues. The participants did not expect to create change in the target audiences in the first place (C1S4), hence, the lack of incentive to do so. Although 45% reported delivering reports to users, but in most cases the users were health service providers (61%), and presentation of results in conferences was the most frequent KT activity (69%), both of which are passive strategies. Lomas demonstrates that passive strategies are more directed toward changing awareness, while active strategies are more directed toward changing behavior (31). 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 (17), which was similar to the rest of the country (18) and also developed countries (32, 33). In addition, a recent study showed that in Eastern-Mediterranean region countries, KT is also an unknown issue (16).

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.

Choosing the research topic

The quantitative section's results showed that 18% of researchers had chosen their topics on personal interest. Here too, multiple factors have been identified that require more fundamental changes. Assessment of research needs and priority setting are primary stages of research conduc-

tion. C2S1 and C4S1 point to the difficulties in priority setting; in many instances priorities are not based on needs, but researchers are expected to choose those very priorities. It may be inferred that, lack of communications between researchers and decision makers contribute to this problem (C1S5). Researchers and decision makers remain unaware of each other's needs. Hence policy makers' research needs remain unknown to researchers, while researchers perform research yielding scientific results -valid for publication. Here we come across two other barriers in KT, i.e. inappropriate promotion criteria for researchers (C3S1) and absence of knowledge brokers. This is why in some countries collaboration of researchers and knowledge users is mandatory in some call for proposals (14).

By the time this study was conducted, publication of articles and presentation of research results alone were considered as promotion criteria. Hence researchers were more interested in the latter cases, and had fewer incentives to deliver research results to users and decision makers. 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 (34). 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. Establishing research collaboration networks may be another alternative (35 - 37). Knowledge brokers can be defined as mediators who exchange knowledge between researchers and decision makers linking them together and informing them of each other's needs and priorities. 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 (34). Knowledge brokers can also address the problems mentioned in C1S2 by creating a trustworthy environment in which ethical issues are observed and researchers do not have to keep their research ideas to themselves to avoid authorship issues with decision makers. On the other hand, recruiting brokers can be a solution for the C3S2 barriers which was the shortage of manpower.

Review of the intervention in other countries, which are mainly developed, shows that the interventions are not only at the meso(organizational) (38, 39) but also granting bodies and macro level (40, 41).

Limitations of the study

While interpreting the quantitative results of this study four 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 second limitation of the study 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. The third limitation of the quantitative part of the study is that the study subjects had been selected from the studies published. However, there may be researchers whose research results have not been published, and their practice may differ from these individuals. In the qualitative section too, the researchers' opinions are significant. A part of the quantitative section of this study examines the status of collaboration. The fourth limitation is that, in this study, the depth of collaboration has not been questioned,

whereas, in addition to collaboration, its method is also important in KT. Whether individuals collaborate as Formal Supporter, Responsive Audience and/or Integral Partner is important (19). In any case, the requisites of collaboration are the levels at which it takes place, a matter which has been investigated in this study.

The fact that the interview guide is a model that has been designed by the research team also raises this possibility. However, the high agreement rate among the themes extracted from the qualitative results shows that the research team have tried to remove this shortcoming.

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.

Conclusion

Barriers exist at all levels of choosing the research topic, researchers' collaboration with decision makers, 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, training human resources and knowledge brokers, 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 KT.

KT 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. Besides, similar networks in choosing the research topic, priority setting, and building trust among researchers and policy makers seem helpful too.

Ethical considerations

This project was approved by the Institutional Review Board 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. Ethical issues (including plagiarism, verbal consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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