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Collaboration in research and the influential factors in Golestan University of Medical Sciences research projects (2005-2007): an academic sample from Iran

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Abstract

Background: Number of Iranian articles published in ISI journals has increased significantly in recent years. Despite the quantitative progress, studies performed in Iran represent low collaboration in research; therefore, we decided to evaluate collaboration in Golestan University of Medical Sciences (GOUMS) research projects.

Methods: In this cross-sectional study, all GOUMS research projects that had got grants from the university between 2005-2007 were studied. Among 107 research projects included in our study, 102 projects were evaluated and checklists were completed. The researcher's questionnaire was sent to the principle investigators (n= 46) of the projects and eventually 40 questionnaires were collected.

Results: The review of 102 research proposals shows that 10 projects (9.8%) have been performed in collaboration with other organizations. Scientific outputs in these projects have been more than projects which were confined to the university (98% compare to 68%; p= 0.04). The total cost of the projects under study was a little more than 300,000 US$. In just 12 projects (11.8%) a part of the cost had been provided by organizations outside the university. About 50% of researchers declared that they had chosen their research topic based on their "personal interest". Only 1 project was performed by the demand of nongovernmental organizations and 12 researchers reported no collaboration in their activities.

Conclusion: This study shows that collaboration in GOUMS research projects is low. Moreover, collaborations with governmental and nongovernmental organizations are trivial. The scientific outputs in collaborative research projects are much more than other projects.

Keywords: Research, Collaboration, Knowledge transfer.

Introduction

Interactive model is one of the several models that have been developed based on knowledge translation concepts. According to this model, knowledge application is a collection of intricate and mutual interac-

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tions between researchers, stakeholders and decision makers (1).In the interactive theory, researchers cooperate with stakeholders and decision makers in the research process beginning from choosing the research topic to implementing the research project. Both parties are actively involved in the research process (2,3).

Collaboration with other national and international research centers and conducting collaborative and joint projects is a fundamental step in scientific research (4). Medical research projects need collaborative and multidisciplinary approaches to exchange researcher's different perspectives and ideas with different expertise.

Several studies have mentioned the advantages of collaboration between researchers and decision makers. These advantageous are listed as follows: access to data sources and data collection process becomes facilitated, the researchers and decision makers become familiar with each other's environment, decision makers potential competency is improved, decision makers become familiar with researcher perspectives, and research results are made useful and decision makers guarantee research grants much easier (5-7). Although international publication of Iranian researches has been quadrupled over the two past decades and from 1993 to 1998 Iranian articles indexed by the Web of Science has been increased by 25% annually, studies conducted in Iran revealed that the collaboration of medical universities with other national and international research centers is trivial (8,9). Therefore, this study was conducted to determine extension of collaboration in research and the influencing factors within Golestan University of Medical Sciences (GOUMS) research projects as an academic sample from Iran.

Methods

Population: In this cross-sectional study that was performed in 2009, the samples under study were all GOUMS research projects, with grants from inside and outside of the university, done from 2005 to 2007. A total of 107 studies were eligible to be included in this study. Only research projects with accepted final report by the GOUMS research council were included in the study .Undergraduate thesis and students' research projects were excluded from study. Data collection was perfumed for 102 projects (completeness rate of 95.3%). The rest of the studies were not included due to lack of access to their data.

Eligible projects (102 projects) had been conducted by 46 principle investigators (PI). PI was defined as one of the executives that were responsible for the implementation and management of the project. Some researchers had been PI in more than one project. A questionnaire was sent to the PIs three times with 20 days intervals. Ultimately, 40 questionnaires were collected (response rate of 86%).

Tools: The data were gathered using a researcher's self-administered questionnaire, which was sent to the PI, in addition to a data gathering form (checklist that was filled out based on the research proposal and its relevant final report. These forms have been utilized in 'TUMS KTE Study Group' studies and their content validity was approved by expert opinions. The intra-class correlation indicator, considered as a repeatability indicator in domains under study, was 0.69 to 0.72 (10). The data gathering form (checklist) included the following variables: researchers' academic major and position, project funds, degree of collaboration with other organizations, and scientific outputs of the project. Scientific outputs of project were considered as articles published in domestic or international journals and research results presented in conferences, etc. which was confirmed by outputs documentation. The questionnaire included: sex, age, professional job record (years), tenure status (part time/ fulltime), having executive responsibility, percentage of time allocated to research activity, percentage of time allocated to educational activity, reason for choosing the research topic, and collaboration of the end-users of

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research at different stages of the project. A single score was given to collaboration items from 'design of the objective and methodology of the project' to 'dissemination of results to the research users'. The 'collaboration score' was the sum of collaboration items (range: 0-5). Projects were independently divided by two assistant professors into the three following categories: 1) basic science projects which were designed to comprehend the basic and fundamental science concepts in anatomy, physiology, genetic, etc. 2) Clinical science projects consisted of those projects the results of which are utilizable for clinicians. 3) Finally, health system research (HSR) projects the results of which are utilizable for decision makers and health managers.

Data Analysis: Findings on continuous variables were expressed as means ±standard deviation (SD) and categorical data were expressed as percentage. Data were analyzed using Kruskal Wallis, Mann-Whitney U and Spearman correlation test in SPSS 11.5 software. P-values less than 0.05 were considered as statistically significant.

Results

Proposal and final reports: Out of 102 projects, 12 (11.8%) had collaboration with other organizations such as Iranian universities (6 projects), an Indian university (1 project), Iranian Blood Transfusion Organization (2 project), Health Researchers Institute (2 projects) and a drug company (1 project).

Most of the Nursing and Midwifery faculty projects (73%) had not any collaboration with other parts of the universities. Review of research proposals and researcher's questionnaire showed that 92% of the projects, which were designed collaboratively, had resulted in scientific outputs such as articles published in domestic or international journals or research results presented in conferences, etc; however, among projects which were confined to the university, only 63% had resulted in scientific outputs. The difference between the two categories of research projects was statistically significant ($p= 0.04$).

The review of 102 research proposals showed that the total budget of projects under study was a little more than 300'000 US$. In just 12 projects (11.8%) part of the cost had been provided by an organization outside of the university. The total budget for these projects that had been attained from external organizations was a little more than 40'000 US$, approximately 13% of the total budget spent on the whole projects.

Based on the type of research, 102 projects were classified in three groups as follows: 26.5% basic science projects (27 projects), 26.5% clinical science projects (27 projects), and 47% HSR projects (48 projects). Principal investigators and project colleagues were categorized based on their expertise in basic science, clinical science, health sciences, and methodology (biostatistician, epidemiologist, and social medicine). Table 1 shows number and ratio of researchers in each major in three types of research projects. In clinical science research, the number of investigators was more than other types of research (6.55 investigators per project in clinical sciences).

Principal investigators' (PI) characteristics: Among 40 PIs, 27 (67.5%) were male, the mean age was 42.7 years (SD=9.4) with minimum and maximum of 28 and 56 years respectively. As for the professional status of the researchers, 10 (25%) were assistant professors, 18 (45%) were instructors, 6 (15%) were associated professors, and 6 (15%) were non academic members. Among participants, 32 (80%) worked full-time and 8 (20%) worked part-time. The mean number of working years in the university was 10.33 (SD=4.85) and it ranged from 1 to 20 years. Along with education and research, 18 participants (45%) had executive responsibilities such as management of hospitals, schools, research deputies of the school and/or research center etc. Researchers were categorized based on the field of their research projects, 6 (15%) in

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Table 1. The number and proportion of GOUMS researcher's attendance in all majors during 2005-2007, based on the type of research.

			Type of research			
			Basic (N=27)	Clinical (N=27)	HSR (N=48)	Total
Investigator majors	Basic science	Number	81	17	5	103
		In the ratio of project	3	0.62	0.185	1
	Clinical science	Number	26	88	6	120
		In the ratio of project	0.96	3.25	0.22	1.17
	Health science	Number	13	53	115	181
		In the ratio of project	0.48	1.96	2.3	1.77
	Methodology	Number	20	19	42	81
		In the ratio of project	0.74	0.7	0.87	0.79
	Sum of all majors	Number	140	177	168	485
		In the ratio of project	5.18	6.55	3.5	4.75
	Sum of all majors except own major	Number	59	89	53	201
		In the ratio of project	2.2	3.2	1.1	1.97

basic sciences, 14 (35%) in clinical sciences, and 20 (50%) in HSRs. Figure 1 shows the responses of researchers to the question of 'reason for choosing the research topic'. The most frequent response of researchers (50%) was "personal interest" and only one project (2.5%) was conducted in response to private and nongovernmental sector demand such as pharmaceutical and medical equipment companies.

Collaboration in research: Figure 2 shows the results of the question on 'research users' collaboration. Twenty researchers stated that users had no collaboration in any kind of activities (50% of 40 cases). The median 'collaboration score' in all researchers was 0.5 (inter quartile range (IQR) =1.30) which in basic sciences, clinical sciences and HSRs was 0.0 (IQR=1.50), 1.0 (IQR=1.25) and 0.5 (IQR=1.0) respectively with no statistically significance (P= 0.75). The frequency of collaboration with users in different stages of research is as following. In 12 projects (30%) collaboration was observed in just one stage. Three projects (7.5%) had involved collaboration in two stages. In three projects (7.5%) collaboration was observed in three stages and in just 2 projects (5%) collaboration was observed in all five stages.

Factors related to collaboration in research: The association between "collaboration score" with sex (p=0.64), researchers' academic position (p=0.48), having executive responsibility (p=0.67), age (Spearman coefficient= -0.07, p=0.65), professional job record (Spearman coefficient=-0.151, p=0.35), percentage of time allocated to educational activity (Spearman coefficient= -0.27, p=0.09), or percentage of time allocated to research activity (Spearman coefficient=0.01, p=0.93) was not statistically significant. As with tenure status, part-time involvement had signifi-

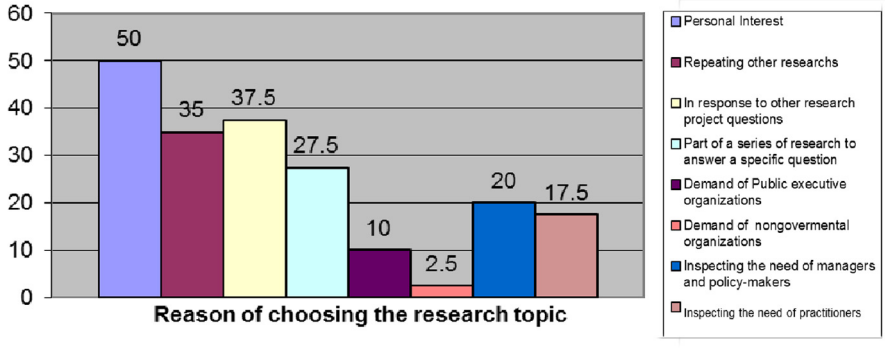

Fig.1. GOUMS researcher's reasons of choosing the research topic during 2005-2007.

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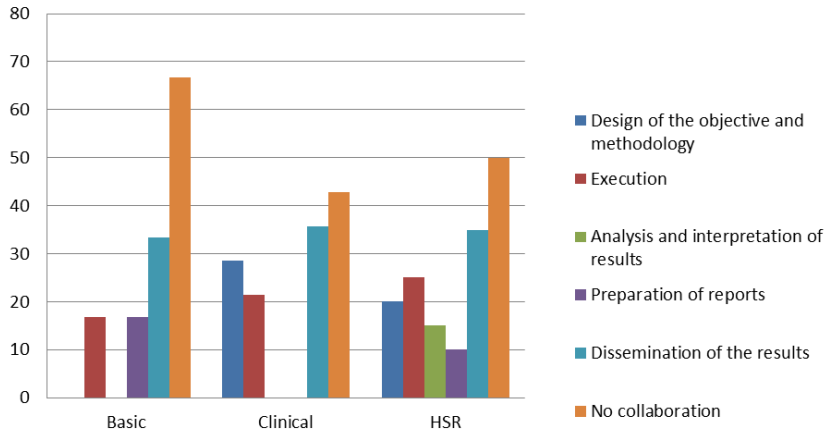

Fig. 2. Collaboration with research users at various stages of research process.

cant association with "collaboration score" (p= 0.045), so that part-time researchers had higher "collaboration score" compare to full-time researchers.

Discussion

The results of the present study showed that out of 102 projects only 10 projects had been done in collaboration with other universities and organizations outside of the university, including 7 (6.9%) with public and 3 (2.9%) projects with private universities or organizations. These results indicate low collaborations within university projects. Moreover, the results of this study showed that joint projects lead to more scientific outputs. In another study about research projects in Tehran University of Medical Sciences (TUMS) has been reported that only 2.2% and 2.4% of the university projects have been conducted in collaboration with other organizations and universities respectively, which is consistent with the results of the current study (11).

Malekzadeh et al stated in a review article that collaboration with international and national research centers and renowned scientists can be a major determinant in improvement of scientific outputs. The authors believe that seclusion of academic research centers in Iran should end and mutual collaboration with other scientific centers should be encouraged. They also stated that more than 90% of the articles published in Medline from Iran have no counterparts from abroad and this fact is in contrast with the current trends in appraisal of multi-centered and mutual collaborations (12).

According to medical research assessment regulations in Iran, collaborative and joint projects earn higher scores in evaluation (13).Iranian government and Ministry of Health and Medical Education impel research centers to conduct collaborative and joint research, while the regulations for academic promotion are reverse. Based on regulations for promotion, single authors' publications receive the highest score and the high number of authors in articles reduces the promotion score (14).

In our study, 13% of the research funds had been secured by sources outside the university. Nedjat et al reported that in TUMS projects this percentage was lower than the present study (6% compare to 13%). This result can be justified by the fact that first type universities such as TUMS undertake more proportion of funds in joint projects compared to second type universities (i.e. GOUMS) (15). In a study done on Iran's research system, it was shown that in only 3-6% of country's research projects the sources were funded by nongovernmental sector (16). It must be considered that in projects which are funded by sources outside the university, behavior change will occur more easily as the funders are waiting for the results to implement changes.

The results of the current study demon-

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strated that in clinical science projects, the number of colleagues is more than those in basic science and HSR projects. This result is concordant with a study by Majdzdeh et al in TUMS (11). The results of the present study also showed that in clinical science projects, approximately half of the colleagues (from 3.2 to 6.5 individuals) were experts in non-clinical sciences which reflects the fact that in clinical science projects collaboration of non-clinical sciences researchers is considerable.

According to a study by Ross et al. the level of collaboration in research is categorized into three following groups: a) Formal supporter: in this situation the decision makers are passively involved in the research process and support the research objectives, b) Responsive audience: decision makers are actively engaged in research, obtain the necessary information, and play the role of consultants, c) Integral partner: the decision maker is completely involved in the research process. Therefore, even though the names of researchers are mentioned in the proposal or the final report, it can't guarantee their collaboration in research (5). Malekzadeh et al have shown that in clinical medicine there is a strong mismatch between the number of faculty staff and scientific outputs. The lower output of the clinical medicine staff probably reflects their more treatment-oriented function compared to research-oriented function (12).

In our study the main reason (50%) for choosing the research topic was 'personal interest'. One of the main concerns regarding biomedical scientists is the extent of their exposure to health problems in real situations (17,18). Most biomedical researchers perform research independent of social needs and exclusively for increasing their publication records.

In the present study only 1 project (2.5%) was done based on the demand of nongovernmental organizations (such as pharmaceutical or medical equipment companies) and 4 projects (10%) were demanded by governmental organizations. In a study by 'TUMS KTE Study Group', 2.4% and 13.5% of projects were demanded by non-governmental and governmental organizations respectively (9). It is obvious that the efficacy of project outputs will be increased if it is demanded by a client (private or governmental organization).

In the current study, the most collaborative effort was performed for dissemination of the research results, which is inconsistent with earlier studies (8,9,19). Figure 2 shows that in half of the cases (50%) there has been no collaboration between researchers and research users at different stages of design, implementation, data analysis, production, and dissemination of research results that is concordant with the study by Majdzadeh et al (9).

Caplan et al assessed the degree of both partners and stakeholders engagement in research process. They stated that the degree of both side involvements will be determined by their ability and willingness to devote time and resources to research and partners should be fully informed of the research process and its objectives and they should understand how the information will be collected and used. Also they stated that stakeholders in research process may have been: a) Informed: notified that research is taking place, b) Consulted: asked to express opinions about the partnership for consideration, c) Involved in process: invited to take part in discussions around research, and d) Integrated into the design: assist in terms of references, the management of the research, and the analysis of findings. In planning the research, partners should use the results of resource mapping to openly discuss potential roles and implications both for research process itself and more strategically for the dissemination and buy-in to possible findings (20).

Gholami et al stated that in order to apply conducted research in research centers and schools, planning and strengthening of knowledge translation resources and strategies and also promoting the use of evidence by decision makers and design and implementation of interventions in these fields

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are of higher priority compared to other aspects (21).

The results of present study showed that full-time researchers gained lower "collaboration score" compared to part-time researchers. One of the reasons that can justify these findings is their involvement in other university activities such as educational and executive responsibilities.

In the present study all projects under study (102 projects) were conducted by 46 PIs; and some researchers were PIs in more than one project. Therefore, we had the following two options: the first option was to send the researcher's questionnaire for all PIs regardless of being involved in one or more research projects, and the second option was to select one of the research projects using random sampling method and researcher's questionnaire be sent for the researcher. Performing the first option may result in bias. Therefore the second option was ultimately adopted and researcher's questionnaire was sent to 46 researchers and eventually 40 questionnaires were collected. This low sample size is one of the limitations of the current study. In the present study data were collected using researchers' self-administered questionnaire, therefore it might be prone to memory recall bias.

Conclusion

Although the results of present study shows that research projects in GOUMS (2005-2007) have low collaboration with organizations outside of the university, it should be considered that there might be so many fundamental changes or improvement in research policies during 2007 to 2012. Since higher collaboration leads to better outcomes in research activity, barriers to collaboration should be addressed. Moreover, universities should provide further opportunities for increasing collaborative research projects with other research centers.

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