

Original Article

Which Information Resources are used by General Practitioners for Updating Knowledge Regarding Diabetes?

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Abstract

Background: Little is known about the degree of utilization of information resources on diabetes by general practitioners (GPs) and its impact on their clinical behavior in developing countries. Such information is vital if GPs' diabetes knowledge is to be improved.

Methods: This cross-sectional study recruited 319 GPs in the summer of 2008. Questions were about the updates on diabetes knowledge in the previous two years, utilization of information resources (domestic and foreign journals, congresses, the Internet, reference books, mass media, and peers), attitude toward the importance of each resource, and impact of each resource on clinical behavior.

Results: A total of 62% of GPs had used information resources for improving their knowledge on diabetes in the previous two years. Domestic journals accounted for the highest utilization (30%) and the highest importance score (83 points from 100); with the importance score not being affected by sex, years elapsed after graduation, and numbers of diabetic visits. Clinical behavior was not influenced by the information resources listed; whereas knowledge upgrade, irrespective of the sources utilized, had a significantly positive correlation with clinical behavior.

Conclusion: Domestic journals constituted the main information resource utilized by the GPs; this resource, however, in tandem with the other information resources on diabetes exerted no significant impact on the GPs' clinical behavior. In contrast to the developed countries, clinical guidelines do not have any place as a source of information and or practice. Indubitably, the improvement of diabetes knowledge transfer requires serious interventions to improve information resources as well as the structure of scientific gatherings and collaborations.

Keywords: Behavior of general practitioners, information resources, knowledge translation

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Introduction

Research in the field of knowledge translation and innovation at large underlines a deep incongruence between knowledge production and its application.^{1,2} The domain of health is no exception as is evident by the gap between new knowledge and its utilization in chronic diseases, in particular diabetes.³ Indeed, for all the advances in the treatment of diabetes in the past three decades, the treatment outcome of this medical condition in developed and developing countries is still far from optimal,⁴ with approximately only one third of patients achieving acceptable levels of blood sugar control.³ A variety of reasons such as non-adherence of patients to treatment protocols and inappropriate treatment prescribed by physicians have been suggested as the causes of failure to achieve treatment goals.⁵ Iran is also faced with this disparity between knowledge production and knowledge use or, in other words, between what is known and what is actually practiced.^{6,7} Enhancing knowledge utilization necessitates novel approaches to forge a link between research and practice.² There are currently several methods for effecting a

change in the clinical behavior of health-care providers, but we should first determine which of these methods are given preferentiality by each particular audience.

In most societies, general practitioners (GPs) represent a high proportion of health knowledge consumers as they are by and large the first line of treatment for patients.⁸ Medical information resources vary from country to country due to a whole host of reasons, the most prominent of which is perhaps accessibility. Therefore, decision-makers should be furnished with information on the most utilized resources with the highest impact on diabetes care by GPs if they are to design appropriate intervention measures for furthering knowledge transfer in this important group.

The main objective of this study was to seek the most effective information resources on the clinical behavior of GPs in the field of diabetes at Iran as an example of developing countries in the Middle East.

Materials and Methods

Study population

This cross-sectional study was conducted in the summer of 2008. In this study, we recruited 319 GPs who had a minimum of two years' clinical experience. GPs employed in centers that directly dealt with diabetics, such as specialized clinics or diabetes clinics affiliated with research centers, as well GPs who worked in clinics where diabetes was less likely to be encountered (i.e., clinics affiliated with the Blood Transfusion Organization) were excluded from the present study.

The study was conducted in two stages: a pre-test stage, where

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Table 1. Comparison of background variables according to “updating diabetes knowledge during last two years” in general practitioners.

Variables	Updating during last two years			P-value
		Positive	Negative	
Gender	Female	<i>n</i> (%)	122 (61.6)	0.64
	Male	<i>n</i> (%)	76 (38.4)	
Elapsed years after graduation	(mean ± SE)	10.3±0.5	10.0±0.6	0.72
Number of monthly diabetic visits	(mean ± SE)	25.7±2.2	24.9±3.2	0.83

Table 2. Utilization of information resources and relationship between independent variables.

Information resources	Utilization	Male/female	Years elapsed after graduation	Number of monthly diabetic visits
	Percentage (95% CI)		Odds Ratio [†] (P-value) (95% CI)	
Domestic journals	29.8 (24.8–35.1)	0.97 (0.89) (0.59–1.58)	1.01 (0.71) (0.97–1.04)	0.99 (0.83) (0.99–1.01)
Reference books	26.3 (21.6–31.5)	1.06 (0.83) (0.64–1.76)	0.98 (0.22) (0.94–1.01)	1.00 (0.72) (0.99–1.01)
Congresses	16.6 (12.7–21.2)	1.60 (0.12) (0.88–2.89)	1.04 (0.05)* (1.00–1.07)	0.99 (0.75) (0.99–1.01)
Internet	14.1 (10.5–18.4)	0.82 (0.56) (0.43–1.59)	0.99 (0.79) (0.95–1.04)	0.99 (0.45) (0.98–1.01)
Mass media	7.8 (5.1–11.3)	0.85 (0.71) (0.36–1.99)	1.01 (0.59) (0.96–1.07)	1.00 (0.36) (0.99–1.02)
International journals	5.3 (3.3–8.4)	2.29 (0.10) (0.85–6.18)	1.05 (0.05)* (1.00–1.11)	1.00 (0.77) (0.99–1.02)
Peers	5.0 (2.9–8.0)	1.20 (0.72) (0.44–3.32)	0.99 (0.75) (0.92–1.07)	1.01 (0.41) (0.99–1.02)

† Because there was no statistically significant relationship between the variables in the adjusted analysis, only crude results are presented.

Table 3. Attitudes of general practitioners toward the importance of different information resources for updating diabetes knowledge and its determinant factors.

Information resources	Importance [†]	Male/female	Years elapsed after graduation	Number of monthly diabetic visits
	Mean ±SD		Linear regression coefficient (P-value) (95% CI)	
Domestic journals	83.15 ± 25.24	-1.34 (0.64) (-7.03–4.36)	-0.14 (0.48) (-0.53–0.25)	0.001 (0.98) (-0.09–0.09)
Congresses	79.34 ± 28.11	1.82 (0.57) (-4.55–8.19)	0.41 (0.06) (-0.02–0.84)	0.04 (0.45) (-0.06–0.13)
Peers	70.77 ± 32.90	3.39 (0.37) (-4.03–10.80)	-0.50 (0.05)* (-1.00–0.00)	0.06 (0.27) (-0.05–0.18)
Internet	69.57 ± 34.28	3.66 (0.35) (-4.08–11.41)	-0.51 (0.06) (-1.03–0.02)	-0.03 (0.66) (-0.14–0.09)
International journals	58.36 ± 33.77	5.88 (0.13) (-1.73–13.49)	-0.12 (0.64) (-0.64–0.40)	0.00(0.99) (-0.12–0.12)
Mass media	51.88 ± 39.95	-13.60 (0.003)** (-22.49– -4.71)	-0.16 (0.61) (-0.78–0.46)	-0.23 (0.001)** (-0.36– -0.09)
Reference books	48.34 ± 46.58	10.37 (0.05)* (-0.15– -20.88)	0.35 (0.33) (-0.37–1.07)	0.07 (0.41) (-0.09–0.23)

† Possible minimum and maximum score, range: 0 to 100. * $P \leq 0.05$ was considered statistically significant. ** $P \leq 0.01$ was considered statistically significant.

20 experts helped revising the questionnaire; and a re-test stage, where we assessed the intra-cluster correlation (ICC) by utilizing the questionnaire to interview 10 GPs. The ICC was 0.63–0.86.

Three research assistants were initially trained and sent to a general refresher course for GPs, where their performance was subjected to imperceptible monitoring by two of the course participants. Before the study commencement, the research assistants fully explained the objectives and methods of the study to the participants. Participants completed the questionnaire, which included information about demographics, utilization of information resources (domestic or foreign journals, congresses, the Internet, reference books, mass media, and peers) on diabetes in the previous two years, attitude toward the importance of each information

resource in knowledge transfer, and the impact of the information resources on clinical behavior.

Given the important role that patient education plays in the control of diabetes and its complications,⁸ this factor was considered to be a positive clinical behavior alongside diabetes medication. Accordingly, the provision and non-provision of at least two educational recommendations to patients for better control of hyperglycemia were selected as the criterion for suitability and unsuitability of clinical behavior. Although this variable was selected to show the patient care of health-care providers, who may spend more time on their patients, it was a surrogate measure for “appropriate clinical behavior”.

Table 4. Factors affecting general practitioners' clinical behaviors on diabetic patients care.

Variable			Clinical behavior		Crude analysis P-value	Adjusted	
			Appropriate	Inappropriate		Odds Ratio (95% CI)	P-value
Gender	Female	n (%)	163 (59.9)	30 (63.8)	0.75	—	—
	Male	n (%)	109 (40.1)	17 (36.2)			
Updating diabetes knowledge	Yes	n (%)	181 (66.5)	17 (36.2)	<0.0001	3.72 (1.93–7.19)	<0.0001
	No	n (%)	91 (33.5)	30 (63.8)			
Years elapsed after graduation		(mean ± SE)	10.18 ± 0.43	10.11 ± 1.13	0.95	—	—
Number of monthly diabetic visits		(mean ± SE)	24.97 ± 1.90	27.83 ± 5.38	0.57	—	—

Table 5. Information resources affecting general practitioners' clinical behaviors on diabetic patients care.

Information resources	Utilization	Clinical behavior		Crude analysis P-value [†]
		Appropriate n (%)	Inappropriate n (%)	
Domestic journals	Yes	87 (32)	8 (17)	0.04
	No	185 (68)	39 (83)	
Reference books	Yes	78 (28.7)	6 (7.1)	0.02
	No	194 (71.3)	41 (87.2)	
Congresses	Yes	49 (18)	4 (8.5)	0.14
	No	223 (82)	43 (91.5)	
Internet	Yes	41 (15.1)	4 (8.5)	0.36
	No	231 (84.9)	43 (91.5)	
Mass media	Yes	23 (8.5)	2 (4.3)	0.55
	No	249 (91.5)	45 (95.7)	
International journals	Yes	17 (6.3)	0 (0)	0.15
	No	255 (93.8)	47 (100)	
Peers	Yes	15 (5.5)	1 (6.3)	0.48
	No	257 (94.5)	46 (97.9)	

[†]Because there was no statistically significant relationship between the variables in the adjusted analysis, only crude results are presented.

Data analysis

Linear and logistic regression was performed for analysis. Utilization or non-utilization of information resources as the predictor (dependent) variable and sex, time lapse after graduation, and number of diabetic visits per month as the independent variables were entered in the logistic regression (Enter Model).

The importance of each single information resource on diabetes was assessed on a numerical scale of 1 to 5, with a score of 5 denoting “very important” and 1 signifying “unimportant”. The final score of each information resource was subsequently calculated and analyzed as the predictor variable of “importance score” alongside the other independent variables in the linear regression (Enter Model).

Finally, the effect of the individual variables and utilization of each single medical information resource on the GPs' clinical behavior was evaluated via the logistic regression analysis.

Ethical consideration

The proposal of this research was submitted to the process of Research Project Evaluation at Tehran University of Medical Sciences and included the approval of the university Ethics Committee. Verbal consent was obtained from the participants.

Results

From a total of 349 GPs who were initially invited to participate in the present study, 319 persons met the inclusion criteria and consented. There were 25 persons who did not meet the inclusion criteria and 5 persons who did not consent to be enrolled into the

study. Thus, 319 (91.4%) GPs responded to our questions.

Characteristics of the study population

The study population comprised 193 (60.5%) women and 126 (39.5 %) men. The mean age of the participants was 38 years [standard deviation (SD) = 7.7] with a range of 27 – 82 years. The time lapse after graduation was between 2 and 55 years with a mean number of 10 years (SD = 7). The number of diabetic patients visited per month was between 1 and 200 persons, with a mean of 25 persons/month (SD = 32).

Updating diabetes knowledge

Regardless of information resource

There were 62% of participants who sought to update their diabetes knowledge during the previous two years. Table 1 depicts the results of the analysis of the variables relating to “updating diabetes knowledge”; there was no significant relationship between the variables.

Utilization of information resources

Table 2 illustrates the results of the analysis of “utilization of information resources” as the dependent variable and the effect of the independent factors, which was conducted to be used in the crude and adjusted analyses. From information resources listed, domestic medical journals (30%), reference books (26%), and congresses (17%) were the most popular sources.

Crude analysis showed that with each elapsed year from graduation, increased utilization of the congresses (1.04 times) and international journals (1.05 times) did not significantly impact the adjusted analysis.

Importance of information resources

The assessment of the GPs' attitudes toward the importance of each information resource in Table 3 revealed that domestic medical journals scored the highest at 83.1 (SD = 25.2), followed by congresses at 79.3 (SD = 28.1) and peers at 70.8 (SD = 32.9). The crude analysis was indicative of the effect of the independent factors on some information resources, while the adjusted linear regression demonstrated no such effect.

Factors influencing clinical behavior

As self-reported by the GPs, 85.3% fulfilled the criterion for appropriate clinical behavior in diabetes care, i.e., providing patients with at least two educational recommendations for improving control of hyperglycemia. The results of the impact of the variables and utilization of information resources on Iranian GPs' clinical behavior on diabetic patients care are shown respectively in Tables 4 and 5. Of all factors, only "updating diabetes knowledge" had an increasing impact (3.72; $P < 0.001$) on clinical behavior in the adjusted analysis.

Discussion

In the present study, 62% of the GPs reported having updated their diabetes knowledge in the two previous years. We did not investigate the barriers to knowledge utilization; be that as it may, the fact that 38% of our study population had failed to bring their knowledge of diabetes and its complications up to date at least in the two-year period leading up to the commencement of our study might have been the result of a lack of an appropriate milieu conducive to up-to-the-minute learning.

Domestic journals, followed by reference books and congresses comprised the most widely used medical information resources on diabetes amongst our study population. Logistic regression analysis has demonstrated that the probability of the utilization of these resources was not correlated with the independent variables. The accessibility of domestic journals and the fact that the utilization of these resources does not require much time or special skills seems to have contributed to their favorability.

Given the priority accorded to domestic medical journals by our study population, drawing upon these information resources for knowledge transfer amongst this group of professionals seems to be a viable option. A review study of cross-sectional and observational articles published during the years 1978 – 1992 regarding the utilization of medical information resources by physicians in the U.S. and Canada⁹ has reported the most utilized medical information resources to be journals and books (the equivalent), followed by peers.⁹

An evaluation of 100 GPs in the urban areas of Pakistan showed that although most of them (62%) were not in line with the standard criteria for diabetes diagnosis, a mere 37% sought to improve their diabetes knowledge. In that study, medical journals (44%), congresses (27%), and the Internet (21%) formed the bulk of the medical information resources utilized by the GPs.

Peers had the lowest percentage (5%) amongst the medical information resources exploited by our GPs. That is in stark contrast to previous studies contending that unofficial channels like peers are one of the ways to update knowledge and influence clinical behavior.^{10–13} Opinion leaders, a concept first introduced by Hiss et al.,¹⁴ are believed to have the greatest standing amongst peers in knowledge upgrade.¹⁵ According to these investigators; opin-

ion leaders are capable of effecting a positive change in behavior as opposed to the mass media, which can only supply fresh information.¹⁶ The criteria for identifying opinion leaders has been assessed in the Iranian health care delivery system and they were almost identical to Western countries.¹⁷ As a result, in addition to promoting such human resources, it is essential that efforts be made to facilitate physical and practical access to these resources and to publicize these unofficial resources alongside official resources (journals) through congresses and seminars.¹⁸ It seemed that a lack of recourse to human resources on the part of the GPs in our study stemmed from unfamiliarity or insufficient access.

Our GPs awarded the highest scores in terms of the importance of medical information resources on diabetes to domestic journals (83 points), congresses (79 points), and peers (71 points). In this scoring, an increase in the time lapse after graduation resulted in a significant decrease of 0.50 in the GPs' attitude toward utilization of peers as an information resource. The importance score of the mass media had a significant decrease of 13.60 in men and also a significant drop of 0.23 per one-diabetic patient increase in the total of monthly diabetic visits. By contrast, the importance score of reference books had a significant rise of 10.37 in men. In addition, none of the independent variables exerted a significant influence on the importance score of any information resource on diabetes in the adjusted analysis. Previous studies have shown that in conjunction with the foregoing factors, values and attitudes can impact knowledge utilization rates.^{19,20}

Table 4 shows that around 85% of study subjects reported that they have made recommendations to their patients. This finding does not agree with the results of a study on the quality of diabetes management in Iran between the years 2005 and 2007.²¹ The said study has evaluated the quality of diabetes management in 2,456 diabetics in all 25 Iranian provinces and found that only 22% of them had received appropriate diabetes education. As this variable was self-reported in the present study, the majority of GPs claimed that they had offered educational recommendations to their diabetic patients in combination with medication. The validity of this variable to reflect reality of clinical practice has limitations. The 'percentage of the diabetic patients' and especially 'ratio of new diabetic patients over follow up patients' could be considered as complementary variables for better assessment of the appropriateness of clinical practice. Since the purpose of the present study was comparison of the different sources of knowledge on the GPs behaviors, we considered the feasibility of data gathering and selected the present variable (giving educational recommendation). This should be considered as a surrogate measurement, although it is of value for the analytical objectives of the present study, it is just a proxy of giving appropriate care to the patients and not appropriate to be used for a description of the appropriateness of the clinical practice.

None of the personal variables or information resources with the exception of "update their diabetes knowledge" exerted a significant influence on the GPs' behavior in the present study. These findings highlight the need for the provision of other information resources such as standard clinical practice guidelines, although there is no guarantee that sufficient attention will be paid to clinical guidelines.²² It should be noted that the present study predated the publication of the clinical diabetes guideline, so "Clinical Guideline" was not on the options of local information resource. Earnest efforts have been underway recently to formulate national clinical guidelines based on "Appraisal of Guidelines for Research and Evaluation" (AGREE) in

the field of diabetes and its complications in Iran entitled “National/Regional Diabetic Foot Guideline” has been published in print²³ and electronic formats (<http://emri.tums.ac.ir>).

An evaluation of 43 published diabetes guidelines between 1980 and 2000 has shown that these guidelines failed to meet the methodological standards of formulating clinical guidelines.²⁴ There is ample evidence that the traditional approach to the enhancement of knowledge, with is merely facilitating access and introducing new information resources, leaves too much to be desired.^{25,26}

It is deserving of note that for all the foregoing measures, knowledge derived from research could still fail to reach its audience and that necessitates structures^{27–29} or individuals to forge a link between researchers and policy makers with a view to conveying the research message.^{30–32}

Given the importance of studying as a significant factor in updating diabetes knowledge of the GPs in our study on the one hand and the non-correlation between the available information resources and clinical behavior of the GPs on the other, it seems that these information resources are devoid of the requisite quality for updating diabetes knowledge. We would, therefore, recommend that in conjunction with a mass distribution of resources such as clinical guidelines, earnest interventions be made in order to alter GPs’ attitude toward available information resources and to improve the quality of the knowledge presented in these resources.

To that end, simultaneous use of several well-structured information resources and introduction of these resources through existing channels can also be advantageous.

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