

Perceived Barriers to Information Access Among Medical Residents in Iran: Obstacles to Answering Clinical Queries in Settings with Limited Internet Accessibility

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ABSTRACT

Studies performed in the US and other Western countries have documented that physicians generate many clinical questions during a typical day and rely on various information sources for answers. Little is known about the information seeking behaviors of physicians practicing in other countries, particularly those with limited Internet connectivity. We conducted this study to document the perceived barriers to information resources used by medical residents in Iran. Our findings reveal that different perceived barriers exist for electronic versus paper-based resources. Notably, paper-based resources are perceived to be limited by resident time-constraints and availability of resources, whereas electronic resources are limited by cost decentralized resources (such as PDAs) and accessibility of centralized, Internet access. These findings add to the limited literature regarding health information-seeking activities in international healthcare settings, particularly those with limited Internet connectivity, and will supplement future studies of and interventions in such settings.

INTRODUCTION

Physicians generate many clinical questions throughout the course of a typical day in practice.¹ Usually, these queries are addressed by consulting the medical literature or a colleague, but unfortunately only one of every three questions is addressed². These lost opportunities are especially hindering to the physician in training as learning theory suggests that the “just-in-time” model of learning has retention rates of 10-20 fold higher than traditional lectures³.

Studies conducted in the US indicate that, among others, two major barriers to answering these clinical questions are time constraints and access³. Many US academic clinical settings provide Internet and electronic resources to physicians and other healthcare providers to help overcome these barriers. These media make evidence-based resources more accessible to answering clinical queries. The

information retrieval behavior of medical students already encompasses these resources; nearly 85% of medical students use reliable electronic resources as their primary reference for clinical queries⁴.

Little research has been conducted on information seeking by professionals in international medical systems with limited access to electronic resources. Nations with developing economic status who lack informatics infrastructure equally note the need for greater research and development of medical informatics systems within their country.⁵ The World Health Organization underscores this need for developing nations since aging populations and rising poverty rates will stress already struggling health structures and the fast pace of technological obsolescence necessitate collaboration and evaluation of technological standards⁶.

From an international public health standpoint, there is a lack of research that evaluates interventions intended to strengthen medical training in health information systems of low-income countries.⁷ As systemic resources are being invested in underdeveloped health informatics infrastructures, improved knowledge of the factors that influence physician use would be very helpful in determining resource allocation and interventions to improve physician knowledge and practice.

We undertook this project to address some of these questions. In particular this project intended to identify among Iranian physicians in training 1) the common resources used in clinical queries; and 2) barriers to common information resources at the point-of-care. Iran was chosen as the research site since it has comparable life expectancies and Information and Communication Technology Diffusion (ICTD) rate to the global average (Figure 1)⁸⁻⁹. It's below global average number of internet users and lack of a centralized informatics infrastructure makes Iran a good model for other nations in the process of developing their national e-Health system.

Figure 1: Informatics and Health indicators of USA, Iran, and global community

Indicator	USA	Iran	Global
Healthy life expectancy (years) males	67.0 ('02)	56.0 ('02)	56 ('02)
Healthy life expectancy (HALE) (years) females	71.0 ('02)	59.0 ('02)	59 ('02)
Health Expenditure %GDP	15.4 ('04)	6.6 ('04)	8.7 ('04)
Adult literacy rate (%)	N/A	77.0 ('04)	82.2 ('04)
Information and comm. tech. (ICT) diffusion index	0.81 ('04)	0.28 ('04)	0.305 ('02)
Internet users (per 100 inhabitants)	55.1 ('02)	4.8-7.88 ('02)	11.91 ('02)

METHODOLOGY

Design: The design of this study is a simple random sample of active medicine, surgery, pediatrics, and OB/GYN wards at SUMS and TUMS during the study period. Residents serving on selected wards were invited to participate in the survey.

The survey tool was developed to assess the barriers residents in training may encounter in pursuing answers to questions that arise during a typical clinical ward rotation. A size-modified replication of the survey questions underlying our findings is presented in figure 2. Questions unrelated to this report are not included due to space constraints.

To summarize, the survey intends to characterize:

- 1) Limitations in access to the following resources: textbooks; paper pocket references; print journals; electronic journals; PDA-based resources; internet-based resources.
- 2) Limitations in access of the above resources to the following parameters: time limitations in using resource; access to resource at time of need; cost of resource; knowledge of how the resources is used; any general limitation.

The original English language version of the survey (Figure 1) was translated into Persian, the native language of Iran, by the primary investigator (DM) and then translated back to English by a bilingual, independent third-party to verify accurate translation.

Subjects: Eligible subjects included the 206 resident (trainee) physicians on service in the following fields: General Surgery; Internal Medicine; Pediatrics; Obstetrics/Gynecology (OB/GYN). All residents were required to have prior ward

experience, active involvement and responsibility in patient care.

By nature of stature in training and the medical education system in Iran, all residents were of legal consenting age. Sample population distribution of sexes was reflective of the enrollment demographics of the medical resident population (60% female).

Data Collection: The survey was distributed in paper-form to subjects on ward rounds and during lectures throughout the TUMS and SUMS campuses. Data collection occurred over the course of a 12-week study period. The survey period took place at the end of the academic year to ensure sufficient ward exposure for all survey subjects.

Data Analysis: Survey results were transferred by trained research assistants into an MS Access database programmed with field restrictions to check for data entry errors or blank fields. Once compiled, data were organized using an Excel spreadsheet for descriptive analysis including calculation of the number and proportion of trainee physicians' responses to each question. Responses were organized according to specialty and site for further analysis and comparison. Findings are reported for the group as a whole, except when differences

Figure 2: Space-modified survey questions

1) What year in training are you?
 ___ 1st year ___ 2nd year ___ 3rd year ___ 4th year ___ 5th year ___ 6th year ___ 7th or greater

2) What department are you in?
 ___ General Medicine ___ General Surgery ___ General Pediatrics ___ OB/Gyn

3) On average, how many patients do you see each day? _____

4) On average, how much do you spend on books or learning material each month? _____

5) On average, how much time per day looking for answers to your questions? (hrs) _____

6) What, if anything, limits your use to each of the following at the moment a question arises? (Please rate 0 = no limitation, 5 = complete limitation):

a) Textbook

___ Lack of Time	___ Availability when question arises	___ Cost of this resource	___ Knowledge on how to use resource	___ Nothing, resource used at will
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b) Paper pocket reference

___ Lack of Time	___ Availability when question arises	___ Cost of this resource	___ Knowledge on how to use resource	___ Nothing, resource used at will
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c) Paper journal

___ Lack of Time	___ Availability when question arises	___ Cost of this resource	___ Knowledge on how to use resource	___ Nothing, resource used at will
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d) Electronic Journal

___ Lack of Time	___ Availability when question arises	___ Cost of this resource	___ Knowledge on how to use resource	___ Nothing, resource used at will
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e) PDA-based resource (handheld computer, Palm Pilot, PocketPC)

___ Lack of Time	___ Availability when question arises	___ Cost of this resource	___ Knowledge on how to use resource	___ Nothing, resource used at will
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f) Internet-based resource

___ Lack of Time	___ Availability when question arises	___ Cost of this resource	___ Knowledge on how to use resource	___ Nothing, resource used at will
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between sites required making that distinction.

Ethical Approval and Considerations: Approval for this study was obtained by the Investigators (DM, PE) US-based Institutional Review Board as well as from the appropriate representatives charged with approving such studies in Iran. No financial or academic incentive was provided to volunteering subjects. The purpose of the study, the anonymity of the survey responses, lack of incentives, and opportunity to decline from taking the survey were explained to the subjects verbally and in the provided informed consent documentation prior to administration of the survey. Respondents were advised that completing the survey indicated consent and no signature was required on the survey.

RESULTS

A total of 195 (95%) subjects participated in the study. All departments were proportionally represented, although the majority of respondents were from internal medicine given that was the largest group targeted (Table 1a).

Table 1a: Subject by department

Department	Respondents (%)
Medicine	81 (96.4%)
Surgery	48 (90.6%)
Peds	20 (95.0%)
OB/GYN	46 (95.7%)

Table 1b: Subject by years in practice:

Years in Practice	Respondents (%)
1 st year	68 (95.8%)
2 nd year	54 (98.2%)
3 rd year	31 (93.9%)
4 th year	25 (89.3%)
5 th year	13 (92.8%)
6 th year	4 (80.0%)

Table 2: Practice, learning activities, and resource expenditures

Location	Pts seen/day	Study Hrs/day	Resource expenditure/month*
Tehran	6.6 σ =2.9	1.43 σ =1.06	\$6.20 σ =\$5.83
Shiraz	26.1 σ =12.6	1.57 σ =1.26	\$9.47 σ =9.03
Total Avg	16.0 σ=14.4	1.49 σ=1.15	\$7.70 σ=\$7.62

*Conversion using Toman:Dollar = 923.5:\$1

The residents surveyed see an average of 16 patients per day, although this differed between the sites due to differences in program structure (Table 2). In particular, Shiraz physician trainees have larger clinics and longer hours than Tehran residents due to differences in regional healthcare needs. Residents reported spending an average of 1.5 hours daily studying or pursuing answers to questions that arise during the clinical workday. This finding did not differ significantly between sites. When asked about spending on information resources, respondents reported spending the equivalent of approximately

US\$7.70* on learning resources per month totaling approximately US\$92.40* per year (Table 2).

Overall barriers: The perception of limitation in access to the resources evaluated in this study varied by location but certain trends were noted. In comparison to electronic resources, residents found paper-based resources to be more available at both sites. Overall, the resource indicated as having the most barriers was the PDA. Over 98% of residents found some limitation that prevents its use. Electronic journals were noted to be the second most limited resource with 90% of responses noting a limitation. Textbooks and pocket reference materials were noted to be the least restricted resources with 64.8% and 63.4% noting some restriction, respectively.

Knowledge of how to use a resource was felt to be a greater barrier for electronic resources than for paper-based resources. However, this was also influenced by site. For electronic resources, Shirazi residents noted greater restrictions based on knowledge of electronic resources. This could, in part, be explained by the extensive Digital library developed at TUMS.

Causes of limited access: Perceived barriers to information resources included time, access, cost and knowledge of the resource, and these differed by type of resource and by study site but there were a number of similarities (Figure 3). Most respondents at both sites (60%) reported that electronic journals were limited by access to the resource. Paper journals were similarly perceived as being limited by access but more residents noted time as a barrier to paper journals (30.9%) than to electronic journals (25.7%)

The most accessible resources were the paper-based pocket references and textbooks, and these were noted to be most limited by the time required for their use and their accessibility on wards.

As noted above, residents in these Iranian programs spend an average of \$92.40/year on information resources; nonetheless, most (64.4%) perceive cost as the greatest limitation to PDA purchase or use. Access to PDA-based resources is perceived as the second greatest limitation at 55.5%.

Internet-based resources were noted by 60.4% to be limited predominantly by access. The next greatest barrier was the time limitations in accessing this resource, noted by 29.8% of respondents.

DISCUSSION

Similar to US physicians, residents in Iran find time and availability of resources to be the most limiting

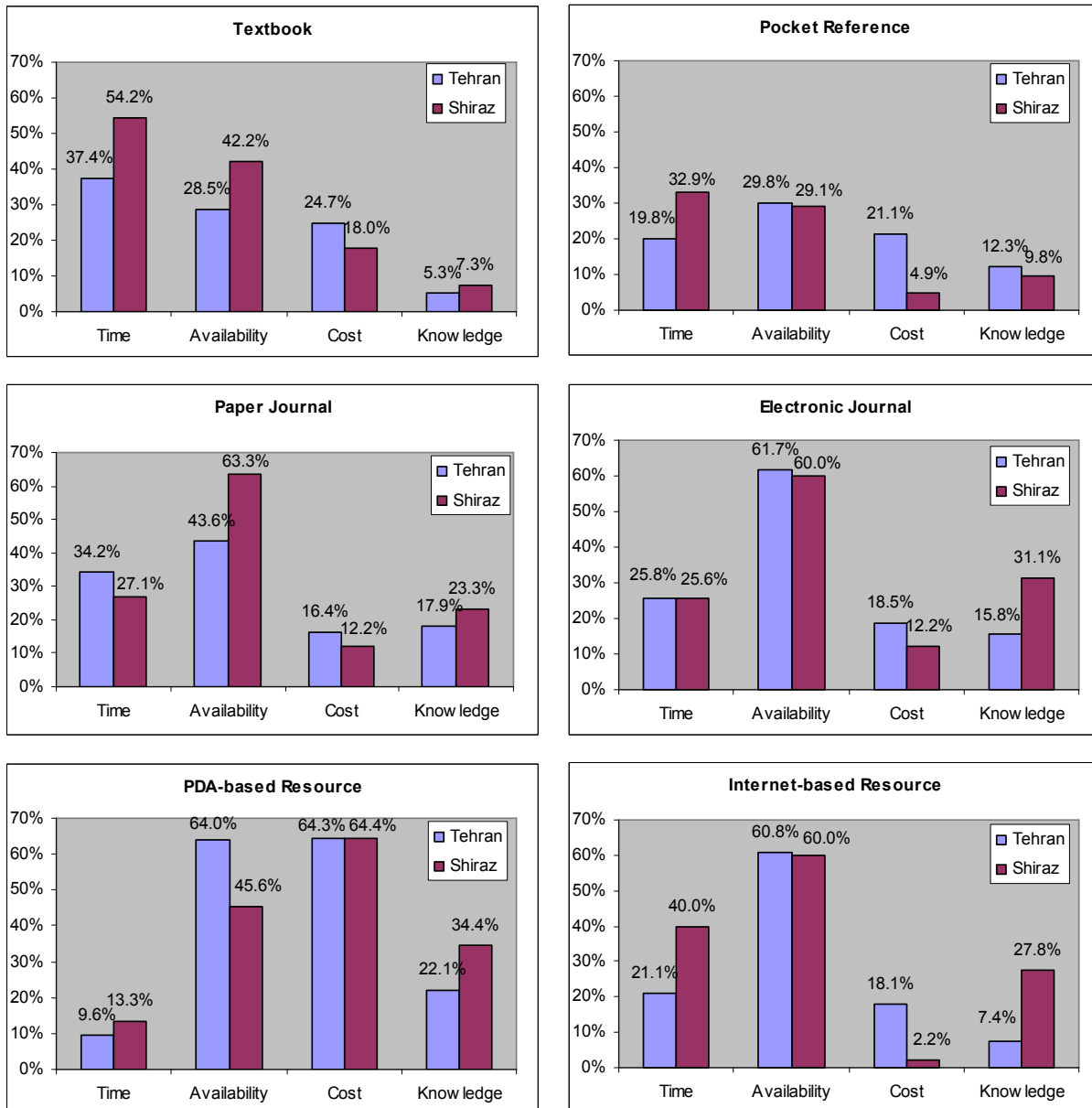
* Conversion rate from Toman:Dollar using 923.5:\$1

factors when it comes to addressing questions that arise during the practice of hospital-based medicine. There are some differences, however, that make it more difficult for Iranian residents to improve their access to information. Whereas the prevalence of electronic resources in the US have increased access to resources and made information seeking more time-efficient, Iranian residents are faced with a number of restrictions that make similar behavior more challenging.

In terms of resources that can be evidence-based, our findings indicate paper-based resources are the most

accessible, however, few residents carry any reference material with them. Making matters worse, texts available on wards are often in poor-shape, outdated, and remain underused, as well. Moreover, while general texts are frequently available, specialized or sub-specialty texts are not. Pocket reference materials are equally hard to find in university bookstores and residents in our study were largely unaware of the existence of certain references commonly used in the US, such as pocket-based pharmacopeias. Paper-based medical journals are available within certain realms of the TUMS and SUMS campuses, but often these are not accessible to

Figure 3: Resident perceptions of barriers to resource



the resident practicing medicine on the wards due to the centralized structure of libraries.

With regard to electronic resources, access points to these resources vary depending on whether they are portable and decentralized, as is the case with PDA-based resources, or centralized, as with computer terminals and Internet workstations. PDA access would seem preferable, but is limited primarily by issues of cost. Indeed, low-cost or even used PDAs are very difficult to find even in the largest electronic markets in Iran. While low-cost or free software exists for PDAs and is more readily available, residents appear to find the hardware costs of PDAs to be the primary limitation to their access or purchase of such resources. This limits what might otherwise be a good solution for having ready access to the full volume of resources resident physicians need.

In terms of centralized resources, TUMS currently has the most extensive digital library in Iran. In the near future, all universities in Iran will share a national digital library through collaborative networks. Unfortunately, terminals to access these electronic databases are in short supply and are likely to remain very difficult to access. On-campus, terminals are inaccessible to ward-based residents. Computers are centralized to labs, which are located away from wards. In addition, residents can only access these terminals if they are provided with written permission from the ward attending. This limitation leaves the computer labs almost entirely empty throughout the working day. Furthermore, as a result of minimal exposure, average residents are also unaware of the full body of resources that are provided to them free of charge. While most residents in Iran have computer access outside of work, Internet access is predominantly available by dial-up connection, making information seeking time-consuming, another factor that might make use of such resources less worthwhile even for those with such access.

LIMITATIONS

This study has some limitations. As with any survey-based study, reported perceptions may not represent actual behavior. While these results may provide insights into the nature of information seeking by physicians in settings with similar developmental and economic characteristics to those studied herein, that remains to be determined. Indeed, it is possible that the unique socio-cultural environment of Iran including its restrictions based on gender and information access as monitored by the government may limit the generalizability of all findings.

CONCLUSION

Resident access to information resources in Iran is most limited by time and availability of resources. Electronic resources are less accessible to Iranian residents than are paper-based resources. Cost remains a perceived obstacle for access to decentralized electronic resources that require independent investment, such as PDAs. Access to electronic resources that require system-based portals, such as electronic journals and Internet-based resources, are limited primarily by limitations in availability. These findings provide insights into information seeking in settings not previously reported upon and may have relevance for those practicing or planning interventions in similar environments.

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