Original Articles

Information-seeking behaviors and attitudes of physicians toward drug information centers in Saudi Arabia

Hisham S. Abou-Auda, PhD.

ABSTRACT

الهدف: تهدف الدراسة إلى معرفة سلوكيات بحث الأطباء العاملين في المملكة عن المعلومات، والمصادر المستخدمة لذلك. تم بحث مدى معرفة الأطباء بمراكز المعلومات ومواقفهم منها، وآرائهم حول احتياجاتهم المستقبلية من المعلومات.

الطريقة: تم إجراء الدراسة بين سبتمبر ٢٠٠٢ ويونيو ٢٠٠٣ بإرسال استبانة إلى ٢٠٠٠ طبيب في مناطق المملكة الخمسة وتم جمع البيانات الديموغرافية ومصادر المعلومات التي يستخدمها الأطباء حالياً، ومواقفهم تجاه المراكز واحتياجاتهم من المعلومات.

النتائج: بلغ معدل استجابة الأطباء ٦٥,٩٪، وكان ٧٠٪ منهم على دراية بوجود مراكز معلومات للأدوية والسموم بالمملكة، ولم يستخدمها منهم من قبل إلا ٣٣,٩٪. وبلغت نسبة طلبهم لمعلومات ٠,٣ طلب شهرياً خلال الستة أشهر الأخيرة. وتبين أن الأطباء يعتمدون على الكتب (٧٩٪)، والدوريات الطبية (٥٩,٢٪)، والندوات العلمية (٥٥,١٪)، وممثلي شركات الدواء (٥٣,٥٪) والصيادلة (٣٥,٣٪). وبلغ عدد مرات بحث الأطباء عن معلومات ١٧,٥ مرة في الستة أشهر الأخيرة التي سبقت الدراسة، وصرح ٥٧,٣٪ منهم أنهم يستخدمون الحاسب الآلي لذلك وأن ٤٠٪ منهم ليس لديهم إنترنت في مكان عملهم.

خاتمة: للأطباء موقف سلبي من مراكز معلومات الأدوية والسموم بالمملكة، وهي غير مستغلة بالشكل الذي يبرر وجودها. وعلى المراكز إصدار واستخدام النشرات العلمية الدورية والتعريف بالطرق العلمية لاستجلاب المعلومات وتقييمها حسب أسس الطب المبني على البراهين.

Objective: To assess the drug information-seeking behavior of physicians in Saudi Arabia and the information resources they were using to obtain information about new drugs. The physicians' awareness of the existence of drug information centers (DICs) and their attitudes toward these centers were also investigated. Physicians were also surveyed concerning their future information needs.

Methods: The study was conducted between September 2002 and June 2003. A questionnaire was sent to 2000 registered physicians. Data were collected on demographics, drug information resources currently used by physicians, attitudes towards DICs and future information needs.

Results: Response rate was 65.9%. Only 70% of the physicians were aware of the existence of DICs in KSA and 33.9% have used this service before with request rate of 0.3/month during the last 6 months prior to survey. Physicians relied heavily on books (79%), periodicals (59.2%), symposia (55.1%) and pharmacists (35.3%). Physicians searched for information 17.5 times during the last 6 months and only 57.3% were using computers and 40% had no access to the Internet at work.

Conclusions: Physicians in KSA had passive attitudes toward DICs. These centers are under-utilized by health care professionals, in part due to the lack of awareness of their existence by physicians. Drug newsletters and continuing education programs in information-retrieval and evaluation based on evidence-based medicine techniques to promote DIC's services should be instituted.

Saudi Med J 2008; Vol. 29 (1):

From the Department of Clinical Pharmacy, College of Pharmacy, King Saud University, Riyadh, Kingdom of Saudi Arabia.

Received 20th February 2007. Accepted 1st August 2007.

Address correspondence and reprint request to: Dr. Hisham S. Abou-Auda, Department of Clinical Pharmacy, College of Pharmacy, King Saud University, PO Box 2457, Riyadh 11451, Kingdom of Saudi Arabia. Tel +966 (1) 4677470. Fax. +966 (1) 4677480. E-mail: hisham@ksu.edu.sa

The year 2005 marked the 25th anniversary of the inauguration of the first drug and poison information center in Kingdom of Saudi Arabia (KSA) at the College of Pharmacy, King Saud University. Despite the rapid proliferation of drug and poison information centers in the country throughout tertiary care governmental and private sector hospitals, the role of these centers is still questionable. In 2003, 8 drug

information centers (DICs) were identified, but this figure only included DICs in the capital city Riyadh without accounting for other DICs located in major hospitals around the country. The number of hospitals in KSA are approximately 300,[1] and we speculate that at least 5-10% of these hospitals furnish some kind of formal drug information services through their pharmacy departments. In all cases, these centers probably are not used to their full potential as far as supplying drug and poison information to health care professionals is concerned. The entire system has yet to be matured and it is far from reaching the level of service established in developed countries, particularly, the United States and Great Britain. The low usage figures of DICs were not uncommon in other parts of the world.[2-4] Kingdom of Saudi Arabia enjoys an advanced health care system almost comparable to Western standards. Before the turn of the millennium, the number of physicians per 1000 population was 1.4 with global ranking of 59 among all countries of the world[5,6] (the number of physicians per 1000 population in UK was 1.5 with global ranking of 55). Preliminary reports suggest that a majority of health care professionals in KSA are not aware of either the functions of such centers or even their existence. The physicians, especially primary care physicians, are expected to manage a wide range of medical conditions for large number of patients. They usually use a variety of information resources to support their personal knowledge base. However, this accumulated knowledge is not enough to answer all questions arising during routine medical care of patients. Furthermore, when seeking information beyond personal knowledge, physicians should resort to DICs. These centers have the resources that could provide information focusing on Patient-Oriented Evidence that Matters "POEM" which have the greatest impact and relevance to the quality of their practice. To date, there are no treatises in published literature that address this question in KSA. An extensive literature search using MEDLINE (English-language literature published 1966-2005, using key words physicians, drug information centers, and Saudi Arabia) yielded no references on the subject. Only few surveys have been conducted to track the staffing, resources and services of DICs.[7-9] The objectives of the present study were to examine the drug information-seeking behaviors of physicians in KSA and the information resources they were using to obtain information about new drugs. The physicians' awareness of the existence of DICs in KSA and their attitudes toward these centers were also investigated. Finally, physicians were also surveyed concerning their future information needs.

Methods. The 6-pages questionnaire comprised 23 closed- and open-ended questions, and checklists. These questions were organized into 4 sections. The first section was devoted to obtain demographic background on gender, age, nationality, qualification, specialty, workplace, employment in current job and years of experience. The second section dealt with the drug information resources that physicians presently rely on in their practice and to ascertain the most important resources that they frequently use to get information about new drugs. For this purpose, 2 tables were constructed to include lists of information categories of information types that are frequently recognized by DICs' specialists. The third section was designed to reveal the most important information categories that physicians may request from DICs. The fourth section sought to obtain information about the actual use and attitude of physicians toward DICs operating in the KSA. A covering letter describing the purpose and procedures of the survey was attached to the questionnaire. To replace those who refused or did not administer the questionnaire, physicians working in the same medical institution or working in the nearest facility were asked to participate. An exploratory face-to-face survey involving 35 physicians was conducted. The questionnaire was pilot-tested with physicians working in a university hospital and 3 health care centers in the capital city Riyadh. Results from pilot testing indicated that the items had good internal consistency. The main concern in this pilot test was with the correlation coefficient between all the statements and the Cronbach's alpha values for each content area. In this study, internal consistency reliability and test-retest reliability were used as indicators of the reliability of the questionnaire. Cronbach's alpha coefficients and Pearson correlations were calculated to indicate reliability.[10]

This study was conducted between September 2002 and June 2003. The questionnaire was delivered to a randomly selected group of hospitals, health care centers, infirmaries (private or governmental) and private clinics throughout the KSA. According to the sample size allocated for the study, the questionnaire was administered by the randomly assigned number of physicians working in these health care institutions. The random selection of participating health care institution was achieved by a random number generating scheme from the list of hospitals, health care centers, infirmaries and private clinics in KSA, including the number of physicians working in these facilities, obtained from the General Health Directorates in each of the 16 health regions of the country. The list was sequentially numbered and itemized and the selection process was carried out using a specially designed computer program written by the investigator for random number generation.

Data were collected following the basic principles of research ethics. Physicians were assured anonymity and that their answers would remain confidential. They were also reassured that the report of the findings would not identify them and only the aggregate data will be reported.

Sample size was decided by a power calculation on the categorical variables, 5% significance level. This study required a minimum of 1866 physicians. It was decided to deliver the questionnaire by volunteer pharmacy students to 2000 physicians in the 16 Health Directorates in the 5 geographical regions of KSA (Central, Eastern, Western, Northern and Southern provinces). The total number of questionnaires collected was 1229. All of these questionnaires were included in the analysis. The most common reason for having less than intended number was that some physicians declined participation in the study.

Responses to each question were coded individually, and data were analyzed using the Statistical Package for Social Sciences (SPSS) version 13.0 for Windows (SPSS Inc., Chicago, Illinois). Results were analyzed and, depending on the type of data, appropriate statistical tests were used for comparisons (such as an independent t test was used to compare continuous variables such as age. For data that were not normally distributed, either the Wilcoxon rank sum or Mann-Whitney U test was used. The chi-square and Fisher exact tests were used to assess the differences in the case of discrete variables. Agreement among responses of physicians was assessed using the Kendall tau rank correlation and Spearman rho test. Additional analyses (such as analysis of variance and Kruskal-Wallis tests) were used when appropriate. If the question of data normality arose (based on a probability plot and/or Shapiro-Wilks test), log-transformed data were used followed by a parametric test. Otherwise, a non-parametric alternative was used. Statistical significance was defined as $p \leq 0.05$.

Results. Only 1229 physicians completed the questionnaires, giving a final response rate of 65.9%, an adequate response rate.[11] The detailed demographic characteristics of the surveyed participants are presented in **Table 1**. The sample of respondent comprised 415 (33.8%) general practitioners (GP), 694 (56.5%) consultants and 120 (9.8%) dentists. The physicians were mainly males (890 [72.4%]), working in the governmental sector (727 [59.2%]), the private sector (484 [39.4%]) or solo practice (18 [1.4%]). This sample is fairly similar to the population of physicians

Table 1 - Demographic characteristics of the physicians and dentists.

Demographic characteristics	General Practitioner n (%)	Consultant n (%)	Dentist n (%)	*P*-value
Age group (years) (n=1229)				
≤39	299 (80.6)	346 (53.4)	81 (73.0)	<0.001
40-49	53 (14.3)	251 (38.7)	26 (23.4)	
≥50	19 (5.1)	51 (7.9)	4 (3.6)	
Gender				
Male	267 (64.3)	550 (79.3)	73 (60.8)	<0.001
Female	148 (35.7)	144 (20.7)	47 (39.2)	
Workplace (n=1229)				
Specialist Hospital	30 (7.2)	85 (12.2)	6 (5.0)	<0.001
Primary care Hospital	232 (55.9)	385 (55.5)	55 (45.8)	
Clinic/Health Center	140 (33.8)	204 (29.4)	43 (35.8)	
Solo Practice	5 (1.2)	8 (1.2)	5 (4.2)	
Others (such as infirmaries)	8 (1.9)	12 (1.7)	11 (9.2)	
Total years of experience (n=1224)				
≤10	306 (73.9)	230 (33.2)	58 (48.7)	<0.001
11-19	74 (17.9)	318 (45.9)	36 (30.3)	
≥20	34 (8.2)	145 (20.9)	25 (21.0)	
Employment in current workplace (years) (n=1184)				
≤10	370 (92.1)	550 (81.6)	90 (85.1)	<0.001
11-19	25 (6.2)	95 (14.1)	19 (17.1)	
≥20	7 (1.7)	29 (4.3)	2 (1.8)	

in KSA. The mean±SD age of respondents was 34.3 ± 6.8 years for GP's, 39.6 ± 6.8 years for consultants and 35.2 ± 6.9 years for dentists. There was a statistically significant difference (p<0.01) in age between male and female physicians in all of the 3 groups. The majority of physicians (79.4%) were Arab nationals (Saudi Arabia, Egypt, Syria, Jordan and Sudan), whereas the rest were from Western countries. There were 36 respondents from UK (4 GPs, 30 consultants and 2 dentists), 16 from USA (9 consultants and 7 dentists) and 6 from Germany (5 consultants and one dentist). The nationality of 194 (15.8%) physicians was not identified. We have reasons to believe that most of these physicians hailed from Southeast Asian countries based on the institutions. The overwhelming majority (90.2%) of the respondent physicians were working in primary care institutions. The mean±SD total years of experience of physicians was 7.9 ± 6.1 years for GPs, 13.8 ± 05.4 for consultants and 11.3 ± 6.8 for dentists. Overall, the mean total experience was 11.6 ± 6.4 years, and on average they had been in their current job for 6.8 ± 4.9 years. The experience in the current job was also divided into distinct categories (≤10, 11-19, ≥20 years) as was the physicians' current workplace (Specialist hospital, primary care hospital, clinic/health center, solo practice and others) (**Table 1**). The total years of experience for GPs, consultants and dentists varied considerably, where approximately two thirds of the consultants had a total experience of more than 11 years. **Table 2** presents the distribution of physicians by type of practice. More than one third of the physicians were of the internal medicine specialty, pediatrics and obstetrics/gynecology. Physician respondents were asked what sources of information they would normally use to answer drug-related questions (**Table 3**). The most used sources were: textbooks, periodicals, symposia/continuing medical education (CME) and drug companies representatives (detailmen), whereas package inserts, pharmacists and colleagues were less likely to be used as a drug information sources. These professionals work in a broad range of practice settings, from tertiary care hospitals, primary care hospitals and small clinics to private practices, all of varying sizes and library facilities. Differences in the resources accessed by GPs, consultants and dentists were apparent. General Practitioners relied heavily on books compared with consultants and dentists (x^2=21.6, p<0.0001) (**Table 3**). It may seem obvious that consultants have information needs relating to specialized patient's care more than the other groups of physicians. In this respect, consultants were found to rely more on periodicals (peer-reviewed journal articles) and symposia/CME compared with GPs and dentists (**Table 3**). The differences in this regard were highly statistically significant (x^2=24.9, p<0.0001 and x^2=26.2, p<0.0001). A plethora of other factors may ultimately affect the overall information-seeking process including age of the physician, the specialty, the total years of experience and the site of practice.

Table 2 - Specialty of the physicians.

Specialty	n (%)
Internal Medicine	195 (17.9)
Pediatrics	191 (17.5)
Obstetrics/Gynaecology	121 (11.1)
Family Practice	97 (8.9)
Surgery	96 (8.8)
E.N.T	60 (5.5)
Dermatology	53 (4.9)
Ophthalmology	43 (3.9)
Urology	28 (2.6)
Orthopedics	27 (2.5)
Neurology	13 (1.2)
Psychiatry	12 (1.1)
Osteopathic Physician	9 (0.8)
Others	144 (13.2)

Table 3 - Physicians' source of information about drugs (information-seeking behavior).

Source	General Practitioner n (%)	Consultant n (%)	Dentist n (%)	Total n (%)
Books	344 (82.9)	551 (79.4)	76 (63.3)	971 (79.0)
Periodicals	206 (50.4)	453 (65.3)	66 (55.0)	728 (59.2)
Symposia/CME	191 (46.0)	426 (61.4)	60 (50.0)	677 (55.1)
Company Representative	191 (46.0)	410 (59.1)	57 (47.5)	658 (53.5)
Package Insert	254 (61.2)	287 (41.1)	52 (43.3)	500 (40.7)
Pharmacist	154 (37.1)	236 (34.0)	44 (36.7)	434 (35.3)
Colleagues	125 (30.1)	197 (28.4)	44 (36.7)	366 (29.8)

CME - continuing medical education

The effect of these factors on physicians' information-seeking behaviors was consequently investigated. Statistically significant differences (p<0.05) were found regarding the use of books, symposia/CME, drug company representatives (detailmen) and periodicals. Arab physicians depended heavily on books, symposia/CME and drug company representatives, while the major source of information for physicians from western countries was primary literatures (periodicals and peer-reviewed journal articles). No statistically significant differences (p>0.05) between the 2 groups with respect to the use of colleagues, package inserts and pharmacists as drug information sources. Furthermore, differences existed between respondents with varying age groups. Within this framework, it was evident that the younger the physicians (≤39 years), the more they used books (81.0% versus 76.1% and 70.3% for the other 2 age groups, x^2=6.8, df=2, p=0.033). This result was confirmed by applying binary logistic regression which revealed that age was negatively correlated with the use of books among physicians. On the contrary, older physicians tended to use symposia (p<0.001), periodicals (p<0.005) and medical representatives (p<0.001) more than their younger counterparts, while no statistically significant differences were found among physicians with respect to soliciting help from colleagues (p=0.072) or package inserts (p=0.887) for information about new drugs. Middle-aged physicians (49-50 years) tended to consult more with pharmacists regarding information about drugs. The total years of experience showed almost identical results as those seen with age. Furthermore, data were analyzed with respect to the site of practice (primary care versus tertiary care facilities). Primary care physicians sought information from books (80.0% versus 70.2%, p=0.0176), medical representatives (54.7% versus 43.0%, p=0.0184) and package inserts (42.1% versus 28.1%, p=0.004) more than physicians working in tertiary care settings, whereas there were no significant differences between them with respect to the use of other information sources.

Physicians were asked about information sources that they usually use to obtain drug-related question categories classified according to question types recognized by DICs (**Table 4**). The table was constructed to include information categories of the type the pharmacists are usually capable of providing to health care professionals and consumers. The usage figures clearly reflected that the vast majority of physicians regardless of their demographic background considered books as the primary source of information about the list categories. The years of experience, age of the physician, the location of practice and specialty of the physician did not significantly (p<0.05) influence their preference. One of the interesting observations was that Saudi national physicians turned to pharmacist more than other groups of physicians to request information about the dose but, generally, the pharmacist was not their favorite drug information source. In addition, female physicians significantly (p<0.05) consulted periodicals and journal articles more than male physicians who relied on CME more than females. Although physicians of Western nationalities (USA, UK, Germany) were found to resort to pharmacist for information about drug interactions more than other physicians (31.0% versus 18.4%), this difference did not reach a statistically significant level. Respondents were also asked to indicate the number of times drug information or literature searches they performed during the last 6 months prior to the survey. The average number of searches performed by these physicians was 17.5 times. Wilcoxon rank-sum test (Mann-Whitney U test) did not reveal any significant differences between Arab and Western physicians (p=0.164) or males and females. The use of the Internet and computerized information services was also investigated. It was found that only 57.3% of the respondent physicians knew how to use computers to search for medicines-related information, and only 51.6% owned a computer at home. Approximately 40% of all physicians had no access to the Internet where this figure exceeded 65% with private sector physicians. Physicians were asked if they were aware of the existence of DICs in KSA (**Table 5**). Approximately 857 (70%) of the physician

Table 4 - Frequency of awareness of the existence of drug information centers.

Physician category	Awareness of drug information centers		
	Yes n (%)	No n (%)	P value
Affiliation			
Governmental sector	587 (81.0)	138 (19.0)	<0.0001
Private sector	256 (53.0)	227 (47.0)	
Solo practice	14 (77.8)	4 (22.2)	
Nationality			
Arab	678 (69.5)	297 (30.5)	0.590
Western (USA, UK, Germany)	44 (75.9)	14 (24.1)	
Unknown	135 (69.9)	58 (30.1)	
Specialty			
Internal medicine	153 (78.5)	42 (21.5)	<0.0001
Dentistry	64 (53.3)	56 (46.7)	
Others	629 (70.5)	263 (29.5)	
Type of practice			
Primary care	758 (66.6)	347 (31.4)	0.003
Tertiary care	99 (81.8)	22 (18.2)	

respondents were aware of the concept of DICs and the existence of such centers in KSA, but they not aware of the services provided by these centers. There was no significant difference between GPs and consultants in this respect, whereas, dentists were significantly (p<0.05) lower (53.3%) than others. The majority of those who were aware of the existence of DICs were affiliated with governmental health facilities (68.5%). **Table** 4 presents the frequency of awareness of drug information services in KSA according to affiliation, nationality, specialty and type of practice. Surprisingly, of those respondents who were aware of the existence of DICs, only 48.4% had previously used the service (about 33.9% of the total number of physicians). On average, GPs previously requested information 2.7 times in the last 6 months prior to the survey, while consultants and dentists had used the service 2.2 and 0.47 times during the same period (F=10.27, p<0.001). One-way analysis of variance did not reveal statistically significant differences between the number of requests to drug information made by physicians and their age, or total years of experience. In addition, despite the fact that Arab national physicians requested information from these centers more than Western national physicians during the last 6 months prior to the survey (an average of 2.3 times versus 1.9 times, respectively), there was no statistically significant difference (t-test, p>0.05) between them in this regard. The overall request rate for all physicians was 0.3/month. When asked if they thought that the information provided by the DICs was better than that which they could have obtained themselves, 482 (56.2%) physicians of those who previously used the service thought this to be the case [184 (62.4%), 279 (56.1%) and 19 (29.7%) of GPs, consultants and

Table 6 - Information categories likely to be requested by physicians from drug information centers in future use.

Categories	General Practitioner n (%)	Consultant n (%)	Dentist n (%)	Total n (%)
Complementary/Herbal Medicine	203 (48.9)	367 (52.9)	51 (42.5)	**621 (50.5)**
Cautions/Contraindications/Adverse effects	209 (50.4)	319 (46.0)	73 (60.8)	**601 (48.9)**
Drug Overview (monographs)	205 (49.4)	320 (46.2)	62 (51.7)	**587 (47.8)**
Pregnancy/Lactation	211 (50.8)	326 (47.0)	44 (36.7)	**581 (47.3)**
Dosing Information	188 (45.3)	280 (40.3)	56 (46.7)	**524 (42.6)**
Incompatibilities	157 (37.8)	309 (44.5)	44 (36.7)	**510 (41.5)**
Drug Identification	149 (35.9)	223 (32.1)	51 (42.5)	**423 (34.4)**
Poisoning Emergencies	149 (35.9)	214 (30.8)	43 (35.8)	**406 (33.0)**
Therapeutics	100 (24.1)	162 (23.3)	38 (31.7)	**300 (24.4)**
Pharmacokinetics/Toxicokinetics	66 (15.9)	114 (16.4)	16 (13.3)	**196 (15.9)**

General Practitioners versus Consultants: Kendall tau-ß=0.764, p=0.0023 (significant),
General Practitioners versus Dentists: Kendall tau-ß=0.644, p=0.0113 (significant)
Consultants versus Dentists: Kendall tau-ß=0.523, p=0.0381 (significant)

Table 5 - Physicians' present sources that they would normally use to answer drug-related question categories.

Drug information category	Source					
	Books n (%)	Periodicals n (%)	Colleagues n (%)	Pharmacist n (%)	CME n (%)	Others n (%)
Dosage/administration	973 (79.2)	260 (21.2)	179 (14.6)	391 (31.8)	163 (13.3)	33 (2.7)
Drug interactions	931 (75.8)	300 (24.4)	137 (11.1)	299 (24.3)	150 (12.2)	29 (2.4)
Pharmacology/toxicology	959 (78.0)	284 (23.4)	92 (7.5)	188 (15.3)	116 (9.4)	20 (1.6)
Therapeutics	936 (76.2)	333 (27.1)	149 (12.1)	231 (18.8)	156 (12.7)	28 (2.3)
Pregnancy/lactation	875 (71.2)	279 (22.7)	172 (14.0)	252 (20.5)	138 (11.2)	32 (2.6)
Adverse drug reactions	957 (77.9)	317 (25.8)	141 (11.5)	246 (20.0)	146 (11.9)	36 (2.9)
Pharmacokinetics/toxicokinetics	867 (70.5)	209 (17.0)	74 (6.0)	186 (15.1)	95 (7.7)	21 (1.7)
Laboratory tests interferences	699 (56.9)	211 (17.2)	86 (7.0)	176 (14.3)	106 (8.6)	29 (2.4)
Complementary therapies	289 (23.5)	90 (7.3)	122 (9.9)	57 (4.6)	36 (2.9)	38 (3.1)

CME - continuing medical education

dentists, respectively]. Some respondent physicians stated that the nature of information they needed did not require the use of a specialized information center. A follow-up 5-point Likert scale question (1=least satisfactory, 5=most satisfactory) was formulated to ascertain the quality of answers physicians received in response to their drug enquiries from the DICs. The mean±SD of satisfaction was found to be 3.78 ±0.87 which represents approximately 75% satisfaction rating. No statistically significant differences existed between physicians in their satisfaction ratings with respect to age, nationality, total years of practice, specialty, affiliation and location of practice. Physicians who previously used DICs were asked if they would encourage their colleagues to utilize these centers to obtain medicines-related information based on their past experience with the services provided to them. Generally, there appears to be consensus (98.7%) among respondents to encourage their colleagues to request information from their respective centers. Furthermore, physicians were asked about the length of time per day the DIC should be in operation. The majority of respondents (899 [80.7%]) stated that the length of operation time should be 24 hours, whereas 148 (13.3%) and 67 (6.0%) indicated that 12 hours and 8 hours, respectively, would be the appropriate length of operation. The physicians' preference regarding the format of information that they would probably need from these centers in the future was also investigated. It was revealed that 622 (50.6%) of the respondents would prefer a verbal answer, 489 (39.8%) prefer written answer and 342 (27.8%) prefer printed literature materials.

Finally, physicians were surveyed concerning the information categories likely to be requested by them from DICs if they would be willing to use the service in the future (**Table 6**). The 3 most selected information categories were: complementary/herbal medicine (50.5%); cautions/contraindications/adverse effects of drugs (48.9%); drug overview (drug monographs) (47.8%). The agreement between the respondents' preferences of drug information categories was inspected using Kendall tau-ß and Spearman's rho. A strong agreement between the preferences of GPs and consultants was observed (Spearman's rho=0.941, $p<0.0001$ and Kendall tau-ß=0.764, $p=0.0023$) indicating a relatively similar information needs. On the other hand, the agreement between dentists versus both GPs and consultants was fairly lower (Spearman's rho=0.832, $p=0.0028$ and 0.727, $p=0173$, respectively and Kendall tau-ß=0.644, $p=0.0113$, and 0.523, $p=0.0381$, respectively) indicated a relatively different drug information needs for dentists.

Discussion. This is the first ever survey to be conducted in KSA to measure the attitudes of physicians towards DICs. To date, no attempts have been made to investigate this issue or the physicians' information-seeking behavior in this part of the world. There is only little earlier research into drug information services in KSA[7-9] and Kuwait.[12] All these studies were a description of activity statistics of the DICs. Other studies focused on the prescribing behavior of primary care physicians in KSA.[13-16] In the present work, information resources currently utilized by physicians were assessed. Physicians were also surveyed concerning their information-seeking behavior and their awareness and satisfaction with the services provided to them by DICs. They were also questioned regarding their expectations and future information needs. We tried to obtain representative sample of physicians and dentists and to obtain a good response rate to assure the validity of the study. All respondents were seeing patients regularly in their sites of practice at the time of the study. Our response rate (65.9%) was favorable and consistent with other surveys of attitudes of health professionals conducted elsewhere. Whilst this response rate cannot be representative of all physicians and dentists in KSA, all regions of the country were represented in this survey, so it is fair to say that the survey provides a sound foundation for at least some tentative conclusions about the questions raised by the study.

The information-seeking behaviors of physicians and dentists in KSA were not very different from those in the UK and USA. The results of our study revealed that textbooks, periodicals, symposia/CME and company representatives (detailmen) were the most frequently consulted sources of information about drugs. The overwhelming dependence of physicians and dentists on textbooks to answer drug related questions was almost predictable. Lack of unbiased and reliable information on drugs contributes to the inappropriate prescribing among primary care physicians.[13-16] In most developing countries such as KSA, one of the major sources of information available to physicians appears to be drug company salesmen. Western physicians (USA, UK, Germany) were less likely to rely on books compared to Arab physicians. In western countries, primary care physicians use their colleagues to help them evaluate and validate the medical development about which they read. They also rely on peers who they feel are better informed about medical advances; therefore, they seek their advice and opinion regarding a multitude of issues including diagnosis and drug treatment.[17,18] Our results indicated that Western physicians working in KSA were less likely to use their colleagues as information source which probably reflects a confidence crisis due to the difference between both groups in their basic medical

training. This relatively high utilization of textbooks for information about new drugs reflects a lack of confidence in other information sources or reluctance from the side of the physicians to admit to being informed by others. The use of textbooks and journal articles may provide adequate information necessary to make prescribing decisions, but to be used effectively as a major information source, a large medical library or information center would be required, which is beyond the physicians' limited resources. Ely et al,[19] recorded the titles of all medical books in the personal libraries of 103 randomly selected family physicians; they found that drug-prescribing textbooks were the most common type of books in the physicians' offices, followed by books on general internal medicine and adult infectious diseases. Furthermore, Connelly et al,[20] reported that physicians used the Physicians' Desk reference (PDR) on daily basis, consulted colleagues at least weekly, but rarely used electronic information-retrieval systems. This result, with the exception of the use of colleagues, is in agreement with our results since most of the surveyed physicians in our sample were affiliated with primary care institutions. The striking observation from this study was that pharmacists and colleagues were the least consulted sources. Our sample of physicians comprised approximately 30% of physicians who are practicing in rural areas of KSA. Gorman[21] compared the self-reported information needs of rural and rural primary care physicians and found that rural physicians reported less frequent use of consultants, colleagues, librarians, and bound journals, a result in a close agreement with our findings. Generally, all results are supporting the idea of establishing specialized DICs, not only in major cities, but also in rural areas. As in the present work, where physicians were satisfied with the drug information services provided to them, other investigators concluded similar observations. In a study[22] dealing with the quality and impact of problem-oriented drug information, 79% of the surveyed physicians found that the answers provided to them by the DIC were fast enough, relevant, adequately comprehensive and with valuable references. Furthermore, the majority of these physicians thought that the answers had caused a change in their clinical practice. Although it was not one of the aims of this study to determine the use of electronic and computerized information-retrieval systems, the use of the Internet was investigated. Our results suggested low levels of awareness and expertise in such resources especially among private sector physicians. One of the probable reasons for the low use of the Internet was the unavailability of this service for physicians in their private institution due to cost considerations. In addition, it may be worth mentioning that our results revealed that the use of electronic resources increased with recency of training. This result may be due to the fact that some medical schools in KSA just started to introduce courses of medical informatics in their curricula. Other studies also reported a relatively poor access to computers among physicians.[23-25] This result does not promote using the Internet as a substitute for DICs. The quality and reliability of drug information on the Internet is still questionable. Seaboldt and Kuiper[26] compared responses to drug information questions posted on the Internet Usenet pharmacy newsgroup (sci.med.pharmacy) with responses from DICs. They found a significantly smaller proportion of accurate drug information responses from the Usenet newsgroup compared with responses from DICs. On the other hand, the awareness of the existence of DICs was investigated. Approximately one third of the physicians were not aware of the existence of these centers in KSA. The majority of those physicians were affiliated with the private sector. This is probably due to the fact that no private sector health institution in KSA has a DIC, where all centers are governmental property. From economical point of view, DICs are not considered profit-generating projects since there are no fees-for-service in KSA as the case of some developed countries. But the striking observation is that about half of the physicians who were aware of the service had never used it, probably reflecting the low trust level in pharmacist-operated DICs, a result consistent with the low use rate of pharmacist as a drug information resource. Similarly, although physicians attempted to find information, on their own, in excess of 17 times during the last 6 months prior to the survey, and despite the relatively high satisfaction rating with the services provided to them by these centers, they only requested information on only 2 occasions during the last 6 months prior to the survey. This is probably due to the ignorance of what is available at these centers or probably because they live in an information-rich environment. A contradicting observation was that physicians who had previously used these centers to request information directly and indirectly expressed their satisfaction with services provided to them. Despite their low usage figures, they almost unanimously (98.7%) stated that they would encourage their colleagues to use these centers. The majority of physicians rely heavily on their personal knowledge, accumulated over years of practice and built up through their past medical education. Our results proved that the future information needs of dentists from DICs are relatively different from the information needs of GPs and consultants. These results are in agreement with other findings.[27-29] Generally, information relating to complementary/herbal medicine; cautions/contraindications/adverse effects of drugs and drug overview (drug monographs) represented the major drug information categories might be requested from DICs in the future.

In conclusion, the results clearly highlighted the relatively passive attitude of physicians towards drug and poison information centers in KSA. These centers are under utilized by health care professional, in part due to the lack of awareness of their existence by physicians. Physicians always deal with an ever-expanding and often overwhelming information universe, including not only reliable primary sources, but also computerized secondary sources and well-established databases. Thus, considering the cost and time of pursuing new information about drugs, and accounting for the shortcomings of medical literature, physicians should use the expertise of drug information specialists to help them in obtaining reliable, validated and well-documented information. On the other hand, DICs have to evaluate their own current processes and outcomes, to set goals and to improve the quality of their services. They also have to reach to physicians through active approaches such as drug newsletters and continuing education programs in information-retrieval and evaluation techniques based on evidence based medicine techniques to promote and publicize their existence, and declare the opportunities available to physicians in terms of the ability of these centers to satisfy their information needs.

References

1. Abou-Auda HS. An economic assessment of the extent of medication use and wastage among families in Saudi Arabia and Arabian Gulf countries. ***Clin Ther*** 2003; 25: 1276-1292.
2. Ruppelt SC, Vann AR. Marketing a hospital-based drug information center. ***Am J Health Syst Pharm*** 2001; 58: 1040.
3. Mullerova H, Vlcek J. Drug information centre--analysis of activities of a regional centre. ***Int J Med Inform*** 1997; 45: 53-58.
4. Scala D, Bracco A, Cozzolino S, Cristinziano A, De Marino C, Di Martino A, et al. Italian drug information centres: benchmark report. ***Pharm World Sci*** 2001; 23: 217-223.
5. Wharrad H, Robinson J. The global distribution of physicians and nurses. ***J Adv Nurs*** 1999; 30: 109-120.
6. Robinson JJ, Wharrad H. The relationship between attendance at birth and maternal mortality rates: an exploration of United Nations' data sets including the ratios of physicians and nurses to population, GNP per capita and female literacy. ***J Adv Nurs*** 2001; 34: 445-455.
7. Timm DM, Swartz KM, Amoh KN. King Khalid University Hospital Drug and Poison Information Service. A descriptive report and comparison with the University of Minnesota Drug Information Center. ***J Pharm Technol*** 1991; 7: 179-183.
8. Najjar TA, Al-Arifi MN, Gubara OA, Dana MH. Ethical requests by drug and poison information center in Saudi Arabia. J Soc Admin Pharm 2000; 17:234-237.
9. Al-Arifi MN, Gubara OA, Korashy HM. Drug information centers in Saudi Arabia: evaluation of community pharmacists' services in Riyadh city. Saudi Pharm J 1997; 5:183-189.
10. Cronbach LJ. Coefficient alpha and the internal structure of test. ***Psychometrika*** 1951; 16:297-334.
11. Babbie B. The practice of social research. 9th ed. Stamford (CT): Wadsworth; 2001.
12. Tarifi HA, Assad AM, Ani FM. Drug information centers as bases for continuing education programs in Kuwait. DICP. 1990; 24: 769-771.
13. Al-Doghether MH, Al-Megbil TI. Prescribing in primary care for the older people. ***Saudi Med J*** 2004; 25: 488-492.
14. Mahfouz AA, Shehata AI, Mandil AM, Al-Erian RA, Al-Khuzayem AA, Kisha A. Prescribing patterns at primary health care level in the Asir region, Saudi Arabia: an epidemiologic study. ***Pharmacoepidemiol Drug Saf*** 1997; 6: 197-201.
15. al-Nasser AN. Prescribing patterns in primary health care in Saudi Arabia. ***DICP*** 1991; 25: 90-93.
16. Irshaid YM, Al-Homrany MA, Hamdi AA, Adjepon-Yamoah KK, Mahfouz AA. A pharmacoepidemiological study of prescription pattern in outpatient clinics in Southwestern Saudi Arabia. ***Saudi Med J*** 2004; 25: 1864-1870.
17. Weinberg AD, Ullian L, Richards WD, Cooper P. Informal advice- and information-seeking between physicians. ***J Med Educ*** 1981; 56: 174-180.
18. Smith GH, Sorby DL, Sharp LJ. Physician attitudes toward drug information resources. ***Am J Hosp Pharm*** 1975; 32: 19-25.
19. Ely JW, Levy BT, Hartz A. What clinical information resources are available in family physicians' offices? ***J Fam Pract*** 1999; 48: 135-139.
20. Connelly DP, Rich EC, Curley SP, Kelly JT. Knowledge resource preferences of family physicians. ***J Fam Pracy*** 1990; 30: 353-359.
21. Gorman P. Information needs in primary care: a survey of rural and nonrural primary care physicians. ***Medinfo*** 2001; 10 (Pt 1): 338-342.
22. Schjott J, Pomp E, Gedde-Dahl A. Quality and impact of problem-oriented drug information: a method to change clinical practice among physicians? Eur J Clin Pharmacol 2002; 57:897-902.
23. Nicholas D, Williams P, Smith A, Longbottom P. The information needs of perioperative staff: a preparatory study for a proposed specialist library for theatres (NeLH). ***Health Info Libr J*** 2005; 22: 35-43.
24. Rutter J, Brown D, Rutter P. Primary care practitioners' uptake of a secondary care-based medicines information service in the United Kingdom. ***Drug Information Journal*** 2004; 38: 407-416.
25. Andrews JE, Pearce KA, Ireson C, Love MM. Information-seeking behaviors of practitioners in a primary care practice-based research network (PBRN). ***J Med Libr Assoc*** 2005; 93: 206-212.
26. Seaboldt JA, Kuiper R. Comparison of information obtained from a Usenet newsgroup and from drug information centers. ***Am J Health Syst Pharm*** 1997; 54: 1732-1735.
27. Morrow NC, D>Arcy PF, Pielou LW. Drug information inquiries--who asks what and where are the answers? ***J Clin Hosp Pharm*** 1984; 9: 321-331.
28. Hayman JN, Brown TR, Smith MC, Liao W. Physician use and evaluation of a hospital-based drug information center. ***Am J Hosp Pharm*** 1978; 35: 1238-1240.
29. Rosenberg JM, Koumis T, Nathan JP, Cicero LA, McGuire H. Current status of pharmacist-operated drug information centers in the United States. ***Am J Health Syst Pharm*** 2004; 61: 2023-2032.

Dear Author, please read through your article carefully, make a critical review and highlight any changes you require to be made, please also list these clearly on a separate sheet. Please pay particular attention to all authors' names (in English and Arabic if applicable [No changes are allowed after the signed final-galley proof), the running title and the footer of the first page. Check the accepted and received dates in this footer. Carefully check all legends to figures and all column headings in tables, ensuring that total numbers in tables are correct and correspond to results in the text of your article. Accuracy of all references are the sole responsibility of the author. Please also pay particular attention to the spelling of all medical and non-medical words.

This is extremely important as mistakes not corrected prior to publication can cause embarrassment, more so to the authors than the publisher. After you have signed and returned the galley proof of your article, the Journal will not be held responsible for any errors that appear in the final print. Although erratum notices may be published, this will only be carried out when the error is the fault of the publisher and not the author.

Please clarify the following .....

1. Please indicate in the methods section the inclusion and exclusion criteria.
2. Please include also the patients' consent.
3. Sentences with yellow highlights please clarify.

4. IMPORTANT NOTE PLS READ: We have selected your article for possible inclusion in the monthly "highlights" section. As such, please can you submit an approximately 100 word unstructured summary of your article. Please write this summary in the present tense, active voice, and 3rd person in a clear and concise manner. Please start with the key message of your article, followed by a brief description of the research and end with the primary conclusions and their implications. Please focus on what this paper adds to the topic.

Please then sign on each and every page of your manuscript and return it to our office together with an indication of whether you wish to order re-prints of your article (see below).

Please do not hesitate to call if you have any further queries.

Not following the instructions will result in a delay in the publication of your manuscript.

Many thanks.

OFFPRINTS REQUIRED YES NO (Please tick relevant box) MS# 20070195 IF YES IS TICKED THEN PLEASE ENSURE THAT YOU COMPLETE THE ENCLOSED OFFPRINT FORM OTHERWISE OFFPRINTS CANNOT BE ORDERED

Saudi Medical Journal

Off-Prints (Original/Review/Case Report)

PLEASE COMPLETE THIS SECTION AND RETURN WITH PROOF TO
SAUDI MEDICAL JOURNAL, RIYADH MILITARY HOSPITAL
PO BOX 7897, RIYADH 11159, KINGDOM OF SAUDI ARABIA

INSTRUCTIONS FOR ORDER REPRINTS

NUMBER OF MANUSCRIPT: ..... NO. OF PAGES: .....

TITLE OF MANUSCRIPT: .....

CORRESPONDING AUTHOR: .....

Address:
(of delivery) ..... Tel. No. .....

.....

..... Fax No. .....

.....

I confirm that I wish to purchase _____ off-prints of the above manuscript (minimum is 50).

Offprint Prices

No. of pages	Number of Offprints requested	50	100	200	300	400
1-4 pages	Price in SR	250	500	1000	1500	2000
Over 4 pages	Price in SR	500	1000	2000	3000	4000
Minimum purchase is 50						

METHOD OF PAYMENT

*I enclose a payment of .....SR, total amount in words .....

(1) Cash

(2) Cheque payable to Saudi Medical Journal