

Original Article

Comparison of prescribing indicators of academic versus non-academic specialist physicians in Urmia, Iran

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ABSTRACT

Objective: As chief prescribers, physicians could have a key role in rational drug use. Core prescribing indicators of all physicians have been evaluated in the Islamic Republic of Iran for several years, but no study has assessed the effects of academic status of doctors on their prescribing behaviors. We aimed to compare prescribing indicators of two groups of academic and non-academic specialist physicians working in Urmia, Iran.

Methods: In this cross-sectional study, prescribing indicators of the total number of 37 academic and 104 non-academic specialist physicians in six medical specialties (infectious diseases, psychiatry, otorhinolaryngology, gynecology, pediatrics and general surgery) were studied during 2012 using Rx-analyzer, a dedicated computer application. A set of five quality indicators was used based on the World Health Organization and International Network for Rational Use of Drugs recommendations.

Findings: Totally, 709,771 medications in 269,660 prescriptions were studied. For academic and non-academic specialist physicians, the average number of medications per prescription was 2.26 and 2.65, respectively. Similarly, patients' encounters with injectable pharmaceuticals were 17.37% and 26.76%, respectively. The corresponding figures for antimicrobial agents were 33.12% and 45.46%, respectively. The average costs of every prescription were 6.53 and 3.30 United States Dollar for academic and non-academic specialist physicians, respectively. All the above-mentioned differences were statistically significant.

Conclusion: Better prescribing patterns were observed in academic specialist physicians. However, they prescribed medications that were more expensive, while the reason was not investigated in this study. Further studies may reveal the exact causes of these differences.

Keywords: Drug utilization review; inappropriate prescribing; Iran; outpatients; Urmia

INTRODUCTION

Irrational drug prescription is a global problem. Many factors may influence prescribing behavior of specialist physicians such as clinical experiences, nature and complexity of diseases, effectiveness or side effects of drugs, the existence of standard treatment guidelines, scientific literatures, and so on. Other factors such as advertisements by professionals, new products

or statement such as optimal safety profile present in promotional leaflet by pharmaceutical companies and above all, drug treatment choices of clinical teachers and other colleagues may play important roles in choosing the prescribed medications by medical students, resident physicians, novice general practitioners, and even some specialist physicians.^[1,2]

The "rational use of drugs" (RUD) requires that patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements for an adequate period of time, and with the lowest cost for them and their community.^[3] A number of performance indicators including the average number and the type of prescribed medications, and the percentage of drugs prescribed by generic name and from essential drug list have been developed by the World Health

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Organization (WHO) and the International Network for RUD (INRUD) for evaluating the quality of drug use at health facilities.^[3-7] Considering these standard indicators, the assessment of drug use patterns is becoming increasingly necessary to promote rational drug use in developing countries.^[6]

In the Islamic republic of Iran, as a member of the WHO and INRUD, similar to other developing countries, the problem of irrational drug use has been investigated using WHO/INRUD indicators in general practitioners and specialist physicians both in national and regional levels.^[7-9] The authors of the current study were interested in realizing “whether academic status of doctors can affect their prescribing behaviors?” or not. Nevertheless, they have not found any evidence or specific study that was able to answer this question in the related literatures. Thus, the aim of the present study was to compare the prescribing indicators of some specialist physicians based on their academic status in Urmia, Iran.

METHODS

In this cross-sectional study, the prescription data of six groups of specialist physicians were studied in Urmia, the capital city of West Azerbaijan Province of Iran, by RUD Committee in Food and Drug Deputy of Urmia University of Medical Sciences in 2012. The West Azerbaijan province is one of the 31 provinces of Iran which is situated in the northwest of the country with a population of 3,080,576 people according to last national census (2012).^[10] There are >3000 general practitioners and 2000 specialist physicians throughout the province, but only in Urmia, both academic and nonacademic physicians are working in different medical specialties and subspecialties.

Six studied medical specialties were infectious diseases, psychiatry, otorhinolaryngology (ENT), gynecology, pediatrics, and general surgery. These fields were chosen based on the recommendations of RUD Committee members because the similarity of academic and nonacademic physicians in these fields was more likely than other medical specialties. Most academic members in these fields were medical specialists with academic rank of assistant or associated professors. Sample sizes of two compared groups were not equal because all academic ($n = 37$) and all nonacademic ($n = 104$) specialist physicians in the above-mentioned fields were included in the study in order to avoid selection bias.

Only outpatient prescriptions were studied because based on our experience and knowledge, the nature

and complexity of diseases of the majority of patients who are visited by either academic or nonacademic specialist physicians in outpatient situations in Urmia are more or less similar to each other.

Prescribing indicators of every specialist physician were extracted from dedicated computer software called Rx-analyzer. This software has been developed by National Committee for RUD (NCRUD) in order to gather and analyze the prescription data of Iranian prescribers based on WHO/INRUD standards. The software has the ability to record unlimited number of prescriptions regarding various medicines and also prescriber information. The input data of the software are provided by all pharmacies in the country. At the time of preparation and dispensing, the prescription's data including names, dosage forms, potency, and price of prescribed medicines and some prescriber information including name, last name, specialty, and medical council registration number are imported into the computer application of the pharmacy. These data are monthly collected by the RUD committees of all Medical Sciences Universities as electronic files in a uniform format from all pharmacies and then imported into the “Rx-analyzer.” The prescribed drugs are classified according to the American Hospital Formulary Service pharmacologic-therapeutic classification system (2009) by the software.^[7,11] The software can analyze data and provide different reports about prescribing indicators for every prescriber or a group of prescribers. This software is now being used by the throughout the country, and its validity and reliability have been tested in previous studies.^[7-9]

In this study, the following WHO/INRUD core prescribing indicators were considered:

1. The average number of medicines per encounter (no. of drugs)
2. The percentage of encounters with a prescribed injection (inj. %)
3. The percentage of encounters with a prescribed antimicrobial agent (Ab. %).

The following additional prescribing indicators were also studied:

4. The percentage of encounters with a prescribed corticosteroid (Cs. %)
5. The average cost of a prescription in United States Dollar (USD) (cost).

The data of the annual report for each prescriber including the above-mentioned prescribing indicators were inserted into SPSS for windows (SPSS, Chicago, IL, USA) version 16.0. The imported data were double-checked by two independent researchers for accuracy. At this stage, an independent variable was used for academic status of every specialist physicians

based on the researchers' knowledge or inquiry from relevant educational Departments of UMSU and/or Local Urmia Medical Council.

Descriptive statistics was reported as mean or percentage of studied indicators. Before comparing the differences of prescription indicators between two groups of academic and nonacademic specialist physicians, the distribution pattern of each variable was determined using one-sample Kolmogorov–Smirnov test. Then, the statistical significance of differences for normally distributed variables was evaluated using independent samples *t*-test. Otherwise, Mann–Whitney U-test was used. In all cases, a confidence interval of 95% and a significance level of 5% ($P < 0.05$) were considered.

All methods and investigational tools in this study were approved by the Ethics Committee of UMSU. The personal information of prescribers was kept confidentially.

There were some limitations in our study. Patients' characteristics were not recorded in this study. Since the information about diagnosis for each prescription was not available, the indication for the use of each drug could not be assessed. Furthermore, demographic properties of prescribers were not studied.

RESULTS

Overall 709,771 pharmaceuticals were prescribed in 269,660 prescriptions by 141 studied specialist physicians during 2012. Among prescribers, 37 specialist physicians were academic members and 104 were nonacademics. Table 1 summarizes the prescribers' information including number, medical specialty, the number of prescriptions, and total prescribed medications. Moreover, Table 2 shows the comparison results between academic and nonacademic physicians with respect to prescribing indicators. Using one-sample Kolmogorov–Smirnov test, none of the studied indicators had a normal distribution prior to data splitting based on academic status or medical specialty. Therefore, Mann–Whitney U-test was applied to compare the means or percentages of all indicators.

As seen in Table 2, the average number of drugs per prescription (no. of drugs) was 2.26 and 2.65 for academic and nonacademic specialist physicians, respectively, ($P < 0.001$). Further analyses revealed that academic gynecologists and pediatricians obviously prescribed fewer medications than nonacademics.

Encounters of patients with at least one injection (inj. %) were 17.37% and 26.76% in the prescriptions of academic and nonacademic specialist

physicians, respectively ($P = 0.07$). Furthermore, academic pediatricians prescribed less injection for their patients than their nonacademic counterparts.

Academic specialist physicians generally prescribed less antimicrobials (Ab. %) than nonacademics (33.12% vs. 45.46%). The difference was statistically significant ($P < 0.001$). The main reason for this finding was less antibiotic prescription by academic pediatricians and otolaryngologists. On the contrary, academic psychiatrists and surgeons prescribed slightly more antimicrobial agents.

Encounters with corticosteroid drugs (Cs. %) were 7.52% and 13.18% in prescriptions of academic and nonacademic specialist physicians, respectively; however, the difference between the two groups was not statistically significant ($P = 0.10$).

The last studied indicator was cost. The average costs of every prescription for academic and nonacademic specialist physicians were 6.53 and 3.30 USD. The difference was statistically significant ($P < 0.001$) and it was noticeable that academic specialist physicians prescribed drugs that were more expensive for their patients compared with nonacademics. This difference was mainly attributed to the academic specialist in infectious diseases, gynecology, and pediatrics fields who prescribed drugs that were about 2–3 times as expensive as those prescribed by their nonacademic counterparts.

DISCUSSION

We found significantly different prescribing patterns among academic and nonacademic specialist physicians. There have been many published articles about prescription pattern of general practitioners in the literature; however, only a few reports exist concerning prescription behaviors of specialist physicians. Based on the extensive search done in PubMed, ISI Web of Science, Google Scholar, and other major medical databases (last search: 2014 October 2), our study seems to be unique in this regard and no other similar studies were found on comparisons between prescribing indicators of academic and nonacademic specialist physicians. Therefore, it was not possible for us to compare our results exactly with other literatures.

Vallano *et al.* performed a drug utilization study in primary health care of Andorra (a small European country) on 2588 prescriptions using WHO/INRUD prescribing indicators. They studied prescribing behaviors of 31 general practitioners and 52 specialist physicians in six specialties including pneumology, cardiology, pediatrics, ophthalmology, gynecology, pediatrics, and so on. They concluded that prescribing

Table 1: Distribution of specialist physicians (N), prescriptions (P), and total prescribed medications (M) based on academic status of prescribers

Prescriber's academic status	Category	Medical specialty						
		Infectious diseases	Psychiatry	ENT	Gynecology	Pediatrics	Surgery	Total
Academic	N	4 (2.84)	5 (3.54)	4 (2.84)	7 (4.97)	12 (8.51)	5 (3.54)	37 (26.24)
	P	7900 (2.93)	13,843 (5.13)	6203 (2.30)	7810 (2.90)	25,312 (9.39)	5371 (1.99)	66,439 (24.64)
	M	19,414 (2.74)	40,693 (4.73)	15,173 (2.14)	14,047 (1.98)	55,005 (7.75)	11,364 (1.60)	155,696 (21.94)
Nonacademic	N	5 (3.54)	4 (2.84)	13 (9.22)	27 (19.15)	37 (26.24)	18 (12.77)	104 (73.76)
	P	13,289 (4.93)	11,777 (4.37)	19,083 (7.08)	56,579 (20.98)	82,081 (30.44)	20,412 (7.57)	203,221 (75.36)
	M	37,577 (5.29)	33,596 (4.73)	49,494 (6.97)	122,283 (17.23)	252,519 (35.58)	58,606 (8.26)	554,075 (78.06)
Total	N	9 (6.38)	9 (6.38)	17 (12.06)	34 (24.12)	49 (34.75)	23 (16.32)	141 (100)
	P	21,189 (7.86)	25,620 (9.50)	25,286 (9.38)	64,389 (23.88)	107,393 (39.83)	25,783 (9.56)	269,660 (100)
	M	56,991 (8.03)	74,289 (10.47)	64,667 (9.11)	136,330 (19.21)	307,524 (43.33)	69,970 (9.86)	709,771 (100)

Data presented as number (%). N=Total number of prescribers, P=Total number of prescriptions, M=Total number of prescribed medications, ENT=Otorhinolaryngology

Table 2: Prescribing indicators of academic versus non-academic specialist physicians working in Urmia, Iran in 2012

Indicator	Prescriber's academic status	Medical specialty						
		Infectious diseases	Psychiatry	ENT	Gynecology	Pediatrics	Surgery	Total
WHO/INRUD indicators								
Number of drugs	Academic	2.49±0.20	2.92±0.29	2.43±0.20	1.77±0.17	2.19±0.33	2.13±0.26	2.26±0.43
	Nonacademic	2.64±0.49	2.98±0.49	2.50±0.33	2.17±0.35	3.04±0.53	2.59±0.65	2.65±0.59
	Total	2.57±0.38	2.94±0.36	2.49±0.30	2.09±0.36	2.83±0.61	2.49±0.61	2.54±0.58
	P value	0.58	0.55	0.66	0.007	<0.001	0.15	<0.001
Inj. %	Academic	20.89±14.29	5.87±4.28	17.35±3.39	22.15±6.69	20.51±12.68	11.82±8.70	17.37±10.81
	Nonacademic	27.07±12.10	5.45±3.14	27.69±14.45	18.34±10.06	37.12±19.54	21.80±21.62	26.76±18.55
	Total	24.32±12.67	5.67±3.59	25.26±13.39	19.13±9.50	33.05±19.37	19.53±19.72	24.28±17.32
	P value	0.50	0.88	0.03	0.11	0.008	0.32	0.007
Ab. %	Academic	40.92±9.37	2.36±1.24	42.89±9.63	40.04±8.35	32.89±16.76	40.67±12.33	33.12±17.19
	Nonacademic	46.23±5.65	2.06±1.81	58.63±12.23	42.62±10.70	50.26±16.02	39.80±14.91	45.46±16.89
	Total	43.87±7.53	2.23±1.43	54.92±13.30	42.09±10.20	46.01±17.72	39.99±14.13	42.22±17.76
	P value	0.32	0.78	0.03	0.56	0.002	0.91	<0.001
Other indicators								
Cs. %	Academic	13.18±10.42	1.17±1.07	16.27±5.59	0.88±0.98	9.42±6.81	7.10±6.51	7.52±7.63
	Nonacademic	23.09±10.22	1.09±1.00	22.22±11.63	2.99±4.34	18.09±17.98	11.76±16.96	13.18±15.56
	Total	18.68±10.96	1.13±0.97	20.82±10.68	2.56±3.97	15.97±16.35	10.75±15.29	11.69±14.12
	P value	0.19	0.91	0.35	0.06	0.15	0.97	0.10
Cost (USD)	Academic	8.32±1.62	5.09±0.39	3.48±0.44	8.80±5.26	7.19±7.63	4.19±2.72	6.53±5.20
	Nonacademic	4.69±1.07	5.66±1.19	4.01±0.90	3.27±1.11	2.44±0.86	3.70±2.19	3.30±1.49
	Total	6.31±2.28	5.35±0.84	3.88±0.83	4.41±3.34	3.60±4.26	3.81±2.25	4.15±3.26
	P value	0.005	0.73	0.14	<0.001	0.04	0.69	<0.001

Data presented as mean±SD. SD=Standard deviation, WHO=World Health Organization, INRUD=International Network for Rational Use of Drugs, ENT=Otorhinolaryngology, No. of drugs=Average number of medicines per encounter, Inj. %=Percentage of encounters with an injectable dosage form, Ab. %=Percentage of encounters with an antimicrobial agent, Cs. %=Percentage of encounters with a corticosteroid, Cost=Average cost of a prescription in USD (1 USD=12,260 IRR in 2012), IRR=Iranian Rial, USD=United States Dollar

patterns and indicators of prescription quality showed wide variability depending on the prescriber's medical specialty that has important implications for priority setting in information, continuous education, and research.^[12]

In a recent study, Sadeghian *et al.* studied prescribing patterns of general practitioners and 10 groups of

specialist physicians in Isfahan province, Iran.^[7] Excluding "infectious diseases," the other five groups of our studied specialist physicians also existed in their study. Similar to our survey, they could not use all WHO/INRUD prescribing indicators for their evaluation due to the limitations of the Rx-analyzer. In their study, general practitioners prescribed most prescriptions (61.74%) and only 38.24% of all

prescriptions were ordered by specialist physicians. Similar to our study, the average number of medicines prescribed per encounter varied from 2.31 for gynecology to 2.76 for ENT in their study; patients receiving antimicrobial medicines differed between 2.5% for psychiatry up to 46.5% for ENT; encounters with corticosteroid medications and injections varied from 1.2% to 18% and 5% to 23.7% for psychiatry and ENT, respectively; and finally the mean costs of a prescription in their study were between 2.26 and 5.74 USD for pediatricians and psychiatrists, respectively.^[7]

Based on the latest available annual report of Iranian NCRUD in year 2011, the average number of medicines per encounter for all prescribers in the country was 3.05; encounters with injections, antibiotics, and corticosteroids were 41%, 45%, and 23%, respectively, and average cost of a prescription was 4.21 USD.^[9]

Although some authors suggested standards value for prescribing indicators based on WHO/INRUD recommendation (for example 1.6–1.8 for no. of drugs, 20–26.8% for Ab. %, 13.4–24.1% and even 1% for inj. %; and so on);^[4,13] we could not find any absolute standards, or even recommendations for prescribing indicators, which are practical globally by searching WHO and INRUD websites and other literatures. Since the clinical mixed cases are the main determinant of the prescribing indicators, which may be influenced to varying degrees by other factors, different countries and regions have their own standards.^[14,15] For example, the indicators of quality use of medicines in seven South-East Asian countries were studied in a systematic review and the average number of medicines per encounter (no. of drugs) found between 1.4 and 3.8 and the percentage of encounter with antibiotics (Ab. %) and injections (inj. %) were 13.1–66.0% and 1.3–32%, respectively.^[16]

In our study, academic specialist physicians prescribed few drugs for their patients. Other prescribing indicators of academic specialist physicians were also lower than their nonacademic counterparts. One explanation for this finding may be related to the greater awareness of academic specialist physicians about the existence of RUD Committee in the University as an official authority for assessment and evaluation of physicians prescribing behaviors. The only exception was the average cost of a prescription that was nearly 2 times as much as that in academic specialist physicians. There is no clear explanation for this interesting finding at present. It can be related to more difficult situation of patients who refer to academic specialist physicians. Nevertheless, disregarding the economic status of patients by

academic specialist physicians can undermine their good performance in other indicators. However, many factors can influence prescribing behaviors of professional prescribers so further investigations will be required to reveal better explanation for different prescribing patterns of academic and nonacademic specialist physicians.

We found evident differences in prescribing behaviors of both academic and nonacademic specialist physicians. There is no doubt that education has an important role in improving the prescribing behaviors of both groups, especially clinical teachers, because medical students, resident physicians, general practitioners and even some other medical specialists learn their various prescribing skills from them in the framework of a hidden curriculum.

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AUTHORS' CONTRIBUTION

LS contributed in study design, provided some initial information, presented useful recommendations and prepared the manuscript's draft; LM contributed in study design, literature search and review, data collection, and analysis; MJ was project advisor and statistical consultant; MD was the project designer and supervised all stages of the study, and all authors critically revised and contributed in finalizing the manuscript.

We accurately collected and analyzed the data, and this manuscript represents thoroughly real and true results.

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