Physicians' prescription practices and knowledge about brand-name versus generic drugs in Yerevan, Armenia:

An analytical cross-sectional study

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Utilizing Professional Publication Framework

by

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LIST OF ABBREVIATIONS

GP - General Practitioners

FDA - Food and Drug Administration

RMP - Rational Pharmaceutical Management

MoH - Ministry of Health

STD - Standard Treatment Guidelines

EDL - Essential Drug List

WHO - World Health Organization

IRB - Institutional Review Board

MLR - Multiple Linear Regression

SLR - Simple Linear Regression

ABSTRACT

Literature review/background information. Health care expenditures have continuously grown during the past decades. One way to reduce healthcare expenditures for families, a heavy economic burden for some, is for physicians to shift to prescribing less expensive bioequivalent generic drugs instead of more expensive brand-name drugs. The use of less expensive generic bioequivalent drugs instead of brand-name can reduce prescription drug expenditures and make healthcare for families more affordable. The aim of the study was to measure the magnitude of the problem among general practitioners working in Yerevan polyclinics and assess and characterize their knowledge about generic vs. brand-name drugs, perceptions and prescribing practices, for the purpose of finding effective ways to increase generic drug prescription proportions over that of brand-name drugs.

Methods. The study design was an analytical cross-sectional survey. The Institutional Review Board of the American University of Armenia reviewed and approved the research protocol. The study population included general practitioners working in polyclinics in Yerevan. The study conducted a stratified cluster sampling of 124 eligible GPs from twelve communities of Yerevan. Basic descriptive statistics were used for describing demographic characteristics. Simple and multivariate linear regression analyses were performed to test the associations between independent variables (demographic characteristics, generic drug knowledge score, generic drug perception score and dependent variables (practice score).

Results and Discussion. All surveyed GPs were female, the mean age was 50.7 years old, the mean work experience was 24.8 years, and on average they wrote 11 prescriptions per day. Most of the respondents (82%) prescribed generics less than half the time for the five most prescribed drugs when given a choice, 79% of participants indicated that they would prefer to use brand-name drugs for themselves and for their family members, and 90% were concerned about the effectiveness and safety of generic drugs. Findings showed that higher generic drug knowledge score was associated with higher proportions of generic drugs prescribed, indicating that the negative beliefs towards generic drugs were associated with reduced confidence in generic drugs and reduced prescribing of generic drugs over equivalent brand-name drugs.

Conclusion and recommendations. The current study found a positive association between generic drug knowledge score and generic drug prescription practices, indicating that correct and positive knowledge towards generics could lead to increased prescription rates of generic drugs. It is recommended that knowledge among GPs and other physicians should be raised about the safety and effectiveness of generic drugs, leading to an increase of generic drug prescription rates and reducing the burden of drug expenditures on families.

LITERATURE REVIEW /INTRODUCTION

Health care and drug expenditures have been increasing rapidly in most countries over the past few decades (1). One of the reasons for increased drug expenditures is the increasing frequency of physicians prescribing more expensive brand-name drugs and fewer generic drugs (1). A brand-name drug has a trade name and it is protected by a patent. Drug companies that hold international patent rights have the exclusive right to produce a new drug for fifteen to twenty years after its development. After that, other companies can start making generic versions of the same drug. Generic medicines have an important place in health care because they are less expensive and equivalent to the brand name drug. A generic drug is equivalent to its brand-name drug in active ingredients, dose, dosage form and bioequivalence (2). Generic drugs are copies of brand-name drugs that have exactly the same intended use, effects and side effects, route of administration, risks, safety, and strength as the original drug (2).

In most countries, including Armenia, physicians decide which drug to prescribe; physicians have the power to determine the particular drug to be taken by a patient (3). Physicians often refer to drugs by their brand-names, resulting in brand-name drugs being dispensed even when less expensive bioequivalent generic alternatives are available (3). By prescribing a generic drug physicians reduce household expenditures spent on drugs, thus reduce the burden on families and allowing more family resources to be spent on food, clothing, transportation, and other products and services. Physicians may prefer brand-names for a variety of reasons. It is often easier to remember brand-names (especially given advertising promotions) than generic names and easier to pronounce (4). Some

physicians believe that brand-name drugs are more effective than their generic counterparts (4). In 2000, 25 of the most commonly mentioned drugs were referred to by their brand-names 89% of the time in the United States of America (U.S.) (5). Another study reported that over 23% of the surveyed U.S. physicians expressed concerns about the effectiveness of generic drugs, with more than a quarter of these preferring to use brand-name drugs for themselves or for their families (6). These negative perceptions about generic drugs represent a potential barrier to generic drug use (6, 7). A study conducted in Slovenia in 2006 found that general practitioners (GPs) were willing to use generic drugs if they were cheaper than their equivalent brand-name drugs and if evidence-based information was provided to these GPs assuring them of the bio-equivalence of generic drugs (8).

Many studies are conducted to test the therapeutic bio-equivalence of generic drugs prior to marketing and there is a wealth of available published studies assuring the safety and efficacy of these generic drugs (9-11). In the U.S. generic drugs are 80% less expensive than brand-name drugs (12, 13). Prescribing brand-name drugs when there are bio-equivalent generic drugs unnecessarily increases household healthcare and drug expenditures both in developing and developed countries (14). According to the World Health Organization (WHO), having Standard Treatment Guidelines and Essential Drug Lists (which includes generic drugs) could promote rational use of medicines and substantially lower medical expenditures (15).

Situation in Armenia

Armenia is especially challenged with drug prescribing problems and lacks regulatory mechanisms for prescribing drugs (16, 17). In 2005, the Rational Pharmaceutical Management (RPM) Plus program conducted a study in Armenia with the assistance of the Ministry of Health (MoH) to compare physicians' prescribing practices with internationally-accepted recommendations - Standard Treatment Guidelines (STGs). This study included an assessment of current primary health care prescribing practices and explored alternatives for improved effective low-cost pharmaceutical management schemes for primary health care. The study found a lack of drug cost controls in physicians' prescribing practices - new generation drugs or combinations of drugs (which are generally more expensive) were prescribed when effective less-costly generic drugs were available. One key finding was that though STGs were available in Armenia, they were not always available in all primary care facilities. This study suggested that implementing STGs could reduce treatment costs in Armenia (16, 17).

To date, no other study examined factors associated with patterns of brand-name versus generic drug prescribing practices by physicians in Armenia. Understanding these associations may identify areas for improvement and to provide direction for effective interventions that increase prescribing rates of generic drugs, thus reducing the cost burden for Armenian families.

Research Questions

It is important to understand if physicians in Armenia prefer prescribing brand-name drugs over generic drugs and what factors might be contributing to prescribing brand-name drugs over generics. The research questions of the study were:

1. What was the percentage of GPs working in polyclinics in Yerevan who prefer to prescribe brand-name drugs when there are bioequivalent generic drugs available?
2. What were the associations between demographic characteristics of GPs working in polyclinics in Yerevan and prescription practices of generic and brand-name drugs among these GPs?
3. What were the associations between knowledge of generic drugs and prescription practices of generic and brand-name drugs among general practitioners (GPs) working in polyclinics in Yerevan?
4. What were the associations between perceptions of generic drugs and prescription practices of generic and brand-name drugs of general practitioners (GPs) working in polyclinics in Yerevan?

METHODS

The study was designed to evaluate characteristics and associations with generic and brand-name drug prescription practices among GPs, the first point of contact for majority of the population. Inclusion criteria for the study population included GPs currently working in polyclinics in Yerevan who knew Armenian. Narrow specialists were excluded because the questionnaire was specifically designed for the GPs. The sampling frame included GPs working in polyclinics in Yerevan. The study team obtained the list of polyclinics in

Yerevan from the Yerevan Municipality, with a total number of 336 GPs working in 23 polyclinics.

Sample size

For the sample size calculation there were no estimates available on prescribing practices of generic drugs in Armenia; therefore, proportions were used from a study where 93% of less experienced GPs prescribed generics most of the time and 78% of more experienced GPs prescribed generics most of the time (18). These assumptions (along with the limited target population of 336 GPs, 95% confidence interval and 80% power) were used to calculate a sample size of 124 GPs for the study (19).

$$n' = \frac{\left(c_{\alpha/2}\sqrt{2\bar{P}\bar{Q}} - c_{1-\beta}\sqrt{P_1Q_1 + P_2Q_2}\right)^2}{(P_2 - P_1)^2}$$

Taking into consideration a refusal rate of 30%, the study would need to approach 177 GPs to reach the desired sample size.

Setting

The sampling frame included GPs working in polyclinics in Yerevan. The study team obtained the list of polyclinics in Yerevan from the Yerevan Municipality, with a total number of the 336 GPs working in 23 polyclinics. Based on the required sample size (calculated to be177) with 12 communities in Yerevan, the goal was set to complete interviews with 14-15 GPs per community. In each community the study selected the polyclinic with the largest number of GPs and approached all available GPs in that

polyclinic and invited to participate in the survey. If the required number of 14-15 GPs (per community) was not yet achieved in the largest polyclinic, then the next largest polyclinic in that community was selected to complete the remaining interviews. Only in one community where there was just one polyclinic the required number of interviews was not achieved; the total number of available GPs to be interviewed in this community was only four. To achieve the final sample size of 177, more interviews were conducted in a much larger community with more GPs.

Design and measurement

The study was a cross-sectional survey using a structured questionnaire adapted from a 23 item survey instrument used in a similar study (18), with additional pretested questions to get the necessary information to address the current study's research questions. The final survey instrument contained three sections: 1) items related to GPs' demographics, 2) items related to GPs' knowledge and perceptions towards brand-name and generic drugs, and 3) items related to GPs' practice of prescribing brand-name and generic drugs. Two experienced members of the Pharmacy faculty of the Yerevan State Medical University reviewed the first draft of the questionnaire. They checked for the face validity of the instrument and provided feedback, based on which the student investigator improved the questionnaire. The modified version of the questionnaire was pretested among eight GPs and further minor changes were made. In its final form, the survey questionnaire included four demographic items, six items to measure knowledge, seven items to measure perception, and six items to measure practice of prescribing generic and brand-name drugs.

The student investigator administered the face-to-face survey in Yerevan polyclinics where the GPs work.

Variables

Variables include gender, age, years in practice, number of prescriptions per day, and knowledge, perceptions and practice of GPs regarding generic vs. brand-name drugs. Independent variables included demographic characteristics (gender, age, years in practice and number of prescriptions per day), generic drug knowledge score (six questions on knowledge) and generic drug perception score (seven questions on perceptions).

Both the generic drug knowledge score and the generic drug perception score were summed up over the individual knowledge and perception questions, respectively. All questions were measured on a 5-point Likert scale. The generic drug knowledge score was summed over six generic drug knowledge statements and the generic drug perception score was summed over seven generic drug perception statements.

Outcome variables included the practice score (for the most frequently used five drugs) and prescriptions for four common diseases for primary health care facilities (hypertension, pneumonia, type-2 diabetes, and diarrhea). Based on the mentioned four diseases, additional cumulative practice score was developed including the four questions.

The generic drug prescribing practice score was computed based on whether the most frequently prescribed five drugs (as reported by GP study participants) were brand-name or

generic. Generic drug prescriptions were assigned a value of 1. Brand-name drug prescriptions were assigned a value of 0. The generic drug prescribing practice score was computed by dividing the count of reported generic drug prescriptions by the total number of responses and then multiplied by 100% to change the computed proportion into percent. The generic drug prescribing practice score was presented as the percent of generic drugs prescribed out of the most frequent drugs prescribed. All reported "most frequently prescribed" drug prescriptions that were brand-name and did not have a generic equivalent registered in Armenia or were generic and did not have brand-name equivalent registered in Armenia were considered as missing. Only those reported "most frequently prescribed" drug prescriptions where the physician had the option to choose brand-name or generic equivalent were included in the computation.

ANALYSIS

The student investigator entered the collected data into an electronic database in the statistical software SPSS 11 for Windows, then cleaned it (checking for unusual and extreme values through frequencies and graphical methods).

The study first conducted univariate analyses providing descriptive statistics, including frequencies, means and medians for study variables. This was followed by bivariate analyses testing simple associations between independent variables individually with the dependent variable, using simple linear regression analysis, the t-test and the chi-squared test. The study used multivariate linear regression for testing associations between

independent variables and the dependent variable while controlling for confounding and for testing interactions.

ETHICAL ISSUES

The Institutional Review Board (IRB) in the College of Health Sciences reviewed the research protocol and gave approval to proceed with the field work.

RESULTS

Response rate

From the 14 polyclinic directors approached for permission to conduct interviews in their facility, 13 provided permission to approach GPs and one refused. The student investigator approached 183 eligible GPs with 124 of them providing consent; the response rate was approximately 68%.

Demographic characteristics

All GP respondents were women. The age of participants ranged from 26-69 years old, with a mean age of 50.7 years and a median age of 53 years. Years of practice ranged from one to 47 years, with a mean of 24.8 years and a median of 26 years. Participants reported about 11 prescriptions per day. Table 1 presents demographic characteristics of participants.

GPs' practice in prescribing generic/brand-name drugs

Based on reported prescribing practices of generic vs. brand-name drugs for the five most frequently prescribed drugs as identified by GP participants,35% of GP participants prescribed generics less then half of the time and about 48%f all participants prescribed generics less than 25% of the time for the five most prescribed drugs when given a choice. Only 8% of all participants always prescribed generic drugs. See Table 1 for further details of the distribution of generic/brand-name prescription patterns for the five most frequently prescribed drugs.

The study also asked about drug prescriptions for common diseases seen by GPs. Over 67% of the participants reported prescribing generic drugs for the treatment of pneumonia or bronchitis most of the time (Graph 1). Among those who responded, the majority of the participants (88%) most of the time prescribed brand-name drugs for treatment of hypertension, and only about 12% mostly prescribed generics (Graph 2). About 75% of participants mostly prescribed brand-name drugs for treatment of diarrhea, and about 25% most of the time prescribed generics (Graph 3).

About 79% of participants indicated that they preferred to use brand-name drugs for themselves and for their family members. The reported reasons for this personal preference included beliefs that the effectiveness of brand-name drugs was higher than generics (40% of those respondents who preferred brand-name drugs), that brand-names were safer (20%), pharmaceutical companies' producing brand names were more credible (5%) and other reasons with smaller percentages (purity and quality of the brand name drug). About 17% of all respondents indicated that they believed there was no difference between brand-name

drugs and generics. Approximately 4% of GPs preferred generics for themselves and for their family members (Graph 4).

GPs' knowledge about generic drugs

About 93% of GP participants correctly identified the correspondence of generic drugs with their brand-name equivalents; 62% of GPs also knew that the dosage form for generic drugs should be the same as for their corresponding brand-name drugs. Approximately 70% of all respondents correctly identified that dosage for generic drugs and their equivalent brand-name drugs were the same. Only 28% of participants identified generics equally effective as brand-name drugs, 29% knew that generics did not produce more side effects, and 23% knew that generics were currently required to meet the same standards as brand-name drugs (according to international standards and regulations (12)). Moreover, 77% of GPs thought that generics should meet higher standards than brand-name drugs. Table 2 presents details about GPs knowledge.

The mean cumulative knowledge score was 19.7 (out of 30 possible) ranging from 12 to 27.

GPs' perceptions concerning generic drugs

Approximately 84% of respondents believed that standard guidelines were needed to inform physicians on brand-name drug substitution. The majority of GPs (70%) agreed that patients should be provided with adequate information on generic medications. More than half of the respondents (54%) stated that advertising by drug companies influences their prescription patterns. About 90% of the GP participants indicated that they needed more

information on the safety and effectiveness of generic drugs, and more than 90% of GPs stated that socio-economic status of the patients influenced their prescription practice. More than 90% of respondents stated that pharmaceutical company's credibility could influence their choice of medicine. Only 15% reported that product bonuses offered by pharmaceutical companies influenced their choice of medicine. Table 3 presents details about GPs perceptions of generic drugs.

The mean cumulative perception score was 15.4 (out of 30 possible) ranging from 9 to 30.

Comparison between generic and brand-name prescribing GPs for individual diseases: pneumonia, hypertension and diarrhea in terms of demographic factors, knowledge score and perception score

Diabetes was not analyzed as there was no data for the variable (most of the GPs stated that they refer the patients with 2^{nd} type diabetes to endocrinologists).

For the specified diseases of pneumonia and hypertension, based on t-test, there were no statistically significant difference for age, years of practice, knowledge score or perception score with whether the GP prescribed generic or brand-name drugs (Tables 4.1 and 4.2 respectively). However for diarrhea, though there are no statistically significant difference for age, years of practice, or perception score with whether the GP prescribed generic or brand-name drugs, there is a highly statistically significant (p=.006) difference between knowledge score and whether the GP prescribed generic or brand-name drugs (Table 4.3).

Cumulative practice score consisting of four disease specific questions was also analyzed towards all independent variables and there was no statistically significant association found. There was no change either when testing for the confounding.

Simple linear regression for testing associations of generic drug knowledge score and demographic factors with generic/brand-name prescribing practice score

The associations for the generic drug knowledge score and GP demographic characteristics with the outcome generic/brand-name prescribing practice score was first analyzed using simple linear regression for unadjusted bivariate associations. The bivariate unadjusted association between knowledge score and practice score were statistically significant. The results showed that higher generic drug knowledge score was associated with higher proportions of generic drugs prescribed (Table 5.1). For every increase in five points in the GPs' knowledge score, there was approximately an 11 percentage increase added to the proportion of generic drugs prescribed. Individual-testing of demographic characteristics of GPs (age, gender, years of practice and number of prescriptions per day) using unadjusted simple linear regression found no statistically significantly associations (Table 5.2). Multiple linear regression (MLR) was performed to further explore these associations, adjusted for potential confounders between independent variables. In multivariate linear regression analysis that included only demographic characteristics (to control for potential confounding between demographic characteristics) in the model with the generic/brand-name prescribing practice score as the outcome, there were still no statistically significant characteristics (Table 5.3). Likewise, with the generic drug knowledge score added to this model as an additional independent variable, there was no change in either the magnitude of

the coefficient or the statistical significance for knowledge from the simple linear regression results for knowledge, thus there was no confounding by the demographic characteristics on knowledge score. The demographic characteristics remained statistically non-significant in this model (Table 5.4). Thus the final linear regression model for generic drug knowledge score with the generic/brand-name prescribing practice score as the outcome excluded the demographic characteristics. Interactions were also tested, and there was no statistically significant interaction found within demographic variables or between demographic variables with the knowledge score.

Associations of generic drug perception score and demographic factors with generic/brand-name prescribing practice score

The bivariate unadjusted association between the generic drug perception score and the generic/brand-name prescribing practice score were not statistically significant (Table 5.5). To test for confounding demographic variables were added to this model, but no statistically significant confounding by the demographic characteristics on perception score was present (Table 5.6). Interactions were also tested and there was no statistically significant interaction found within demographic variables or between demographic variables with the perception score.

Separate analysis was conducted individually with the statements that made up the perception score. After applying Bonfferoni's adjustment, no statistical significant association was found between perception questions and practice score (Table 5.7).

DISCUSSION

Substituting more expensive brand-name drugs with their bio-equivalent generic drugs, when writing prescriptions, is considered one of the most effective ways to reduce the financial burden on families due to health expenditures (1). This is especially a rational approach because generics fall under the same regulatory and testing standards as their equivalent brand-name drugs and thus, share the same effectiveness , safety and side-effects as their brand-name counterparts—the beliefs that brand-name drugs are better that their generic equivalents is incorrect and not evidence-based. This problem needs attention in Yerevan, where GPs in polyclinics were found to more often prescribe brand-name drugs over that of bio-equivalent generic drugs. Among GPs' five most often prescribed drugs (as identified by them), were brand-names more often than the available generics and more than a third of all GPs reportedly always prescribed brand-names for their five most frequently prescribed drugs. Almost four-out-of-five GPs reportedly prefer to use brand-name drugs for themselves and their families, with 60% citing the incorrect belief that brand-names were either better or safer than generics. Similar distrust towards generic drugs by physicians has also been found in other countries (6, 7, 8).

The study found that for Yerevan polyclinic GPs, years of professional practice, number of prescriptions prescribed per day and age were not associated with the percent of drugs being prescribed. The findings on age and years of practice was in contrast with a study conducted in Malaysia, where younger physicians with fewer years of practice were more likely to prescribe generic drugs (18). This might reflect differences in how the two medical systems work or in differences in the consistency of medical instruction content

concerning generic and brand-name drugs over time. Also, these differences may be also due to differences in type of physician. City polyclinic GPs may have different bases of generic drug knowledge and behaviors compared to other specialized physicians that made up other study populations.

This study found that Yerevan polyclinic GPs who participated in this study, were limited in their knowledge regarding the safety and effectiveness of generic drugs. Though a high percentage of the participants was able to identify correctly the generic's equivalence of brand-name drugs, dose and form of dosage, more than half of the respondents thought that manufacturing standards for generics were not as stringent as for brand-name drugs and; and more than 70% of respondents believed that generic drugs produce more side effects and are less effective when compared to their brand name equivalents. A positive association was found between knowledge score and generic prescription practices; this indicated that incorrect knowledge reduced confidence in generic drugs and thus reduced the prescribing of these generic drugs and increasing prescribing of equivalent brand-name drugs. The more correctly physicians were informed on the equivalence of generic drugs with their brand-name counterparts, the more frequently these physician prescribed generics over brand-names. This finding was similar to that reported in France, where physician's lower prescriptions rates of generic drugs were due to their incorrect belief that generic drugs produced more side effects than brand-name drugs (20).

More than half of the respondents indicated that advertising and pharmaceutical company's credibility influences their choice of medicines; brand-name medicines are larger profit-

makers for drug companies and thus the drug companies have incentive to promote their brand-name drugs. This finding is consistent with the findings of a published paper that reviewed twenty nine published studies conducted in different countries (U.S., Holland, Canada, Australia, etc) (21). However, though only 15% of respondents reported that product bonuses from drug companies influence their prescribing practices, this percent may biased towards lower values due to physicians bias—physicians may be more likely to lie about these influences or are possibly not even aware of how much product bonuses influenced them. Such influences are more likely to lead to more frequent prescribing of newer, more expensive brand-name drugs that have no evidence-based advantage over generics.

More than 90% of GPs indicated that they needed more information regarding generic drug safety and effectiveness , indicating an area of improvement to reduce the distrust in generic drugs. Furthermore, most GPs indicated that it is important to establish closer collaboration between physicians and pharmacists and to provide patients with more information regarding generic drugs, which is similar to findings in Malaysia (18). These findings provide a target for programs educating physicians, pharmacists and patients on the evidence-based equivalence of generics.

The overall generic drug perception score was not associated with the generic drug prescription practices- suggesting that despite concerns and suspicions about generic drugs, physician's prescription practices are decided more on what they believe is correct evidence-based knowledge, regardless of their perceptions. So the study does suggest that

there is a lack of confidence among physicians towards generics, and knowledge is the target area to be improved for higher utilization of generics.

STRENGTHS AND LIMITATIONS

One of the strengths of the study is that the research investigating the issues of generic versus brand-name drugs was conducted in Armenia for the first time. The study was conducted in polyclinics located in all twelve communities of Yerevan, so the results could be generalized among GPs working in Yerevan.

Limitations in the study include possible biases involving less-than-truthful answers to some sensitive questions regarding incentives for drug sales from drug companies and interactions among GPs and pharmaceutical companies. In addition, because the study was cross-sectional in design the direction of causality was not always clear in some cases, where generic drug prescription practices may also harden or influence beliefs in generic drug characteristics. It was also impossible to assess potential gender differences among GPs in Yerevan polyclinics because the participant GPs were all women. The findings from this study cannot be generalized to other physicians in Armenia, as all the respondents were general practitioners from Yerevan.

CONCLUSION AND RECOMMENDATIONS

The current study found a positive association between knowledge score and generic prescription practices, indicating that training programs for GPs to improve their knowledge about generic drugs could lead to increased prescriptions of generic drugs.

This study would recommend conducting similar studies among GPs from marzes and among other specialist physicians to understand their prescribing practices and find ways to improve them to reduce drug expenditures and the financial burden on families, especially those living in poverty.

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TABLES AND GRAPHS

Table 1: Demographic and prescribing characteristics of GPs participating in the study

Variable Name	**% (N)**
Gender	
Male	0% (0)
Female	100% (124)
Age	
20-40	16.1% (20)
41-60	58.1% (72)
60>	25.8% (32)
Years in practice	
0-10	11.3% (14)
11-20	20.2% (25)
21-30	28.2% (35)
31-40	24.2% (30)
40>	16.1% (20)
Number of prescriptions per day	
0-10	63.7% (79)
11-19	27.4% (34)
20>	8.9% (11)
Distribution of GPs percent of prescribing generics for five most frequently prescribed drugs	
47.5% (55) GPs	25% of the time or less
34.5% (40) GPs	26%-50% of the time
10.3% (12) GPs	51%-75% of the time
7.9% (9) GPs	76% of the time or greater

Table 2: Percentages (numbers) of GPs' responses to generic drug knowledge
Knowledge score is 19.7 (12-27)

Variable name	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. Bioequivalence	48.4% (60)	43.5% (54)	2.4% (3)	4.8% (6)	0% (0)
2.Dosage form	23.4% (29)	37.9% (47)	20.2% (25)	16.9% (21)	0.8% (1)
3. Dose	33.9% (42)	42.7% (53)	10.5% (13)	10.5% (13)	0.8% (1)
4. Effectiveness	12.1% (15)	35.5% (44)	23.4% (29)	27.4% (34)	0.8% (1)
5. Side effects	8.9% (11)	29.8% (37)	31.5% (39)	28.2% (35)	0.8% (1)
6. Safety standards	39.5 (49)	31.5% (39)	5.6% (7)	20.2% (25)	2.4% (3)

Table 3: Percentages (numbers) of GPs' responses to generic drug perceptions
Perception score is 15.4 (9-30)

Variable name	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. STG	40.3% (50)	39.5% (49)	7.3% (9)	12.1% (15)	0% (0)
2. Patient information	26.6% (33)	43.5% (54)	8.1% (10)	21.0% (26)	0% (0)
3. Advertisement	10.5% (13)	39.5% (49)	13.7% (17)	31.5% (39)	4.0% (5)
4. Information on safety and efficacy	36.3% (45)	53.2% (66)	3.2% (4)	5.6% (7)	0.8% (1)
5. Patient's socio-economic factor	53.2% (66)	37.1% (46)	1.6% (2)	4.8% (6)	0.8% (1)
6. Credibility of the manufactures	53.2% (66)	39.5% (49)	0% (0)	6.5% (8)	0% (0)
7. Pharmaceutical companies bonuses	3.2% (4)	8.9.% (11)	25.8% (32)	45.2% (56)	12.9% (16)

Table 4.1: Bivariate unadjusted analysis of potential risk factors for prescribing generic vs. brand name drugs for pneumonia

Variable name	GPs prescribing brands	GPs prescribing generics	P-value (t-test)
Age	49.5	51.3	0.69
Years of practice	23.5	25.4	0.45
Knowledge Score	19.9	19.7	0.28
Perception Score	19.5	18.9	0.80

Table 4.2: Bivariate adjusted analysis of potential risk factors for prescribing generic vs. brand name drugs for hypertension

Variable name	GPs prescribing brands	GPs prescribing generics	P-value (t-test)
Age	50.8	48.6	0.67
Years of practice	25.0	22.6	0.93
Knowledge Score	19.7	20.1	0.59
Perception Score	19.1	18.2	0.29

Table 4.3: Bivariate adjusted analysis of potential risk factors for prescribing generic vs. brand name drugs for diarrhea

Variable name	GPs prescribing brands	GPs prescribing generics	P-value (t-test)
Age	51.4	48.1	0.31
Years of practice	25.5	22.6	0.28
Knowledge Score	19.4	20.0	0.006
Perception Score	19.6	19.3	0.78

Table 5.1: Bivariate unadjusted simple linear regression analysis between generic drug knowledge score and generic drug prescribing practice score as the outcome variable

Independent Variable	Coefficient	P-value	95% Confidence Interval
Knowledge of GPs of generic medicines	0.219	<0.019	(0.038, 0419)

Table 5.2: Bevariate unadjusted linear regression analysis between age, years of practice, number of prescriptions per day and practice score as the outcome variable

Independent Variable	Coefficient	P-value	95% Confidence Interval
Age of participants	0.125	0.183	(-0.018, 0.093)
Years of practice	0.072	0.440	(-0.028, 0.065)
Number of prescriptions per day	0.127	0.176	(-0.034, 0.185

Table 5.3: Multiple linear regression analysis of demographic characteristics adjusted for confounding with generic prescribing practice score as the outcome variable

Independent Variable	Coefficient	P-value	95% Confidence Interval
Age of participants	0.389	0.123	(-0.032, 0.266)
Years of practice	-0.308	0.220	(-0.203, 0.047)
Number of prescriptions per day	0.103	0.280	(-0.051, 0.173)

Table 5.4: Multiple Linear Regression analysis adjusted for potential confounding with generic drug knowledge score as the independent variable and generic prescribing practice score as the outcome variable

Independent Variable	Coefficient	P-value	95% Confidence Interval
Age of participants	0.343	0.166	(-0.043; 0.249)
Years of practice	-0.249	0.312	(-0.185, 0.060)
Number of prescriptions per day	0.131	0.165	(-0.034, 0.195)
Knowledge of GPs of generics	0.219	0.019	(0.038, 0.419)

Table 5.5: Unadjusted bivariate simple linear regression analysis between generic drug perception score and generic drug prescribing practice score as the outcome variable

Independent Variable	Coefficient	p-value	95% Confidence Interval
Perceptions of GPs of generic medicines	0.07	0.48	(-0.109, 0.228)

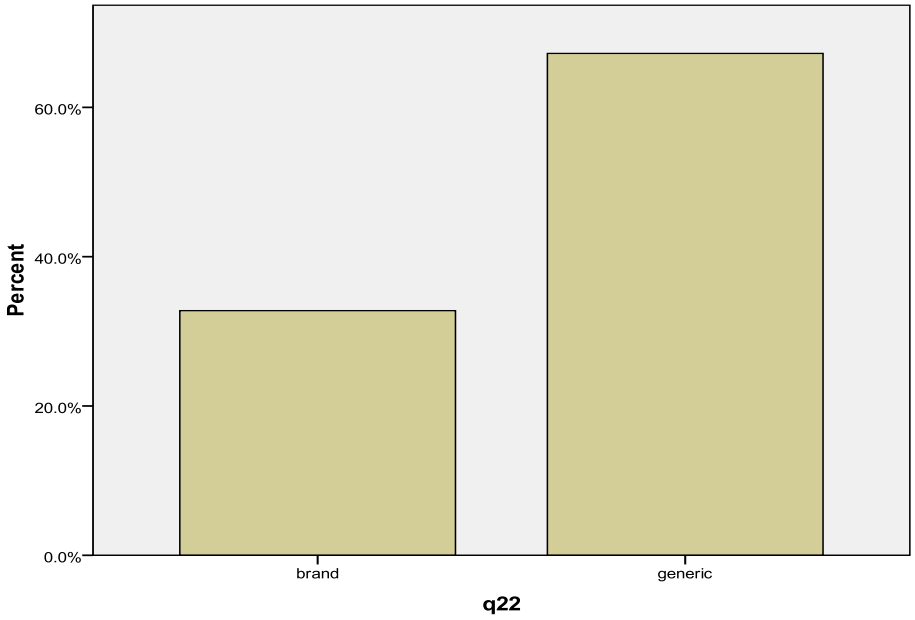
Table 5.6: Multiple linear regression analysis controlling for potential confounding with generic drug perception score and generic prescribing practice score as the outcome variable

Independent Variable	Coefficient	p-value	95% Confidence Interval
Age of participants	0.443	0.087	(-0.020, 0.285)
Years of practice	-0.348	0.172	(-0.216, 0.049)
Number of prescriptions per day	0.126	0.200	(-0.043, 0.204)
Perceptions of GPs of generics	0.089	0.359	(-0.092, 0.251)

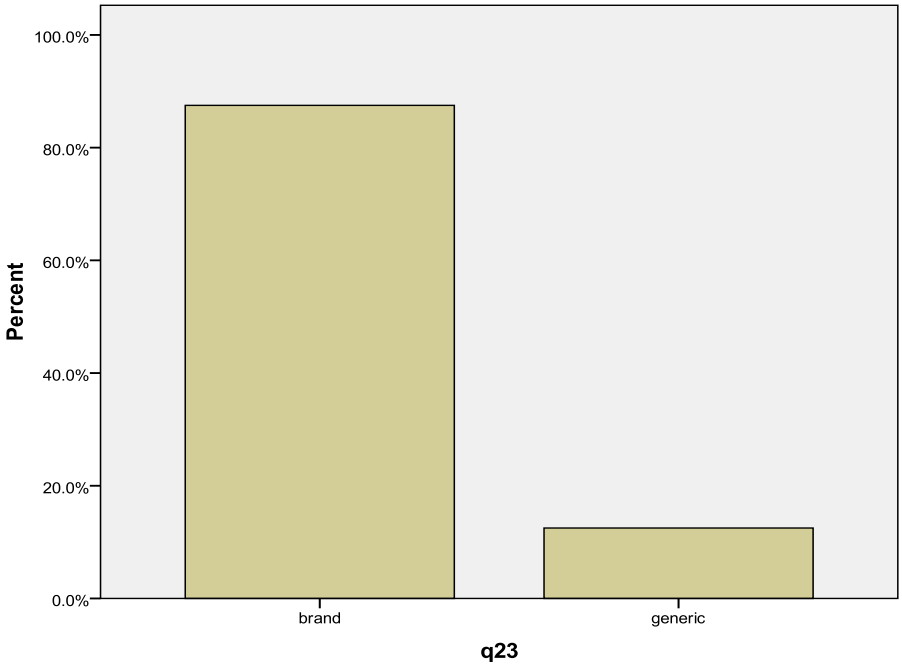
Table 5.7: Unadjusted bivariate simple linear regression analysis between individual generic drug perception statements and generic drug prescription practice score as the outcome variable

Independent Variable	Coefficient	p-value	95% Confidence Interval
I believe we need a standard guideline to both GP's and pharmacist on brand substitution process	0.22	0.02	(0.120, 1.260)
I think patient should be given an enough information about generic medicines in order to make sure they really understand about the medicines they take	0.17	0.07	(-0.049, 1.032)
I believe advertisement by the drug companies will influence my future prescribing pattern	-0.05	0.56	(-0.660, 0.353)
I need more information on the issues pertaining to the safety and efficacy of generic medicines	0.02	0.82	(-0.631, 0.788)
Patient's socio-economic factor will affect my choice of medicines	0.01	0.93	(-0.661, 0.716)
Credibility of the manufactures/suppliers are my concern when prescribing medicines	-0.03	0.73	(-0.829, 0.583)
Pharmaceutical companies product bonuses will influence my choice of medicines	-0.11	0.23	(-0.964, 0.242)

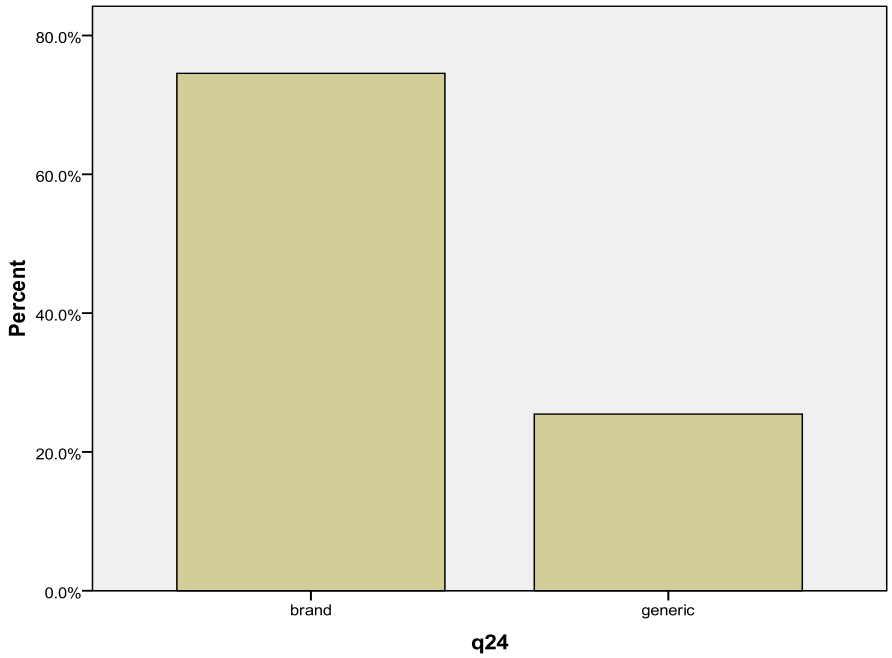
Graph 1: The percentages of GPs who prescribed brand-name and generic drugs for treatment of pneumonia or bronchitis most of the time



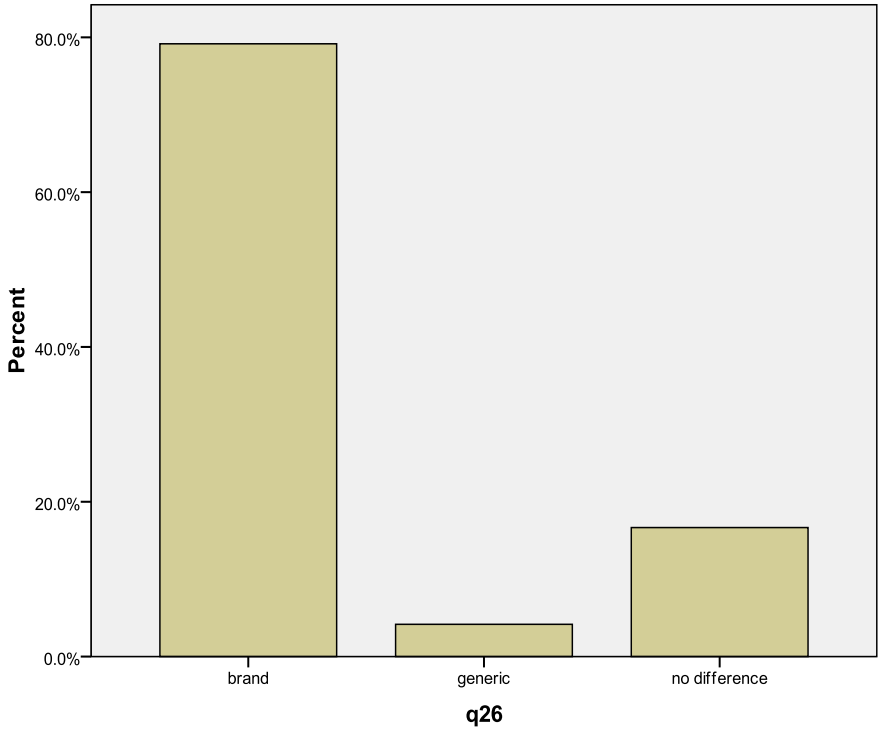
Graph 2: The percentages of GPs who prescribed brand-name and generic drugs for treatment of hypertension most of the time



Graph 3: The percentages of GPs who prescribed brand-name and generic drugs for treatment of diarrhea most of the time



Graph 4: Preferences of GPs towards brand name versus generic drugs for themselves and for their family members



APPENDIX 1: CONSENT TO PARTICIPATE IN A RESEARCH STUDY

Prescription practices and knowledge about brand name versus generic drugs in Armenia

My name is Tatevik Gevorgyan. I am a Clinical Pharmacologist, and a graduate student of Public Health at the American University of Armenia. The College of Health Sciences at AUA is conducting a research project to explore the issue of generic vs. brand name drugs among the health providers in Yerevan.

You are asked to participate in the study because you are a GP working in a polyclinic. You will help us a lot with your participation to understand the issue of generic vs. brand name drugs in Armenia and make recommendations for improvement. If you agree to participate in this assessment you will be interviewed for not more than 10-15 minutes.

Your participation in the interview is voluntary and there is no penalty for refusing to take part. You may refuse to answer any question in the interview or stop the interview at any time. The interview will be confidential; the information you provide will be kept confidential and will be used only for the study. To protect your privacy, we will not collect or report any identifying information such as your name or the health facility where you work. Only aggregated data will be reported in the final presentation/report.

Your participation in the study poses no risk for you, except of time consuming. There will be no direct benefits for you if you participate in this project, but your participation will help to understand the issue better.

If you have any questions about this study you can contact Dr. Varduhi Petrosyan, the Associate Dean if the College of Health Sciences at AUA calling 512592.
If you feel you have not been treated fairly or think you have been hurt by joining this study, please contact Dr. Hripsime Martirosyan, AUA Human Subjects Administrator calling (374 1) 51 25 61.

If you agree to participate could we continue?

Բժիշկների գիտելիքներն ու նշանակումները ջեներիկ և բրենդային դեղերի վերաբերյալ Երևանում

ԻՐԱԶԵԿ /ՀԱՄԱՁԱՅՆՈՒԹՅԱՆ ՁԵՎ

Բարև Ձեզ: Իմ անունն է Տաթևիկ Գևորգյան: Ես մասնագիտությամբ կլինիկական դեղաբան եմ, ինչպես նաև Հայաստանի ամերիկյան համալսարանի (ՀԱՀ) հանրային առողջապահության մագիստրատուրայի ավարտական կուրսի ուսանող: Հայաստանի ամերիկյան համալսարանի (ՀԱՀ) հանրային առողջապահության ֆակուլտետը իրականացնում է հետազոտություն՝ուսումնասիրելու ընդհանուր պրակտիկայի բժիշկների մոտեցումները օրիգինալ (բրենդային) և վերարտադրված (ջեներիկ) դեղերի վերաբերյալ:

Դուք ընդգրկվել եք այս ուսումնասիրության մեջ, քանի որ Դուք ընդհանուր պրակտիկայի բժիշկ եք և աշխատում եք պոլիկլինիկայում: Ձեր մասնակցությամբ կնպաստեք ավելի լավ հասկանալու ջեներիկ և բրենդային դեղերի հետ կապված խնդիրները, որոնք առկա են Հայաստանում: Եթե համաձայն եք մասնակցել, ապա հարցազրույցը կտևի մոտ 10-15րոպե: Ձեր մասնակցությունը այս հարցազրույցին կամավոր է: Դուք կարող եք հրաժարվել պատասխանել ցանկացած հարցին կամ դադարեցնել հարցազրույցը ցանկացած պահին: Հարցազրույցը անանուն է, Ձեր տրամադրած տեղեկությունները գաղտնի կպահվեն և միայն ընդհանրացված տվյալները կներկայացվեն զեկույցում: Ձեր անունը և աշխատանքի վայրը չի նշվի հարցաթերթիկում: Մասնակցելով այս հետազոտությանը՝ դուք որևէ ռիսկի չեք դիմում, բացի ժամանակ տրամադրելուց: Այս հետազոտությանը Ձեր մասնակցության դեպքում որևէ ուղղակի շահ չեք ունենա, բայց կօգնեք ավելի լավ պատկերացնելու ջեներիկ/վերարտադրված և բրենդային/օրիգինալ դեղերի հետ կապված խնդիրները Հայաստանում:

Հետազոտության հետ կապված հետագա հարցերի համար կարող եք զանգահարել Հայաստանի ամերիկյան համալսարանի Հանրային առողջապահության մագիստրատուրայի փոխդեկանին՝ Վարդուհի Պետրոսյանին - 512592, ինչպես նաև եթե կարծում եք, որ հետազոտության ընթացքում Ձեզ հետ լավ չեն վերաբերվել և/կամ հետազոտությունը Ձեզ վնաս է հասցրել կարող եք զանգահարել Հայաստանի ամերիկյան համալսարան, Հռիփսիմե Մարտիրոսյանին հետևյալ համարով՝512561; նա հանդիսանում է ՀԱՀ-ի Էթիկայի հանձնաժողովի քարտուղարը:

Եթե համաձայն եք մասնակցել կարող եմ շարունակել:

APPENDIX 2: QUESTIONNAIRE

Identifying physicians' prescription practices, perceptions and knowledge about brand name versus generic drug use in Yerevan: factors that influence prescribing behaviors of physicians

ID number _____

1. Date of interview: _____
2. Time of interview start: _____
3. Time of interview finished: _____

4. Gender

□.1 Male □.2 Female

5. Age (years) _____

6. Years in practice _____

7. On average, number of prescriptions written per day, excluding the prescriptions of drugs from the list that are given to the patient free of charge _____

Knowledge about generic drugs	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
8. A generic medicine is bioequivalent to a brand name medicine	□.1	□.2	□.3	□.4	□.5
9. A generic medicines must be in the same dosage form (e.g. tablet, capsule) as the brand name medicine	□.1	□.2	□.3	□.4	□.5
10. A generic medicines must contain the same dose as the brand name medicines	□.1	□.2	□.3	□.4	□.5
11. Generic medicines are less effective compared to brand name medicines	□.1	□.2	□.3	□.4	□.5
12. Generic medicines produce more side effects compared to brand name medicines	□.1	□.2	□.3	□.4	□.5
13. Brand name medicines are required to meet higher safety standards than generic medicines	□.1	□.2	□.3	□.4	□.5

Perceptions about generic drug use					
14. I believe we need a standard guideline to both GP's and pharmacist on brand substitution process	□.1	□.2	□.3	□.4	□.5
15. I think patient should be given an enough information about generic medicines in order to make sure they really understand about the medicines they take	□.1	□.2	□.3	□.4	□.5
16. I believe advertisement by the drug companies will influence my future prescribing pattern	□.1	□.2	□.3	□.4	□.5
17. I need more information on the issues pertaining to the safety and efficacy of generic medicines	□.1	□.2	□.3	□.4	□.5
18. Patient's socio-economic factor will affect my choice of medicines	□.1	□.2	□.3	□.4	□.5
19. Credibility of the manufactures/suppliers are my concern when prescribing medicines	□.1	□.2	□.3	□.4	□.5
20. Pharmaceutical companies product bonuses will influence my choice of medicines	□.1	□.2	□.3	□.4	□.5

Physician practices regarding generic/versus brand name drugs

21. What are the most prescribed top five drugs in your practice?

Top five drugs (ranked by frequency)
21.1.
21.2.
21.3.
21.4.
21.5.

22. Name the specific antibiotic that you most prescribe for treating the respiratory tract diseases (bronchitis and pneumonia) .

_____

(a note: to be completed by the student investigator later □.1 Brand □.2 Generic)

23. Name the specific antihypertensive drug that you most prescribe for treatment of hypertension.

_____

(a note: to be completed by the student investigator later □.1 Brand □.2 Generic)

24. Name the specific drug that you most prescribe for diarrhea.

_____

(a note: to be completed by the student investigator later □.1 Brand □.2 Generic)

25. Name the specific anti-diabetic drug that you most prescribe for 2nd type diabetes mellitus.

_____

(a note: to be completed by the student investigator later □.1 Brand □.2 Generic)

26. What drug would you prefer for you or your family member?

□.1 Brand
□.2 Generic
□.3 No difference

27. Why? (Do not read the options)
□.1 Cost
□.2 Efficacy
□.3 Pharmaceutical companies
□.4 Safety
□.5 Other

ՀԱՎԵԼՈՒՄ 1: ՀԱՐՑԱԹԵՐԹԻԿ

Բժիշկների մոտեցումները, գիտելիքներն ու նշանակումները
ջեներիկ/վերարտադրված և բրենդային/օրիգինալ դեղերի վերաբերյալ Երևանում;
նշանակումների վրա ազդող գործոնները

ID No _____
1.Հարցազրույցի ամսաթիվը: _____
2.Հարցազրույցը սկսելու ժամը:_____
3.Հարցազրույցը ավարտելու ժամը:_____
4.Մասնակցի սեռը

□.1 Արական □.2 Իգական

5. Մասնակցի տարիքը _____

6. Որքա՞ն ժամանակ եք աշխատում այս մասնագիտությամբ _____

7. Միջին հաշվով օրական քանի՞ դեղատոմս եք դուրս գրում՝ չհաշված բուժ. հաստատության կողմից անվճար տրվող դեղերի ցուցակում ընդգրկված դեղերի դեղատոմսերը _____

Կցանկանայի իմանալ Ձեր համաձայնության աստիճանը ջեներիկ (վերարտադրված) դեղերի վերաբերյալ `պատասխանելով հետեվյալ կերպ՝
1.Լիովին համաձայն եմ,
2.Համաձայն եմ,
3.Չեզոք եմ,
4.Համաձայն չեմ,
5.Բոլորովին համաձայն չեմ

Ջեներիկ (վերարտադրված) դեղերի վերաբերյալ գիտելիքները	Լիովին համաձայնեմ	Համաձայնեմ	Չեզոք եմ	Համաձայն չեմ	Բոլորովին համաձայն չեմ
8.Ջեներիկ(վերարտադրված) դեղը պետք է համապատասխանի բրենդային (օրիգինալ) դեղին իր կենսամատչելիությամբ	□.1	□.2	□.3	□.4	□.5
9.Ջեներիկ(վերարտադրված) դեղը պետք է լինի նույն դեղաձևով(հաբ, դեղապատիճ) , ինչ որ բրենդայինը կամ օրիգինալը	□.1	□.2	□.3	□.4	□.5
10.Ջեներիկ(վերարտադրված) դեղը պետք է պարունակի միևնույն դեղաչափը, ինչ բրենդայինը (օրիգինալը)	□.1	□.2	□.3	□.4	□.5
11. Ջեներիկ (վերարտադրված) դեղերը ավելի քիչ արդյունավետ են՝ համեմատած բրենդային (օրիգինալ) դեղերի հետ:	□.1	□.2	□.3	□.4	□.5
12. Ջեներիկ (վերարտադրված) դեղերը օժտված են ավելի շատ կողմնակի երևույթներով, քան բրենդային (օրիգինալ) դեղերը	□.1	□.2	□.3	□.4	□.5
13. Բրենդային (օրիգինալ) դեղերը պետք է համապատասխանեն ավելի բարձր ստանդարտների, քան ջեներիկ կամ վերարտադրված դեղերը:	□.1	□.2	□.3	□.4	□.5

Պատկերացումները ջեներիկ(վերարտադրված) դեղերի վերաբերյալ	Լիովին համաձայնեմ	Համաձայնեմ	Չեզոք եմ	Համաձայն չեմ	Բոլորովին համաձայն չեմ
14. Կարծում եմ թե՛ բժիշկները, և թե՛ դեղագործները պետք է ունենան ստանդարտ ուղեցույց բրենդային (օրիգինալ) դեղը ջեներիկով կամ վերարտադրված դեղով փոխարինելու համար:	□.1	□.2	□.3	□.4	□.5

15. Կարծում եմ հիվանդներին պետք է տրվի բավականաչափ տեղեկատվություն ջեներիկ (վերարտադրված) դեղի վերաբերյալ, որպեսզի նրանք տեղեկացված լինեն նշանակված դեղի վերաբերյալ:	□.1	□.2	□.3	□.4	□.5
16. Կարծում եմ դեղագործական ընկերությունների գովազդը ազդեցություն կունենա իմ նշանակումների վրա	□.1	□.2	□.3	□.4	□.5
17. Ինձ հարկավոր է ավելի շատ տեղեկատվություն, որոնք հաստատում են ջեներիկ (վերարտադրված) դեղերի անվտանգությունն ու արդյունավետությունը	□.1	□.2	□.3	□.4	□.5
18. Դեղորայք նշանակելիս հաշվի եմ առնում հիվանդի սոցիալ տնտեսական վիճակը	□.1	□.2	□.3	□.4	□.5
19. Դեղորայք նշանակելիս հաշվի եմ առնում արտադրող ընկերության հավաստիությունը	□.1	□.2	□.3	□.4	□.5
20. Դեղորայք նշանակելիս հաշվի եմ առնում դեղագործական ընկերությունների տրամադրած բոնուսները	□.1	□.2	□.3	□.4	□.5

Նշանակումները՝ ջեներիկ (վերարտադրված)/ բրենդային (օրիգինալ) դեղորայք

21. Ձեր գործունեության ընթացքում որո՞նք են հինգ ամենից հաճախ նշանակվող դեղերը

Հինգ ամենահաճախ նշանակվող դեղեր
21.1.
21.2.
21.3.
21.4.
21.5.

22. Շնչառական համակարգի հիվանդությունների (բրոնխիտ, թոքաբորբ) բուժման համար կոնկրետ ո՞ր հակաբիոտիկն եք ավելի հաճախ նշանակում:

_____

(հետագայում կլրացվի հետազոտող ուսանողի կողմից
□.1 Բրենդ □.2 Ջեներիկ)

23. Հիպերտոնիկ հիվանդության բուժման համար կոնկրետ ո՞ր դեղն եք ավելի հաճախ նշանակում:

_____

(հետագայում կլրացվի հետազոտող ուսանողի կողմից
□.1 Բրենդ □.2 Ջեներիկ)

24. Փորլուծության բուժման համար կոնկրետ ո՞ր դեղն եք ավելի հաճախ նշանակում:

_____

(հետագայում կլրացվի հետազոտող ուսանողի կողմից
□.1 Բրենդ □.2 Ջեներիկ)

25. 2-րդ տիպի շաքարային դիաբետի բուժման համար կոնկրետ ո՞ր հակաշաքարախտային դեղն եք ավելի հաճախ նշանակում:

_____

(հետագայում կլրացվի հետազոտող ուսանողի կողմից
□.1 Բրենդ □.2 Ջեներիկ)

26. Ձեր կամ Ձեր ընտանիքի անդամների համար ինչ դեղ կնախընտրեք՝ բրենդային (օրիգինալ) թե՞ ջեներիկ (վերարտադրված) դեղ:

□.1 Բրենդային/օրիգինալ
□.2 Ջեներիկ/վերարտադրված
□. 3 Տարբերություն չկա

27. Ինչու՞ (տարբերակները չկարդալ)
□.1 Արժեք
□.2 Արդյունավետություն
□.3 Դեղագործական ընկերություններ
□.4 Անվտանգություն
□.5 Այլ