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Family practice patients' adherence to statin medications

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ABSTRACT

OBJECTIVE To measure family practice patients' adherence to statin medications and to identify factors associated with adherence to these medications.

DESIGN Cross-sectional study using a mailed self-report survey sent to 400 patients.

SETTING Two academic family practice clinics in Halifax, NS.

PARTICIPANTS A total of 284 patients aged 40 or older who were prescribed statin medications by their family physicians, either for the first time or as a renewal during a 20-month period.

MAIN OUTCOME MEASURES Level of adherence to statin medications as measured by patients' self-report on the Morisky scale; association between high adherence on the Morisky scale and 38 patient-reported factors.

RESULTS Response rate was 82.5%. Average age of patients was 65 years, 57% were men, 62% had been on statin medications for more than 2 years, and 97% reported that their family physicians managed their cholesterol levels. More than 63% of patients reported high adherence as measured by the Morisky scale. On multiple logistic regression, being older than 65, taking 4 to 6 other prescribed medications, and having a lifestyle that included regular exercise or a healthy diet were significant independent predictors of high adherence scores on the Morisky scale.

CONCLUSION Almost two-thirds (63%) of patients who were prescribed statins by their family physicians reported high adherence to the medications. Strategies to improve adherence would best be directed at patients who are younger or taking fewer than 4 or more than 6 other prescribed medications. Patients should be encouraged to maintain a lifestyle of regular exercise and a healthy diet, as this was associated with better adherence to statin medications.

EDITOR'S KEY POINTS

- Adherence to statin medications is thought to be generally poor, but most studies of adherence to statins are based on analyses of large databases of patient prescription refill claims.
- In this study of patients prescribed statin medications by their family physicians, 63% reported a high level of adherence.
- Several factors were found to be associated with high levels of adherence: being older than 65 years, taking 4 to 6 other medications, and having a lifestyle that includes regular exercise or a healthy diet.

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Observance des patients des cliniques de médecine familiale à la prise de statines

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RÉSUMÉ

OBJECTIF Évaluer l'observance des patients des cliniques de médecine familiale à la prise de statines et identifier les facteurs favorisant la fidélité à ce traitement.

TYPE D'ÉTUDE Étude transversale utilisant une enquête postale auto-administrée adressée à 400 patients.

CONTEXTE Deux cliniques universitaires de médecine familiale d'Halifax, Nouvelle-Écosse.

PARTICIPANTS Un total de 284 patients de 40 ans ou plus ayant reçu une prescription de statine de leur médecin de famille au cours d'une période de 20 mois, pour la première fois ou en renouvellement.

PRINCIPAUX PARAMÈTRES ÉTUDIÉS Niveau d'observance à la prise de statines tel que mesuré par le score que le patient s'attribue sur l'échelle de Morisky; association entre un haut niveau d'observance sur l'échelle de Morisky et 38 facteurs rapportés par les patients.

RÉSULTATS Le taux de réponse était de 82,5%. Les patients avaient en moyenne 65 ans, 57% étaient des hommes, 62% prenaient des statines depuis plus de 2 ans et 97% déclaraient que leur médecin de famille surveillait leur niveau de cholestérol. Plus de 63% rapportaient un haut niveau d'observance tel que mesuré par l'échelle de Morisky. L'analyse de régression logistique multiple a révélé que le fait d'avoir plus de 65 ans, de prendre 4 à 6 autres médicaments et d'avoir un mode de vie qui inclut exercice régulier et alimentation saine étaient des facteurs prédictifs indépendants significatifs de scores d'observance élevés sur l'échelle de Morisky

CONCLUSION Près des deux tiers (63%) des patients auxquels leur médecin de famille avait prescrit des statines ont rapporté un haut niveau d'observance à cette médication. Les stratégies visant à améliorer l'observance devraient cibler les patients plus jeunes ou ceux qui prennent moins de 4 ou plus de 6 médicaments prescrits. On devrait encourager les patients à faire de l'exercice régulièrement et à avoir une alimentation saine, puisque ces habitudes sont associées à une meilleure observance de la prise de statines.

POINTS DE REPÈRE DU RÉDACTEUR

- On croit généralement que les patients sont peu fidèles à la prise de statines, mais la plupart des études sur ce sujet sont basées sur l'analyse de grandes bases de données portant sur les demandes de renouvellement de prescriptions par les patients.
- Dans cette étude, 63% des patients qui avaient reçu une prescription de statines de leur médecin de famille ont déclaré être très fidèles à ce traitement.
- On a trouvé que plusieurs facteurs sont associés à un taux élevé d'observance: le fait d'être plus âgé, de prendre de 4 à 6 autres médicaments et d'avoir un mode de vie comprenant exercice régulier et alimentation saine.

Large clinical trials have shown that patients with dyslipidemia who take statin medications on a regular basis have substantially fewer major cardiovascular events and lower mortality after 1 to 2 years of continuous treatment.[1-6] Despite this evidence, prescription refill database studies have indicated that patients' adherence to statin medications is generally poor.[7-13] Patients who adhere poorly to their regimens are less likely to achieve target levels of low-density lipoprotein[14] and are at increased risk of recurrent cardiovascular events.[6,15]

A search of the literature revealed that previous studies on statin adherence have been conducted using large database records of prescription refills claims. No studies directly asked family practice patients about their adherence to statins and associated factors. In Canada, family practice is an important setting in which to study adherence to statin medications, as most patients receive their cardiovascular preventive care from their family physicians.

Adherence is a complex process, and patients' decisions on how to manage their medications are likely based on economic, physical, psychological, and social considerations.[16] Identifying factors associated with adherence would be of value for formulating strategies to enhance patients' adherence to statin medications. The objectives of this study were to measure family practice patients' adherence to statin medications and to identify factors associated with adherence to these medications.

METHODS

Design and setting
The study was approved by the Research Ethics Board of the Capital District Health Authority in Halifax, NS.

Data were obtained from responses to a self-report survey that was mailed to a cross-section of patients from 2 family practices in Halifax. Both practices are academic teaching units; 1 is hospital-based, and the other is community-based. We calculated a sample size of 245 using a 95% confidence interval and a 0.05 specified margin of error. From the medication prescription section of the electronic medical records from these practices,

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we identified 400 patients aged 40 or older who were prescribed statin medications by their family physicians as new or repeat prescriptions between January 2004 and September 2005. The survey was mailed to the 400 patients using a modified Dillman method.[17]

Survey
We designed a patient self-report survey. To measure patients' adherence to statin medications, the survey included the Morisky scale, a 4-item adherence measure[18] (**Table 1**[18]). This scale, originally designed to evaluate medication adherence in hypertensive patients, has been validated and found to be reliable in a variety of medication adherence studies.[19-26]

Table 1. Morisky scale: *No—0 points, Yes—1 point; total score of 0—high adherence, 1 to 2—medium adherence, 3 to 4—low adherence.*

1 Do you ever forget to take your medicine?	Yes or No
2 Are you careless at times about taking your medicine?	Yes or No
3 When you feel better do you sometimes stop taking your medicine?	Yes or No
4 Sometimes if you feel worse when you take the medicine, do you stop taking it?	Yes or No
Adapted from Morisky et al.[18]	

To identify factors that might be associated with patients' adherence to statin medications, we developed questions for the survey following a conceptual framework of 38 factors in 7 categories that have previously been thought to affect patients' adherence to hypertension medications[27-29] (**Table 2**). Hypertension and hyperlipidemia are asymptomatic, last throughout life, and are managed for prevention of cardiovascular disease. Much research has been conducted in the area of adherence to hypertension medications, and we thought similar factors were likely to affect adherence to statin medications. Face and content validity of the questions were assessed by an experienced survey researcher, a physician, and a pharmacist. The survey was pilot-tested in a community family practice.

Analysis
Patients' adherence to statin medications was measured on the Morisky scale. A high threshold was set for categorizing patients as adherent. Patients who answered "no" to all 4 questions were classified as highly adherent. Patients who answered "yes" to at least 1 question were classified as having medium or low adherence (see scoring in **Table 1**[18]). This scoring system is consistent with that used in developing the original scale and has been used in other studies to categorize adherence.[19-26] As a measure of concurrent criterion validity, we calculated the correlation between patients' scores on the Morisky

scale and their reports of the number of times they had not taken their statin medications in the 30 days before completing the survey.

Univariate logistic regression was used to examine associations between patients' adherence as rated on

Table 2. Factors explored in the survey

DEMOGRAPHICS
Age
Sex
Education
Work status
Income

CLINICAL TREATMENT VARIABLES
Length of time taking statin
Side effects to statins
Side effects to medications in general
Number of other prescribed medications
Number of cardiovascular risk factors
Use of medication dispenser
History of heart attack or stroke
History of bypass surgery or angioplasty
Started statin after heart attack or stroke
Family history of heart attack or stroke
Lifestyle: exercises at least 3 times a week and eats 3 to 5 servings of fruit or vegetables a day

KNOWLEDGE AND BELIEFS ABOUT CHOLESTEROL AND ITS MANAGEMENT
Knowledge of current cholesterol level
Knowledge of personal risk of heart attack or stroke
Knowledge of length of time patient is required to take statin
Fear of side effects from statin
Belief that statin lowers cholesterol level
Belief that statin reduces risk of heart attack or stroke
Belief that regular exercise lowers cholesterol levels
Belief that a healthy diet lowers cholesterol levels
Belief that exercise and diet alone can lower cholesterol levels

PATIENT AND HEALTH CARE PROVIDER RELATIONSHIPS
Frequency of visits to family doctor during 1 year for cholesterol
Frequency of visits to family doctor during 1 year for any reason
Satisfaction with family physician's care

HEALTH SYSTEM INFLUENCES
Affordability of medication
Drug insurance coverage

HEALTH STATUS
Overall health

HEALTH PROBLEMS
Angina
Diabetes
Heart disease
Hypertension
Depression or anxiety
Overweight
Smoking status

the Morisky scale and the 38 patient-reported factors (**Table 2**). Significant results of univariate analysis were adjusted for age and sex.

Multivariate logistic regression was then carried out using manual backward elimination to determine the most parsimonious model of factors associated with high adherence. The initial model included all factors found to be statistically significant at the level of $P=.10$ in the univariate analyses. Factors were then sequentially eliminated from the multivariate model until only factors significant at the level of $P=.05$ remained in the final model. All statistical analysis was done using SAS version 9.1.

RESULTS

Descriptive statistics
The response rate was 82.5%; 330 patients returned the survey. Eighteen patients had discontinued their statin medications, 17 were either taking a non-statin or did not specify what cholesterol-lowering medication they were taking, and 11 had incomplete responses on the Morisky scale. These patients were dropped from the study, leaving an effective sample of 284 patients.

Average age of patients was 65 years (standard deviation ±10 years), and 57% were men. Sixty-one percent of patients were retired; 41% had college or university education; and 41% had annual income above $50 000. Fifty-seven percent were taking atorvastatin, and 62% had been taking their statin medications for more than 2 years. Nearly all patients (97%) reported that their family physicians managed their cholesterol levels and prescribed their statin medications.

Measurement of adherence
On the Morisky scale, 63.4% of patients reported high adherence, 34.4% reported medium adherence, and 2.2% reported low adherence. There was a high correlation between patients' scores on the Morisky scale and patients' reports of the number of times they had not taken their statin medications in the last 30 days (Spearman correlation coefficient $r=.70$, $P<.0001$).

Univariate analysis
Few patients reported low adherence on the Morisky scale, so the dependent variable of patient adherence was dichotomized into 2 groups: high adherence versus medium and low adherence. **Table 3**[18] shows the significant results ($P<.05$) of the univariate analyses examining the unadjusted relationships between high scores on the Morisky scale and patient-reported factors.

Adjusting the significant factors for sex did not affect the strength of their relationship to adherence. When these factors were adjusted for age, only 3 factors remained significant predictors of high adherence:

Table 3. Univariate association between high adherence on the Morisky scale[18] and patient-reported factors: *Only significant results (P <.05) are presented.*

FACTOR	N (%)	ODDS RATIO	95% CONFIDENCE INTERVAL	P VALUE
Age (y)				.0004
• 40–54	48 (17.6)	1		
• 55–64	86 (31.5)	1.30	0.64–2.63	
• 65–74	79 (28.9)	3.26	1.53–6.95	
• ≥75	60 (22.0)	3.88	1.70–8.86	
Drug insurance coverage				.0477
• None	30 (10.6)	1		
• Nova Scotia Pharmacare	92 (32.5)	2.17	0.92–5.12	
• Other drug coverage (private, Veterans)	153 (54.1)	0.98	0.45–2.16	
No. of other prescribed medications				.0346
• 0–3	147 (52.7)	1		
• 4–6	76 (27.2)	2.13	1.72–3.89	
• ≥7	56 (20.1)	1.59	0.84–3.01	
Lifestyle				.0045
• Neither exercise nor a healthy diet	45 (16.1)	1		
• Either exercise or a healthy diet	85 (30.5)	3.05	1.44–6.45	
• Exercise and a healthy diet	149 (53.4)	2.97	1.50–5.90	
No. of cardiovascular risk factors				.0367
• 0	44 (15.8)	1		
• 1	119 (42.8)	1.84	0.92–3.69	
• 2	83 (29.9)	2.78	1.31–5.93	
• 3–4	32 (11.5)	3.07	1.16–8.11	
Secondary or primary prevention				.0298
• Primary	88 (31.5)	1		
• Secondary	191 (68.5)	1.77	1.06–2.97	
Belief that statin reduces risk of heart attack or stroke				.0058
• A little or not at all	85 (31.4)			
• A lot	123 (43.9)	12.57	1.44–4.59	
• Doesn't know	72 (25.7)	1.61	0.85–3.04	
Frequency of visits to family doctor for any reason				.032
• Twice a year or less	66 (23.4)	1		
• More than twice a year	216 (76.6)	1.84	1.05–3.23	

Table 4. Final multivariate model of association between high adherence on the Morisky scale[18] and patient-reported factors

FACTOR	ODDS RATIO	95% CONFIDENCE INTERVAL	P VALUE
Age (y)			.0007
• 40–54	1		
• 55–64	1.07	0.50–2.29	
• 65–74	3.35	1.50–7.48	
• ≥75	3.13	1.31–7.47	
Number of other prescribed medications			.0113
• 0–3	1		
• 4–6	2.69	1.37–5.29	
• ≥7	1.82	0.88–3.76	
Lifestyle			.008
• Neither exercise nor a healthy diet	1		
• Either exercise or a healthy diet	3.18	1.41–7.16	
• Exercise and a healthy diet	3.14	1.46–6.78	

taking 4 to 6 other prescribed medications, having a lifestyle of regular exercise or a healthy diet or both, and a strong belief in the efficacy of statins for reducing the risk of heart attack or stroke.

Multivariate analysis

The initial multivariate model included the following factors found to be statistically significant at the level of $P = .10$ in the univariate analyses: age, drug insurance coverage, number of other prescribed medications, healthy lifestyle, number of cardiovascular risk factors, current depression or anxiety, secondary versus primary prevention, belief that statins reduce risk of heart attack or stroke, and frequency of visits to family doctors. In the final most parsimonious model, being older than 65, taking 4 to 6 other prescribed medications, and having a lifestyle of regular exercise or a healthy diet or both remained independent significant predictors of high adherence as measured by the Morisky scale (**Table 4**[18]).

DISCUSSION

In this study of patients prescribed statin medications by their family physicians, 63% reported a high level of adherence. Other studies of statin adherence are based on large database analyses of patient prescription refill claims. Rates of adherence to statins in these studies vary depending on the definition of adherence used. Four large database studies using a definition of adherence of at least 80% of days covered by a statin prescription found that 40% to 60% of patients were adherent during the first 1 to 2 years of new prescriptions.[8-10,30]

There could be several reasons for the relatively high level of adherence reported by patients in our study. First, 2 previous American studies had reported that lower out-of-pocket expense increased patient adherence to statin therapy.[11,14] Almost 90% of our patients had drug insurance coverage, so cost of medication was not a barrier. Second, studies suggest that patients' adherence to statins declines substantially in the first 1 to 2 years of treatment but then stabilizes over time.[8,10,12,30] In our study, more than 60% of patients had been taking their statins for more than 2 years.

Several factors were found to be strongly associated with high adherence to statins in our study. Patients older than 65 years were more than 3 times as likely to report high adherence as those between the ages of 40 and 54. In some database studies, older age was also found to be associated with better adherence. Results from other studies, however, indicate either no association with older age or that adherence actually decreased with increasing age.[7-11,13]

Patients who were taking 4 to 6 other medications were more than twice as likely to report high adherence as those taking fewer than 4 or more than 6 other

medications. Two previous database studies of prescription claims found that patients who claimed a greater number of concurrent medications were more adherent to their statins.[9,31] Two other database studies found the opposite effect.[7,13] Given the results of our study and these other studies, it appears that there might be a minimum number of concurrent medications that optimizes patient adherence; in our study, this was 4 medications. Adherence is maintained only up to a threshold number of concurrent medications; in our study, 6. Then adherence begins to decline with the increasing complexity of the medication regimen.

Patients in our study who reported that they maintained a lifestyle of regular exercise or a healthy diet or both were more than 3 times as likely to report high adherence. Thus, if patients are encouraged to maintain a healthy lifestyle they might be more adherent to their statin medications. Clinical practice guidelines for treatment of dyslipidemia established by the Canadian Cardiovascular Society also promote regular exercise and healthy eating as the cornerstones of heart disease prevention.[32]

It has been recognized that patients' beliefs about prescribed medications can be a predictor of adherence.[16,26] In our study, univariate analysis indicated that patients who strongly believed that taking statins reduced their risk of having heart attacks or strokes were more than twice as likely to report high adherence. Similarly, in a French study that surveyed 193 hyperlipidemic patients coming to a specialty endocrine clinic, patients reported better adherence to statin medications if they believed these medications lowered their risk of future cardiovascular events.[33]

Limitations

We acknowledge several limitations to our study. First, participants were all drawn from 2 academic family practices that might not be representative of all family practice settings. Second, patients could be overestimating their adherence in their self-reports in order to give socially acceptable responses. No method of measuring adherence is considered a criterion standard, however, and all methods have limitations.[34] Indirect methods, such as database analysis, only estimate actual patient behaviour, and more direct testing, for example of serum drug levels, is complicated and expensive. In our study, we used a well-validated scale and set a high threshold for classifying patients as adherent. In order to diminish reporting bias, patients were asked to return the survey anonymously and were guaranteed that no feedback would be given to their health care providers. A third limitation of our study was that we explored a large number of factors and our sample size might not have been large enough to detect significant associations between adherence and some of the factors.

Conclusion

More than 63% of patients prescribed statins by their family physicians reported high adherence to these medications. Strategies to improve adherence would best be directed at patients who are younger or taking fewer than 4 or more than 6 other prescribed medications. Patients should be encouraged to maintain a lifestyle of regular exercise and a healthy diet as this was associated with better adherence. Future research should be directed at formulating strategies to enhance patients' adherence to statin medications; such strategies might best be implemented in family practice settings. 🍁

Contributors

Dr Natarajan *contributed to initial development of the research question and study design, created the survey and oversaw its administration, contributed to analysis of the data, and wrote the paper.* **Dr Putnam** *contributed to development of the research question, the study design, and the survey, and edited the paper for intellectual content.* **Ms Yip** *conducted the data analysis and contributed to writing the paper.* **Ms Frail** *contributed to the research question, the study design, and the survey, and edited the paper for intellectual content.*

Competing interests

None declared

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