Physician adherence to the dyslipidemia guidelines is as challenging an issue as patient adherence

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Background. A wide therapeutic gap exists between evidence-based guidelines and their practice in the primary care, which is primarily attributed to physician and patient adherence.

Objective. This study aims to differentiate physician and patient adherence to dyslipidemia secondary prevention guidelines and various factors affecting it.

Methods. A post hoc analysis of data collected by a prospective cluster randomized trial with 7041 patients diagnosed with clinical atherosclerosis requiring secondary prevention of dyslipidemia and 127 primary care physicians over an 18-month period. Adherence was measured by physicians’ and patients’ actions taken according to the guidelines and correlated using multivariate logistic regressions.

Results. Physician adherence was 36.9% for lipid profile screening, 27.6% for pharmacotherapy up-titration and 21.0% for pharmacotherapy initiation. Physician adherence was positively correlated with frequent patient visits [odds ratios (OR = 1.304)], having more dyslipidemic patients (OR = 1.304) and treating immigrants (OR = 1.268). Patient adherence was 83.8%, 71.9% and 62.6% for medication up-titration, lipid profile screening and pharmacotherapy initiation, respectively. Patient adherence was affected by attending clinics with many dyslipidemic patients (OR = 1.542), being older (OR = 1.271) and being treated by a male physician (OR = 0.870).

Conclusions. We learn from this study that (i) physician non-adherence was a major cause for the failure to follow guidelines, (ii) pharmacotherapy initiation was the most challenging issue to tackle and (iii) greater adherence occurred mainly in high volume conditions (patients and visits). Practical implications are designated focus on metabolic condition prevention in primary care by cardiologists or primary care clinics specializing in metabolic conditions and the need to facilitate more frequent follow-up visits.

Keywords. Adherence, cholesterol, compliance, coronary heart disease, evidence-based medicine, guideline, primary care.

Introduction

The prevention of coronary artery disease (CAD) is a major public health challenge, as CAD is the leading cause of morbidity and mortality.1 Although evidence-based guidelines2–4 and effective treatments exist,5 there is a wide therapeutic gap between guidelines and practice, and low-density lipoprotein cholesterol (LDL-C) targets are not achieved in many high-risk patients.6,7 This treatment gap is largely attributed to physician and patient adherence, in addition to health care organizations’ attitudes.8,9 As most dyslipidemia management is done in the primary care, successful prevention interventions primarily depend on the primary physician’s and the patient’s behaviour.
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Factors affecting it. We hypothesized that adherence is a multi-dimensional process that may be influenced by demographic, clinical and work environment factors.

Methods

Setting and design
We performed a post hoc analysis of data collected by a prospective study, the ‘Computerized Community Cardiovascular Control’ (4C) intervention, aimed to enhance secondary prevention of cardiovascular diseases. A computerized decision-support system periodically identified patients eligible for secondary prevention of dyslipidemia, based on the patient’s lipid profile, medications and clinical background. The system provided primary care physicians with a periodic patient-specific ‘clinical status’ with treatment suggestions, aiming to assist physicians in identifying and treating patients who have not met their target lipoprotein goals. Each patient’s clinical status was re-evaluated every 4 months and provided one of the following suggestions: (i) LDL-C screening and monitoring for patients not screened for LDL-C levels within the last 6 months; (ii) pharmacotherapy initiation with statins for patients with LDL-C >115 mg/dl or bezafibrate for triglycerides (TG) >200 mg/dl; (iii) statin dose up-titration or switch to a higher potency statin for patients with LDL-C >115 mg/dl or TG >200 mg/dl who are already being treated; (iv) metabolic specialist consultation for patients with high LDL-C and TG levels, low high-density lipoprotein cholesterol or resistant dyslipidemia or at high risk for adverse effects. The clinical rationale for these clinical statuses was a synthesis of the American College of Cardiology and the American Heart Association, National Cholesterol Education Program (NCEP-III) and the European guidelines for dyslipidemia management, modified to the Health Maintenance Organization (HMO) regulations. The clinical statuses were based on timely data that appeared in the patient Electronic Medical Record (EMR), and if such data were unavailable, the physician was asked to provide it (e.g. perform a lipid profile).

Subjects and sampling method
The sample included 20- to 74-year-old patients with diagnoses of clinical atherosclerosis (CAD, peripheral vascular disease and cerebrovascular accident; International Classification of Diseases codes: 410-414, 428, v36.0, v45.81 and v45.82). The patients were members of the Clalit Health Services HMO, the largest HMO in Israel serving >3.7 million people. The sample included all urban clinics in the studied geographical region, representing >85% of the patients. Of 34 397 clinical statuses identified by the system between 1 January 2004 and 15 May 2005, 15 222 statuses (44.3%) showed that patients were properly screened for lipid profile and were adequately treated, hence requiring no further action. Eventually, the dataset included 19 175 clinical statuses requiring prevention measures, 127 physicians in 36 clinics regarding 7041 patients (2.2 clinical statuses per patient on average). The protocol was approved by the local institutional ethics review board.

Outcome measures
Outcome measures were physician adherence, patient adherence and composite physician and patient adherence to the guidelines. Each clinical status was categorized as ‘implemented by the physician’ if the physician acted concordantly according to the clinical status detected (referred the patient to lipid profile screening or prescribed the appropriate lipid-lowering medication, within 4 months of detecting the status). This lag-time (4 months) was determined according to the prevailing regular appointments custom of the studied population and hence represents the usual ‘window of opportunity’ to practice diagnostic and therapeutic actions. Each of these clinical statuses adhered to by the physician was categorized as ‘implemented by the patient’ if the patient performed the lipid profile screening or purchased the medication within 4 weeks after referral to screening or receiving the prescription, respectively. Composite physician and patient adherence was calculated as the multiplication of the net physician adherence and net patient adherence for the entire cohort (e.g. if the physicians adhered in 60% of the cases and the patients adhered in 50% of these 60% and then the composite adherence would be 30%). Prescriptions, referrals to lipid profile and metabolic consultations were extracted from the patients’ EMR and the Soroka University Medical Centre databases.

Adherence predictors
We evaluated various patient, physician and clinic factors potentially affecting adherence. Patient characteristics were (i) age, (ii) gender, (iii) being a new immigrant (patients who immigrated to Israel after 1989, mostly from the former Soviet Union), (iv) co-morbidity by Charlson co-morbidity index, (v) total number of cardiovascular risk factors, (vi) number of visits to the corresponding physician during the study period (18 months) and (vii) recent ‘cardiovascular admission’ within the year prior to the evaluated clinical status. Physician characteristics were (i) professional seniority in years, (ii) gender and (iii) being a new immigrant (same definition as for patients). The clinic characteristics were (i) percentage of dyslipidemic patients requiring secondary prevention in the clinic, (ii) socio-economic level, which was measured by the percentage of low-income patients (a lower per cent indicates a higher socio-economic
level) and (iii) clinic size (the number of patients ≥21 years old registered to the clinic).

**Statistical analysis**

We aimed to explore the effect of the various predictors on adherence. Due to the binary outcome and the hierarchical nature of the data (clinical statuses clustered in patients, patients clustered in physicians and physicians clustered in clinics), we specified logistic regression models, within the framework of Generalized Estimating Equations. The models included the binomial adherence score as the dependent variable; the various predictors as fixed effects and the clinic, physician and patient identifiers as random effects for clustering. We ran one model for physician adherence and one model for patient adherence with the same set of predictors. We used backward elimination for model selection. The elimination method was Wald, based on the robust estimator of the parameter estimate covariance matrix. The threshold for elimination was 0.05. Each clinical status was analysed as a case. There was a one-to-one assignment of clinical statuses to patients, patients to physicians and physicians to clinics. The regressions were run using SPSS statistical package version 17.

**Results**

The descriptive statistics of the independent factors are shown in Table 1. Screening of lipid profile was the most frequent clinical status. Most patients were male and were >60 years old. A third of the patients were rehospitalized for cardiac indications. Most physicians were females and were recent immigrants.

**Adherence rates**

Physician adherence was greatest when screening of lipid profile was appropriate according to the guidelines, lower when pharmacotherapy up-titration was appropriate [odds ratios (OR) = 0.411, 95% confidence interval (CI) 0.371–0.454, relative to lipid profile screening] and lowest when pharmacotherapy initiation was appropriate (OR = 0.539, 95% CI 0.496–0.585) (Figures 1 and 2). Patient adherence was greatest for pharmacotherapy up-titration (OR = 1.929, 95% CI 1.637–2.272, relative to lipid profile screening) and lowest for pharmacotherapy initiation (OR = 0.675, 95% CI 0.562–0.810, relative to lipid profile screening) (Figures 1 and 3). In total, the composite physician and patient adherence (the multiplication of physician adherence by patient adherence) was greatest for screening of lipid profile (26.5%), somewhat lower for pharmacotherapy up-titration (23.1%) and lowest for pharmacotherapy initiation (13.2%).

**Factors affecting adherence**

Greater physician adherence was associated with frequent patient visits (OR = 1.304, 95% CI 1.258–1.352) and higher volume of dyslipidemic patients (OR = 1.304, 95% CI 1.128–1.507) (Figure 2). Other factors associated with greater physician adherence were being a female physician, treating patients with many risk factors, or immigrants, as well as working in large clinics or in clinics with patients of higher socio-economic class. Treating patients who were recently hospitalized for cardiovascular reasons was associated with lower adherence.

Greater patient adherence was associated with attending clinics with high dyslipidemic patients proportion (OR = 1.542, 95% CI 1.178–2.018), older patient age (OR = 1.271, 95% CI 1.174–1.377) and being treated by a male physician (OR = 0.870, 95% CI 0.766–0.988). Greater patient adherence was also associated with having lower co-morbidity, attending larger clinics and being treated by more experienced physicians (Figure 3).

**Discussion**

Ideally, physicians are expected to follow clinical guidelines, and patients should follow their physicians’ recommendations. Overall, the composite physician and patient adherence rates were very low (13.2–26.5%), representing a vast treatment gap, especially for pharmacotherapy. Such a gap is well known in the literature.

**Physician adherence**

Physician adherence was greatest when screening of lipid profile was appropriate according to the
guidelines, lower when pharmacotherapy up-titration was required and lowest when pharmacotherapy initiation was required. It should be noted, however, that our analysis pertains only to situations in which patients did not meet the target LDL-C level (55.7% of the total cohort) and hence represents the relatively complex patients. Our analysis might therefore underestimate actual treatment in practice. The low adherence rates may result from several reasons. The everyday dynamic of a usual ‘acute’ patient visit puts prevention efforts in a lower priority and focuses on current complaints. Guideline non-adherence can be rational due to several reasons, such as lack of patient compliance, short life expectancy, drug contraindication, near-goal lipid levels or other priorities or physician disagreement with the guideline recommendations, some of which can be controversial. Failure to integrate patient preferences in guidelines may also lead to non-compliance. Failure to integrate patient preferences in guidelines may also lead to non-compliance. Moreover, guidelines for dyslipidemia management (e.g. the American NCEP guidelines, the European prevention guidelines, the British NICE guidelines for dyslipidemia management) often differ in their recommendations. The inability of guidelines to cover all individual patients is also recognized as a provider-perceived barrier for guideline adherence.

Greater physician adherence was interestingly associated with frequent patient visits and a higher volume of dyslipidemic patients. Assumedly, more frequent visits provide a greater ‘window of opportunity’ to practice preventive measures. The physician may also have better follow-up over the patient’s care. It was previously shown that sustained continuity of care improves quality of care for patients with chronic conditions and that frequent follow-up by physicians was associated with improved adherence to lipid-lowering therapy. Moreover, physicians seeing many cardiac patients are commonly more aware of current evidence-based guidelines and the need to provide preventive measures and perhaps are more experienced in treating these conditions. Treating a large volume of patients that have acute myocardial infarction was associated with improved adherence to guidelines. This can be also a result of a ‘spillover’ effect (i.e. transfer of actions given to some patients to another patients).

Patient adherence
Patient adherence was highest for pharmacotherapy up-titration, lower for screening of lipid profile and lowest for pharmacotherapy initiation. Patient compliance with therapy has been identified as a pivotal element in achievement of treatment success and there is strong evidence that long-term adherence to taking statins is suboptimal, reaching ~40% after 3 years. Greater patient adherence was mainly associated with attending clinics with high dyslipidemic patient volume, older patient age and being treated by a male physician. Older patient age was previously noted as a dominant adherence predictor and can presumably be explained by increased patient awareness of
their clinical condition and the importance of following their doctor’s orders as well as more free time. However, the more co-morbidities the patient had (as expressed by the Charlson index), the lower their adherence.

While some of our results seem quite clear and to have a logical explanation, other findings are less obvious and require further exploration. For example, the non-obvious finding is that although female physicians were more compliant with the guidelines, patients were more compliant with male physicians. It was previously shown that female physicians do more preventive services, spend more time with their patients and engage in more patient-centred communication. Furthermore, the greater patient adherence associated with attending clinics with large dyslipidemic patient volume may presumably be explained by possible informal interactions between patients attending the same clinic. Such dynamics should be further studied.

Physicians and patients negotiate adherence

Overall, the composite physician and patient adherence rates were very low (13.2–26.5%), representing a vast treatment gap, especially for pharmacotherapy. Such data are well known in the literature and support a recent study that showed poor patient adherence or lack of therapy intensification in 53–68% of patients above LDL target levels. Differentiating physician adherence (range 21–37%) versus patient adherence (range 62–84%) points out a major ‘bottleneck’ on the physician side. Yet, these adherence rates may reflect a possible negotiation between the physician and the patient that may have occurred during the visit. Communication with the patient plays an important role in the GPs’ approach to the treatment of cardiovascular risks. Hence, caution is warranted in ‘blaming’ the physicians for the apparent lack of adherence, as this low rate often represents a final negotiation between the physician and the patient. Hence, the low rate does not necessarily reflect poor quality of care. Interestingly, when such a negotiation is positively settled, the patients will up-titrate medication in >80% of the cases and will begin a new treatment in >60% of the cases. Thus, the first important step is to prescribe, whether patients are compliant or not. Some confluences between physician adherence and their patients’ adherence were previously noted. For example, it was previously shown that patients’ adherence to statin therapy was influenced by their primary care provider’s compliance with cholesterol management guidelines and that symmetry in patient and physician beliefs about the degree of personal control over health outcomes (locus of control) was associated with greater cardiovascular medication adherence.

We suggest a possible explanation for the findings of a greater adherence rate in dose titration than initiation, on both the physician’s and the patient’s side. Physicians who are already convinced of the utility of the treatment are more likely to intensify it. Patients
who already accept the need for treatment and have personal experience with it are possibly calmer and more willing to intensify the current treatment. Patients’ beliefs about prescribed medicines play a major role in adherence to treatment in chronic physical illness.32 These might induce a smoother negotiation that leads to greater adherence rates.

Practical implications
Surprisingly, greater physician and patient adherence was associated with more dyslipidemic patients. This was the most influential predictor in the regression models. Due to the importance of the metabolic syndrome for public health, an implication of this finding may be a special focus on treatment and prevention of metabolic conditions in the primary care. This can be implemented by ideas such as having cardiologists practicing in primary care settings or initiating primary care clinics specializing in the treatment and prevention of metabolic syndrome-related conditions. We assume that cardiologists practicing in primary care settings, or GPs with special focus in cardiology, are more aware and committed to the prevention of these conditions. That can be implemented in some form of a combination between a primary and a secondary clinic. This is in the spirit of the Pareto Law, focussing effort on the most prevalent or problematic components of a process. Another reason is that patients tend to comply more with cardiologists. In a recent study, having a statin prescribed by a cardiologist was a positive predictor of patient adherence.25 A clinic-based strategy with emphasis on targeting high-risk patients with lipid-lowering agents has been practiced elsewhere.33,34 Follow-up of patients in a specialized clinic enhances the achievement of LDL-cholesterol treatment goals as well as other risk factors, due to increased patient compliance and increased use of medications.33

Another implication according to our data is the need to facilitate more frequent follow-up visits. This can be achieved by proactive invitation of patients to periodic follow-ups and treatment in their primary care clinic and by patient education. Currently, patients visit their GPs upon their own initiative, and many of them fail to attend periodic follow-ups.

Strengths and limitations
This study provides empirical data on adherence rates to secondary prevention practice guidelines in primary care in a large patient sample. It revealed factors affecting adherence that were not studied before and simultaneously tested the effect of these factors. The distinction between physician and patient adherence in the same data is unique, as usually adherence refers to patient adherence or the composite physician and patient adherence. The findings can also help to target populations that may benefit from improved adherence. Several limitations should be noted. Firstly, together with this set of system-wide predictors, some other factors may affect adherence as well, such as
awareness, familiarity and agreement with the guidelines; self-efficacy, outcome expectancy and ability to overcome inertia,\textsuperscript{a} physician attitudes and beliefs; prescription costs and other physician, patient or organizational factors.\textsuperscript{b,9,10,25} Secondly, adherence measurement by electronic data might miss the physician-patient dynamics occurring during the visit and hence misestimate adherence. Also, we measured adherence in a rather unique manner, which is different from common measures, such as Medication Possession Ratio and Proportion of Days Covered. Thirdly, adherence was measured here by physician actions that took place during visits, yet it disregarded patients who did not show up for visits and hence no action was taken by the physician.

Conclusions

We described here a systematic evaluation of physician and patient adherence rates to dyslipidemia secondary prevention guidelines and various factors affecting adherence, based on a large-scale dataset from EMRs and hospital databases. We learn from this study that (i) differentiating physician and patient adherence demonstrates a major bottleneck on the physician side, (ii) the most challenging issue to tackle is pharmacotherapy initiation and (iii) that greater adherence was mainly achieved in high volume conditions (patients and visits). These findings may be relevant to current efforts to improve adherence and help target populations that may benefit from improved adherence. Future research should evaluate additional adherence predictors and the underlying reasons for physician and patient non-adherence.

Declaration

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Conflict of interest: none.

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