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Patient and Physician discordance in reporting symptoms of Angina among stable CAD patients: insights from the Angina Prevalence and Provider Evaluation of Angina Relief (APPEAR) Study

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Abstract

Background—A principal goal of treating patients with coronary artery disease (CAD) is to minimize angina and optimize quality of life. For this, physicians must accurately assess presence and frequency of patients' angina. The accuracy with which cardiologists estimate their patients' angina in contemporary, busy outpatient clinics across the United States (US) is unknown.

Methods—We enrolled patients with CAD across 25 US cardiology outpatient practices. Patients completed the Seattle Angina Questionnaire (SAQ) prior to their visit, which assessed their angina and quality of life over the prior 4 weeks. The SAQ angina frequency (AF) domain categorized patients' angina as none, daily/weekly or monthly. After the visit, cardiologists estimated the frequency of their patients' angina using the same categories. Kappa statistic helped to assess agreement between patient-reported and cardiologist-estimated angina.

Results—Among 1257 outpatients with CAD, 67% reported no angina, 25% reported monthly and 8% daily/weekly angina. When patients reported no angina, cardiologists accurately estimated this 93% of the time but when patients reported monthly or daily/weekly angina symptoms, cardiologists agreed 17% and 69% of the time, respectively. Among patients with daily/weekly angina, 26% were noted as having no angina by their physicians. Agreement between patients' and cardiologists' reports (assessed by the kappa statistic) was 0.48 (95% CI = 0.44, 0.53), indicating moderate agreement.

Conclusions—Among outpatients with stable CAD, there is substantial discordance between patient-reported and cardiologist-estimated burden of angina. Inclusion of patient-reported health

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status measures in routine clinical care may support better recognition of patients' symptoms by physicians.

Keywords

assessment of angina; stable coronary artery disease

In addition to modification of risk factors to prevent ischemic events and mortality, a primary goal of treating patients with stable coronary artery disease (CAD) is to minimize angina and optimize patients' quality of life.^{1, 2} In order to optimally manage patients' angina with interventional, pharmacological, or lifestyle treatments, physicians must first accurately elicit the presence and frequency of patients' angina. While this process may seem intuitive, prior studies have demonstrated that this can be challenging in busy outpatient clinics. A large study of general practice clinics in Australia showed that 37% of patients who reported having frequent daily angina symptoms were thought by their physicians to be optimally controlled, and this was associated with suboptimal antianginal therapy and impaired quality of life.³ If physicians do not accurately quantify and appreciate that a patient has angina, then it seems unlikely that they would intensify treatment to alleviate their patients' symptoms. Understanding the accuracy of physicians' assessments of patients' angina is a critical first step to improving angina recognition and treatment.

To address this gap in knowledge and define whether better strategies are needed to support physicians' recognition of patients' angina, we designed the Angina Prevalence and Provider Evaluation of Angina Relief (APPEAR) study. While finding high agreement between patients' and physicians' assessment of angina prevalence and frequency would be reassuring, finding a lower correlation between the two would support emerging efforts to include patient-reported outcomes measures (PROMs) in clinical care.⁴⁻⁶

METHODS

Study population and design

The APPEAR study is a cross-sectional observational study of patients with stable CAD who visited outpatient cardiology practices in the US. It was explicitly designed to assess the frequency of angina in patients with chronic CAD and compare patient-reported angina with physicians' assessments. Between April 2013 and July 2015, we identified 25 practices participating in the National Cardiovascular Data Registry (NCDR) Practice Innovation and Clinical Excellence (PINNACLE) registry. Saint Luke's Mid America Heart Institute (MAHI) served as the coordinating and analytic center. Each invited site was encouraged to enroll 50 consecutive adult patients with a history of CAD, irrespective of the reason for their appointment. Patients had to be 18 years or older; have a history of CAD [defined as having at least one of the following: prior myocardial infarction (MI), prior percutaneous intervention (PCI), prior coronary artery bypass grafting (CABG), or stable angina] and have had at least one prior office visit to the practice. Patients were excluded if they had dementia, were unable to speak/read English, or were currently incarcerated. Institutional review board (IRB) approval for the study was obtained from each participating site and the data

coordinating center. The study was registered at clinicaltrials.gov (NCT01705054). The APPEAR study was supported by an investigator-initiated grant from Gilead Sciences.

Study protocol and data collection

During enrollment at each site, consecutive patients meeting eligibility criteria were approached to participate in this cross-sectional study. After consent for participation was obtained, patients were given a questionnaire to describe their socio-demographic profile and their health status. Trained nurses abstracted clinical variables from patients' charts. Immediately following the clinic visit, the cardiologist completed a questionnaire detailing the patients' history, symptoms, medications, and treatment plans.

Patient-reported and cardiologist-assessment of angina

Although there is no gold standard diagnostic test to objectively measure a patient's angina burden, the Seattle Angina Questionnaire (SAQ) is a self-administered, disease-specific health status questionnaire with 19 items that has been shown to be a very reliable, and valid instrument^{7, 8} to assess patients' frequency of angina. We reasoned that by using the SAQ we could get an accurate assessment of patients' perceptions of their angina frequency. Although not all patients' perceived episodes of chest pain are truly angina, we felt that it would be very important for physicians to accurately understand the frequency with which their patients were experiencing chest pain so as to optimize their treatment or perform further diagnostic evaluations. The SAQ measures five clinically relevant dimensions of health in patients with coronary artery disease, including angina frequency, angina stability, physical limitations due to angina, treatment satisfaction, and patients' perceived quality of life, as impacted by their angina. Each domain ranges from 0 to 100, with higher scores indicating better health status over the past 4 weeks. For this study, we considered patients' SAQ angina frequency (SAQ AF) scores as the patients' reports of their angina. The SAQ AF scale has previously been shown to correlate strongly with daily diaries of angina⁹ and to be prognostic of mortality, admissions for acute coronary syndromes and healthcare costs.^{10, 11} To simplify interpretability, the SAQ AF scores were classified as daily/weekly angina (SAQ score ≤ 60), monthly angina (SAQ score=61–99), or no angina (SAQ score=100).

Immediately after the clinic visit, the cardiologist completed a case report form documenting whether or not the patient had experienced any chest pain or angina within the last 4 weeks while being blinded to patients' SAQ scores. For patients who were believed to have experienced chest pain, the following data were documented by the cardiologist: type of chest pain (typical, atypical, or non-cardiac), the Canadian Cardiovascular Society (CCS) class of angina, location of pain (chest, neck, back, arm, stomach etc), frequency (daily, weekly, monthly, or less than monthly), any associated symptoms, and aggravating/relieving factors. For this study, we used the report of angina frequency by the cardiologists to represent the physician's estimation of the patient's angina.

Association of health status outcomes with angina status

As a secondary analysis, we examined whether cardiologist-estimated or patient-reported angina correlated better with the patients' health-related quality of life (HRQOL). Disease-

specific and generic quality of life was assessed using the Quality of Life subscale of the SAQ (SAQ QOL) and the Visual Analog Scale (VAS) from the EuroQol-5D (EQ-5D) respectively. We used this comparison to assess whether patient-reported or cardiologist-estimated patients' angina correlated more closely with patient-reported quality of life.

Statistical analysis

We compared baseline characteristics across categories of angina (none, monthly or daily/weekly) using Mantel-Haenszel trend tests for categorical variables and linear trend tests for continuous variables. The association of the patient-reported and cardiologist-estimated angina was assessed by cross-tabulation of response frequencies and by the kappa statistic (Kappa values range from -1 to +1, where 0 represents the degree of agreement that may be expected by random chance, -1 represents perfect disagreement, and +1 represents perfect agreement between the raters¹³). We collected only a few variables regarding the physician characteristics (gender, interventional versus non-interventional cardiologists, and years of practice [≥ 20 y or < 20 y]). We dichotomized the results of the comparison between patient-reported and cardiologist-estimated angina based on these physician characteristics.

As an additional secondary analysis, we assessed the associations of patient-reported and physician-estimated angina frequency with patients' HRQOL using Spearman correlation coefficients, and compared these using a test for dependent correlations with a common variable.^{14, 15} All statistical analyses were performed in SAS version 9.4 (SAS Institute Inc, Cary, NC). All statistical tests were 2-tailed and evaluated at a significance level of 0.05.

RESULTS

Study Population

1259 outpatients with stable CAD were enrolled from 25 US cardiology practices (Figure 1). Two patients who did not complete the SAQ AF were excluded. The average age of the remaining 1257 patients was 71 ± 11 years with a majority of patients being male (68%) and Caucasian (90%). Eighty percent of patients had a diagnosis of hypertension, and 35% had diabetes. Prior MI, prior PCI, and prior CABG were reported in 38%, 62%, and 37%, respectively. As compared with patients who reported having angina, those who reported no angina were more likely to be older, male, and Caucasian (Table 1).

Patients and cardiologists reports of angina

At the time of their clinic visit, 67% of patients reported having no angina over the prior 4 weeks, while 25% reported monthly angina, and 8% reported daily or weekly symptoms. The cardiologists, when assessing the same patients, estimated that 76% of patients had no angina, 7% had monthly angina, and 17% had daily/weekly angina symptoms. There were substantial differences between patient-reported and cardiologist-estimated angina frequency. When patients reported no, monthly, or daily/weekly angina, cardiologists agreed 93%, 17% and 69% of the time, respectively. When patients reported having monthly angina, cardiologists estimated that the 46% of these patients did not have any chest pain in the prior month. Among patients who reported daily or weekly angina, 26% were believed

by their physician to have had no angina (Figure 2). There was modest agreement between patient-reported and cardiologist-estimated angina frequency (κ 0.48, 95% CI 0.44 to 0.53).

Effect of physician characteristics on angina recognition

There were 155 physicians who participated in the study (range of 1–17 physicians per site; Figure 1). In terms of angina recognition, we found that there was no noticeable difference by gender, with male and female physicians agreeing with their patients' angina reports in 72% and 71% of the time respectively, p -value=0.699. There was a statistically significant difference regarding recognizing angina with non-interventional cardiologists agreeing with their patients' symptoms in 75% and interventional cardiologists agreeing only 67% of the time with p value=0.004. There was no difference between physicians with practice $\geq$ 20 years as compared to those whose practice was $<$ 20 years both agreeing with their patients' angina reports in 72% of the time with p -value=1.000.

HQROL by patients' vs. cardiologists' reports of angina frequency

There was a moderately strong association between patients' report of their angina frequency and their angina-related HRQOL as assessed by the SAQ QOL (r =0.60) whereas; the association with physicians' estimates of angina frequency, on the other hand, was weaker (r =0.42), p <0.001 (Figure 3). Associations with general quality of life (EQ-5D VAS) were also stronger for patients' assessments than physicians' (r =0.26 vs. -0.16), p <0.001. These findings suggest that patients' report of angina frequency is more closely aligned with their self-reported HRQOL than physicians'.

DISCUSSION

In this multicenter cross-sectional study of patients with stable CAD, we found a significant discordance between patients' reports of angina frequency and the cardiologists' estimation of patients' symptom frequency and a stronger association between patients' reported angina and their generic and disease-specific HRQOL. Even when patients reported frequent (daily or weekly) angina, a quarter of the time their physicians reported that they had no angina. This discordance between patient and provider assessment of angina highlights a significant impediment to doctor-patient communication that could potentially lead to untreated symptoms and worse quality of life than might be attained if doctors had a better insight into the frequency of patients' symptoms. While the etiology of this miscommunication, whether due to poor patient reporting or the realities of a busy outpatient setting that limits physicians' time to talk with patients, cannot be determined, these findings support the use of a standardized patient-reported assessment of angina at the time of the clinic visit to facilitate better understanding by physicians of their patients' symptom burden.

Our findings extend the few prior studies that compare physicians' and patients' reports of angina severity. The CADENCE study³, conducted in Australia, assessed 2031 patients with stable angina who had attended general practitioners' primary care practices. While not directly comparing physicians' and patients' assessments of angina, this study demonstrated that almost 30% of patients reported daily/weekly angina and that physicians often considered these patients to have Canadian Cardiovascular Class I and II symptoms and to

be optimally managed. Our study, although conducted in cardiology clinics rather than primary care clinics, suggests that physicians' under-recognition of the frequency of patients' angina may explain these findings. Another study, conducted in Spain (AVANCE)¹⁶, compared the perception of disease severity resulting from angina between cardiologists and patients. This study of 2024 patients with stable angina assessed patients' perception of disease severity by having them complete the SAQ and SF-12 (12-Item Short-Form Health Survey) whereas the cardiologists reported their impression of disease severity through another questionnaire and linear scale. The study showed little concordance between physicians' and patients' perceptions of disease severity ($\kappa < 0.3$). Our study, the first in the US, thus joins a growing series of investigations highlighting the inaccuracy of physician assessments of angina severity and highlighting the need for novel strategies to support better communication of patients' angina symptoms.

PROMs represent information that is directly reported by the patients regarding their health.¹⁷ Despite the potential of PROMs to measure and report patients' physical function, mental health, social function, and wellbeing, they are rarely used in routine clinical practice.¹⁸ Even when the AMA/ACC/AHA Physicians' Consortium for Performance Improvement and the National Quality Forum endorsed the SAQ as a performance measure in the 1990s, it was not adopted in clinical practice.^{19, 20} Our study underscores the potential for PROMs to support more effective methods of communication between patients and physicians, although this will need to be prospectively demonstrated in future studies. The SAQ, which has been extensively used as an outcome in clinical trials,²¹ has been shown to correlate strongly with daily angina diaries⁹ and may be an efficient means for supporting communication between patients and their physicians regarding the frequency of patients' angina.²² While integrating the SAQ into routine clinical care has logistical challenges, given the growing use of electronic health records and smart devices, it is not unreasonable to conceive of a time when patients complete PROMs prior to clinic visits (or perhaps in the waiting room) and their results are rapidly scored and presented to physicians at the time of an office visit. This information could streamline care, as the physician might be able to spend less time on patients with SAQ scores of 100 (indicating no angina over the past 4 weeks) and focus more time on eliciting a history from patients with lower or worsening scores. Furthermore, the development of shorter PROMs, such as the SAQ-7, can make clinical use of these measures even more feasible.²³

Our work should be interpreted in the context of an observational, descriptive, cross-sectional study, which is subject to some potential limitations. First, the physicians were aware of the study purpose and might have spent more time on assessing patients' angina, so the discordance that we found may underestimate the true rate in routine clinical practice. Second, only 25 motivated centers participated in the study, so this may also limit the generalizability of our findings. Third, it is possible that physicians who viewed patients' chest pain as not being non-cardiac in origin may have paid less attention to quantifying the frequency of these symptoms, although the majority of under-recognition in this study was when the physician thought that the patient had no chest pain symptoms at all. Finally, this was a cross-sectional study, and the long-term implications of discordance of patient reports and physician estimations of angina could not be assessed.

In conclusion, this observational, cross-sectional study found significant discordance between patient-reported angina and the amount of chest pain estimated by the treating cardiologist in US outpatient clinics. Improving the communication between patients and physicians about the presence of angina may improve recognition of ischemic symptoms, which could impact patients' treatment and outcomes. These findings support recent proposals to include patient-reported outcomes measures in routine clinical care and for quality assessment as a means for supporting better recognition of patients' symptoms.

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The authors are solely responsible for the design and conduct of this study; all study analyses, the drafting and editing of the paper and its final contents.

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Figure 1. APPEAR (Angina Prevalence and Provider Evaluation of Angina Relief) study sites along with number of physicians at each site

This map of the United States shows all the enrollment sites of the APPEAR study along with the number of physicians who did assessments at each site.

Figure 2. Physicians' estimation of angina when patients reported no, monthly or daily/weekly angina symptoms

X-axis shows the frequency of angina (none, monthly or daily/weekly) as reported by the patients on the SAQ AF domain. Y-axis shows percentage of time physicians estimated that the patients had no, monthly or daily/weekly angina. SAQ AF, Seattle Angina Questionnaire Angina Frequency.

Association of Angina with SAQ QOL

Association of Angina with EQ5D VAS

Figure 3. Association of patients' and cardiologists' reported angina to their HRQOL

For both graphs, X-axis shows the frequency of angina as reported by the patients or physicians. For A) Y-axis shows the average scores for angina-specific quality of life as measured by the SAQ QOL scale and for B) Y-axis shows the average scores for overall quality of life as measured by the EQ-5D VAS. In both graphs the black and grey lines signifies the quality of life trend as a function of the patients and cardiologists reported angina frequency respectively. HRQOL, health related quality of life; SAQ QOL, Seattle Angina Questionnaire Quality of Life; EQ-5D VAS, European Quality of Life-5 Dimension Visual Analogue Scale.

Table 1
Baseline characteristics of patients in the study group and with respect to their angina frequency (no, monthly or daily/weekly angina)

Variables	All patients n=1257	No angina n=846	Monthly angina n=315	Daily/weekly angina n=96	p value
<i>Demographics</i>					
Age (yrs)	71.1 ± 11.1	72.2 ± 10.6	68.9 ± 11.8	69.1 ± 11.2	0.011
Male sex	68.4%	72.3%	60.6%	59.4%	< 0.001
Caucasian	89.7%	92.3%	83.8%	86.5%	< 0.001
<i>Socioeconomic status</i>					
Married	66.1%	67.2%	63.5%	65.3%	0.340
No medical insurance	0.6%	0.6%	0.6%	1.1%	0.659
Self-reported avoidance of medications due to cost	1.2%	1.3%	1.0%	1.0%	0.664
<i>Medical history</i>					
Atrial Fibrillation	23.1%	24.6%	20.3%	18.8%	0.068
Diabetes mellitus	35.4%	34.0%	38.1%	38.5%	0.164
Dyslipidemia	84.4%	85.3%	83.2%	80.2%	0.141
Hypertension	79.8%	79.6%	80.6%	78.1%	0.958
Peripheral arterial disease	8.3%	7.7%	9.8%	8.3%	0.412
Stroke/TIA	7.6%	8.6%	5.7%	5.2%	0.068
Chronic lung disease	10.1%	9.2%	11.7%	12.5%	0.146
Prior AMI	38.4%	38.5%	40.0%	32.3%	0.543
Prior CABG	37.4%	40.2%	29.2%	39.6%	0.043
Prior PCI	62.4%	62.4%	62.5%	61.5%	0.909
<i>Smoking status</i>					
Current	10.1%	8.2%	15.5%	9.5%	0.007
Former	60.6%	61.3%	58.2%	62.2%	
Never	29.3%	30.6%	26.2%	28.4%	
<i>In-clinic characteristics</i>					
Ejection Fraction	55.7 ± 13.2	55.4 ± 13.3	56.6 ± 12.7	55.2 ± 13.6	0.871
Total Cholesterol	157.2 ± 39.8	154.4 ± 37.0	159.7 ± 39.3	176.9 ± 60.1	< 0.001
LDL	83.6 ± 33.0	82.3 ± 30.7	83.4 ± 31.2	99.7 ± 53.6	< 0.001
HDL	46.3 ± 14.4	46.1 ± 13.9	47.3 ± 15.6	45.6 ± 14.7	0.807

Variables	All patients n=1257	No angina n=846	Monthly angina n=315	Daily/weekly angina n=96	p value
Triglycerides	140.0 ± 92.0	135.0 ± 80.5	148.0 ± 110.7	163.7 ± 121.6	0.014
<i>Anxiety/Depression</i> *					<0.001
I am not anxious or depressed	55.4%	64.0%	38.9%	34.4%	
I am slightly anxious or depressed	31.1%	27.9%	40.1%	30.2%	
I am moderately anxious or depressed	10.5%	6.9%	15.9%	24.0%	
I am severely anxious or depressed	2.1%	1.1%	3.5%	6.3%	
I am extremely anxious or depressed	0.9%	0.1%	1.6%	5.2%	

Data are reported as mean ± standard deviation or %.

* Assessed through EQ-5D (European Quality of Life-5 Dimension) Questionnaire. CABG, coronary artery bypass grafting; HDL, high density lipoproteins; LDL, low density lipoproteins; LV, left ventricular; AMI, myocardial infarction; PCI, percutaneous coronary intervention; TIA, transient ischemic attack