Acute Coronary Syndrome: What Do Patients Know?

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Abstract

Background. The effectiveness of therapy for an acute coronary syndrome (ACS) is dependent on patients' quick decision to seek treatment. We surveyed level of knowledge about heart disease and self-perceived risk for a future acute myocardial infarction (AMI) in patients with documented ischemic heart disease.

Methods. Patients (N= 3522) were mean age 67 years, 68% male and all had a history of AMI or invasive cardiac procedure for ischemic heart disease. Data were gathered using a 26-item instrument focusing on ACS symptoms and appropriate steps to seeking treatment. Patients were asked to identify their level of perceived risk for a future AMI.

Results. Forty-six percent of patients had low knowledge levels (i.e., <70% correct). The mean score was 71%. Higher knowledge scores were significantly related to female gender, younger age, higher education, participation in cardiac rehabilitation, and receiving care by a cardiologist rather than an internist or general practitioner. Clinical history (e.g., AMI or cardiac surgery) was not a significant predictor of knowledge. The majority (57%) identified themselves as being at higher risk for a future AMI compared to an age-matched individual without heart disease with one exception. Namely, patients who had coronary artery bypass surgery felt significantly less vulnerable for a future AMI than other individuals of the same age.

Conclusions. Even following diagnosis of ACS and numerous interactions with physicians and other healthcare professionals, knowledge about ACS symptoms and treatment on the part of patients with cardiac disease remains poor. Patients require continued reinforcement about the nature of cardiac symptoms, the benefits of early treatment, and their risk status.

Although knowledge about heart disease and its symptoms is not sufficient to reduce delay in seeking treatment, it is necessary for patients so that they can quickly identify symptoms of acute coronary syndrome (ACS) and take prompt action to seek care. A decision to seek care quickly is critical to minimizing morbidity and mortality in ACS.[1-4] In fact, the goal for instituting definitive treatment in an evolving acute myocardial infarction (AMI) is one hour from symptom onset,[5] with survival rates improved by up to 50% if reperfusion is achieved within one hour.[5] Delaying treatment even by 30 minutes reduces average life expectancy by 1 year,[6] underscoring the importance of patients knowing the nature of ACS symptoms, and seeking care quickly. The median time from symptom onset to admission to the hospital is 2.5 to 3.0 hours, and this delay has not changed significantly for the past decade, despite extensive community education programs.[7,8]

Barriers to seeking appropriate care quickly are both cognitive and emotional.[9-11] If patients do not know symptoms of ACS such as nausea, jaw pain and syncope, as well as the more commonly associated symptoms such as chest and left arm pain, they will not label their physical symptoms appropriately. If they do not perceive themselves as vulnerable or at risk for experiencing AMI, they will seek another explanation for their new symptoms. Thus, a lack of knowledge about cardiac symptoms and low perception of risk can contribute to the prolonged delay seen in many cases of ACS. It is important to determine what patients with coronary heart disease know about the symptoms of their disease and the appropriate course of action to take, as well as their level of perceived risk for a future cardiac event in order to provide appropriate information during the brief encounter available to most physicians and to design appropriate educational programs.

Therefore, we conducted a study to assess level of knowledge about heart disease and ACS symptoms in patients with documented ischemic heart disease who were at high risk for a future cardiac event. We also identified the characteristics of those patients who had inadequate knowledge about cardiac symptoms and treatment options, as well as those who identified themselves as having a low risk for a future ACS event.

Methods

Following review and approval of the study by the Institutional Review Boards at the participating institutions, we enrolled 3,522 patients with diagnosed ischemic heart disease into a randomized controlled trial. The study design has been described previously,[12] but briefly consisted of randomization to a single educational session delivered face-to-face by a nurse or to a care-as-usual control group. The hypothesis of the trial was that the experimental intervention would decrease pre-hospital delay time (from ACS symptom onset to hospital admission), and increase ambulance use and appropriate use of aspirin. The current analysis focuses on the knowledge of cardiac patients and their perceived risk for a future AMI measured prior to group assignment.

Sample

Patients were recruited from participating centers' cardiovascular in-patient units and coronary catheterization laboratories and from a variety of out-patient cardiac clinics, cardiac rehabilitation programs and community medical practices in the United States, Australia and New Zealand. When allowed by the appropriate Institutional Review Boards, eligible patients were sent a letter signed by their private physician inviting them to participate and giving them a toll-free number to call. Subjects were eligible if they had a confirmed diagnosis of ischemic heart disease and if they lived independently (i.e.,

not in an institutional setting). No attempt was made to categorize patients as being either acute or chronic since complete medical records were not always available at the time of enrollment. The diagnosis of ischemic heart disease was confirmed by medical record review, either of hospital medical records in the case of those patients currently or recently hospitalized, or records maintained in the offices of private physicians if patients were referred by a medical practice. Subjects were excluded if they had: 1) untreated malignancy or neurological disorder with impaired cognition, 2) an inability to read or understand English, and 3) a major and uncorrected hearing loss. The latter two criteria were assessed by the research assistant in the first face-to-face meeting.

All participants gave informed consent prior to randomization. Baseline data were collected by medical record review, patient interview, and written questionnaires. Instruments were administered in a place convenient to the patient (e.g., out-patient clinic, physician's office, or patient's home). Data collected from the medical record and interview included sociodemographic information, clinical history, and the specialty of the treating physician. Data regarding patients' knowledge about cardiovascular disease and ACS symptoms, as well as their perceived vulnerability for a future AMI, were collected using a structured questionnaire. Interviewers were registered nurses with graduate degrees and special expertise in cardiac care. Project directors at each study site audited 10% of all enrollments.

Instruments

Knowledge was measured by the Knowledge Scale of the ACS Response Index, a modification of the instrument developed for the Rapid Early Reaction for Coronary Treatment (REACT) study to measure knowledge, attitudes and beliefs about coronary

heart disease.[13] Content validity, discriminant validity, and internal consistency reliability were assessed and demonstrated for scales measuring knowledge, attitudes and beliefs using established methods.[14] The knowledge scale consists of 21items in which patients were asked to identify possible AMI symptoms from a list of 15 correct and 6 incorrect symptoms. Patients were also asked to respond to 5 additional items about heart disease that were framed as statements with true/false responses. Examples are "Hospitals have drugs that reduce the damage done when a heart attack occurs" and "Heart disease is the most common cause of death in women in the United States". The instrument was self-administered. Internal reliability of the Knowledge Scale was measured by Cronbach's alpha and was judged adequate at .76.

Perceived vulnerability to a future ACS event was measured by the following question: "Compared to other people your age, how likely do you think it is that you could have a heart attack in the next five years?" Participants were asked to respond to the statement using a 5 point Likert scale that ranged from 1 (much less likely) to 5 (much more likely).

Statistical Analysis

SPSS version 15.0 for Windows (Chicago, Illinois) was used for data analysis, and accuracy of data entry was checked by systematic audits, as well as by examining the data in order to identify outliers and missing data. The chi-square test was used to examine categorical data, and the independent t-test was used to test continuous data in relation to the high and low knowledge groups and the high and low perceived risk groups. There was no significant difference in knowledge or risk perception scores between patients recruited from the U.S. compared to patients from Australia or New

Zealand so the sample was combined for all analyses. Logistic regression analyses were performed to identify predictors of high knowledge (> 70% correct on the Knowledge Scale of the ACS Response Index, with 70% set as a common demarcation of failure on educational tests) and high perceived risk group membership (based on a response that the patient perceived the risk of a heart attack in the next 5 years as greater than or equal to that of an age-matched healthy control). Variables showing marginal association with $p < 0.25$ in univariate analyses were forwarded to the regression analysis. The Hosmer-Lemeshow statistic was used to evaluate goodness-of-fit of the model. Except where otherwise specified, the level of significance for statistical analyses was set at $p< .05$.

Results

On average, patients were 67±11 years of age, 68% were male, and all had documented ischemic heart disease. See Table 1. Despite having a history of coronary heart disease, 44% of patients had significant gaps in knowledge about ACS, as documented by scores of less than 70% on the Knowledge Scale of the ACS Response Index. The mean cardiac knowledge score for the entire sample on the ACS Response Index was 71% (SD 12%) with a range of 8 to 100%. Characteristics associated with higher knowledge scores were female gender, participation in a formal cardiac rehabilitation program, higher levels of education, younger age, and medical care by a cardiologist (compared to a family practitioner or internist) as summarized in Table 2. Clinical history such as previous AMI, cardiac surgery or percutaneous coronary intervention made no significant difference in knowledge level. Documented cardiac risk factors (i.e., being a current smoker or having hypercholesterolemia) were also not significant predictors of knowledge about ACS.

Gender is an important predictor of clinical outcome in ACS, with women having significantly higher mortality following AMI[14] and longer prehospital delay to treatment of an ACS.[16] Given that one of the most powerful predictors of knowledge in our sample was gender, with women significantly more likely to score ≥70% on the Knowledge Scale than men (O.R. 1.77, p<0.000), we further examined differences between men and women in cardiac knowledge. Overall knowledge scores were higher for women than men (73% vs. 70%). Women more accurately identified less typical symptoms of AMI than men (back pain, jaw pain, heartburn, nausea, and neck pain). Fewer men than women knew that heart disease was the most common cause of death in women. More men than women stated their preference for someone to drive them to the hospital if they experienced AMI symptoms rather than go by ambulance. (Table 3).

In this group of patients, who were all at significant risk for a future AMI, 43% inappropriately assessed their risk as less than or the same as other people their age. More men than women perceived themselves as being at low risk (47% vs, 36% respectively). Yet, men were significantly more confident that they would recognize signs/symptoms of an AMI in themselves or others compared to women, despite the fact that they knew less about symptoms of AMI than women. Patients were most likely to identify themselves at "low risk" for a future AMI in the next five years if they had coronary bypass surgery or were younger in age. Patients who were female, had higher scores on the Knowledge Scale, were current smokers, had a history of AMI or angioplasty, and had hypercholesterolemia were significantly less likely to describe themselves as being at low risk for a future AMI. Patients were not significantly different in their assessment of risk by virtue of their participation in cardiac rehabilitation, receiving care from a cardiologist

rather than an internist, or having a higher level of formal education (Table 4). We evaluated patients' attitude about calling the EMS when experiencing symptoms of an ACS; 69% said they would call EMS, while 31% would choose private transportation.

Discussion

Where do patients who are diagnosed with ACS obtain their health information? In decades past, such patients were frequently hospitalized and would receive education and counseling from physicians and nurses during their hospital stay. Unfortunately, structural changes in health care delivery have led to decreased lengths of hospital stay and increased use of outpatient facilities for cardiac diagnosis and treatment, which in turn have had a dramatic effect on the time available for the education of patients with ACS. In a recent study of the discharge education given to heart failure patients, only 54% received the instructions comprising the Joint Commission (TJC) process-of-care measure.[17] This percentage was achieved given the impetus of TJC standards and it is likely that the percentage for non-mandated discharge education is much lower. Thus, there is an increasing onus on physicians to insure that patients who are at high risk for a future AMI are knowledgeable about ACS symptom presentation and that these patients understand the importance of responding quickly to cardiac symptoms to optimize survival and treatment outcomes.

Our study is the first large-scale, international study conducted to assess the knowledge of patients with documented ACS about their disease and its symptoms. Given that individuals with coronary heart disease have a five to seven times greater risk of AMI or death than the general population,[18] we also assessed their sense of perceived risk for a future AMI with the assumption that a heightened sense of perceived risk may

contribute to quicker action to seek treatment at the onset of symptoms and reduced prehospital delay time. Physicians and other health professionals might appropriately believe that this group of high-risk patients will be knowledgeable about the actions to take in the face of new ACS symptoms and will act quickly to access the emergency medical system. However, numerous investigators have documented that patients who have experienced an AMI in the past have prehospital delay times that are not significantly different than patients with no history of AMI.[7,19] Given the relatively low level of knowledge in this high-risk population, it is perhaps not surprising that persons with a previous history of AMI are not more likely to recognize AMI symptoms and seek treatment early when compared to previously healthy individuals. [19]

Our findings about what patients with documented heart disease know about the symptoms of AMI and appropriate actions to take, as well as their perceived risk of vulnerability for a future AMI, provide important insights into this phenomenon that is counterintuitive for clinicians. Their knowledge about heart disease was relatively low and perceptions of personal risk lower than expected in this high-risk group with a history of heart disease. In an attempt to identify which patients in clinical practice may need extra attention by physicians in medical follow-up visits, we identified characteristics associated with higher and lower levels of knowledge about heart diseases. Gender, age and education were all significant predictors of knowledge, with male sex, older age, and less formal education associated with less knowledge.

The findings about gender were particularly surprising, because women have often underestimated their risk for heart disease in years past[20,21] and have had longer pre-hospital delay times than men,[22,23] suggesting a lack of knowledge about AMI symptoms

or a lack of appreciation for the importance of heart disease as a cause of death in women. In recent large community samples of healthy individuals, gender made no difference in knowledge about heart disease and its symptoms,[24,25] findings that are in direct contrast to the findings in the current study. In our study that included only people with known coronary artery disease, we found that women were more knowledgeable than men about ACS symptoms and more likely to see themselves at higher risk than age-matched healthy controls.

The findings related to gender differences suggest that physician counseling of female patients, coupled with a number of community-based, public education programs conducted over the past decade by the federal government and organizations such as the American Heart Association and the National Heart Foundation of Australia have had a positive effect. Some of the campaigns such as the American Heart Association's "Go Red" and the National Heart, Lung, and Blood Institute's "Heart Truth" campaign have focused specifically on women to alert them to their risk for heart disease, and our findings support recent evidence that such campaigns have had a positive effect.[21] We found that women were more likely than men to identify less well appreciated symptoms of AMI and were more likely to identify the appropriate actions to take in the face of new AMI symptoms. Compared to men, women were significantly more likely to know about the possibility of reperfusion therapy and the need to call the Emergency Medical System (EMS) rather than drive themselves to the hospital. Other investigators have found that the majority of information for women about ACS symptoms comes from the media,[25] suggesting that the recent media campaigns have been successful in raising women's level of knowledge and sense of perceived risk.

Two other clinical variables were associated with higher levels of knowledge; namely, being under the care of a cardiologist and having attended a cardiac rehabilitation program. Both underscore the importance of specialty care for patients with heart disease, findings that are well supported in previous studies of clinical outcomes. For example, patients with heart disease who are seen by cardiologists rather than generalists for their care are more likely to receive care recommended in clinical guidelines and more likely to have positive clinical outcomes.[26]

Although not yet documented, a perceived sense of vulnerability to a future AMI may be helpful in getting patients to pay attention to cardiac symptoms when they occur and to seek treatment promptly by calling EMS. Patients were more likely to feel at appropriately high risk if they were older, a current smoker, and had a history of AMI, angioplasty or hypercholesterolemia, all of them highly accurate perceptions given epidemiological data about cardiac risk factors. Higher levels of knowledge were also associated with higher levels of perceived risk, suggesting that instruction about ACS symptoms and steps to take in an emergency may influence patients' understanding of their vulnerability for a future heart attack. This inverse relationship of knowledge and perceived risk suggests that the lower levels of knowledge about ACS documented in men compared to women underscores the need for continuing reinforcement of the information in physician-patient encounters. A sense of perceived risk or vulnerability may decrease prehospital delay to treatment, although this association awaits further study.

In summary, knowledge about ACS symptoms and correct actions to take in seeking care is required for appropriate self care. Physicians can identify patients who are

less likely to have necessary knowledge and an appreciation of their high risk status and provide extra education and counseling. Our findings suggest that men, the elderly, those with low levels of education and those who have not attended a cardiac rehabilitation program are more likely to require special efforts during medical office visits to review symptoms of AMI and to learn the appropriate actions to take in the face of new symptoms of ACS.

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Table 1. Demographic and Clinical Characteristics of Patients at Risk for an Acute Coronary Syndrome (N=3522)

Characteristic	**Percentage (Number)**
Age in years	
<60	25% (884)
60-69	31% (1092)
70-79	32% (1127)
≥80	12% (417)
Male	68% (2393)
Country	
United States	56% (1985)
Australia/New Zealand	44% (1537)
Race/ethnicity	
Caucasian	91.0% (3207)
Asian Pacific-Islander	3.6% (126)
African American	1.8% (62)
Hispanic	1.2% (42)
American Indian	0.9% (33)
Other	1.5% (52)
Marital status	
Married or living with significant other	70% (2468)
Education	

Less than high school	15.8% (557)
High school	18.2% (641)
Some college, technical training, other	37.7% (1326)
College, graduate school or higher	28.3% (994)
Medical history	
History of angina	60.1% (2056)
History of myocardial infarction	55.2% (1894)
History of prior cardiac surgery	46.0% (1618)
History of prior coronary angioplasty	47.9% (1666)
History of current smoking	6.5% (227)
History of cardiac rehabilitation	52.5% (1763)

Table 2. Patient characteristics associated with high levels of knowledge about acute coronary syndrome (≥70% correct), N=3176

Characteristic	**Odds Ratio**	**Lower 95% C.I.**	**Higher 95% C.I.**	**P value**
Gender – female	1.77	1.50	2.08	0.000
Cardiac Rehabilitation	1.49	1.28	1.73	0.000
Education §				0.000
Education – High school graduate	1.38	1.08	1.77	0.010
Education – Some college/technical	1.21	.97	1.50	0.086
Education – college graduate	1.78	1.41	2.24	0.000
Age #				0.000
<60 years	2.62	2.01	3.41	0.000
60-69 years	2.31	1.79	2.98	0.000
70-79 years	1.68	1.31	2.16	0.000
Cardiologist	1.34	1.10	1.64	0.004
History of PTCA	1.11	.95	1.30	0.197
History of CABG	1.08	.92	1.26	0.375
History of MI	1.09	.94	1.27	0.238
Hypercholestrolemia	1.03	.88	1.20	0.704
Current smoker	1.05	.77	1.43	0.763

C.I. = Confidence Interval; CABG = coronary artery bypass grafting; MI = myocardial infarction; PTCA percutaneous transluminal coronary angioplasty;

§ All levels of education compared to “less than high school diploma”

All age categories compared to >80 years

Table 3. Differences in correct responses about an acute coronary syndrome by gender

Item	**Level of Agreement**	**Male (n=2393)**	**Female (n=1128)**	**Significance**
Women rarely have HA§	Disagree	89.1% (2133)	94.6% (1067)	0.001
Should wait with symptoms to be sure	Disagree	84.1% (2013)	77.8% (878)	0.001
If having HA, have another person drive you to the hospital rather than call EMS#	Disagree	67.3% (1610)	72.3% (815)	0.003
Hospitals have drugs to reduce HA damage	Agree	73.8% (1762)	78.9% (890)	0.001
CHD most common cause of death in women	Agree	49.8% (1192)	72.5% (818)	0.001

Legend: § HA=heart attack; # EMS=Emergency Medical System; ┼ =Coronary Heart Disease

Table 4. Demographic and clinical characteristics associated with perceived moderate to high risk for future acute myocardial infarction (N=3149)

Characteristic	**Odds Ratio**	**Lower 95% C.I.**	**Upper 95% C.I.**	**P value**
Gender – female	1.62	1.37	1.69	0.000
Cardiac knowledge - high	1. 45	1.69	1.908	0.000
History of MI	1.50	1.30	1.74	0.000
History of CABG	0.79	0.67	0.92	0.003
Age #				0.003
<60 years	0.99	0.756	1.29	0.933
60-69 years	0.75	0.97	1.731	0.025
70-79 years	0.73	0.57	0.946	0.017
Current smoker	1.47	1.06	2.03	0.020
Hypercholesterolemia	1.19	1.02	1.39	0.026
History of PTCA	1.17	1.00	1.37	0.047
Cardiac rehabilitation	0.90	0.76	1.04	0.135
Care by cardiologist	1.21	0.99	1.47	0.066
Education§				0.069
HS diploma	0.81	0.63	1.04	0.103
Some college	0.93	0.75	1.16	0.523
College graduate	1.09	0.86	1.37	0.482

CI = confidence interval; CABG = coronary artery bypass grafting; MI = myocardial infarction; PTCA = percutaneous transluminal coronary angioplasty;

§ All levels of education compared to “less than high school diploma”

All age categories compared to ≥80 years