Get With the Guidelines for Cardiovascular Secondary Prevention

Pilot Results

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Background: The use of Web-based technology and a collaborative model to improve hospital adherence to secondary prevention guidelines has not been previously evaluated.

Methods: Twenty-four hospitals in Massachusetts participated in a collaborative that met quarterly, with didactic and best-practice presentations and interactive multidisciplinary team workshops. A customized tool kit and interactive, Web-based management tool were used for data collection and on-line feedback. Data from 1738 patients admitted with coronary artery disease were collected by hospital staff from July 1, 2000, to June 30, 2001. Outcome measures included differences between baseline and 10- to 12-month follow-up measurements of use of aspirin, β-blockers, angiotensin-converting enzyme inhibitors, cholesterol measurement and treatment, smoking cessation counseling, blood pressure control, and cardiac rehabilitation referral.

Results: Clinically and statistically significant increases from baseline to 10- to 12-month follow-up were demonstrated in smoking cessation counseling (48% [95% confidence interval {CI}, 36.6%-58.4%] to 87% [95% CI, 73.1%-100.7%]), lipid treatment (54% [95% CI, 46.6%-70.2%] to 79% [95% CI, 70.2%-88.3%]), lipid measurement (59% [95% CI, 51.5%-66.0%] to 81% [95% CI, 72.0%-89.5%]), and cardiac rehabilitation referral (34% [95% CI, 25.9%-39.7%] to 73% [95% CI, 63.2%-82.9%]). An improving trend was seen in blood pressure control (60% [95% CI, 55.3%-65.6%] to 68% [95% CI, 60.2%-76.1%]). High baseline use was maintained for use of aspirin, β-blockers, and angiotensin-converting enzyme inhibitors.

Conclusion: Implementation of a collaborative quality improvement initiative, interactive training of hospital teams with physician champions, and the use of an interactive Web-based Patient Management Tool enhanced adherence to prevention guidelines in hospitalized patients with coronary artery disease.

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CORONARY ARTERY DISEASE (CAD) remains a leading cause of morbidity and mortality in the United States despite the understanding of underlying risk factors, extensive well-tolerated drug therapy options, and the availability of published practice guidelines for the secondary prevention of coronary heart disease. Evidence suggests that many patients with CAD receive inadequate treatment in light of clinical evidence and widely publicized treatment guidelines.[1,2] Failure to achieve clinical treatment goals has been attributed to poor physician adherence to treatment guidelines, patient noncompliance, and the presence of concomitant medical conditions modifying management.[3] Underlying this has been the absence of a system to ensure adherence as a part of the care process.[4] The management of hyperlipidemia in patients with CAD is one example of the gap that exists between knowledge of guidelines and implementation in clinical practice.[5]

Many patients do not receive optimal preventive therapy on hospital discharge after a cardiovascular event.[6] The recent American College of Cardiology Evaluation of Preventive Therapeutics trial reported that, on hospital discharge after a cardiovascular event, only 87% of patients were receiving aspirin; 63%, β-blockers; and 24%, lipid-lowering therapy.[7]

Previous hospital-based programs have demonstrated improvement in treatment rates for β-blockers and aspirin in patients with acute myocardial infarction when therapy is started during hospital-

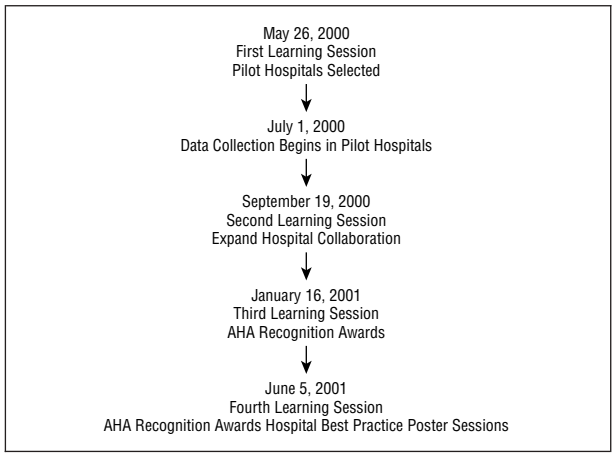

Figure 1. Project timeline. AHA indicates American Heart Association.

ization as part of a quality improvement effort.[8,9] The demonstration of the ability to implement system change to increase rates and improved outcomes formed the basis for the American Heart Association's (AHA's) Get With the Guidelines (GWTG) program, an acute-care hospital-based quality improvement program designed to close the treatment gap in cardiovascular disease. The AHA initiated the New England pilot in July 2000 to provide the model for a national program to significantly improve patient outcomes and move the AHA closer to its 2010 goal of reducing death, disability, and risk by 25%.

The program uses the AHA and American College of Cardiology Comprehensive Risk Reduction Guidelines for Patients With Coronary and Other Vascular Diseases (AHA/ACC) secondary prevention guidelines.[10] The GWTG program focuses on the use of treatment guidelines to ensure that patients are discharged on a regimen of appropriate medications and receive adequate counseling for risk factor modification. The interventions are based on the AHA/ACC guidelines, which recommend pharmacologic therapy including aspirin, angiotensin-converting enzyme (ACE) inhibitors, lipid-lowering therapy, and β-blocker use, and lifestyle modifications including smoking cessation counseling, weight loss, physical activity, and diabetes management.[11]

An integral part of the GTWG program is the use of the interactive AHA Web-based data collection tool, the Patient Management Tool (PMT). The PMT, developed by Outcomes Sciences, Inc, Cambridge, Mass, is a customizable, Web-based, interactive quality improvement reporting system used to prospectively collect data and measure program performance individually or against AHA's national benchmark over time. Drop-down reminder screens provide immediate reference to the appropriate guideline and alert clinicians to omission of needed measurements and intervention before the patient leaves the hospital. Health care professionals can also generate patient education sheets and produce a letter (which can be printed or sent via facsimile) to be sent to the patient's primary care physician, summarizing diagnosis, procedures, risk assessment, and interventions initiated during the hospitalization. The system also may be used to collect data for the Joint Commission on Accreditation of Healthcare Organizations ORYX core measure sets for acute myocardial infarction and congestive heart failure.

This quality improvement initiative evaluated initial baseline and follow-up data in 24 pilot hospitals enrolled in the GWTG program and using the Web-based tool.

METHODS

Key regional organizations developed consensus to pursue a single cardiovascular quality improvement project broad enough to satisfy the interests and needs of the stakeholders. Hospital teams attended quarterly meetings that included reviews of the guidelines science, best-practice examples, and workshops for teams from multiple institutions to work together to solve common problems in implementation. Each workshop was led by an experienced facilitator-leader. Barriers and solution were discussed and each hospital team developed a plan for implementation and refinement of protocols at their institution. The shared experience of hospital teams provided synergies and mutual shared commitment that they identified as keys to their success. A point-of-service, interactive, Internet-based PMT was developed for the program that allows hospitals to collect data and receive real-time feedback and analysis of their performance with 95% confidence intervals (CIs) available on-line, at any time. Hospitals could also track their performance compared with AHA benchmarks and the aggregate performance of all hospitals in the pilot.[12]

The AHA GWTG New England Pilot was launched with an initial conference for hospital teams on May 26, 2000. The PMT was introduced, and hospitals began their review of existing protocols and preprinted orders. Confidentiality agreements for hospital data were then completed and formal data collection began on July 1, 2000. The pilot continued until June 30, 2001. Data were collected from July 1, 2000, to June 30, 2001 (**Figure 1**). All 24 participating hospitals implemented data collection in patients with acute myocardial infarction, and several hospitals also captured data from patients with unstable angina, coronary revascularization, or congestive heart failure. Hospitals were required to submit data from consecutive patients in each quarter. Data were collected during hospitalization by means of the interactive Web-based PMT. Specific methods for data entry varied by hospital setting. Some hospitals used a paper version of the data fields attached to the front of the chart, doing electronic entry later in the admission or before discharge. Several hospitals entered data directly via the Internet at the point of service. Data entry was performed by nursing staff, medical house staff, case managers, and nurse practitioners. Measurements included smoking cessation counseling; the use of aspirin, β-blockers, and ACE inhibitors; low-density lipoprotein (LDL) measurement; lipid-lowering therapy; adequate blood pressure control; and referral to cardiac rehabilitation or exercise counseling. The Medicare definitions for eligible patients receiving smoking cessation counseling, discharge aspirin, β-blockers, and ACE inhibitors were used.[13] These include counseling for patients who have smoked in the past 12 months, aspirin and β-blockers for patients without contraindications, and ACE inhibitors for patients with left ventricular ejection fraction less than 40% and no contraindications. The LDL measurement was defined as the percentage of all patients who had a lipid profile obtained in the hospital; lipid-lowering therapy was any lipid-altering drug prescribed at discharge for patients with LDL cholesterol level greater than 100 mg/dL (2.6 mmol/L) who had no contraindications. Blood pressure control was defined as blood pressure less than 140/90 mm Hg within 48 hours before discharge for all patients. Percentage of patients with documented referral

Table 1. Aggregate and Patient Subgroup Data

	% of Patients						
	Total (N = 1738)	MI (n = 1400)	Non-MI (n = 338)	Male (n = 940)	Female (n = 798)	Age <65 y (n = 557)	Age ≥65 y (n = 1181)
Smoking cessation							
Baseline	48	53	30	47	48	48	47
4-6 mo	51	54	43	50	54	63	34
10-12 mo	87*	75*	100*	88*	80	93*	75*
Aspirin							
Baseline	88	92	81	90	87	89	89
4-6 mo	89	91	83	89	89	89	89
10-12 mo	86	86*	86	92	76*	89	87
β-Blocker							
Baseline	85	93	64	87	83	88	84
4-6 mo	85	91	71	87	85	90	84
10-12 mo	84	89	76*	84	85	84	86
ACE inhibitor							
Baseline	82	87	70	79	85	82	82
4-6 mo	85	88	78	86	82	83	86
10-12 mo	86	83	100*	86	87	100*	84
Lipid treatment							
Baseline	54	67	46	58	51	63	48
4-6 mo	57	64	51	64	49	67	52
10-12 mo	79*	71	84*	82*	70*	89*	71*
LDL measurement							
Baseline	59	60	58	57	61	68	53
4-6 mo	56	72	41	57	61	65	51
10-12 mo	81*	82*	80*	84*	70	86*	76*
BP control							
Baseline	60	54	74	63	58	68	57
4-6 mo	68	63	79	74	61	76	64
10-12 mo	68*	62*	78	72*	61	78*	64*
Cardiac rehabilitation							
Baseline	34	52	21	36	30	41	27
4-6 mo	44	40	48	48	39	50	41
10-12 mo	73*	64	78*	79*	55*	86*	62*

Abbreviations: ACE, angiotensin-converting enzyme; BP, blood pressure; LDL, low-density lipoprotein; MI, myocardial infarction.
*Significance based on nonoverlapping 95% confidence intervals compared with the baseline period.

to cardiac rehabilitation or exercise counseling, in all patients without contraindications, was the definition used for the cardiac rehabilitation-exercise indicator. All data were collected at the time of hospitalization only and therefore did not include outpatient attainment of goals such as smoking cessation, LDL level less than 100 mg/dL, blood pressure of 130/85 mm Hg or less, or completion of cardiac rehabilitation.

Measures were analyzed by quarter starting at the onset of data collection in July 2000, the beginning of the baseline quarter, and then in the 4- to 6-month and 10- to 12-month intervals after onset. Data were evaluated with regard to sex (male vs female), age (<65 years vs ≥65 years), and diagnosis (myocardial infarction vs no myocardial infarction).

Data were stored in an Oracle 8i database (Oracle Corp, Redwood Shores, Calif) and transferred to an Excel 7.0 spreadsheet (Microsoft Corp, Redmond, Wash). Analyses were conducted with the SAS software package (SAS Institute Inc, Cary, NC).

Subgroups data were compared by means of *t* test. A 2-tailed *P* value of .05 was chosen as the significance level. Where frequencies are compared, nonoverlapping 95% CIs were considered to be at the significance level.

RESULTS

A total of 24 hospitals participated in the pilot. Sixteen hospitals were classified as nonteaching, while 8 were teaching. There were 6 hospitals with more than 250 beds and 18 with 250 beds or fewer. Fourteen hospitals were considered urban by location.

Data were collected on 1738 patients. There were 940 male and 798 female patients. Of the total, 1181 were 65 years or older, and 557 were younger than 65 years. Acute myocardial infarction was present in 1400 patients, while 338 had unstable angina, congestive heart failure with CAD, or coronary revascularization. Data from the entire population are presented in **Table 1**.

In the overall patient population, clinically and statistically significant increases in adherence to treatment guidelines from baseline compared with 10- to 12-month follow-up were demonstrated in smoking cessation counseling (48% [95% CI, 36.6%-58.4%] to 87% [95% CI, 73.1%-100.7%]), lipid treatment (54% [95% CI, 46.6%-70.2%] to 79% [95% CI, 70.2%-88.3%]), LDL measurement (59% [95% CI, 51.5%-66.0%] to 81% [95% CI, 72.0%-89.5%]), and cardiac rehabilitation referral (34% [95% CI, 25.9%-39.7%] to 73% [95% CI, 63.2%-82.9%]). A smaller increase was demonstrated in blood pressure control (60% [95% CI, 55.3%-65.6%] to 68% [95% CI, 60.2%-76.1%]). Baseline use in the 82% to 87% range was maintained for the use of aspirin, β-blockers, and

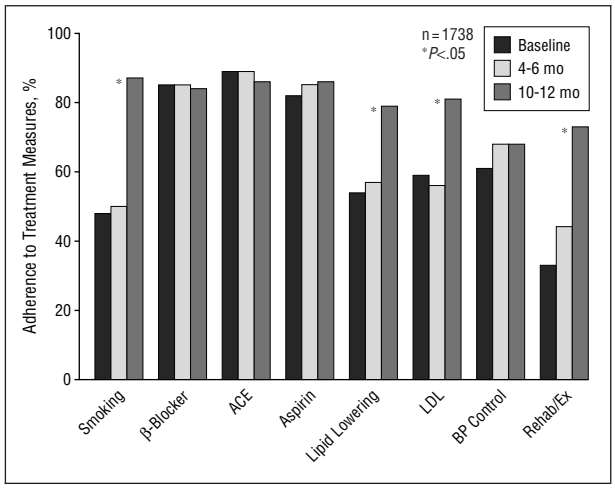

Figure 2. Pilot data from the New England Get With the Guidelines program (12-month results). Smoking indicates smoking cessation counseling; β-blocker, β-blocker at discharge; ACE, angiotensin-converting enzyme inhibitor use at discharge; aspirin, aspirin use at discharge; lipid lowering, use of lipid-lowering agents at discharge; LDL, lipid profile measurement in the hospital for determination of low-density lipoprotein level; BP control, blood pressure less than 140/90 mm Hg by the time of discharge; and Rehab/Ex, referral to cardiac rehabilitation or exercise recommendations at discharge. Significance (asterisk) was based on nonoverlapping 95% confidence intervals compared with the baseline period.

ACE inhibitors at the time of discharge, while hospitals focused on interventions with low baseline values, including smoking cessation counseling, lipid measurement and treatment, blood pressure control, and referral to cardiac rehabilitation (**Figure 2**).

Significant increases from baseline percentage to 10- to 12-month follow-up were also demonstrated in subgroup analysis (**Table 2**). In patients without myocardial infarction, which included patients with unstable angina or heart failure with CAD, increases were demonstrated in smoking cessation counseling, use of β-blockers, ACE inhibitors, lipid treatment at discharge, LDL measurement, and referral to cardiac rehabilitation. In those with a myocardial infarction diagnosis, significant increases from baseline were seen in smoking cessation counseling, LDL measurement, and blood pressure control.

In the male patients, significant increases from baseline were demonstrated in smoking cessation, lipid treatment, LDL measurement, blood pressure control, and referral to cardiac rehabilitation. In female patients, increases from baseline were demonstrated only in lipid treatment and referral to cardiac rehabilitation. A reduction in aspirin therapy rate was also seen in this group.

Patient data were also evaluated by age. For those younger than 65 years, significant increases from baseline were demonstrated in all variables except aspirin and β-blocker use at discharge. For patients 65 years or older, significant increases were demonstrated in all measures except aspirin, β-blocker, and ACE inhibitor use.

COMMENT

This study demonstrated that a quality improvement initiative, using the synergy of multiple organizations and physician champions with their hospital teams, could work collaboratively to successfully change the process of care. By using an interactive, Web-based PMT to augment and improve system changes, including protocols and standing orders, significant improvement in secondary prevention was demonstrated in a diverse group of hospitals. By embedding data collection and system change in the process of care, this improvement occurred rapidly, in less than 1 year. The absence of significant changes in the first 6 months suggests that real system changes, such as those noted herein, not merely better measurement, were the likely reason for the improvement demonstrated. We believe that with these interventions now a part of care, and with ongoing data collection and feedback, it is likely that this improvement will continue in the long term, particularly with the emergence of required Joint Commission on Accreditation of Healthcare Organizations ORYX core measures that are consistent with the GWTG measures. Although the 24 hospitals participated in a 1-year pilot, they and other hospitals in GWTG have continued to use the PMT and attend follow-up meetings.

National benchmarks for secondary prevention at discharge for acute myocardial infarction continue to demonstrate suboptimal use of evidence-based therapy. The results from the 1998 Medicare data collection demonstrate that aspirin (85%), β-blockers (72%), and ACE inhibitors (71%) are not always used, even in ideal patients.[13] Smoking cessation counseling is documented in only 40%, but that figure rose from 48% to 87% in our hospitals. Data from 138001 patients with acute myocardial infarction participating in the National Registry of Myocardial Infarction 3 represent the largest data sample for lipid-lowering therapy in patients after acute myocardial infarction.[6] Only 37% of patients were discharged on a regimen of lipid-lowering therapy during a period similar to that of the present study. In our GWTG hospital group, approximately half of patients overall (54%) were receiving lipid-lowering therapy at discharge at baseline, rising to 79% of patients discharged in the fourth quarter of the project, more than twice the rate in the National Registry of Myocardial Infarction.

The American College of Cardiology Evaluation of Preventive Therapeutics study demonstrated that at 6 months after hospitalization for a cardiac diagnosis, only 28% of patients had achieved the National Cholesterol Education Program goal for LDL cholesterol level.[7] Although our study did not evaluate follow-up LDL levels or attainment of goal, at baseline only 54% of patients had lipid-lowering therapy initiated at time of discharge. This significantly increased to 79% in the fourth quarter of the pilot. Initiation of secondary prevention programs for patients with CAD before hospital discharge is important.[9] Initiating drug therapy in the hospital provides 2 advantages. First, at time of discharge, patients are motivated to begin and maintain interventions that lower their risk. Second, failure to initiate therapy early is believed to be one of the causes of a large treatment gap because outpatient follow-up may be less consistent[14] and changing outpatient systems is more complex. Initiation of CAD interventions such as lipid-lowering therapy in the hospital may provide long-term

Table 2. GWTG Pilot Data: Significant Changes on Subgroup Analysis*

Criteria	% of Patients					
	MI (N = 1738)	Non-MI (n = 1400)	Male (n = 940)	Female (n = 798)	Age <65 y (n = 557)	Age ≥65 y (n = 1181)
Smoking cessation						
Baseline	53	30	47	†	48	47
10-12 mo	75	100	88	†	93	75
Aspirin						
Baseline	92	†	†	87	†	†
10-12 mo	86	†	†	76	†	†
β-Blocker use						
Baseline	†	64	†	†	†	†
10-12 mo	†	76	†	†	†	†
ACE inhibitor use						
Baseline	†	70	†	†	82	†
10-12 mo	†	100	†	†	100	†
Lipid treatment						
Baseline	†	46	58	51	63	48
10-12 mo	†	84	82	70	89	71
LDL measurement						
Baseline	60	58	57	†	68	53
10-12 mo	82	80	84	†	86	76
Blood pressure control						
Baseline	54	†	63	†	68	57
10-12 mo	62	†	72	†	78	64
Cardiac rehabilitation						
Baseline	†	21	36	30	41	27
10-12 mo	†	78	79	55	86	62

Abbreviations: ACE, angiotensin-converting enzyme; GWTG, Get With the Guidelines; LDL, low-density lipoprotein; MI, myocardial infarction.
*Significance based on nonoverlapping 95% confidence intervals compared with the baseline period.
†No significant difference.

benefits. Patients are more aware and focused on their current condition, have access to health care professionals for patient education, and have a strengthened perception that their current therapy is important for the prevention of future cardiac events.[15]

These observations support the concept that guidelines do not implement themselves[16] and approaches designed solely to bring information to practitioners do not produce significant changes in performance.[17] In contrast, active interventions directed to changing systems of care have reduced the gap in treatment in single hospital interventions with all or some of the guideline interventions.[18-20] One early example of system change with associated outcome improvement was the UCLA Medical Center's Cardiac Hospitalization Arteriosclerosis Management Program (CHAMP), which demonstrated change during a 2-year period by putting a system of protocols and standing orders with retrospective data collection and quarterly feedback to clinicians for patients admitted for a cardiac event.[9] When 1992 to 1993 treatment rates (before CHAMP) were compared with 1994 to 1995 rates (after CHAMP implementation), aspirin use (78% to 92%), β-blocker use (12% to 61%), ACE inhibitor use (4% to 56%), and lipid-lowering therapy use (6% to 86%) all rose substantially. Of interest, the use of lipid-lowering medication at 1 year rose from 10% to 91% without a specific intervention in the outpatient arena, suggesting that adherence to medication is improved when the medication is started in the hospital. The authors also reported a significant reduction in death and recurrent myocardial infarction from 14.8% to 6.4% ($P<.01$). This demonstrated that a more intense intervention in a single academic medical center could produce striking improvements in performance with an associated improvement in patient outcomes.

The Cooperative Cardiovascular Project Pilot in 4 states produced significant changes in smoking cessation counseling (28.6% to 41%), aspirin use (83.6% to 90.3%), β-blocker use (47.5% to 68.4%), and ACE inhibitor use (48.5% to 62.2%) during a similar time frame (1992-1993 to 1995-1996) with the use of feedback of performance and opinion leaders.[8] Although performance in these ideal patients remained suboptimal, a significant 2.7% reduction in 1-year mortality was seen. While this project demonstrated more modest levels of performance, it did demonstrate the ability to produce change in a more diverse group of hospitals, although with a less intense intervention than the present study. Like CHAMP, the Cooperative Cardiovascular Project Pilot also demonstrated improved patient outcomes when guidelines were implemented.

Both of these studies demonstrate that, when process measures derived from clinical guidelines are implemented more frequently, better patient outcomes, including reductions in mortality, are observed. Although the GWTG pilot did not assess patient outcomes, it is reasonable to predict improvement in patient outcomes, on the basis of the magnitude of change of the process measures and the observations of CHAMP and the Cooperative Cardiovascular Project Pilot.[8,9]

The Guidelines Applied in Practice (GAP) intervened in 10 hospitals during 2000.[21] Eight of the 10 hospitals were teaching hospitals with relatively high levels of baseline performance. The intervention used a tool kit for clinicians and patients that included care maps, standing admission orders, and discharge forms and used a consultative model with dedicated opinion leaders. Significant improvement in the late indicators occurred for aspirin use (84% to 92%) and smoking cessation counseling (53% to 65%). Of interest, the tools were used for approximately 25% of patients and produced significant improvement in the use of aspirin, β-blockers, cholesterol treatment, and smoking cessation counseling.[21]

Like GAP, GWTG maintained performance in indicators with high baseline values and produced significant change in indicators with more opportunity for change, including smoking cessation counseling, lipid treatment, and referral to cardiac rehabilitation. The performance levels were higher in GWTG compared with GAP for smoking cessation (88% vs 65%) and similar for lipid treatment (79% vs 75%), although the magnitude of change in the proportion of patients treated (0.23 vs 0.07) was greater.

The editorial accompanying the GAP article[22] suggested that the reason for modest change was the short duration of the intervention. Our results suggest another possible explanation, that the intensity of the intervention is more important than duration. As the authors point out, the use of the tools in GAP produced more robust change in the subset of patients in which they were used. In GWTG, sample care maps, preprinted orders, and discharge forms are also made available, but the PMT embeds the use of prompts and reminders with point-of-service data feedback to ensure more consistent system change. The use of the collaborative model, in which hospital teams are brought together in workshops and follow-up conference calls and ongoing data feedback is provided to support rapid cycle improvement,[12] has been demonstrated to produce breakthrough change in a 1-year period in a number of disease states.[23-25]

Cardiovascular disease remains a leading cause of death in the elderly and women in the United States.[15] Evidence suggests these populations are undertreated.[26-29] Data from the National Registry of Myocardial Infarction 3 showed that elderly patients were at increased risk of being discharged without lipid-lowering therapy.[6] Elderly patients have been shown to obtain benefit from secondary prevention interventions.[18] In our study, only 48% of patients 65 years or older were receiving lipid treatment at baseline, compared with 63% of patients younger than 65 years. This number significantly increased to 71% (for age ≥65 years) after initiation of our intervention program. Women in this study had a significant increase in lipid treatment from 51% to 70% and in referral to cardiac rehabilitation from 30% to 55%. Aspirin treatment, however, decreased from 87% to 76%. These observations demonstrate that increases in may of the treatment rates in these populations can occur with system changes such as those implemented in GWTG. In this small pilot program, closing of the age and sex disparities was not observed.

CONCLUSIONS

Implementation of a hospital-based quality improvement initiative that used an interactive Web-based tool at the point of care, physician champions, and interactive workshops for hospital teams significantly enhanced adherence to the AHA/ACC Secondary Prevention Guidelines in patients with CAD. This successful pilot project demonstrated to the AHA the potential of GWTG using the CHAMP model, enhanced by a multihospital collaborative and point-of-service data collection, to produce rapid, breakthrough change.[12] National rollout of the program is now under way and will be reported in the near future.

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