

Comprehensive Coronary Artery Disease Care in a Safety-Net Hospital: Results of Get With The Guidelines Quality Improvement Initiative

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ABSTRACT

BACKGROUND: Adherence to published coronary artery disease (CAD) guidelines is suboptimal, particularly among minorities and the poor. While hospital-based quality-improvement programs may increase the use of evidence-based therapies, little data exist regarding the impact of such programs in sociodemographically disadvantaged (vulnerable) populations. Vulnerable patients in the United States are cared for primarily within the safety-net health system, which comprises urban public hospitals and outpatient community health centers. Denver Health is an example of an integrated system that encompasses both types of facilities.

OBJECTIVE: To assess evidence-based medication use in CAD patients after initiation of an inpatient quality-improvement program at Denver Health.

METHODS: We reviewed the medical records of 499 patients with angiographically proven CAD who were hospitalized between July 1998 and December 2002. Patients were prospectively identified through a multidisciplinary intervention led by a nurse manager, and their records were input retrospectively into the American Heart Association's Get With The Guidelines patient management tool. The association's program, which recommends initiating 4 cardioprotective drug classes while patients are hospitalized, was started 2 years into the observation period (August 2000). Treatment rates were compared over the ensuing years.

We evaluated temporal trends in discharge use of 4 drugs: (1) beta-blockers, (2) angiotensin-converting enzyme inhibitors (ACEIs), (3) hydroxymethylglutaryl coenzyme A reductase inhibitors (statins), and (4) aspirin. We calculated the proportion of eligible patients (no documented contraindication) who were prescribed each drug category as well as the proportion who received all 4 drug categories, our principal composite outcome. If any one drug was absent, the composite criterion was considered unmet.

RESULTS: We observed progressive improvement in discharge use of the 4-drug composite: 18% in 1998-1999 (95% confidence interval [CI], 12%-25%), 50% in 2000 (95% CI, 37%-63%), 62% (95% CI, 54%-70%) in 2001, and 72% (65%-79%) in 2002 ($P < 0.001$ for between-year differences). Among eligible patients discharged in 2002, 90% received beta-blockers, 91% received ACEIs, 86% received statins, and 93% received aspirin.

CONCLUSIONS: Implementation of a multidisciplinary program led by a nurse manager was associated with increased CAD guideline compliance among sociodemographically disadvantaged patients. This compliance exceeded national averages. Achievement of the composite measure of use of all 4 recommended drug categories at discharge improved from 18% in 1998-1999 to 72% in 2002.

KEYWORDS: Coronary artery disease, Get With The Guidelines, Safety-net hospital

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What is already known about this subject

- Despite strong scientific evidence and national guidelines, patients with CAD are undertreated with evidence-based drugs.
- The American Heart Association's Get With The Guidelines program is an inpatient quality-improvement initiative; its successful implementation in safety-net hospitals has not been well characterized.

What this study adds

- Our study suggests that a multidisciplinary team intervention improves CAD process of care in a vulnerable patient population.
- To our knowledge, this is the first Get With The Guidelines study to use a composite 4-drug measure of quality, and it reinforces the need to provide comprehensive pharmacologic care to CAD patients.

Coronary artery disease (CAD) is the leading cause of morbidity and mortality in the United States, with annual costs exceeding \$160 billion.¹ Effective pharmacologic interventions to attenuate atherosclerotic risk have been identified, including angiotensin-converting enzyme inhibitors (ACEIs), aspirin, statins, and beta-blockers. All 4 drugs are recommended in the American College of Cardiology and American Heart Association (ACC/AHA) guidelines.²

The AHA's Get With The Guidelines (GWTG) program is a hospital-based initiative that promotes incorporation of the ACC/AHA secondary prevention guidelines into national CAD care delivery.³ A major focus is appropriate pharmacologic treatment during hospitalization, since many patients are inadequately treated despite widespread guideline dissemination. The AHA GWTG program defines appropriate treatment based on eligible CAD patients receiving ACEIs, beta-blockers, hydroxymethylglutaryl (HMG) coenzyme A reductase inhibitors (statins), and aspirin.

Despite the fact that these medications are recommended in evidence-based guidelines,² a substantial treatment gap remains, particularly among minorities and the poor.⁴⁻⁶ The mission of Denver Health is to care for poor and uninsured people, but it also provides a broad spectrum of care, including trauma and emergency (911) services, to all citizens in the Denver metro area. In 2000, we instituted a multidisciplinary program at our safety-net institution to enhance care for hospitalized patients

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with CAD. We piloted this program for 1 year but were able only to demonstrate significant improvements in ACEI and statin use, not in aspirin or beta-blocker use.⁷

We therefore evaluated the program over a longer period (4.5 years). Specifically, we assessed whether compliance with all 4 guideline-based medication classes had increased. The Joint Commission (previously known as the Joint Commission on Accreditation of Healthcare Organizations) continues to emphasize isolated medication core measures but has begun to shift its focus toward more comprehensive care. The 5 Million Lives Campaign suggested that hospitals aspire to “perfect care” across 7 treatment domains, 6 of which are medication related.⁸ Given recent data suggesting an additive mortality reduction when all 4 drugs are used for hospitalized CAD patients,⁹ we sought to assess compliance with this more comprehensive quality-of-care measure after patients were discharged.

Methods

Patients and Setting

The Colorado Multiple Institutional Review Board approved the study. The patient population consisted of patients with angiographically documented CAD who were admitted to the cardiology service at Denver Health between July 1998 and December 2002. Denver Health is a member of the National Association of Public Hospitals and Health Systems. It is organizationally unique since it integrates both inpatient and outpatient community health services and maintains an academic affiliation with the University of Colorado.⁶ Denver Health is a safety-net hospital with 406 staffed beds and serves a population that includes a high proportion of minorities and many financially disadvantaged patients. Our hospital actively screens hospitalized patients for enrollment in an indigent care program, which provides discounted prescription drug benefits to all financially disadvantaged patients who do not qualify for Medicare or Medicaid. At the time of the study, Denver Health provided nearly one third of the uncompensated care for indigent patients in Colorado and was one of the first medical centers in the state to adopt the GWTG program.

Intervention

Beginning in August 2000, we assembled a multidisciplinary GWTG hospital team, including a physician champion, a clinical pharmacist, and a dedicated nurse manager who directly participated in daily Coronary Care Unit (CCU) teaching rounds with cardiology attending staff and resident physicians. Each month, new resident physicians were oriented by the nurse manager, who emphasized the importance of prescribing the 4 classes of evidence-based medications (aspirin, beta-blockers, statins, and ACEIs) to all CAD patients unless their use was contraindicated.⁷

Mandated treatment algorithms or printed orders were not

used; however, a sticker reminding staff of the importance of the 4 guideline-based drugs was placed on all patients' charts. Although prescribing decisions were left to the discretion of the responsible physicians, during CCU rounds, the nurse manager was encouraged to highlight patients who were not receiving target medications. The clinical pharmacist also alerted resident physicians by pager about similar oversights when the pharmacist was reviewing medication orders.

The nurse manager provided educational materials and individual counseling to CAD patients. The encounter was documented in the medical record. Counseling focused on smoking cessation, activity recommendations, dietary suggestions (e.g., minimizing intake of saturated fat and cholesterol), and medication teaching. Medication teaching principally focused on the need for long-term medication adherence to reduce the risk of future MI and, if needed, for navigating our medication assistance program. The hospital team participated in semiannual GWTG workshops and monthly teleconferences to identify barriers to providing optimal care.

Data Abstraction and Definitions

Patient data were stored using an Internet-based patient management tool designed specifically for AHA GWTG participating hospitals. The electronic medical record was reviewed to confirm clinical, demographic, and outcome data for all CAD patients. The chart abstraction process focused on the provision of evidence-based cardiovascular drugs recommended by the GWTG program (aspirin, beta-blockers, statins, and ACEIs) and determining eligibility (lack of documented drug contraindication). Initiation of the target drugs, as well as of documented educational counseling, during hospitalization was ascertained. We required the drug to be explicitly written in the discharge orders and therapeutic lifestyle counseling to be clearly recorded in the progress record. Clinical comorbidities and sociodemographic characteristics of the patients were also assessed. Acute MI was defined according to the revised Joint European Society of Cardiology/ACC consensus document.¹⁰ Patients were included for analysis only if they had angiographically significant CAD, defined as a >50% diameter obstruction of a major epicardial coronary artery.¹¹

Statistical Analysis

Medication treatment rates were compared temporally as the proportion of eligible patients receiving a guideline-based drug at hospital discharge. We calculated the proportion of eligible patients prescribed each drug as well as the proportion receiving all 4 drugs each year. If any one drug was absent, the composite criterion was considered unmet. Hospitalizations between 1998 and 1999 were randomly selected and served as historical controls and were compared with patients discharged after the program started in 2000.

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TABLE 1 Patient Sociodemographic Characteristics*

	All Patients (N = 499)	1998-1999 (n = 131)	2000 (n = 54)	2001 (n = 148)	2002 (n = 166)	P Value
Age, mean [SD]	59 [12]	58 [11]	59 [14]	59 [12]	60 [9]	0.66
Female gender	35%	39%	41%	36%	31%	0.41
Race						
White	38%	41%	35%	39%	37%	0.51
Latino	42%	44%	33%	41%	43%	
African American	18%	15%	29%	18%	17%	
Other	2%	2%	2%	3%	2%	
Below high school education	53%	53%	56%	50%	53%	0.92
Insurance status						
Uninsured	54%	54%	50%	54%	55%	0.73
Medicare/Medicaid	36%	40%	39%	36%	33%	
Private/HMO	10%	6%	11%	11%	12%	
Current tobacco use	45%	52%	48%	41%	41%	0.12
Alcohol abuse	18%	18%	19%	22%	13%	0.22
Illicit drug abuse	12%	11%	17%	13%	8%	0.19

* Values are expressed as simple proportions or means with standard deviation [SD].

TABLE 2 Clinical Characteristics*

	All Patients (N = 499)	1998-1999 (n = 131)	2000 (n = 54)	2001 (n = 148)	2002 (n = 166)	P Value
Body mass index†	29 [5]	28 [6]	29 [8]	28 [6]	29 [5]	0.25
Diastolic BP (mm Hg)	67 [13]	68 [12]	68 [15]	64 [13]	67 [12]	0.08
Systolic BP (mm Hg)	121 [19]	122 [17]	119 [20]	122 [18]	121 [19]	0.76
Total cholesterol (mg/dL)	177 [50]	174 [51]	173 [47]	181 [49]	175 [54]	0.71
HDL-C (mg/dL)	39 [12]	41 [12]	39 [13]	39 [11]	40 [12]	0.73
LDL-C (mg/dL)	102 [37]	105 [38]	102 [40]	103 [37]	99 [35]	0.75
Triglycerides (mg/dL)	179 [165]	148 [177]	157 [164]	203 [159]	181 [170]	0.16
History of COPD	16%	21%	8%	20%	12%	0.02
Diabetes	39%	34%	28%	41%	43%	0.11
Hypertension	67%	67%	65%	66%	67%	0.99
Myocardial infarction	38%	47%	37%	35%	35%	0.14
Peripheral arterial disease	6%	7%	4%	5%	7%	0.75
Chronic renal disease	9%	8%	4%	9%	10%	0.53
History of stroke	10%	13%	6%	10%	9%	0.45

* Values are expressed as simple proportions or means with standard deviation [SD].

† Body mass index = weight in Kg/height in m².

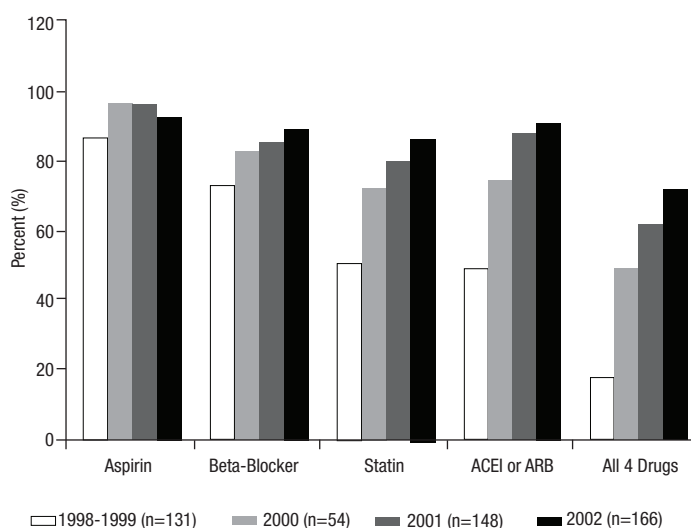
BP = blood pressure; COPD = chronic obstructive pulmonary disease; HDL-C = high-density lipoprotein cholesterol; LDL-C = low-density lipoprotein cholesterol.

Continuously distributed variables were summarized using means and standard deviations. Means across years were then compared using analysis-of-variance models. Categorical variables were summarized as proportions, and 95% confi-

dence intervals (CIs) were calculated for the principal outcome variables (individual and composite drug use). Proportions were compared using chi-square tests. A Cochran Armitage test was conducted to determine if the proportion of patients treated

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FIGURE 1 Temporal Changes in Coronary Artery Disease Medication Utilization



ACEI=angiotensin-converting enzyme inhibitor; ARB=angiotensin receptor blocker.

with all 4 drugs as well as the individual component medications increased over time. All tests were 2-sided and conducted at the 5% level of statistical significance. Statistical analyses were performed using SAS version 8.0 (SAS Institute, Cary, NC).

Results

Sociodemographic characteristics reflected a vulnerable population and are listed in Table 1. The overall mean age was 59 ± 12 years, and 59% (296 of 499) of patients were Latino or African American. Nearly half of the patients (49%, 244 of 499) were uninsured, and 53% of the overall population did not complete high school. In addition, tobacco, alcohol, and illicit drug use were common in this population. Overall, the distribution of sociodemographic characteristics did not differ across time. Clinical comorbidities are depicted in Table 2 and were similar across all time periods, except for a history of chronic obstructive pulmonary disease, which was lower in 2000 and 2002. Hypertension and diabetes mellitus were prevalent, and acute MI was documented on admission in one third of the total cohort.

Overall, we observed progressive improvement in guideline-based drug therapy over the duration of the study period (Figure 1). Exact proportions with 95% CIs are depicted for each drug class in Table 3, and demonstrate that a significant increase in use of all 4 guideline-based drugs was observed over time ($P < 0.001$). By the end of the observation period (2002), absolute increases from baseline were 6% for aspirin (87% to 93%), 17% for beta-blockers (73% to 90%), 35% for statins

(51% to 86%), and 42% for ACEIs (49% to 91%). Overall, use of each individual drug class approached or exceeded 90% in 2002, and the composite use of all 4 medication classes was 72% compared with 18% among the historical control group before the intervention. Additionally, there were significant increases in smoking cessation, lifestyle, and dietary counseling, and referral for cardiac rehabilitation (Table 4).

Discussion

We observed significant temporal improvements in guideline-based care among patients with angiographically proven CAD at a public safety-net hospital. To our knowledge, this is the first analysis of the AHA GWTG program to consider composite therapy with a 4-drug regimen as a potential core measure for overall CAD quality of care. We noted a >50% absolute improvement in this more comprehensive quality measure from baseline, simply by instituting a non-coercive intervention based on the AHA GWTG program. Overall, prescription rates at discharge in our population exceeded contemporary adherence in less vulnerable CAD populations over an identical timeframe.^{4,5} Among Medicare beneficiaries suffering acute MI, absolute increases during a similar timeframe (1998-2001) were only 3%, 4%, and 7% for aspirin, ACEIs, and beta-blockers, respectively.¹² By contrast, we observed much larger absolute increases in these medications (6%, 42%, and 17%) in the present study, even though only one third of our cohort met the criteria for acute MI.

Successful implementation of this program at our institution does not by itself make the case for using a composite measure of 4 evidence-based drugs. Nonetheless, comprehensive drug therapy in CAD appears warranted, given recent data demonstrating improvement in outcomes after initiation in the hospital of all 4 drug categories. In one retrospective analysis of acute coronary syndrome (ACS) patients, providing ACEIs, beta-blockers, cholesterol-reducing agents, and aspirin led to an adjusted relative event-rate reduction of 90%.⁹ A recent analysis of 31,750 CAD patients noted that adherence to aspirin, beta-blockers, and lipid-lowering drugs was associated with reduced mortality.¹³ The study assessed longer-term drug adherence, which is likely to be lower than use at discharge as measured in our study. However, it is noteworthy that use of a composite of these 3 drugs was only 39% at the end of the study period (2002), less than half the observed use rate in our study (72%) during the same year, despite a more comprehensive 4-drug composite measure.

Our postintervention utilization rates mirror data from the Comprehensive Hospital Atherosclerosis Management Program, in which increased use of all 4 drug classes led to a 50% reduction in event rates 1 year after the intervention.¹⁴ A retrospective analysis of 5,477 acute MI patients on background aspirin and ACEI therapy found that only a third of MI patients received

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TABLE 3 Utilization of Target Drug Therapy at Discharge*

	1998-1999 (n = 131)	2000 (n = 54)	2001 (n = 148)	2002 (n = 166)	P Value for Trend
Aspirin	87% (81-93)	96% (91-100)	96% (93-99)	93% (89-97)	0.030
Beta-blocker	73% (66-81)	83% (73-93)	86% (80-91)	90% (85-94)	<0.001
Statin	51% (43-60)	72% (60-84)	80% (73-86)	86% (81-91)	<0.001
ACEI	49% (40-57)	74% (62-86)	89% (84-94)	91% (87-95)	<0.001
All 4 drug classes	18% (12-25)	50% (37-63)	62% (54-70)	72% (65-79)	<0.001

* Values are expressed as proportions with 95% confidence intervals (CIs).

ACEI = angiotensin-converting enzyme inhibitor.

TABLE 4 In-Hospital Risk-Factor Intervention Counseling*

	1998-1999 (n = 131)	2000 (n = 54)	2001 (n = 148)	2002 (n = 166)	P Value for Trend
Smoking cessation	4% (1-7)	31% (19-44)	26% (19-33)	33% (26-40)	<0.001
Activity recommendations	15% (9-21)	28% (16-40)	41% (33-49)	54% (47-62)	<0.001
Cardiac rehabilitation referral	4% (1-7)	6% (0-12)	8% (4-13)	26% (19-33)	<0.001
Weight management	0% (0-3)	19% (8-29)	26% (17-30)	30% (23-37)	<0.001
Medication teaching	5% (1-9)	7% (2-18)	6% (2-10)	34% (27-41)	<0.001

* Values are expressed as proportions with 95% confidence intervals (CIs).

beta-blockers or statins before hospital discharge.¹⁵ Despite this treatment gap, the 1-year cardiovascular death rate was 50% lower among patients receiving both agents even after adjustment for baseline risk variables.

Improvements in outcomes appear to be mediated in large part through increased adherence when therapies are initiated in the hospital setting. Initiating evidence-based medications in the hospital reinforces to patients the importance of these therapies while allowing physicians to monitor for adverse drug effects. This practice serves as the conceptual basis for both the AHA GWTG program¹⁶ and the ACC's Guidelines Applied in Practice (GAP) initiative.¹⁷ Improved compliance is exemplified in a study of 10,288 ACS patients. Among patients who received lipid-lowering drugs while in the hospital, 88% were in compliance 10 months later compared with 34% of patients who were not discharged on lipid-lowering therapy.¹⁸

Initiating beta-blockers and ACEIs while patients are in the hospital is well known to reduce short-term ischemic complications in ACS patients.² Recent observational data suggest that similar benefits may be obtained by initiating statins early in the hospitalization,¹⁹ even though statins are traditionally thought of as providing only long-term cardio-protection. In addition, greater benefits have been noted in ACS patients achieving more stringent low-density lipoprotein cholesterol (LDL-C) target levels (62 mg/dL) compared with traditional target levels (95 mg/dL).²⁰ Furthermore, statin initiation within the first 24 hours of ACS presentation has been shown to reduce the incidence of adverse cardiac events.²¹ These data taken together suggest that statins may possess ancillary plaque-stabilizing properties and support early initiation of statins in ACS patients regardless of their LDL-C level, which may be transiently depressed

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during an ACS.²² Most important, a strategy of drug initiation for inpatients eliminates the barriers inherent in traditional stepwise approaches to care, which foster inertia²³ and ultimately result in missed opportunities to improve outcomes.

These hospital-based data are aligned with an outpatient secondary prevention movement toward comprehensive drug therapy—the so-called “poly-pill” approach. A recent epidemiologic analysis concluded that a comprehensive pharmacologic approach to post-MI patients would reduce CAD mortality by 93% over 5 years, translating into a number needed to treat of only 16 patients.²⁴ The authors note that the addition of therapeutic lifestyle changes would further enhance the effectiveness of drug therapy. While all of these nonrandomized studies have inherent limitations, their consistent results support a more comprehensive pharmacologic approach to CAD care.

Limitations

First, the current study is retrospective without a contemporaneous control group, which raises the possibility that factors other than our intervention program may be responsible for the observed improvement in care. Important confounding factors include publication of new trials²⁵ and greater awareness of treatment guidelines, both of which are inseparable from our intervention. Specifically, our intervention corresponded with publication of the Heart Outcomes Prevention Evaluation trial,²⁶ which demonstrated improved outcomes with ACEI therapy in a broad spectrum of CAD patients and may have contributed to the temporal improvement in ACEI therapy we observed. Nonetheless, previous data suggest that knowledge of guidelines and new publications does not necessarily translate into appropriate CAD care.²⁷

Second, an obvious limitation in choosing a new quality measure for comprehensive care is the absence of outcomes data from prospective randomized studies validating the effectiveness of initiating all 4 drugs simultaneously during hospitalization. However, such a study would be methodologically difficult and ethically untenable, given current practice guidelines.² Third, our study did not assess clinical outcomes or long-term adherence associated with our intervention, as the AHA GWTG program itself focuses only on the surrogate marker of medication use at the time of discharge from the hospital. These valid surrogates, however, seem reasonable given their proven life-saving benefits in randomized clinical trials, their emphasis in Joint Commission standards, and more recently, the mortality reductions associated with implementation of a similar quality-improvement program (GAP) in Michigan.²⁸

Conclusions

We observed marked improvements in comprehensive pharmacologic care among vulnerable CAD patients after initiating an intervention based on the AHA GWTG program. Our findings

may prompt other safety-net hospitals with limited resources to consider a CAD quality-improvement program. Vulnerable patients have a high risk of medication noncompliance and a tendency to rely on inpatient services.²⁹ Therefore, the impact of inpatient quality-improvement programs may be greatest in vulnerable populations, since prescribing drugs at the time of discharge is one of the strongest predictors of outpatient adherence.³⁰ It has been projected that optimal use of all evidence-based drugs has the potential to save 80,000 lives in the United States.³¹ We suggest that using a more comprehensive quality measure for CAD care provides a template to improve outcomes, even among vulnerable patients.

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REFERENCES

1. American Heart Association. 2005 *Heart and Stroke Statistical Update*. Dallas, TX: American Heart Association; 2005.
2. Gibbons RJ, Abrams J, Chatterjee K, et al. ACC/AHA 2002 guideline update for the management of patients with chronic stable angina. summary article: a report of the American College of Cardiology/American Heart Association Task Force on practice guidelines (Committee on the Management of Patients with Chronic Stable Angina). *J Am Coll Cardiol*. 2003;41:159-68.
3. LaBresh KA, Ellrodt AG, Gliklich R, Liljestrand J, Peto R. Get with the guidelines for cardiovascular secondary prevention: pilot results. *Arch Intern Med*. 2004;164:203-09.
4. EUROASPIRE I and II Groups. European Action on Secondary Prevention by Intervention to Reduce Events. Clinical reality of coronary prevention guidelines: a comparison of EUROASPIRE I and II in nine countries. *Lancet*. 2001;357:995-1001.
5. Stafford RS, Radley DC. The underutilization of cardiac medications of proven benefit, 1990 to 2002. *J Am Coll Cardiol*. 2003;41:56-61.
6. Gabow P, Eisert S, Wright R. Denver Health: A model for the integration of a public hospital and community health centers. *Ann Intern Med*. 2003;138:143-49.
7. Krantz MJ, Havranek EP, Mehler PS, Haynes DK, Long CS. Impact of a cardiac risk reduction program in vulnerable patients hospitalized with coronary artery disease. *Pharmacotherapy*. 2004;24(6):768-75.
8. Institute for Healthcare Improvement. Protecting 5 million lives from harm. Available at <http://www.ihi.org/IHI/Programs/Campaign/>. Accessed April 26, 2007.
9. Mukherjee D, Fang J, Chetcuti S, Moscucci M, Kline-Rogers E, Eagle KA. Impact of combination evidence-based medical therapy on mortality in patients with acute coronary syndromes. *Circulation*. 2004;109:745-49.
10. Alpert JS, Thygesen K, Antman E, Bassand JP. Myocardial infarction redefined—a consensus document of the Joint European Society of Cardiology/American College of Cardiology Committee for the Redefinition of Myocardial Infarction. *J Am Coll Cardiol*. 2000;36:959-69.
11. Califf RM, DeLong ER, Ostbye T, et al. Underuse of aspirin in a referral population with documented coronary artery disease. *Am J Cardiol*. 2002;89:653-61.
12. Jencks SF, Huf ED, Cuerdon T. Changes in quality of care delivered to Medicare beneficiaries, 1998-1999 to 2000-2001. *JAMA*. 2003;289:305-12.
13. Newby LK, LaPointe NM, Chen AY, et al. Long-term adherence to evidence-based secondary prevention therapies in coronary artery disease. *Circulation*. 2006;113:203-12.
14. Fonarow GC, Gawlinski A, Moughrabi S, Tillisch JH. Improved treatment of coronary heart disease by implementation of a Cardiac Hospitalization Atherosclerosis Management Program (CHAMP). *Am J Cardiol*. 2001;87:819-22.
15. Hognestad A, Dickstein K, Myhre E, Snapinn S, Kjekshus J, OPTIMAAL investigators. Effect of combined statin and beta-blocker treatment on one-year morbidity and mortality after acute myocardial infarction associated with heart failure. *Am J Cardiol*. 2004;93:603-06.
16. McCarthy M. US heart-guidelines strategy makes a promising start (editorial). *Lancet*. 2001;358:1618.
17. Mehta RH, Montoye CK, Gallogly M, et al. Improving quality of care for acute myocardial infarction. The Guidelines Applied in Practice (GAP) Initiative. *JAMA*. 2002;287:1269-76.
18. Smith CS, Cannon CP, McCabe CH, Murphy SA, Bentley J, Braunwald E. Early initiation of lipid-lowering therapy for acute coronary syndromes improves compliance with guideline recommendations: observations from the Orbofiban in Patients with Unstable Coronary Syndromes (OPUS-TIMI 16) trial. *Am Heart J*. 2005;149:444-50.
19. Aronow HD, Topol EJ, Roe MT, et al. Effect of lipid-lowering therapy on early mortality after acute coronary syndromes: an observational study. *Lancet*. 2001;357:1063-68.
20. Cannon CP, Braunwald E, McCabe CH, et al. Intensive versus moderate lipid lowering with statins after acute coronary syndromes. *N Engl J Med*. 2004;350:1495-504.
21. Saab FA, Eagle KA, Kline-Rogers E, et al. Comparison of outcomes in acute coronary syndrome in patients receiving statins within 24 hours of onset versus at later times. *Am J Cardiol*. 2004;94:1166-68.
22. Brugada R, Wenger NK, Jacobson TA, Clark WS, Cotsonis G, Iglesias A. Changes in plasma cholesterol levels after hospitalization for acute coronary events. *Cardiology*. 1996;87:194-99.
23. Phillips LS, Branch WT, Cook CB, et al. Clinical inertia. *Ann Intern Med*. 2001;135:825-34.
24. Robinson JG, Maheshwari N. A “poly-portfolio” for secondary prevention: a strategy to reduce subsequent events by up to 97% over five years. *Am J Cardiol*. 2005;95:373-78.
25. Jackevicius CA, Anderson GM, Leiter L, Tu JV. Use of the statins in patients after acute myocardial infarction. Does evidence change practice? *Arch Intern Med*. 2001;161:183-88.
26. Effects of an angiotensin-converting-enzyme inhibitor, ramipril, on cardiovascular events in high risk patients. The Heart Outcomes Prevention Evaluation Study Investigators. *N Engl J Med*. 2000;342:145-53.
27. Pearson T, Kopin L. Bridging the treatment gap: improving compliance with lipid-modifying agents and therapeutic lifestyle changes. *Prev Cardiol*. 2003;6(4):204-11.
28. Eagle KA, Montoye CK, Riba AI, et al. Guideline-based standardized care is associated with substantially lower mortality in Medicare patients with acute myocardial infarction: the American College of Cardiology's Guidelines Applied in Practice (GAP) Projects in Michigan. *J Am Coll Cardiol*. 2005;46(7):1242-48.
29. Shea S, Misra D, Ehrlich MH, Field L, Francis CK. Correlates of nonadherence to hypertension treatment in an inner-city minority population. *Am J Public Health*. 1992;82:1607-12.
30. Muhlestein JB, Horne BD, Bair TL, et al. Usefulness of in-hospital prescription of statin agents after angiographic diagnosis of coronary artery disease in improving continued compliance and reduced mortality. *Am J Cardiol*. 2001;87:257-61.
31. Bahit MC, Granger CB, Alexander KP, et al. Applying the evidence: opportunity in US for 80,000 additional lives saved per year [abstract]. *Circulation*. 2000;102(suppl II):II-873.