The Role of In-Hospital Initiation of Cardiovascular Protective Therapies to Improve Treatment Rates and Clinical Outcomes

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Patients with acute myocardial infarction (MI) face a high risk of recurrent cardiovascular events, repeat hospitalizations, heart failure, and mortality. There is compelling scientific evidence that antiplatelet therapy, ß-blockers, angiotensin-converting enzyme inhibitors, and lipid-lowering therapy reduce these risks in patients with acute MI. Despite this evidence and national guidelines, a number of studies in a variety of clinical settings have documented that a significant proportion of patients with acute MI is not being treated with these guideline-recommended, evidence-based therapies when receiving conventional care. The demonstration that initiation of cardiovascular protective medications, including lipid-lowering therapy, prior to hospital discharge for atherosclerotic cardiovascular events results in a marked increase in treatment rates, improved long-term patient compliance, and better clinical outcomes has led to the revision of national guidelines to endorse this approach as the standard of care. Physicians have been reluctant to initiate ß-blockers in post-MI patients with significant left ventricular dysfunction and/or heart failure symptoms, and this reluctance has contributed to the treatment gap. Recent studies suggest that when the ß-blocker carvedilol is initiated in acute-MI patients with left ventricular dysfunction with or without symptoms of heart failure prior to hospital discharge, it is safe and effective and improves clinical outcomes. Adopting in-hospital initiation of cardiovascular protective medications as the standard of care for patients hospitalized with acute MI could dramatically improve treatment rates and thus substantially reduce the risk of future cardiovascular events and hospitalizations and prolong life in the large number of patients hospitalized each year.
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Key words: Acute myocardial infarction • ß-blocker • Angiotensin-converting enzyme inhibitor • Statin • Antiplatelet therapy

Compelling clinical trial evidence exists that antiplatelet, ß-blocker, angiotensin-converting enzyme (ACE) inhibitor, and lipid-lowering therapies reduce the risk of recurrent cardiovascular events, hospitalization, and heart failure and substantially improve survival in patients with acute

myocardial infarction (MI).[1-5] Despite this evidence, as well as national and international clinical guidelines recommending these cardiovascular protective treatments in patients with acute MI, a number of studies have documented low treatment rates in this patient population.[6-11] The conventional approach to the initiation of lipid-lowering therapy was to not start therapy in the hospital for patients with acute MI; instead, the national guidelines recommended waiting a period of time until the patient was metabolically stable as an outpatient.[12] Unfortunately, in the majority of post-MI patients, lipid-lowering therapy does not get initiated during outpatient follow-up. A similar situation exists for ß-blocker use in patients with acute MI with significant left ventricular systolic dysfunction with or without heart failure.[14] Based on the scientific evidence demonstrating that in-hospital initiation of lipid-lowering and other cardiovascular protective medications resulted in a marked increase in treatment rates, improved long-term patient compliance, and improved clinical outcomes, this approach has been integrated into the National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III), American Heart Association (AHA)/ American College of Cardiology (ACC) Secondary Prevention Guidelines, and ACC/AHA Acute Coronary Syndromes Guidelines and is now considered the standard of care.[1-3] The under-use of cardiovascular protective therapies in patients after acute MI represents a major clinical-practice and public-health issue.[6,15] This article will review the rationale for in-hospital initiation of cardiovascular protective therapies in acute MI, describe successful hospital-based programs that have been demonstrated to improve treatment rates, and present the evidence supporting in-hospital initiation of cardiovascular protective medications as the standard of care in patients hospitalized with acute MI.

The under-use of cardiovascular protective therapies in patients after acute MI represents a major clinical-practice and public-health issue.

Cardiovascular Risk Following MI

This year an estimated 1.1 million individuals in the United States will have a new or recurrent acute MI.[16] It is estimated that 7.6 million individuals (4.7 million men and 2.9 million women) have a history of acute MI.[16] The cardiovascular risk after acute MI remains substantial. Within 1 year after an acute MI, 25% of men and 38% of women will die. Within 6 years of a clinically evident event, 18% of men and 35% of women will have a recurrent MI.[16] During this time frame, approximately 22% of men and 46% of women will go on to develop heart failure.[16] Patients with a prior history of MI are five to seven times more likely to sustain a cardiovascular event than are individuals without clinically evident atherosclerotic vascular disease. These post-infarction patients remain at risk for recurrent events even if they are entirely asymptomatic, have no demonstrated ischemia on stress testing, and have undergone complete revascularization. Patients after acute MI thus constitute a very high-risk group for recurrent cardiovascular events, hospitalizations, heart failure, and cardiovascular mortality.

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Benefits of Cardiovascular Protective Medications

As stated above, compelling evidence exists that antiplatelet therapy, ß-blockers, ACE inhibitors, and lipid-lowering therapy each reduce the risk of recurrent cardiovascular events, hospitalizations, heart failure, and mortality in patients following MI.[1-5] Each of these therapies individually has been demonstrated to have early as well as long-term benefits in patients presenting with MI. Meta-analyses of randomized, placebo-controlled clinical trials in patients after acute MI have shown a 20% to 25% relative risk reduction in mortality with antiplatelet therapy with aspirin, a 20% to 30% relative risk reduction with ß-blockers, and a 20% to 25% risk reduction with ACE inhibitors.[1,2,17] Lipid-lowering therapy with HMG-CoA reductase inhibitors (statins) has been associated with a 24% to 42% reduction in cardiovascular risk in post-MI patients.[1-3,18]

The benefits of these cardiovascular protective medications have been shown to apply to both men and women, patients older and younger than 65 years of age, and diabetics and nondiabetics.[1-3] Recently, statins have been demonstrated to be beneficial irrespective of the baseline low-density lipoprotein (LDL)–cholesterol in patients following MI or other clinical presentations of atherosclerosis or diabetes.[19] Controversy

Table 1
Cumulative Impact of Four Cardiovascular Protective Medication Classes

Medication Class	Relative Risk Reduction	5-Year CV-Event Risk
None	0%	20.0%
Aspirin	25%	15.0%
ß-blocker	25%	11.3%
ACE inhibitor	25%	8.4%
Lipid-lowering	30%	5.9%

The cumulative risk reduction if all four cardiovascular protective medication classes are used is 70%, the absolute risk reduction is 14.1%, and the number requiring treatment to prevent one major cardiovascular event, over 5 years of treatment, is 7.
CV events, cardiovascular events: cardiovascular death, nonfatal myocardial infarction, nonfatal stroke.

had existed as to the safety and effectiveness of ß-blocker therapy in post-MI patients with significant left ventricular dysfunction and/or heart failure symptoms, as these patients had been excluded from the clinical trials. In addition, prior trials of ß-blockers had been performed in an era before the routine recommended use of reperfusion therapy, ACE inhibitors, and lipid-lowering therapy.[4] The Carvedilol Post-Infarct Survival Control in Left Ventricular Dysfunction (CAPRICORN) study has now demonstrated that carvedilol substantially reduced all-cause mortality in patients with MI with left ventricular systolic dysfunction, with or without symptoms of heart failure.[20] These patients clearly derived net benefit from the addition of carvedilol to their medication regimen, and the benefits were additive to the other cardiovascular protective therapies, including aspirin, ACE inhibitor, and lipid-lowering therapy. Long-term benefits are seen with carvedilol even in post-MI patients with severe heart failure. The Carvedilol Prospective Randomized Cumulative Survival Study (COPERNICUS) examined the impact of ß-blockade in patients with severe, chronic heart failure symptoms and an ejection fraction of less than 25%.[21] Treatment with carvedilol resulted in a significant 35% reduction in all-cause mortality rates and a significant reduction in the combined risk of death or hospitalization in this severely symptomatic heart failure population. Review of recent clinical trials has failed to identify significant subgroups of post-MI patients who failed to benefit from each of the proven cardiovascular protective therapies.[1,2] Thus, the vast majority of post-MI patients would be expected to be appropriate candidates for, and to benefit from, the combination of these cardiovascular protective medications.

Treatment with carvedilol resulted in a significant 23% reduction in all-cause mortality rates in patients post myocardial infarction with left ventricular dysfunction with or without heart failure symptoms.

The benefits of the cardiovascular protective medications have been shown to be additive. Patients derived substantial risk reductions with the addition of the fourth class of medication even when receiving each of the other three classes. In the Heart Outcomes Prevention Evaluation (HOPE) trial, the effect of the ACE inhibitor ramipril was additive to those of aspirin, ß-blocker, and lipid-lowering therapies.[22] In the Heart Protection Study (HPS), simvastatin provided additive cardiovascular risk reduction to aspirin, ß-blockers, and ACE inhibitors.[19] As stated above, the benefits of carvedilol were additive to aspirin, ACE inhibitors, and lipid-lowering therapy in post-MI patients.[20] The cumulative benefits of all four classes of medications in combination is estimated to be of the magnitude of a 70% to 75% reduction in relative risk for recurrent cardiovascular events or death (Table 1).[17,23] The magnitude of benefit with aspirin, ß-blockers, ACE inhibitors, and lipid-lowering medications matches or exceeds the benefits seen with early reperfusion and other revascularization strategies in the acute-MI patient.[3,23]

The Gap in Applying Guideline-Recommended Therapy in Acute MI

Multiple clinical trials have convincingly demonstrated the secondary-prevention benefits of aspirin, ß-blocker, ACE inhibitor, and lipid-lowering therapy after acute MI. On the basis of these results, the ACC and AHA guidelines for the management of acute MI and coronary heart disease recommend routine aspirin, ß-blocker, ACE inhibitor, and lipid-lowering therapy for all patients without a contraindication or documented intolerance (Class I

indications, level of evidence A).[1,2] Despite this wealth of scientific evidence and the guideline recommendations regarding effective risk-reducing therapy after acute MI, there has been an extensive body of evidence documenting that post-MI patients have been receiving inadequate treatment to reduce their risk of cardiovascular events and that the guidelines have been failing to fulfill their purpose.[6-11] The Centers for Medicare and Medicaid Services' (CMS) Cooperative Cardiovascular Project reported that the quality of care for Medicare beneficiaries with acute MI was far from optimal, with substantial under-use of therapies such as aspirin, ß-blockers, and ACE inhibitors in ideal patients without documented contraindications or intolerance.[24] Other studies have shown similar disappointing adherence to clinical trial evidence–based therapies recommended in published national guidelines.[6-11] The quality of care of patients with acute MI has been shown to vary with age, sex, race, geographic location, physician specialty, and hospital teaching status.[6,7,11]

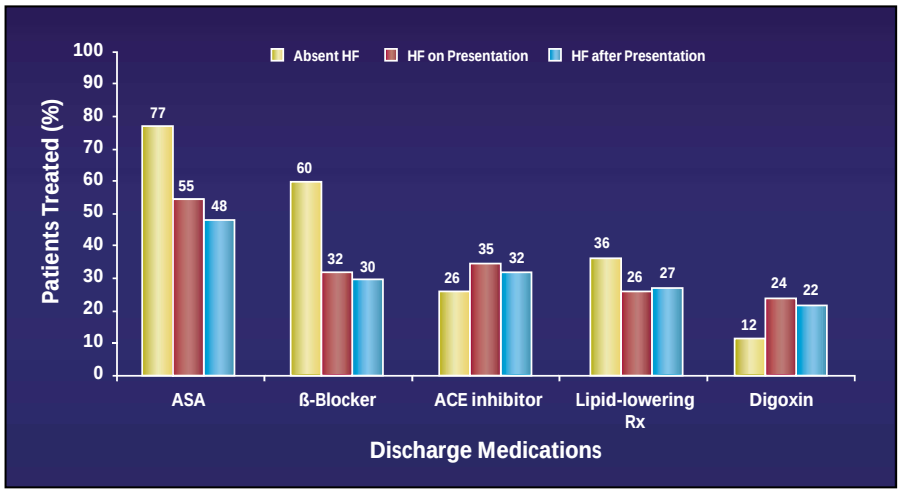

Figure 1. *Use of cardiovascular medications at time of hospital discharge in acute–myocardial infarction (MI) patients with and without heart failure (HF). This study included 606,500 patients with acute MI in the National Registry of Myocardial Infarction (NRMI). Of these patients, 430,615 (71%) did not develop heart failure, 123,938 (20.4%) had heart failure at hospital presentation, and 52,220 (8.6%) developed heart failure thereafter. Patients with heart failure, despite being at higher risk for morbidity and mortality, were less likely to receive treatment with aspirin, ß-blockers, and lipid-lowering therapy. ASA, aspirin.*

The use of antiplatelet therapy with aspirin and the use of ACE inhibitors have similarly been shown to be less than optimal. In the National Registry of Myocardial Infarction during the years 1990 to 1999, improvements in treatment were observed, but in 1999, 20% of patients were still discharged without aspirin and 60% without ACE inhibitors.[10] The highest-risk patients, those who present with or develop heart failure during hospitalization for acute MI, are particularly unlikely to receive cardiovascular protective therapies despite the even greater benefit these patients derive from treatment (Figure 1).[13] The problem of undertreatment does not appear to be restricted solely to the United States, with a recent European follow-up survey of post-MI and other coronary heart disease patients reporting a high prevalence of under-use of aspirin, ß-blocker, ACE inhibitor, and lipid-lowering drug therapies and failure to obtain plasma lipid and blood pressure targets.[11]

The highest-risk patients, those who present with or develop heart failure during hospitalization for acute MI, are particularly unlikely to receive cardiovascular protective therapies despite the even greater benefit these patients derive from treatment.

The National Cooperative Cardiovascular Project studied a cohort of 115,015 eligible patients aged 65 years or older who survived hospitalization with a confirmed acute MI in 1994 or 1995.[6] Across the United States, 63% of elderly survivors of an acute MI were not prescribed a ß-blocker at discharge. Even among what were described as ideal candidates for long-term ß-blocker therapy, half were not prescribed the drug at discharge.[6]

With regard to lipid-lowering therapy, a study of over 138,000 patients enrolled in the National Registry of Myocardial Infarction found only 31.7% of patients hospitalized with an acute MI received lipid-lowering therapy upon discharge.[7] Under-use was seen in both men and women and across all age groups. A variety of other clinical, demographic, treatment, and process-of-care factors that significantly influenced treatment use of lipid-lowering medications was also identified. Among the 20,809 patients hospitalized with an acute coronary syndrome and enrolled in the Platelet Glycoprotein IIb/IIIa in Unstable Angina: Receptor Suppression Using Integrilin Therapy (PURSUIT) trial or Global Use of Streptokinase or t-PA for Occluded Coronary Arteries (GUSTO) IIb trial, only 3653 patients (17.6%) were discharged on

lipid-lowering therapy.[25] This low use of lipid-lowering therapy was seen despite the fact that 68% of the patients in these two studies had a history of MI or an MI at the time of enrollment. In a study of 19,599 acute-MI patients hospitalized at 58 Swedish hospitals, only 28.2% of patients younger than 80 years of age were discharged on statins.[26] The treatment gap that begins in the hospital under conventional management continues on an outpatient basis. The Quality Assurance Project (QAP) analyzed treatment rates in 48,586 outpatients with documented coronary heart disease from 140 medical practices (80% cardiology) and found that only 39% of these patients were treated with lipid-lowering medications and only 11% were documented to have a LDL-cholesterol of 100 mg/dL or lower.[8]

Together, these studies demonstrate that under conventionally guided management, regardless of the health care delivery system, unacceptably large numbers of MI patients are left untreated and under-treated with guideline-recommended cardiovascular protective medications. Given the substantial number of patients at risk and the benefits of therapy, there is an urgent need to adopt effective strategies that will improve the number of post-MI patients who are being effectively treated with these cardiovascular protective therapies.

Barriers to Implementing Cardiovascular-Risk Reduction

A number of barriers to implementing cardiovascular-risk–reducing therapy in patients with coronary heart disease were highlighted at the 27th American College of Cardiology Bethesda Conference.[27] These barriers included the focus of physicians on acute problems, time constraints and lack of incentives, lack of training, and poor communication between specialists and primary care physicians (Table 2). Provider awareness of the national guidelines has been shown not to be sufficient to ensure effective implementation of cardiovascular protective therapies. In the Lipid Treatment Assessment Project (L-TAP) study, 95% of the surveyed physicians reported that they were knowledgeable about the NCEP guidelines, and 65% reported that they follow the guidelines on most patients, yet only 18% of outpatients with coronary heart disease being treated for hyperlipidemia by these physicians had achieved an LDL-cholesterol less than 100 mg/dL.[9] It has more recently been recognized that the setting in which treatment is initiated may exert a very important influence on treatment rates. Adherence to cardiovascular protective medication regimens initiated on an outpatient basis has been shown to be surprisingly poor.[28] The failure of cardiologists and other inpatient physicians to initiate therapy during hospitalization may lead to long-term management problems in the outpatient setting. Indeed, patients, their family members, and primary care physicians likely perceive inadequate treatment received in the hospital as a lack of endorsement for the cardiovascular protective medications.[15]

Table 2
Barriers to Implementing Cardiovascular Protective Therapies in Patients with Cardiovascular Disease

- Focus of physicians on acute problems
- Time constraints and lack of incentives, including lack of reimbursement
- Lack of physician training, including inadequate knowledge of benefits and lack of prescription experience
- Lack of resources and facilities
- Lack of specialist-generalist communication; passing on of responsibility
- Costs of therapy, inadequate prescription-medication benefits, restrictive formularies
- Guidelines that call for delaying initiation of therapy and for multiple steps, time points, and treatment options

The studies assessing use of cardiovascular protective medical therapies in patients following MI have consistently identified a variety of clinical, demographic, treatment, and process-of-care factors that significantly influenced treatment use.[6,7] These findings would seem to indicate that cardiovascular protective medication use is affected by physician education and the process of care in place within the health care delivery system and thus could be favorably influenced by educational initiatives, quality-improvement programs, and treatment systems.

Does In-Hospital Initiation of Cardiovascular Protective Therapy Improve Treatment Use and Clinical Outcomes?

Initiation of cardiovascular protective therapy in the inpatient setting for patients with acute MI has a number of advantages.[23] It may help to alleviate patient concerns regarding medication tolerability and side effects. Also, linking the initiation of secondary-prevention measures to the patient's cardiac hospitalization conveys the message that this therapy is essential for the prevention of

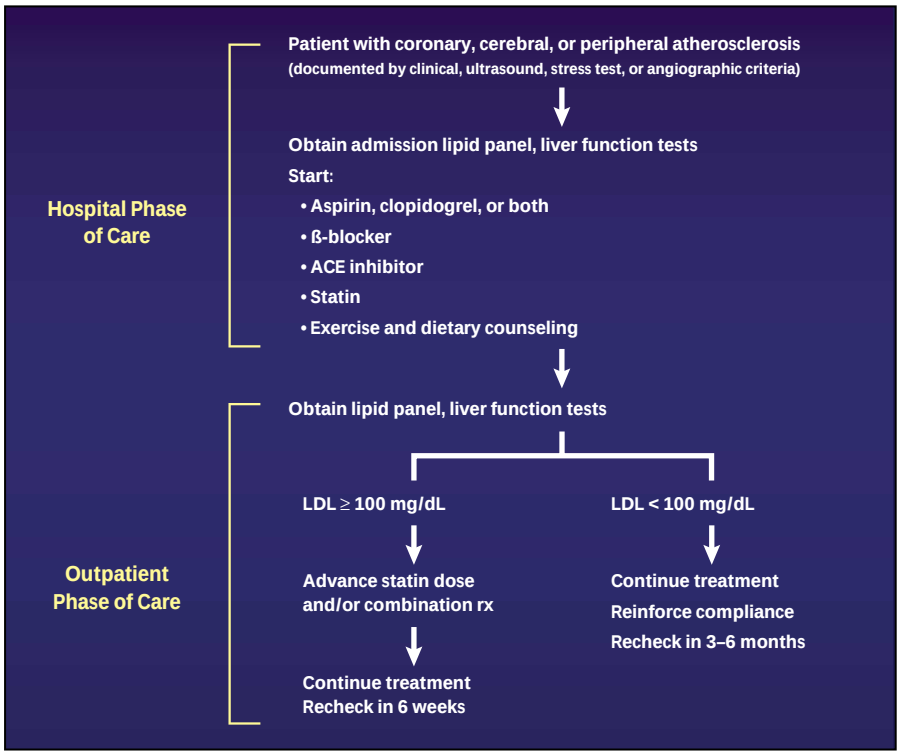

Figure 2. *Treatment algorithm for the University of California, Los Angeles Cardiovascular Hospitalization Atherosclerosis Management Program (CHAMP), designed to ensure that all patients receive indicated therapy. LDL, low-density lipoprotein.*

recurrent events and is an essential part of the patient's long-term treatment.[23,29] Furthermore, hospital-based initiation of therapy can be facilitated by the structured setting within the hospital through the use of physician prompts and reminders such as preprinted order sets, discharge forms, and involvement of other health care professionals.[23]

Proof that in-hospital initiation of lipid-lowering and other cardiovascular protective medications improves treatment rates and long-term patient compliance was provided by the University of California, Los Angeles Cardiovascular Hospitalization Atherosclerosis Management Program (CHAMP).[30] This program, implemented in a university-hospital setting in 1994, focused on in-hospital initiation of aspirin, statin (irrespective of baseline LDL-cholesterol, titrated to achieve LDL-cholesterol <100 mg/dL), ß-blocker, and ACE inhibitor therapy in conjunction with dietary and exercise counseling in patients with established coronary heart disease (Figure 2). Preprinted order sets, care maps, pocket cards, discharge forms, physician/nursing education, and treatment-utilization reports were used to facilitate program implementation.[23,30]

Use of lipid-lowering medication at the time of discharge increased from 6% before initiation of CHAMP to 86% after ($P < .001$).[30] Improved use of aspirin, ß-blockers, and ACE inhibitors was also observed (Table 3). Importantly, the in-hospital initiation of lipid-lowering medications had a dramatic effect on long-term treatment rates and patient compliance. With CHAMP, 1 year after hospital discharge, 91% of coronary heart disease patients were treated with statins and 58% were documented to have LDL-cholesterol less than 100 mg/dL, compared with 10% and 6%, respectively, with conventional management before CHAMP was implemented ($P < .01$).[30] This improved use of lipid-lowering medications, along with other cardiovascular protective therapies, was associated with a significant reduction in clinical events the first year after discharge: the death and nonfatal MI rate decreased from 14.8% to 7.3% (odds ratio 0.43, $P < .01$) (Figure 3). These improved treatment rates have been sustained over an

Table 3
Treatment Rates at Hospital Discharge and at 1-Year Follow-Up with the Cardiovascular Hospitalization Atherosclerosis Management Program (CHAMP)

	Pre-CHAMP (n = 256)		Post-CHAMP (n = 302)	
Therapy	**Discharge**	**1 Year**	**Discharge**	**1 Year**
Aspirin	78%	68%	92%	94%
ß-blocker	12%	18%	61%	57%
ACE inhibitor	4%	16%	56%	48%
Statin	6%	10%	86%	91%
LDL < 100	—	6%	—	58%

LDL, low-density lipoprotein.

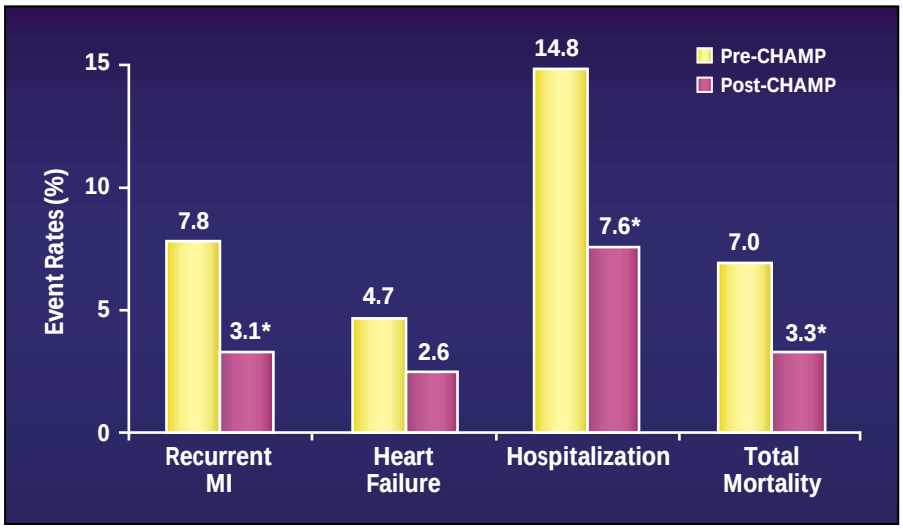

Figure 3. *Clinical-event rates during the first year after discharge before and after the Cardiovascular Hospitalization Atherosclerosis Management Program (CHAMP) study intervention in patients with acute myocardial infarction (MI). *P < .05 vs pre-CHAMP.*

8-year period.[31] The data generated by CHAMP suggest that postponing the initiation of cardiovascular protective therapy by even a few days to weeks following a cardiovascular event may reduce drug compliance, and could contribute to the mismanagement of cardiovascular-event risk reduction.

This discovery regarding the impact of in-hospital initiation of cardiovascular protective medications on long-term treatment rates and patient adherence has been supported by a number of subsequent studies. In a study of 22,334 patients who began statin treatment on an outpatient basis after an acute coronary syndrome, 40% of patients were no longer filling their prescription after 12 months.[28] In contrast, an analysis of the 10,288 patients in the Orbofiban in Patients with Unstable coronary Syndromes, Thrombolysis In Myocardial Infarction 16 (OPUS-TIMI 16) study of patients hospitalized with an acute coronary syndrome demonstrated that 90% of patients who were started on statin treatment in the hospital remained on therapy at 10 months.[32] The adherence to ß-blocker therapy in eligible patients after MI was studied in an extension of the Cooperative Cardiovascular Project.[14] Among post-MI patients who were discharged on ß-blockers, 85% had filled a prescription by 30 days post-discharge, and 63% and 61% were current users at 180 and 365 days, respectively. In contrast, only 8% of those patients with no discharge order for ß-blockers had filled such a prescription by 30 days, and only 12% of patients were current users at 365 days.[14] Patients with a discharge order for ß-blocker therapy were thus substantially more likely to fill a prescription for ß-blocker therapy in the first 30 days post-discharge after acute MI (hazard ratio 15.8, 95% CI 10.8-23.3).[14] Hospitalization can thus serve as an opportunity for physicians to teach their patients about the importance of cardiovascular protective therapy to their long-term cardiovascular health.[23]

The CHAMP results have now been replicated in other hospital settings. In an integrated health system of 10 hospitals, this model of care increased the statin treatment rate at discharge after a coronary heart disease–related hospitalization from 18% at baseline (1994–1997) to 88% after intervention (1999–2000).[33] One-year readmission rates and 1-year mortality rates were also significantly reduced. The AHA has recently launched a national program called Get With The Guidelines℠, based in part on CHAMP. In a pilot phase conducted in 24 New England hospitals in the year 2000, substantial improvement occurred in the use of cardiovascular protective therapies including aspirin, ß-blockers, and ACE inhibitors.[34] The use of lipid-lowering therapy increased from 54% pre-intervention to 78% post-intervention ($P < .01$).[34] Provision of smoking-cessation counseling and referral to cardiac rehabilitation also significantly improved.

The ACC's Guidelines Applied in Practice (GAP) quality-improvement project, which consisted of baseline measurement, implementation of hospital-based acute-MI care–improvement strategies, and remeasurement in 10 acute-care hospitals in southeast Michigan, also provides supporting evidence.[35] Increases in adherence to key treatments were seen with the GAP program in the administration of aspirin (81% vs 87%, $P = .02$) and ß-blockers (65% vs 74%, $P = .04$) on admission and use of aspirin (84% vs 92%, $P = .002$) and smoking-cessation counseling (53% vs 65%, $P = .02$) at discharge.[35] For most of the other quality-of-care indicators, favorable trends toward improvement in adherence to treatment goals were observed. Evidence in the chart that the preprinted order sets and discharge check list tools were used was strongly associated with a very high level of use of cardiovascular medications and adherence to the other quality indicators (Figure 4).[35] Thus, hospital-based

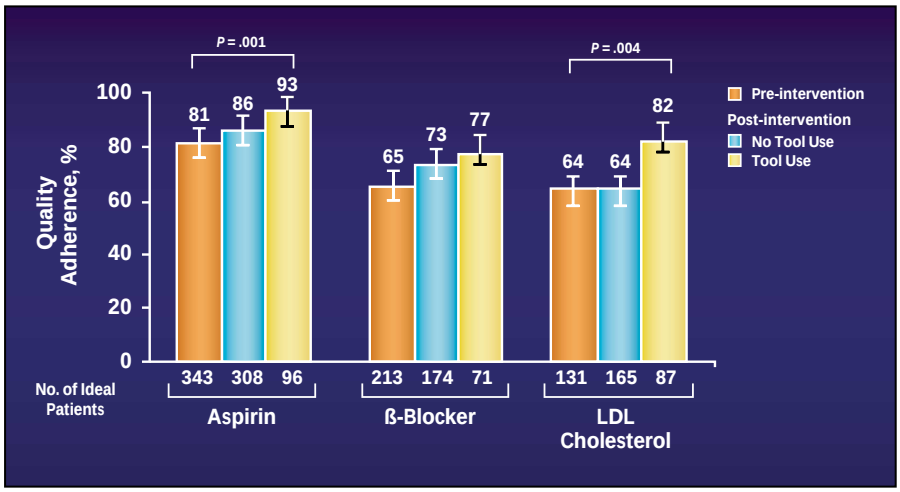

Figure 4. *Adherence to early quality indicators in patients with and without evidence of use of standardized admission orders in the American College of Cardiology Guidelines Applied In Practice (GAP) program. LDL, low-density lipoprotein.*

systems for implementing cardiovascular protective therapy have been demonstrated to be equally successful in university and community, teaching and nonteaching, and urban and rural settings.

In-Hospital Initiation of Cardiovascular Protective Therapy as the Standard of Care

The NCEP-ATP III, AHA/ACC Secondary Prevention 2001, and the ACC/AHA Acute Coronary Syndromes 2002 guidelines recommend in-hospital initiation of lipid-lowering medications and other cardiovascular protective therapies in appropriately selected patients hospitalized with cardiovascular disease.[1-3] Thus, in-hospital initiation of lipid-lowering therapy along with other cardiovascular medical therapies is now recommended as the standard of care in patients with coronary heart disease, including patients after acute MI.

In-hospital initiation of therapy can also complement outpatient preventative-cardiology and disease-management programs.[23] With the initiation of therapy in the hospital, fewer titration steps are necessary to achieve target doses. While studies have demonstrated that outpatient disease-management programs improve treatment rates with cardiovascular protective therapies, these programs often draw only a small, selected proportion of the patients with acute MI from the health care delivery system.[36] In-hospital initiation of therapy can help to ensure that all of the cardiovascular protective medications are started in patients who will not have access to specialized outpatient preventative-cardiology and disease-management programs. Outpatient systems to ensure appropriate monitoring of patients and up-titration of medical therapy to target doses remain essential for patients who will not be followed in a specialized program. However, patients would still be expected to fare better on the doses started in the hospital than they would if the therapy had never been initiated.[29]

Early Benefits of Cardiovascular Protective Medications

Beyond the long-term benefits of improved treatment use, in-hospital initiation of cardiovascular protective medications may also be associated with a reduction in cardiovascular events or mortality in the short term. While the early use of antiplatelet and ß-blocker therapy is beneficial, evidence also exists that the survival curves significantly diverge within 48 hours when ACE inhibitors are initiated within the first 12 to 24 hours of acute MI.[37] Recent evidence also supports the short-term benefits of in-hospital initiation of statins.[38] Early initiation of carvedilol therapy benefitted patients with severe heart failure in the first 8 weeks after initiation.[39] As patients discharged after acute MI are at high risk for recurrent nonfatal and fatal cardiovascular events, early initiation of antiplatelet, ß-blocker, ACE inhibitor, and statin therapy can ensure that the patient will benefit from the risk reduction provided by these cardiovascular protective medications.

Conclusions

Despite compelling scientific evidence of the benefits of antiplatelet, ß-blocker, ACE inhibitor, and lipid-lowering therapy, a substantial proportion of patients after acute MI is not on treatment with these evidence-based, guideline-recommended therapies. It has been clearly documented that not enough has been done to change this situation. Projecting available data nationwide, in the year 2002 over half of the patients discharged after MI and

Early initiation of carvedilol therapy benefitted patients with severe heart failure in the first 8 weeks after initiation.

lacking relevant contraindications or intolerance were not treated with all four of the key classes of medications. Under conventional management, less than 20% of patients discharged without one or more of the cardiovascular protective medications will be started on these drugs on an outpatient basis.[14,29] The evidence from recent trials and clinical studies provides a compelling argument for prescribing a combination of cardiovascular protective medications in the hospital as part of a systematic approach to prevent remodeling and address the underlying atherosclerotic vascular disease process. Hospital-based systems to ensure initiation of cardiovascular protective therapies have been demonstrated to improve treatment rates, long-term patient compliance, and clinical outcomes in patients with acute MI. Widespread application of hospital-based cardiovascular protective treatment–initiation programs for acute MI could dramatically increase treatment rates with these proven, cost-effective therapies and thus substantially reduce the risk of recurrent cardiovascular events, heart failure, and hospitalizations in the large number of patients hospitalized with acute MI and save as many as 21,000 additional lives every year. ■

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Main Points

- Following acute myocardial infarction (MI), patients face a high risk of recurrent cardiovascular events, hospitalizations, heart failure, and mortality.
- Antiplatelet therapy, ß-blockers, angiotensin-converting enzyme (ACE) inhibitors, and statins all reduce cardiovascular risks following acute MI, and their effects are additive.
- In-hospital initiation of aspirin, ß-blocker, ACE inhibitor, and lipid-lowering therapy has been shown to improve treatment rates, long-term patient compliance, and clinical outcomes in patients with acute MI and is now recommended as the standard of care in patients with coronary heart disease.
- Despite these findings and national guidelines, a substantial proportion of post-MI patients is not receiving these medications.
- Reasons for the under-use of these medications include the reluctance of physicians to prescribe ß-blockers to post-MI patients with left ventricular dysfunction and/or symptoms of heart failure; however, recent studies suggest that the ß-blocker carvedilol is safe and effective in these patients.
- Widespread implementation of hospital-based cardiovascular protective treatment–initiation programs for acute MI could dramatically increase treatment rates with these therapies and thus substantially reduce the risk of recurrent cardiovascular events, heart failure, and hospitalizations in the large number of patients admitted for acute MI every year.

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