Acute coronary syndrome (ACS) is a common condition encountered in the hospital setting and has the potential to result in a high rate of morbidity and mortality. Extensive research and the development of effective treatments have reduced the risk of adverse outcomes in ACS. Despite the existence of evidence-based guidelines for ACS management, many institutions do not demonstrate consistent adherence to these guidelines. Critical pathways for ACS management have been developed to achieve ACS care that is reflective of evidence-based medicine, and institutions that adopt these pathways have demonstrated improved outcomes in ACS. This article will highlight the clinical trial evidence supporting critical pathways in ACS management and will address some of the potential barriers to the effective adoption of institution-specific treatment protocols. The role of the hospital pharmacist in the implementation of ACS critical pathways also will be discussed.

(Adv Stud Pharm. 2007;4(7):186-191)
tics, and laboratory tests; pocket cards summarizing recommended medications and guidelines for staff members; a critical pathway of daily activities for nursing staff; a standard patient information sheet; a patient discharge contract, including a checklist of items to review with patients; a chart to track the institution’s overall performance; and chart stickers to alert staff members of appropriate care protocols. Researchers reported that in the 5 hospitals included in the Michigan study, 1 or more of these tools were used in 93% of patients, and standard orders were used in 82% of patients. The use of the tools offered by the initiative correlated with a significantly higher rate of adherence to discharge quality indicators, including aspirin use, angiotensin-converting enzyme (ACE) inhibitor use, smoking cessation counseling, and dietary counseling. Another analysis of the ACC GAP initiative within the Loyola University Health System reported that real-time implementation of the GAP tools resulted in fewer rehospitalizations for heart disease, incidents of MI, and incidents of the combined endpoint of death/cerebrovascular accident/MI during the 6 months after discharge.

**The CRUSADE Registry**

Large-scale registries are also under way to track the relationship between quality of care and adherence to established treatment guidelines. The Can Rapid Risk Stratification of Unstable Angina Patients Suppress Adverse Outcomes with Early Implementation of the ACC/AHA Guidelines (CRUSADE) initiative sought to determine the relationship between early invasive management strategies for non-ST-segment elevation (NSTE) ACS, which are recommended by ACC/AHA guidelines for NSTE ACS, and mortality risk in a population of 17,926 patients. A significant decrease in mortality risk (2% vs 6.2%) was observed in those undergoing an early invasive management strategy within 48 hours of presentation compared with those who did not receive early intervention. The authors noted that early invasive strategies were more likely to occur in younger patients who had been under the care of a cardiologist before presentation, suggesting that quality improvement efforts should focus on education for non-cardiology staff members responsible for managing patients with NSTE ACS. Another analysis of the CRUSADE registry found that patients who were overweight and obese were more likely to receive early invasive strategies because of a perception of higher overall risk. The more aggressive strategies used in patients who were overweight and obese in the CRUSADE registry resulted in superior outcomes compared with patients who were underweight or of normal weight. Researchers concluded that although obesity predisposes patients to develop ACS at an earlier age, excess weight also is associated with the use of more aggressive strategies that improve outcomes.

**The GRACE Registry**

The Global Registry of Acute Coronary Events (GRACE) continuously tracks the care of patients with ACS treated in institutions worldwide. In an analysis of the first 11,543 patients enrolled in the registry, investigators reported that more than 91% received the recommended aspirin or other antiplatelet therapy on admission. Meanwhile, use of percutaneous coronary intervention, glycoprotein IIb/IIIa inhibitors, and calcium channel blockers was significantly higher (P < 0.01) in teaching hospitals and those with on-site catheterization facilities. Teaching and non-teaching hospitals prescribed ACE inhibitors at discharge at similar rates, but institutions without onsite catheterization facilities were significantly more likely to prescribe ACE inhibitors at discharge than those with catheterization facilities (P < 0.0001, 57% vs 50%, respectively). Statin and β blocker discharge prescriptions were also lower in non-teaching hospitals and those without catheterization facilities (P < 0.0001). An observational outcomes analysis of the GRACE registry, conducted from 1999 to 2006, reported that improvements in adherence to evidence-based management strategies in patients with ACS over the period studied was associated with significant reductions in the risk of new heart failure (9% reduction in patients with ST-segment elevation MI [STEMI] and 6.9% reduction in non–ST-segment elevation MI [NSTEMI]) and mortality during hospitalization (18% reduction in STEMI and 0.7% reduction in NSTEMI), as well as stroke (0.8% in STEMI and 0.7% in NSTEMI) and subsequent MI (2.8% in STEMI) in the 6 months following hospital discharge. However, another GRACE analysis revealed a persistent risk of adverse outcomes, including mortality and rehospitalization for cardiovascular events, in the 6 months following hospital discharge. Investigators concluded that more aggressive management and post-discharge follow-up may be needed to improve long-term outcomes.
The FINACS Study

A Finnish prospective nationwide study on ACS (FINACS) evaluated adherence to treatment guidelines in ACS, especially among patients with diabetes. Researchers reported a significantly higher risk of a composite endpoint of death, new MI, refractory angina, or hospital readmission in patients with diabetes compared to those without diabetes (39% vs 20%, P < .0001). Despite the higher risk demonstrated in patients with diabetes, the use of recommended therapies, including glycoprotein IIb/IIIa inhibitors and statins, was similar in patients with diabetes and those without diabetes. Moreover, patients with diabetes were more likely to be subjected to delays in interventional procedures and were more likely to not receive interventional procedures during hospitalization.12 These data suggest that education may be needed to improve adherence to evidence-based treatments in populations at higher risk of poor outcomes in ACS, including patients with diabetes. A follow-up study conducted by the FINACS investigators reported that targeted educational initiatives facilitated adherence to evidence-based treatments compared with care provided by those who did not receive the targeted education, which resulted in both improved in-hospital (95% vs 90%, P = .05) and 6-month (89% vs 78%, P = .05) survival in high-risk patients.13

Available Tools for Protocol-Driven Care

Institutions can make use of a variety of important tools to improve adherence to evidence-based treatment guidelines.

CRUSADE Registry Tools

The CRUSADE registry offers institutions standard tools for use in streamlining care, including guideline-based standing orders and a discharge instruction form.14 The standing orders allow clinicians to check off recommended diagnostic studies, such as echocardiography and laboratory orders. The form also lists categories and dosages of ACC/AHA recommended pharmacologic therapies to be administered on diagnosis, including antiplatelet therapies, nitrates, morphine, and β blockers. The pharmacologic and interventional recommendations for early invasive strategies and early conservative strategies also are presented in detail to facilitate the appropriate use of pharmacologic support before and after the interventional procedure.14 The CRUSADE discharge form reviews recommended prescriptions on discharge, smoking cessation counseling, exercise plans, and secondary prevention strategies, such as diabetes follow-up, dietary counseling, and lipid control.14 The CRUSADE tools have been proven to be very useful, and during the 5 years since the initial release of the ACC/AHA guidelines for NSTE ACS, adherence to class I recommendations has significantly improved among hospitals participating in CRUSADE, with a 5% increase in the in-hospital use of antiplatelet agents, a 12% increase in in-hospital β blocker use, a 13% increase in glycoprotein IIb/IIIa inhibitors, a 22% increase in the use of clopidogrel at discharge, and an 11% increase in discharge statin therapy.15 These tools are available at the CRUSADE Web site (http://www.crusadeqi.com/Main/QIToolbox_OpTools_StandOrd.shtml).

The STRIVE Program

The Strategies and Therapies to Reduce Ischemic and Vascular Events (STRIVE) program was developed to keep clinical practices current in an environment of rapid advancements in the care of ACS, stroke, and peripheral arterial disease. These efforts resulted in the development of the ACS Critical Pathways Toolkit, which was designed to assist institutions in implementing an evidence-based critical pathway for ACS from admission through discharge. The STRIVE initiative also developed an ACS Critical Pathways flowchart (Figure) to facilitate the institutional implementation of evidence-based practices. STRIVE tools include critical pathways broken down by day of admission, critical pathways for the emergency setting, critical pathways for the cardiac care unit (CCU), and a summary of important therapeutic reminders in patients undergoing catheterization.16

Institute for Clinical Systems Improvement

The Institute for Clinical Systems Improvement (ICSI) has likewise developed a healthcare order set for admission to the CCU for ACS. A detailed ICSI order set, most recently revised in October 2006, is available through the ICSI Web site (www.icsi.org). The order set prompts clinicians to report admission data, including vital signs and known medication allergies; nursing orders that address oxygen use, glucose screening, and depression screening; strategies to reduce the in-hospital risk of venous thromboembolism; diet; medications to address symptoms; laboratory orders;
and discharge planning. The use of antiplatelet agents, β blockers, ACE inhibitors, statins, nitrroglycerin, and narcotics also are covered in the ICSI order set.17

LIMITATIONS TO PROTOCOL IMPLEMENTATION

Although many clinicians and hospital staff understand the importance of protocol-driven healthcare in ACS, important barriers have been identified that limit the widespread implementation of critical pathways in ACS management. A systematic review of protocol-driven quality improvement efforts in ACS found that several factors contributed to the lack of protocol adoption. Lack of clinician awareness, familiarity, and agreement with guidelines had a significant impact on the adoption of and adherence to standardized treatment protocols. Researchers proposed that clinicians may encounter important time constraints, a lack of resources dedicated to quality improvement, and substantial difficulty in changing practice patterns that all contribute to hinder the adoption of protocol-driven care.4 Likewise, the lack of standardized protocols in some institutions may prevent the widespread adoption of best practices in ACS. Systematic reviews of studies that focused on quality improvement in ACS concluded that a multifaceted approach incorporating educational initiatives, quality standards, and regular performance feedback is needed to achieve widespread protocol adoption and long-term improvements in patient care.4

It is important to note that clinicians are often uncomfortable depending solely on standard treatment protocols in patient management, especially in the treatment of complex conditions such as ACS. Clinicians may feel unnecessarily constrained by detailed treatment pathways. Although each patient should certainly be managed as an individual, the presence of standardized critical pathways should not restrict clinicians from providing the care that they think is the best for the patients. Critical pathways should aim to provide consistent, high-quality care to all patients. Moreover, in a complex healthcare system, in which multiple staff members are caring for patients, critical pathways should minimize miscommunication and cases of patient mismanagement. The healthcare environment is rapidly changing as many payers consider pay-for-performance initiatives that link performance benchmarks, often represented by best practices and standard protocols, with payment rates. Although clinicians may resist initiatives that compare care delivery between providers, institutions will increasingly demand that best practices are reflected in daily care. It is clear that educational initiatives and major institu-

---

This flowchart is a template for an ACS management algorithm that incorporates the updated ACC/AHA Guidelines for UA/NSTEMI. It should be used as a starting point to customize critical pathways for ACS at your hospital. As an implementation tool (modified or used as-is), it offers helpful reminders to all personnel involved in the treatment of the patient with suspected STEMI or UA/NSTEMI. The pathway includes risk stratification criteria based on ECG, cardiac markers, and TIMI risk score. For acute management of UA/NSTEMI, initial medical treatment should include aspirin, clopidogrel, either heparin or LMWH, β blockers, and nitrates. Then, risk stratification can be applied, and for high-risk patients (eg, ST-segment changes, positive troponin, or TIMI risk score ≥3), the above-mentioned medications plus GP IIb/IIIa inhibition and an early invasive strategy are beneficial

ACC/AHA = American College of Cardiology/American Heart Association
ACEI = angiotensin-converting enzyme inhibitor
ACS = acute coronary syndrome
BP = blood pressure
CK-MB = creatinine kinase-MB
ECG = electrocardiogram
ED = emergency department
ETT = exercise tolerance testing
GP = glycoprotein
IV = intravenous
LMWH = low-molecular weight heparin
NSTEMI = non-ST-segment elevation myocardial infarction
PCI = percutaneous coronary intervention
R/O = rule out
STEMI = ST-segment elevation myocardial infarction
STRIVE = Strategies and Therapies to Reduce Ischemic and Vascular Events
TIMI = thrombolysis in myocardial infarction
UA = unstable angina

tional cultural shifts may be necessary before the widespread adoption of critical pathways is realized.

**ROLE OF PHARMACISTS IN ESTABLISHMENT OF INSTITUTIONAL ACS CRITICAL PATHWAYS**

Hospital pharmacists can play a significant role in the development of critical pathways, specifically in the development of institution-specific, preprinted medication treatment orders when standard protocols are developed. Pharmacy staff members are also responsible for therapeutic monitoring of recommended medications in ACS management. This includes ensuring that optimal doses of medications are administered, as well as monitoring and managing any adverse effects experienced by patients.

Hospital pharmacists can likewise assist in improving the adoption of evidence-based, protocol-driven healthcare that makes use of critical pathways by providing education to the multidisciplinary healthcare team regarding the pathways, as well as performing medication utilization evaluations to ensure that medication use is consistent with evidence-based guidelines. As demonstrated by the materials developed through the CRUSADE and STRIVE initiatives, preprinted orders are commonly used to standardize treatment and encourage institutional protocol adoption. Other decision support tools, backed by evidence-based treatment recommendations, have demonstrated the ability to improve adherence to standard pharmacologic order sets. Hospital pharmacists also can play a prominent role in ensuring that standard pharmacologic order sets continue to be updated and reflect current treatment guidelines, and that order sets are adaptable to the institution’s current policies and procedures.

**CONCLUSIONS**

It is now well recognized that evidence-based treatment of ACS improves patient outcomes. The use of critical pathways streamlines care and ensures that the institution as a whole follows best practices in ACS. Hospital pharmacists play an important role in developing the treatment orders that are needed under a protocol-driven system of care. Although institution-wide educational strategies and overhauls in standard practices may be needed to bring about change, these efforts are worthwhile and have demonstrated the ability to improve patient outcomes.

**REFERENCES**


