ABSTRACT

Institutions face a substantial challenge in the management of acute coronary syndrome (ACS) as evidenced by its increasing prevalence and potential to incur substantial health risks and treatment costs. Substantial quality gaps in the delivery of evidence-based care in ACS suggest that standardized protocols are needed to encourage the institution-wide adoption of best practices. Critical pathways have been proposed to facilitate the process of protocol implementation across the entire continuum of ACS care. This article will address the current gaps in ACS care and the evidence supporting a need for standardized protocols and critical pathways in ACS. The role of the hospital pharmacist in driving the development and adoption of critical pathways in ACS also will be discussed.


Acute coronary syndrome (ACS) is a relatively common cardiovascular condition that inflicts a substantial burden on the US healthcare system. More than 1.5 million hospital discharges in 2004 were attributable to ACS, including 840 000 in which ACS was the first-listed diagnosis. Of patients presenting with ACS, approximately 57% are diagnosed with myocardial infarction (MI), and 43% are diagnosed with unstable angina (UA). Non–ST-segment elevation MI accounts for 63% of MI cases, whereas ST-segment elevation MI (STEMI) is diagnosed in approximately 37% of MI cases. In patients aged 40 years and older who are diagnosed with a first MI, 33% of men and 43% of women will die within 5 years of diagnosis. ACS events result in $400 billion in estimated annual healthcare costs within the first year of diagnosis, of which 71.3%, or $285 billion, is directly attributable to hospitalization costs.

Despite the critical nature of ACS in terms of costs and the potential for long-term morbidity and mortality, many institutions do not provide standardized, evidence-based care in ACS management. Critical pathways can be used as effective tools to streamline care and encourage protocol adoption in ACS. Hospital pharmacists play an important role in the creation and implementation of these critical pathways. This article will address the need for protocol-driven, standardized care in ACS and the role of the hospital pharmacist in developing critical pathways to achieve consistent care and superior patient outcomes.

GAPS IN QUALITY OF CARE FOR ACS

Despite the existence of evidence-based treatment guidelines for ACS that were developed by the American College of Cardiology (ACC) and the American Heart Association (AHA), many institutions have not adopted standard protocols for ACS.

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management. The National Registry of Myocardial Infarction (NRMI) has reported that although the use of recommended pharmacologic agents, including antiplatelet agents, β blockers, and angiotensin-converting enzyme (ACE) inhibitors, substantially increased from 1994 to 1999, more than 25% of eligible patients still do not receive reperfusion therapy in clinical practice. Targeted educational campaigns through the NRMI initiative did not substantially improve time from symptom onset to hospital arrival from 1990 to 1999, despite the existence of clinical guidelines that stress the importance of early, effective care for ACS.

The Can Rapid Risk Stratification of UA Patients Suppress Adverse Outcomes with Early Implementation of the ACC/AHA Guidelines (CRUSADE) registry has likewise reported that patients are not consistently managed according to best practices. Although an early invasive strategy is recommended for eligible patients presenting with non–ST-segment elevation (NSTE) ACS, the CRUSADE investigators found that the majority of high-risk patients, including older patients with substantial comorbidities, did not receive early invasive care. Furthermore, patients treated with an early invasive strategy were more likely to receive evidence-based pharmacologic management and had a lower risk of in-hospital mortality.

The CRUSADE registry also reported important trends in prescribing habits that may complicate treatment of ACS. Excessive dosing of antiplatelet and antithrombin agents was observed, with 42% of patients receiving at least one dose of antithrombotic agent that was beyond the recommendation range of dosing. Excessive doses were administered to 32.8% of patients receiving unfractionated heparin, 13.8% of patients receiving low-molecular weight heparin, and 26.8% of those receiving platelet glycoprotein IIb/IIIa inhibitors. Patients who received excessive doses of antithrombotic agents had a higher risk of major bleeding, and bleeding risk increased proportionately with the degree of excess dosing and the number of antithrombotic agents administered in excess. Mortality risk and length of stay also were increased in patients who received excess antithrombotic dosing. The Joint Commission has recognized the risk posed by inappropriate anticoagulant use and has included anticoagulant prescribing recommendations in its proposed National Patient Safety Goals and Requirements for 2008.

Evidence-based treatment guidelines also recommend prompt treatment after symptom onset. Public educational interventions have aimed to shorten the time from symptom onset to hospital arrival, but have demonstrated limited success. The Rapid Early Action for Coronary Treatment trial investigated the impact of an 18-month education campaign in specific communities that made use of mass media, community advocacy groups consisting of specialists and leaders of locally based health organizations, professional education campaigns, public education, and patient education focused on shortening the time between symptom onset and hospital arrival or emergency medical services (EMS) intervention. Despite the implementation of this widespread educational initiative, the average time between symptom onset and hospital presentation did not change considerably between targeted communities and control communities, with a decrease in delay time of 4.7% in targeted communities and 6.8% in control communities (P = .54). However, there was a significant 20% increase in the use of EMS in targeted communities compared to control communities.

The time between diagnosis and treatment is also predictive of outcomes in ACS and has been identified as an appropriate target for quality improvement in ACS. Early, effective management after ACS diagnosis is critical to realize the best patient outcomes. Mortality risk increases substantially with every 30 minutes that elapse between diagnosis and treatment, and the NRMI registry has identified the time taken to make treatment decisions contributes substantially to treatment delays. Standardized protocols may reduce the need for drawn-out consultations before treatment and may demonstrate the ability to ameliorate treatment delays.

CRITICAL PATHWAYS AND THE ADVANCEMENT OF ACS CARE

With the advent of managed care in the 1980s, critical pathways were developed to streamline care and control costs without sacrificing quality of care. Critical pathways identify important targets of care for patients presenting with specific disease states. Unlike clinical treatment guidelines, which usually identify appropriate care for a specific medical indication, critical pathways usually standardize the adoption of evidence-based treatment guidelines for a medical condition. Critical pathways often include tools to track compliance with
guidelines, patient outcomes, and continuous quality improvement. Furthermore, critical pathways can help train clinicians to provide efficient and clinically appropriate care. Critical pathways are designed to balance quality of care and cost control by targeting high-volume, high-cost, or high-risk conditions or procedures. ACS is a condition that meets these criteria and is amenable to care through critical pathways.

Research findings support the use of standard protocols that are facilitated through critical pathways. In the CRUSADE registry, guideline adherence was found to significantly reduce the risk of in-hospital mortality in patients admitted for ACS (Figure). Furthermore, a multidisciplinary AHA panel has recognized the value of developing standardized systems of care and regional cooperative networks for the effective management of STEMI. Institutions that do not conduct ACS management according to standardized protocols may benefit considerably from the adoption of critical pathways to streamline care.

**IMPROVING CLINICAL DECISION MAKING IN ACS**

In addition to the ACC/AHA treatment guidelines for ACS, important performance measures have been identified that can be integrated into critical pathways for ACS. Performance measures are used to track an institution's quality of care and compare care quality between institutions.

The Joint Commission has identified quality performance measures for high-volume conditions, including acute MI. Both the Joint Commission and the Centers for Medicare and Medicaid Services (CMS) use these performance measures to track institutional care quality. The Joint Commission core measures (Table 1) identify important prescribing targets, including the use of aspirin, ACE inhibitors, β blockers, and time to reperfusion therapy. The performance measures also address the amount of time that elapses between hospital arrival and the administration of fibrinolytic therapy, as well as the time that elapses before interventional procedures (primary percutaneous coronary intervention) are initiated, as substantial time lags can be important predictors of morbidity and mortality. As CMS and other healthcare payers consider pay-for-performance initiatives that would link performance with reimbursement structures, institutions are increasingly interested in developing care protocols that reflect these quality performance measures.

**Table 1. Joint Commission National Quality Measures for Acute Myocardial Infarction**

<table>
<thead>
<tr>
<th>Measure ID#</th>
<th>Quality Measure</th>
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<tbody>
<tr>
<td>AMI-1</td>
<td>Aspirin at arrival</td>
</tr>
<tr>
<td>AMI-2</td>
<td>Aspirin prescribed at discharge</td>
</tr>
<tr>
<td>AMI-3</td>
<td>ACE inhibitor or ARB for LVSD</td>
</tr>
<tr>
<td>AMI-4</td>
<td>Adult smoking cessation advice/counseling</td>
</tr>
<tr>
<td>AMI-5</td>
<td>β blocker prescribed at discharge</td>
</tr>
<tr>
<td>AMI-6</td>
<td>β blocker at arrival</td>
</tr>
<tr>
<td>AMI-7</td>
<td>Median time to fibrinolysis</td>
</tr>
<tr>
<td>AMI-7a</td>
<td>Fibrinolytic therapy received within 30 min of hospital arrival</td>
</tr>
<tr>
<td>AMI-8</td>
<td>Median time to primary PCI</td>
</tr>
<tr>
<td>AMI-8a</td>
<td>Primary PCI received within 90 min of hospital arrival</td>
</tr>
<tr>
<td>AMI-9</td>
<td>Inpatient mortality</td>
</tr>
<tr>
<td>AMI-T1a</td>
<td>LDL-C assessment</td>
</tr>
<tr>
<td>AMI-T2</td>
<td>Lipid-lowering therapy at discharge</td>
</tr>
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</table>

In response to the current focus on tools to track institutional quality of care, clinical performance measures for ACS also have been developed by the ACC/AHA. Eleven ACC/AHA performance measures have been identified that address the care of NSTE ACS and STEMI. The majority of the ACC/AHA quality measures are identical to those identified by the Joint Commission and CMS. Similar to the performance measures used by CMS, the ACC/AHA measures also monitor the number of patients assessed for low-density lipoprotein cholesterol levels and those receiving lipid-lowering therapy at discharge. In addition, the ACC/AHA performance measures track the number of eligible patients with STEMI who receive any reperfusion therapy with medical management or intervention-al procedures during hospitalization, thus institutions can detect and remedy situations in which reperfusion therapy with medications or intervention is underused.15

In ACS, critical pathways linked to patient outcomes can help institutions achieve consistent quality assurance and improve patient outcomes in ACS. Importantly, critical pathways can focus on reductions in hospital arrival times and time between arrival and intervention, both of which are reflected in the Joint Commission and ACC/AHA performance measures and can have a significant impact on mortality risk. Likewise, critical pathways can target prescribing habits, with goals of reducing inappropriate prescribing habits and increasing the use of recommended medications, including antiplatelet therapy, fibrinolytic therapy, ACE inhibitors, and β blockers. More judicious use of antithrombotic therapy also can be achieved with the implementation of critical pathways. Hospital pharmacists therefore play a central role in developing and implementing institution-specific critical pathways for ACS.

### Critical Pathway Implementation: The Role of Hospital Pharmacists

Hospital pharmacists play a crucial role in the development and implementation of critical pathways in ACS and other conditions that are heavily supported by pharmacologic therapy. The major steps in critical pathway development are presented in Table 2. When pharmacologic treatments feature prominently in proposed critical pathways, hospital pharmacists are involved in many of these steps as the critical pathway is presented to institutional staff and implemented in clinical practice.11 When institutional critical pathways are under development, hospital pharmacists are responsible for developing, reviewing, and revising pharmacy policies and protocols to ensure that consistent care is delivered during the process and that pharmacy procedures reflect the care outlined by the critical pathway. Furthermore, hospital pharmacists are important team members in evaluating critical pathways that focus on appropriate drug use. Pharmacists develop standard order sets to support the pathways that identify rational, evidence-based, cost-effective therapies reflecting departmental and institutional policies. In pathways that focus on pharmacologic treatments or monitoring, it is suggested that pharmacy services, including pharmacotherapy consults and discharge drug counseling, be integrated into the clinical pathway because of the expertise pharmacists provide in integrating evidence-based pharmacotherapy into daily care.11

### Benefits of Standardized Care Through Critical Pathways

Institutions that implement critical pathways in ACS and other high-risk, high-volume conditions can realize many benefits by operating under standardized care protocols. For instance, institutions that make use of critical pathways may be able to demonstrate improved patient

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**Table 2. Major Steps in Critical Pathway Development**

- Identify target patient population, procedure, or disease category
- Educate staff about critical pathways
- Convene a multidisciplinary group of care providers
- Identify ideal key outcomes and corresponding timeline for accomplishment of key outcomes
- Gather information, including chart audits when warranted
- Develop critical pathway based on ideal, realistic, or current standard practice
- Educate staff about the proposed critical pathway and implementation plan
- Implement the critical pathway
- Perform periodic evaluations of the success of the critical pathway
- Add alternatives, interventions, and treatment plans to the critical pathway, when warranted, to improve performance
- Reevaluate the critical pathway after each adjustment

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outcomes after protocol implementation and may likewise be able to demonstrate superior quality of care compared with similar local institutions. Moreover, institutions that demonstrate improved outcomes through the use of critical pathways are more likely to gain support for wider changes in care protocols that reflect best practices and evidence-based medicine.

As mentioned previously, healthcare payers are increasingly considering a change in payment structures that are directly linked to institutional performance in terms of standardized quality measures. Institutions that develop critical pathways that standardize treatments for important high-volume, high-risk conditions, including ACS, would be better equipped to operate in this changing reimbursement environment.

**CONCLUSIONS**

Acute coronary syndrome has the potential to contribute to a high degree of morbidity and mortality risk in the absence of evidence-based treatment strategies that have demonstrated the ability to lower the risk of complications. Standardized institutional treatment protocols are necessary to achieve consistent favorable outcomes in ACS. All institutional staff members, including physicians, pharmacists, and nurses, need to consider the entire continuum of care to realize better patient outcomes. The adoption of critical pathways in ACS can represent an important strategy to improve adherence to evidence-based treatment guidelines and improve patient outcomes.

**REFERENCES**


