Improving the Care of Patients with Non-ST-elevation Acute Coronary Syndromes in the Emergency Department: The CRUSADE Initiative

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Abstract

Although acute coronary syndromes (ACS) represent a well-recognized source of morbidity and mortality for patients with cardiovascular disease, evidence-based therapies shown to improve outcomes for ACS are frequently underused in appropriate patients, especially in the emergency department (ED). Despite dissemination of expert recommendations from the American College of Cardiology/American Heart Association (ACC/AHA) and ED-focused recapitulation of them in the emergency medicine literature, significant barriers continue to limit the adoption of guidelines in clinical practice and appear to hinder the use of beneficial therapies and interventions in the ED. Unique and creative approaches are therefore needed to stimulate better adherence to practice guidelines and improve the quality of care for patients with non-ST-elevation myocardial infarction (NSTE) ACS. The CRUSADE (*C*an *R*apid Risk Stratification of *U*nstable Angina Patients *S*uppress *AD*verse Outcomes with *E*arly Implementation of the ACC/AHA Guidelines) quality improvement and educational initiative provides an innovative and multifaceted approach to the education of emergency physicians and cardiologists in the care of patients with NSTE ACS. The CRUSADE initiative is a multidisciplinary cooperative effort involving over 400 EDs and medical centers. It includes an ACS registry designed to characterize demographic patterns and risk stratification results in patients who meet diagnostic criteria for high-risk NSTE ACS. It also measures the use of ED treatment modalities including aspirin, heparin, beta-blockers, and platelet inhibitors as recommended in the ACC/AHA guidelines. The results of a given institution's treatment patterns will be reported back to the practitioners, with comparisons with national norms. These reports can be used as quality improvement tools to improve care at participating institutions. Beyond a static registry, these reports are coupled with educational efforts by the CRUSADE steering committee, scientific publications of risk stratification practice and success, as well as ED patterns of care, and tailored educational interventions, to reinforce compliance with the ACC/AHA guidelines. This initiative represents a truly innovative approach to improving care for ACS patients in the ED as well as on the cardiology service. This article describes the CRUSADE initiative and its implications for the practicing emergency physician. It is the intent of CRUSADE to improve patient care in the ED by tracking and encouraging compliance with evidence-based guidelines for the evaluation and management of NSTE ACS. **Key words:** CRUSADE; acute coronary syndromes; evidence-based guidelines; compliance; practice guidelines; quality. ACADEMIC EMERGENCY MEDICINE 2002; 9:1146–1155.

PRACTICE GUIDELINES AND MODIFICATION OF PHYSICIAN BEHAVIOR

Emergency physicians have for many years focused their evaluation and targeted interventions for chest pain on acute ST-segment-elevation myocardial infarction (STEMI, or AMI). Recent advances both in the understanding of pathophysiology and aggressive management of non-ST-segment-elevation chest pain [encompassing non-ST-segment-elevation myocardial infarction (NSTEMI) and unstable angina (UA), or collectively non-ST-elevation acute coronary syndromes (NSTE ACS)] have provided an increased capability to approach these elements of acute cardiovascular disease as well. Large-scale clinical trials have identified numerous beneficial interventions for patients with STEMI that can and should be initiated in the emergency department (ED), such as aspirin, fibrinolytic agents, beta-blockers, and angiotensin-converting enzyme (ACE) inhibitors, but these remain fre-

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quently underutilized for eligible patients with NSTE ACS.[1,2] Studies such as the National Registry for Myocardial Infarction (NRMI-4) indicate that ED use of evidence-based therapies for NSTE ACS, such as platelet glycoprotein IIb/IIIa receptor antagonists, are even less well utilized in the ED.[3]

The American College of Cardiology/American Heart Association (ACC/AHA) Guidelines for the Management of Unstable Angina/Non-ST-Elevation Myocardial Infarction (2000, updated on the World Wide Web in 2002[4]) were promulgated in an effort to standardize and optimize the evaluation, diagnosis, and management of patients with NSTE ACS and to provide physicians with a framework for clinical decision making.

Practice guidelines for the treatment of STEMI[5] and NSTE ACS[4] developed by the ACC and AHA represent an effort to standardize the ED-based and inpatient care of patients with chest pain of ischemic origin based upon evidence from broad clinical experience. These guidelines were recapitulated in the ED-focused medical literature in September 2001.[6,7] It is recognized from past experience, however, that dissemination of guidelines has only a limited effect on clinician behaviors unless they are accompanied by other focused educational efforts and directed feedback.[8–10] Cabana et al.[10] conducted a literature review to determine the barriers to adoption of practice guidelines in clinical practice. The barriers they identified included lack of awareness, lack of familiarity, lack of agreement, lack of self-efficacy, lack of outcome expectancy, inertia of previous practice, and external barriers. Of these barriers, lack of awareness and lack of familiarity are best remedied by educational initiatives, while lack of self-efficacy and lack of outcome expectancy are best remedied by providing continuous feedback on guideline adherence and patient outcomes data, respectively. Cabana and colleagues identified lack of awareness as the predominant barrier to implementation of guidelines, and recommended educational approaches that incorporate educational and feedback strategies to augment guideline adherence.

Multiple strategies designed to change physician behavior have been evaluated, but success rates have been highly variable. Interventions designed to enhance physician education such as continuing medical education conferences and printed materials have been shown to have little impact upon improving physician performance.[11,12] Reminder systems such as critical care pathways or computerized support programs, patient-oriented interventions, and the use of local opinion leaders in the education of physicians are strategies that have generally been shown to improve adherence to practice guidelines.[11–14] Further success has been demonstrated when feedback was provided to physicians regarding their performance according to quality indicators.[15] A randomized trial confirmed that improvements in patient care were greater when physicians were motivated by feedback provided according to achievable benchmarks for care (based upon top-performing practices) compared with longitudinal physician-specific feedback.[16] Despite the benefits of these single interventions, systematic reviews have concluded that combined or multifaceted quality improvement interventions have the greatest likelihood of successfully changing physician behavior.[11,12]

While a comprehensive approach to quality improvement appears to the best strategy for improving the use of evidence-based therapies, institutional and methodological obstacles must be overcome to ensure sustained improvement in patient care. A prospective study identified characteristics associated with improved use of beta-blockers for patients with STEMI, including shared goals for quality improvement, sustained administrative support for quality improvement initiatives, strong leadership from physician champions, and high-quality, rapid-cycle data feedback.[17] Institutional characteristics appear to strongly influence the outcomes of interventions designed to improve care, so rigorous research methods are needed to identify the key determinants of success with quality improvement studies. However, quality improvement studies are often limited by inadequate statistical power, difficulties in defining baseline performance measures, uncertainty regarding the optimal duration of time needed to assess the effect of an intervention, problems applying local results to regional and national practice, and inability to determine the differential impact of the components of multifaceted quality improvement strategies. As quality improvement studies continue to evolve, these challenges must be surmounted to develop evidence-based strategies for implementing practice guidelines and defining quality standards.

In STEMI, the effectiveness of the AHA/ACC STEMI guidelines was augmented by the National Heart Attack Alert Program, which was widely publicized in the emergency medicine literature.[18] This national emergency medicine education program, funded by industry and the federal government, resulted in increased awareness of the guidelines, reduction of door-to-drug times, and a reduction mortality from STEMI. Results from the National Registries of Myocardial Infarction (NRMI) also demonstrated consistent improvements in the use of aspirin, beta-blockers, and ACE inhibitors and more rapid administration of fibrinolytic therapy during the last decade in associa-

tion with NRMI-published results and educational endeavors based on NRMI data.[1]

Although many quality improvement (QI) initiatives designed to assess physician and institutional compliance with practice guidelines and motivate health care providers to improve the use of evidence-based therapies and interventions are already in place for STEMI,[19] less attention has been devoted to assessing the quality of care of the much larger, and more diverse population of patients with NSTE ACS.[4–7,20–22] Patients with NSTE ACS are older and more heterogeneous compared with patients with STEMI, and in ED populations the proportion of patients presenting with NSTE ACS is rapidly expanding.[1–3] The Agency for Health Care Policy and Research (AHCPR) initially published guidelines together with the ACC and AHA for the treatment of patients with unstable angina in 1994 to help clarify treatment strategies in this diverse patient population.[23] However, despite educational initiatives following publication of the AHCPR guidelines, beneficial medical therapies continued to be underutilized for patients with NSTE ACS.[2,24–26] Unfortunately, physician characteristics and treatment biases also appeared to impact adversely the quality of care for patients with NSTE ACS.[27–30]

The initial evaluation and treatment of patients with suspected ischemic chest pain in the ED has traditionally focused on the prompt identification and treatment of patients with STEMI given the time-dependent benefits of reperfusion therapy.[31] Whereas STEMI patients are readily identified with an initial ECG, the diagnosis of NSTE ACS is often uncertain upon initial hospital presentation. Dynamic risk stratification strategies are used in the ED to identify chest pain patients who subsequently manifest high-risk characteristics indicative of NSTE ACS.[4] These high-risk clinical findings (Table 1) are prognostic of morbidity and mortality but also predictive of response to aggressive treatment.[4,32,33] Because the treatment of NSTE ACS is invariably linked to the diagnostic strategy utilized in the ED, the AHCPR practice guidelines were recently revised to incorporate improved risk stratification tools and new treatments for the acute management of NSTE ACS.[4–7] Therefore, the major challenges to implementing practice guidelines for NSTE ACS are linking risk stratification strategies to early therapeutic intervention and overcoming treatment biases and institutional obstacles that hinder the use of beneficial therapies. The dynamic nature of this patient identification strategy also demands the cooperative involvement of both emergency medicine and cardiology, since either specialty may be involved in patient identification and initiation of treatment along a time continuum.

TABLE 1. High-risk Clinical Features for Adverse Outcomes in Patients with Chest Pain and Presumed Non-ST-elevation Acute Coronary Syndromes (NSTE ACS)[1]

1. Accelerating tempo of anginal symptoms over 48 hours
2. Prolonged or ongoing rest pain
3. Pulmonary edema secondary to ischemia
4. New or worsening MR murmur
5. S3 or worsening rales
6. Hypotension
7. Bradycardia
8. Tachycardia
9. Age >75 years
10. ST deviation on electrocardiogram (ST depression or transient elevation)
11. New bundle branch block
12. Sustained ventricular tachycardia
13. Elevated serum cardiac markers (creatine kinase-MB or troponin)

The CRUSADE (*C*an *R*apid Risk Stratification of *U*nstable Angina Patients *S*uppress *AD*verse Outcomes with *E*arly Implementation of the ACC/AHA Guidelines) quality and educational initiative was designed to provide a multifaceted approach to the education of emergency physicians in the care of patients with NSTE ACS. The CRUSADE initiative is novel in that it: 1) targets patients with NSTE ACS, a previously underrepresented population; 2) incorporates a patient registry, educational sessions, and QI data feedback mechanisms as integral pieces of the multifaceted program; and 3) is multidisciplinary, including both cardiology and emergency medicine, in an effort to improve care for ACS patients in the ED and beyond.

THE CRUSADE INITIATIVE

Given the rapidly expanding population of patients with NSTE ACS and the difficulties establishing a link between risk stratification and acute treatments in the ED, novel approaches are needed to improve implementation of diagnostic and treatment guidelines for patients presenting with NSTE ACS. The CRUSADE national quality improvement initiative utilizes a structured collaboration between emergency physicians and cardiologists to improve the care of patients with high-risk NSTE ACS. CRUSADE is a national, prospective, rapid-cycle quality improvement initiative focusing on the diagnostic evaluation of patients with ACS in the ED as well as acute and chronic treatments recommended by the ACC/AHA guidelines for NSTE ACS (Table 2).[4] It consists of a multidisciplinary, multicenter ACS registry and an accompanying national educational program aimed at increasing the use of ACC/AHA recommended therapies.

The CRUSADE NSTE ACS registry is a multidis-

TABLE 2. Recommendations from the ACC/AHA Guidelines for the Management of NSTE ACS[1]*

Medication	Acute Therapies 2000 Guidelines	Acute Therapies 2002 Update	Discharge Therapies
Aspirin (ASA)	IA	IA	IA
Clopidogrel in ASA-allergic patients	IB	IA	IA-B, depending on duration
Clopidogrel, intended medical management	—	IA, ''at admission''	IA-B, depending on duration
Clopidogrel, intended early catheterization/ percutaneous coronary intervention (cath/PCI)	—	IA, time of first dose not specified	IA-B, depending on duration
Heparin (unfractionated heparin or low-molecular-weight heparin)	IB	IA	—
β-blockers	IB	IB	IB
ACE inhibitors†	IB	IB	IA
Glycoprotein (GP) IIb/IIIa Inhibitors for intended early cath/PCI			
Eptifibatide/tirofiban	IA	IA	—
Abciximab	IA	IA	—
GP IIb/IIIa inhibitors for high-risk patients without intended early cath/PCI			
Eptifibatide/tirofiban	IA	IIaA	—
Abciximab		IIIA	
Lipid-lowering agent‡	—		IA
Smoking cessation counseling	—		IB
Dietary modification	—		IB

*IA recommendations are derived from large-scale randomized trials. IB recommendations are derived from smaller randomized trials or carefully conducted observational analyses. IIaA recommendations are issued when evidence from large-scale randomized trials are in conflict, but on balance are supportive of efficacy. IIIA recommendations are issued when evidence from large-scale randomized trials is clearly not supportive of efficacy and may suggest harm. ACC/AHA = American College of Cardiology/ American Heart Association; NSTE ACS = non ST-elevation acute coronary syndromes.
†For patients with persistent hypertension despite treatment, diabetes, congestive heart failure, or asymptomatic left ventricular dysfunction. ACE = angiotensin-converting enzyme.
‡For patients with a low-density-lipoprotein cholesterol level >125 mg/dL.

ciplinary registry, with patient enrollment by emergency physicians, cardiologists, and their study personnel. More than 400 institutions are slated for inclusion in this registry, with a targeted registry population of more than 20,000 patients. In the first three months of the registry, more than 250 sites are actively enrolling patients, 200 more sites are planning to participate, and more than 9,000 patients have been enrolled.

The CRUSADE NSTE ACS registry includes patients who are prospectively identified in the ED as well as those who are retrospectively identified by discharge diagnosis or procedural logs. Patient inclusion criteria listed in Figure 1 include 1) chest pain or anginal equivalent at rest, at least 10 minutes in duration and occurring less than 24 hours prior to presentation; *and* 2) ischemic electrocardiogram (ECG) changes (ST depression or transient ST elevation); *or* 3) elevated levels of markers of myocardial necrosis (creatine kinase-MB or troponin) above baseline levels. Patients transferred into participating hospitals must arrive within 24 hours of their symptom onset to be eligible.

The CRUSADE ACS registry analyzes patient

Chest pain or anginal symptoms of >10 minutes' duration within 24 hours of presentation to the enrolling institution

and

ECG with >1-mV ST-segment depression or transient (<30 minute) ST-segment elevation

or

Elevated serum markers of myocardial necrosis (CK-MB or troponin above baseline)

Figure 1. The CRUSADE non-ST-elevation acute coronary syndromes (ACS) registry inclusion criteria. ECG = electrocardiogram; CK-MB = creatine kinase–MB.

records to determine compliance with ACC/AHA guidelines for patients with NSTE ACS. The data points include those treatment elements listed in Table 2. The patient data collection form is shown in Figure 2. Risk stratification criteria such as ECG and biomarker results are documented for each patient. Exclusion criteria for each therapy (such as medication allergy) are sought to determine optimum utilization of ACC/AHA recommended therapies for eligible patients. Utilization of glycoprotein IIb/IIIa platelet inhibitors (GP IIb/IIIa) is expanded on the Crusade Data Form (Fig. 2) because early initiation of GP IIb/IIIa therapy is a relatively new treatment, of special importance to emergency physicians, which has been linked to improved outcome in patients with NSTE ACS. Timing of therapies is documented for other medications as well in order to differentiate ED utilization from downstream interventions. Patients are also followed throughout their hospitalizations to determine outcomes.

Site-specific registry data on medication utilization rates and process measurements that conform to the ACC/AHA guidelines are compiled and returned to the participating institution on a rapid turnaround quarterly basis. Utilization rates for specific therapies and procedures are compared with national benchmarks, best practice (top 10%) sites, and like hospitals (low versus high patient volume, teaching versus community, presence or absence of catheterization laboratories, geographic locations, etc.). Data are presented in graph form, with comparisons and percentile ranks with national and peer institution norms. Data presentation also includes a breakdown by patient subgroups (diabetics, elders, women, etc.) for more effective targeting of continuous quality improvement (CQI) intervention. Site and timing of medication administration are also graphed. Data are collated into acute care, discharge care, and overall care groupings based on Class I guideline indications for QI feedback to their specific physician groups (ED versus cardiology). Data are fed back to site participants, who can then disseminate the data to their colleagues in cardiology, internal medicine, or emergency medicine.

The CRUSADE initiative is more than just a patient care registry, however. Prior to participation in the CRUSADE registry, clinical site participants and their research personnel undergo a half-day educational session on the ACC/AHA guidelines, their implications in patient care, and the research behind them. These sessions, which have included up to 250 participants, are taught by nationally recognized faculty with experience in ACS research and clinical care. Participants in the CRUSADE registry also have access to the "CRUSADE Initiative Toolbox." This toolbox includes posted placards, pocket cards, order sets, discharge planning forms, and chart indicators, which serve as reminders to site participants regarding risk stratification, patient classification, specific therapies for NSTE ACS and their doses, and discharge planning programs.

In addition to the ACS registry, the CRUSADE initiative utilizes expert faculty and steering committee members to provide educational opportunities for participating institutions and physician groups. Educational symposia were included in the Society for Academic Emergency Medicine (SAEM), ACC, AHA, the American College of Emergency Physicians (ACEP), and the Society of Chest Pain Centers Providers meetings in 2002. Steering committee members were committed to providing educational lectures, utilizing CRUSADE registry data and standardized CRUSADE educational material, to increase compliance with the ACC/AHA guidelines. If regional or site-specific therapy compliance problems are identified by the registry, individual site participants may request a visiting lecturer to provide feedback to the site faculty. This feedback is intended to improve adherence to the ACC/AHA guideline recommendations. National emergency medicine and cardiology meetings and symposia have been identified for presentation of the CRUSADE registry data as an additional educational feedback mechanism. In addition, risk stratification and patient outcomes data from the CRUSADE registry can be analyzed for publication in peer-reviewed journals, further emphasizing the importance of ACC/AHA guideline adherence.

Data analysis and registry feedback reporting for the CRUSADE initiative are coordinated by the Duke Clinical Research Institute in Durham, North Carolina. Funding for the CRUSADE initiative is provided through a grant from Millennium Pharmaceuticals, Inc., in Boston, Massachusetts, and Key ACS Pharmaceuticals in Kenilworth, New Jersey.

TRACKING NSTE ACS RISK STRATIFICATION AND TRIGGERING THERAPY

The ACC/AHA guidelines for NSTE ACS make a number of recommendations for early and aggressive risk stratification that are pertinent to ED practice. These have been summarized previously.[6,7] These guidelines identify patients who are at highest risk for adverse outcomes so that appropriate therapy can be initiated. These high-risk patients are the focus of the CRUSADE initiative. Features identified as "high-risk" in the ACC/AHA guidelines, listed in Table 1, include ST-segment depression or transient ST-segment elevation, elevated biomarkers,

CRUSADE

Site Number: ___ ___ ___ ___ ___ Patient Number: ___ ___ ___ ___

1 History

NO	YES	Check 'No' or 'Yes' for each
☐0	☐1	**Hypertension**
☐0	☐1	**Insulin-treated diabetes mellitus**
☐0	☐1	**Non-insulin-treated diabetes mellitus**
☐0	☐1	**Currently smoking**
☐0	☐1	**Hypercholesterolemia** *(Total Cholesterol > 200 mg/dL or 6 mmol/L or treatment with a lipid-lowering agent)*
☐0	☐1	**Prior MI**
☐0	☐1	**Prior stroke**
☐0	☐1	**Prior CHF**
☐0	☐1	**Peripheral vascular disease**
☐0	☐1	**Prior PCI**
☐0	☐1	**Prior CABG**
☐0	☐1	**Renal insufficiency** *(Known creatinine > 2.0 mg/dL)*

Age: ___ ___ years

Gender: ☐1 Male
☐2 Female → **If female, post-menopausal?** ☐0 No ☐1 Yes

Weight: _____ ☐1 lb ☐2 kg

Ethnic origin: ☐1 Caucasian ☐2 Black ☐3 Asian ☐4 Hispanic ☐5 American Indian ☐6 Pacific Islander ☐98 Other, *specify*: _____

Arrival at enrolling hospital:

Date: ___/___/___ (day/month/year) **Time:** ___:___ (00:00 to 23:59)

Location patient first evaluated: ☐1 Emergency Department ☐2 ICU/Cardiac Floor ☐3 Other/non-cardiac

Transfer from another hospital? ☐0 No ☐1 Yes

2 Signs and Symptoms at Presentation

Onset date and time of ischemic symptoms:

___/___/___ (day/month/year) ___:___ (00:00 to 23:59)

Check all that apply:

☐1 Ischemic symptoms > 10 min duration
☐2 ST (> 0.5 mm) depression
☐3 Transient ST elevation (> 1 mm) for less than 30 min
☐4 Elevated CK-MB
☐5 Elevated troponin I or T
☐6 Positive bedside troponin I assay
☐7 None of the above

Blood pressure: ___/___ (systolic/diastolic) mmHg

Heart rate: ___ bpm

1st 12-lead ECG obtained:

Date: ___/___/___ (day/month/year)

Time: ___:___ (00:00 to 23:59)

Signs of CHF? ☐0 No ☐1 Yes

3 GP IIb/IIIa Inhibitor Administration

Was GP IIb/IIIa inhibitor administered? ☐0 No ☐1 Yes

→ **If No**, reason not given (1-6): _____

→ **If Yes**, provide details below:

Medication	Date and Time Therapy Started	Total Duration of Treatment	Location First Administered
Abciximab	___/___/___ (day/month/year) ___:___ (00:00 to 23:59)	___ ___ hours	☐1 ED ☐2 Cath Lab ☐3 Other
Eptifibatide	___/___/___ (day/month/year) ___:___ (00:00 to 23:59)	___ ___ hours	☐1 ED ☐2 Cath Lab ☐3 Other
Tirofiban	___/___/___ (day/month/year) ___:___ (00:00 to 23:59)	___ ___ hours	☐1 ED ☐2 Cath Lab ☐3 Other

Figure 2 *(above and following pages).* The CRUSADE data collection form.

CRUSADE

Site Number: ___ ___ ___ ___ ___ Patient Number: ___ ___ ___ ___

4 Medications Check ALL that apply (at least one must be checked for each medication).

	Prior to Arrival	In ED	Admission - Hospital Discharge	At Hospital Discharge	Reason Not Given (1-6)
ACE inhibitor	☐1	☐2	☐3	☐4	_____
Aspirin	☐1	☐2	☐3	☐4	_____
Beta blocker	☐1	☐2	☐3	☐4	_____
HMGCO-A inhibitor	☐1	☐2	☐3	☐4	_____
Ticlopidine/clopidogrel	☐1	☐2	☐3	☐4	_____
Additional Medications					
Calcium channel blocker	☐1	☐2	☐3	☐4	
Direct thrombin inhibitor	☐1	☐2	☐3	☐4	
IV unfractionated heparin	☐1	☐2	☐3	☐4	
Low molecular weight heparin	☐1	☐2	☐3	☐4	
Warfarin	☐1	☐2	☐3	☐4	

5 In-hospital Procedures

No	Yes	Procedure	Date	Time
☐0	☐1	**Noninvasive imaging**	___ ___/___ ___ ___/___ ___ ___ ___ (day / month / year)	___ ___ : ___ ___ (00:00 to 23:59)
		➥ If Yes, performed during: ☐ Rest ☐ Stress		
☐0	☐1	**Diagnostic cath**	___ ___/___ ___ ___/___ ___ ___ ___ (day / month / year)	___ ___ : ___ ___ (00:00 to 23:59)
		➥ If Yes, vessels with significant stenosis: ☐ LM ☐ LAD ☐ Graft ☐ LCX ☐ RCA ☐ None/Insignificant		
		➥ If Yes: ☐ Nuclear scan ☐ ECHO ☐ EKG treadmill		
☐0	☐1	**LVEF**	___ ___/___ ___ ___/___ ___ ___ ___ (day / month / year)	
		➥ If Yes: _____ % **OR** ☐ Normal ☐ Mild ☐ Moderate ☐ Severe		
☐0	☐1	**IABP**	___ ___/___ ___ ___/___ ___ ___ ___ (day / month / year)	___ ___ : ___ ___ (00:00 to 23:59)
☐0	☐1	**PCI**	___ ___/___ ___ ___/___ ___ ___ ___ (day / month / year)	___ ___ : ___ ___ (00:00 to 23:59)
☐0	☐1	**CABG**	___ ___/___ ___ ___/___ ___ ___ ___ (day / month / year)	___ ___ : ___ ___ (00:00 to 23:59)

6 In-Hospital Clinical Events

No	Yes	Event	If Yes, Date of First Occurrence	
☐0	☐1	(Re)infarction	___ ___/___ ___ ___/___ ___ ___ ___ (day / month / year)	
☐0	☐1	Cardiogenic Shock	___ ___/___ ___ ___/___ ___ ___ ___ (day / month / year)	
☐0	☐1	CHF	___ ___/___ ___ ___/___ ___ ___ ___ (day / month / year)	
☐0	☐1	Stroke	___ ___/___ ___ ___/___ ___ ___ ___ (day / month / year)	➥ Hemorrhagic? ☐0 No ☐1 Yes
☐0	☐1	Transfusion	___ ___/___ ___ ___/___ ___ ___ ___ (day / month / year)	➥ CABG related? ☐0 No ☐1 Yes Overt bleeding? ☐0 No ☐1 Yes
☐0	☐1	Died	___ ___/___ ___ ___/___ ___ ___ ___ (day / month / year)	

Figure 2 (*cont.*).

CRUSADE

Site Number: ___ ___ ___ ___ ___ Patient Number: ___ ___ ___ ___

7 Labs

Lab	Not Done	Date and Time	Baseline Value	Unit	Date and Time	Peak (use same units)	ULN (use same units)
Cardiac Markers							
CK (Creatinine Kinase)	☐0	___/___/___ ___ (day/month/year) ___:___ (00:00 to 23:59)	_____	☐1 IU/L ☐2 % ☐3 mg/mL IU ☐4 ng/ml	___/___/___ ___ (day/month/year) ___:___ (00:00 to 23:59)	_____	_____
CK-MB	☐0	___/___/___ ___ (day/month/year) ___:___ (00:00 to 23:59)	_____	☐1 IU/L ☐2 % ☐3 mg/mL IU ☐4 ng/ml	___/___/___ ___ (day/month/year) ___:___ (00:00 to 23:59)	_____	_____
Troponin ☐ I ☐ T	☐0	___/___/___ ___ (day/month/year) ___:___ (00:00 to 23:59)	_____ ng/mL OR ☐0 Neg ☐1 Pos		___/___/___ ___ (day/month/year) ___:___ (00:00 to 23:59)	_____	_____ ☐0 Neg ☐1 Pos
Cholesterol							
TC Total Cholesterol	☐0	_____		☐1 mmol/L OR ☐2 mg/dL			
HDL High Density Lipoprotein	☐0	_____		☐1 mmol/L OR ☐2 mg/dL			
LDL Low Density Lipoprotein	☐0	_____		☐1 mmol/L OR ☐2 mg/dL			

8 Recommendations at Discharge

NO	YES	Check 'No' or 'Yes' for each documented.
☐0	☐1	Smoking cessation counseling
☐0	☐1	Dietary modification counseling
☐0	☐1	Cardiac rehabilitation referral

9 Discharge

Patient: ☐1 Discharged → ___ ___/___ ___ ___/___ ___ ___ ___ (day/month/year)

☐2 Died

☐3 Transferred to another acute care center → ___ ___/___ ___ ___/___ ___ ___ ___ (day/month/year)

- ☐1 For cath/PCI/CABG
- ☐2 Other

10 Investigator/Coordinator Signature

I have reviewed all the data recorded on these CRF pages and they are accurate and complete to the best of my knowledge.

_____ ___ ___/___ ___ ___/___ ___ ___ ___

Investigator Signature (day/month/year)

Figure 2 (*cont.*).

and advanced age.[34–38] The CRUSADE initiative tracks selected objective inclusion criteria (Fig. 1) as well as other high-risk features and relates them to medical and interventional therapy for ACS. Medical therapy potentially indicated for high-risk NSTE ACS patients in the ED includes aspirin, clopidogrel, heparin or low-molecular-weight heparin, GP IIb/IIIa receptor antagonists, and beta-blockers. Data entered into CRUSADE will document qualifying signs and symptoms, therapy given with timing of administration, disposition, use of interventional therapy, in-hospital outcomes, and medications and referrals at hospital discharge. Participating emergency physicians and cardiologists can compare guideline recommendations for the care of these patients with care actually provided.

The CRUSADE initiative can also be modified over time as changes are made to the guidelines, based on accumulating medical evidence. The recent 2002 update to the 2000 ACC/AHA guidelines are summarized in part in Table 2. In the update, several changes in recommended therapy that potentially impact ED care were made. By placing a date stamp in the CRUSADE database that indicates promulgation of an update, performances before and after the update can be compared. This will allow measurement of acceptance of new recommendations as well as measurement of the success of CRUSADE-related educational interventions put into place after the update is published.

For example, the 2002 update includes substantially different recommendations for the use of the thienopyridine agent, clopidogrel. The update was prompted by the publication of the CURE Trial,[39] which was published after the 2000 guidelines. In 2000, the ACC/AHA recommended the use of clopidogrel only as a substitute for aspirin in aspirin-allergic patients. In the 2002 update, clopidogrel is recommended as additive therapy to aspirin, likely initiated in the ED for patients being medically managed. CRUSADE data will indicate the degree and the pace to which this recommendation is accepted across a wide variety of hospitals in the United States. As more data are published in this field and recommendations are changed or initiated by the ACC/AHA, similar date stamps can mark time intervals in which a change in practice can be expected to occur. This will also afford the CRUSADE investigators an objective means of comparing the relative success of different educational interventions used over time.

CONCLUSIONS

Treatments for patients with ACS have evolved considerably during the last decade, but the implementation of practice guidelines that incorporate new treatments has been challenging.[10] Recently completed and ongoing quality improvement studies have delineated multiple steps that are necessary to surmount these challenges and ensure continuous improvement in the quality of care for patients with ACS. The CRUSADE initiative combines a straightforward collection of pertinent data with educational programs that cross medical specialties, with multidisciplinary cooperation between emergency medicine and cardiology. It assesses the diagnostic approach utilized in the emergency department for patients with suspected ACS, with risk stratification strategies directly linked to the use of acute therapies for patients with confirmed ACS.

The CRUSADE initiative aims to track the success of this effort, as well as to provide educational efforts that may enhance that success. It is a truly national project, including a diverse representation (geographic, bed size, type of hospital) of hospitals and specifically encouraging collaboration between emergency medicine and cardiology, with QI feedback that can be used by either or both specialties to improve the care of patients. It will include more patients in its registry than any prior NSTE ACS program, increasing the statistical power of its conclusions. Data specific to the ED care of these patients will be provided for comparison both to published guidelines and to the performance of peer institutions. The large-scale, national focus of this and other programs and the longitudinal description of care for patients with ACS will help to overcome the obstacles that typically hinder QI studies and will help to determine the impact of improved adherence to practice guidelines on clinical outcomes.

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