

## GUEST EDITORIAL

## Chest Pain Centers

Treatment of acute coronary syndromes has come a long way since 1969, when Dr. Arthur Moss and I held a symposium at the University of Rochester titled "The Prehospital Phase of Acute Myocardial Infarction." It was one of the first such events focused on the early pathophysiologic events and care of patients with symptoms of an acute myocardial infarction (*Am. J. Card.* 1969;24:609-11).

This meeting was held about 4 years after Prof. Desmond Julian in Edinburgh, Scotland, proposed the concept of a coronary care unit and a few years after Dr. Frank Partridge had organized the first mobile coronary care unit in Belfast, Northern Ireland, and Dr. Hughes Day established the first CCU in Bethany, Kan. These seminal efforts showed that patients with an acute MI were best cared for in the setting of a unit dedicated to the treatment of the pathophysiologic events associated with acute myocardial ischemia. Prior to the development of CCUs, patients with acute MIs

were hospitalized in the general hospital ward without any special monitoring.

We became interested at that time in the prodromal symptoms leading up to the event and factors that lead to the decision to come to the hospital. We observed that approximately 3.5 hours elapsed from the onset of symptoms to hospital arrival (*Circulation* 1970; 41:737-42). More than half of that time was taken up with the patient and or family making a decision to come to the hospital. It is more than likely that many patients who experienced an acute MI could have died in that time.

To deal with hospital delay, we among others urged for the first time that patients come promptly to the emergency department without consulting their physicians. This was a sharp departure from the standard of practice at that time. The rest, of course, is history. The floodgates were opened and the emergency departments (EDs) were deluged with the myriad of medical causes of chest pain, real and fancied. The emergency physicians were left to sort it all out.



BY SIDNEY GOLDSTEIN, M.D.

Fast forward to the development of biomarkers, exercise technology, and imaging that developed from the need to define and identify the individual with an acute coronary event. Today there are approximately 8 million visits to the ED for chest pain and related symptoms. Of these, approximately 20% are defined as an acute coronary syndrome (ACS) event. Of the estimated 1.1 million myocardial infarctions annually in the United States, about half the patients survive and make it to the ED for care. Recent studies indicate that the diagnosis of acute myocardial infarction is missed in 2.1% of them (*N. Engl. J. Med.* 2000;342:1163-70). Similarly, 2.3% of patients seen in the ED for unstable angina are discharged and their diagnosis is missed. The risk-adjusted mortality rate in those patients in whom the diagnosis was missed is associated with an increased mortality risk.

In response to this deluge of patients coming to EDs, more than 1,500 chest pain units have been established, where patients can be monitored and evaluated outside of the hurly-burly atmosphere characteristic of EDs. These units were first established by the American College of Cardiovascular Administrators in 1991, which later merged into the Society of Chest Pain

Centers and Providers (SCPCP). The organization is made up predominately of ED physicians and bridges the fields of emergency medicine, cardiology, and critical care nursing. Although often located within emergency facilities, they provide an atmosphere where patients can be evaluated using current diagnostic facilities at a cost less than that of the traditional CCU. They also expedite early therapy for patients with ACS by shortening door-to-needle time and by early administration of thrombolytic and pharmacologic therapy to minimize ischemia. The chest pain centers are now undergoing an accreditation process under the direction of the SCPCP.

To deal with this increased volume of patients coming to the ED for evaluation of chest pain, hospitals have modified facilities and procedures. The establishment of chest pain centers has provided a model of how chest pain patients can be expeditiously managed and treated in the face of increasing patient volume in an era of decreasing numbers of EDs nationwide. ■

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## Level 1 Centers Lower Cardiac Mortality

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rates. The project ([www.takeheartamerica.org](http://www.takeheartamerica.org)) is ongoing in St. Cloud; Austin, Tex.; Anoka County, Minn.; and Columbus, Ohio.

The level 1 cardiac arrest center is the inpatient element of Take Heart America. The community aspect includes promotion of bystander CPR through aggressive CPR training, especially in schools and businesses, as well as widespread placement of automated external defibrillators in public places and schools. Also, EMS personnel are retrained in state-of-the-art resuscitation methods designed to enhance circulation, including use of impedance threshold devices, performing CPR before and after a single shock defibrillation, use of the LUCAS (Lund University Cardiopulmonary Assist System) automated CPR device to provide good-quality CPR while a patient is being moved, and interosseous drug infusion when an intravenous line can't quickly be placed.

These out-of-hospital interventions have led to markedly increased rates of survival during the first 24 hours after cardiac arrest. But most of these new survivors were dying in the hospital after the 24-hour mark. That was the impetus for creating level 1 cardiac arrest centers.

St. Cloud Hospital is a regional referral center in central Minnesota with a catchment area of roughly 500,000 people. In the year before launch of the level 1 cardiac arrest center, 33 patients were admitted to the hospital alive with a pulse following out-of-hospital cardiac

arrest; 11 left the hospital alive. In contrast, in the first 19 months after the December 2005 introduction of the level 1 cardiac arrest center, 104 patients with a pulse were brought in by ambulance and airlift, 54 of whom survived to discharge. That's a 52% discharge rate, well over twice the national average, and significantly higher than the 33% rate in the local historic controls.

"It's fantastic. We've had so many survivors in central Minnesota that the level 1 center's first survivor has started a survivor network there. They share their experiences, teach CPR in the schools, and advocate for better care for patients with heart disease," Dr. Lurie said in an interview.

Moreover, a high-level administrator at St. Cloud State University who survived his out-of-hospital cardiac arrest was inspired to help Dr. Lurie and his colleagues start a program called CPR Goes to College. "All students at St. Cloud State are being trained in how to do CPR as part of a widespread bystander CPR awareness campaign," he said.

Dr. Lurie presented a cost-effectiveness analysis of 69 patients treated at the level 1 cardiac arrest center. The hospital collected an average of \$57,783 in billings per treated patient. After subtracting the direct costs of care, the hospital was left with an average net direct margin of \$20,684 per survivor and \$3,329 per nonsurvivor.

"This is a nonprofit hospital. In a for-profit hospital, this money would be pure profit for the hospital," he noted.

Dr. Lurie recalled that getting the hospital to approve the level 1 cardiac arrest center was a protracted political struggle. Administrators were particularly resistant to the idea of laying out \$25,000 for a rapid cooling system. His first clue that the center was making money for the hospital rather than running in the red came when the hospital purchased a second \$25,000 hypothermia system within 3 months of the center's opening.

The improved survival rates and financial benefits documented at St. Cloud Hospital have been replicated at the other level 1 cardiac arrest centers participating in Take Heart America. Level 1 centers also have been started in Ann Arbor, Mich.; Oshkosh, Wis.; William Beaumont Hospital in Royal Oak, Mich.; and Washington state.

"By taking this comprehensive approach, we've basically doubled survival rates in all patients following out-of-hospital cardiac arrest in the communities where we've deployed Take Heart America, from 9%—which was already twice the national average—up to 17%," Dr. Lurie observed.

More than 300,000 Americans per year die of sudden cardiac arrest.

Take Heart America is financed by more than a dozen hospital foundations and corporate contributors. Among them is Advanced Circulatory Systems Inc., where Dr. Lurie is chief medical officer. He is the inventor of the company's ResQPOD, a noninvasive impedance threshold device widely used in CPR. ■

## QT-Prolonging Drugs Often Given To At-Risk Inpatients

NEW ORLEANS — Nearly 40% of a large series of patients with a known preexisting long QT interval received an order for a QT-prolonging medication while hospitalized, thereby increasing their risk for sudden cardiac death.

Further, at-risk patients rarely underwent monitoring for further widening of the QT interval. Indeed, 8% had an ECG within 48 hours after starting the new QT-prolonging medication, Dr. Ravi K. Mareedu reported at the annual scientific sessions of the American Heart Association.

This is a situation fraught with potential for iatrogenic injury, according to Dr. Mareedu of the Medical College of Wisconsin, Milwaukee. A possible solution: adoption of automated hospital prescribing interventions that trigger formal surveillance protocols when QT-prolonging drugs are used in patients with a known long QT interval.

Dr. Mareedu reported on 1,586 inpatients with 2,616 ECGs showing a prolonged QT that was specifically noted in the ECG report. During 3,258 hospital admissions, 599 of these patients (38%) received an order for any of 34 known QT-prolonging medications generally considered contraindicated in the setting of a long QT interval. Two-thirds of these patients were in critical care units at the time.

Antiarrhythmic agents accounted for more than half of all prescriptions for QT-prolonging medications, with amiodarone leading the way. Another 30% were for haloperidol. There were 115 orders for erythromycin and other QT-prolonging antimicrobials, 82 for methadone, and 97 orders for chlorpromazine and other antinausea drugs.

—Bruce Jancin