Organization of Care for Acute Myocardial Infarction in Rural and Urban Hospitals in Kansas

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ABSTRACT: ***Context:*** *One in 4 Americans lives in a rural community and relies on rural hospitals and medical systems for emergent care of acute myocardial infarctions (AMI). The infrastructure and organization of AMI care in rural and urban Kansas hospitals was examined.* ***Methods:*** *Using a nominal group process, key elements within hospitals that might influence quality of AMI care were identified, including personnel, equipment, organizational systems, and quality improvement activities. These elements were included in a survey of 45 rural and 12 urban Kansas hospitals.* ***Findings:*** *Though emergency 911 systems were widely available in both urban and rural communities, paramedics and advanced cardiac life support were less likely to be available in rural communities. Few rural hospitals were capable of emergent catheterization, angioplasty, or coronary artery bypass surgery; cardiologists, though readily available by phone, were rarely available on-site. Nevertheless, most rural ambulances could not bypass local hospitals. Most rural hospitals transferred the vast majority of their patients to urban medical centers within an average distance of 78 miles. Standardized protocols were used for emergent AMI care in 67% of urban and 62% of rural hospitals. Hospitals included aspirin in 53% and beta-blockers in 28% of either protocols or standing orders.* ***Conclusions:*** *Although faced with more limited resources, some rural hospitals, like their urban counterparts, have implemented protocols to address emergent care of AMI patients. Nevertheless, many of these protocols omit crucial aspects of AMI care. Rural and urban hospitals should jointly develop systems that assure consistent, rapid delivery of AMI care.*

In the past 10 years, tremendous advances in the ability to care for patients with acute myocardial infarction (AMI) have been observed. Nevertheless, many patients still do not receive care that is fully consistent with the latest scientific knowledge.[1] This gap between scientific knowledge and clinical performance, labeled the 'Quality Chasm' by the Institute of Medicine,[2] has led to a wide variety of national efforts to improve AMI care. The Centers for Medicare and Medicaid Services has launched the Cooperative Cardiovascular Project,[3] the American Heart Association has launched Get with the Guidelines,[4] the American College of Cardiology has developed Guidelines Applied in Practice,[5] and the American Hospital Association and Joint Commission on the Accreditation of Healthcare Organizations have included AMI in their national measurement programs.[6]

Donabedian, an early leader in quality improvement, identified 3 domains for quality measurement: structure, process, and outcomes.[7] Outcome measures have not been widely used to assess care of AMI patients due to the limitations of both sample size and risk adjustment models. The national AMI programs mentioned previously have focused almost entirely on process measures.[8] Nevertheless, both process and outcome measures of quality may be inappropriate for examining AMI care at small rural hospitals. Many small rural hospitals may see only 1 or 2 AMI patients in any given month, which is not enough to provide stable estimates of the quality measures commonly used in national measurement programs. Efforts to examine quality of AMI care in small rural communities may need to rely mostly on structural assessments of quality. Unfortunately, structural measures for AMI care have received very little attention.[8]

Likewise, rural hospitals have received little attention in quality improvement and quality assurance efforts. These hospitals face unique obstacles, including

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low volume of AMI cases, limited resources, and lack of specialized personnel. Moreover, AMI patients in rural hospitals are less likely to receive standard care and tend to have worse outcomes compared to their urban counterparts.[9] These findings suggest that national efforts to improve quality of care for AMI patients will need to address the unique problems faced by rural hospitals. In this study, the authors sought to characterize unique elements in the structure of AMI care and examine how these structural elements are incorporated into health care systems in Kansas with a comparison of certain key elements between rural and urban hospitals.

Methods

Participants. All non–critical access hospitals in the state of Kansas and 14 of 49 critical access hospitals were asked to participate in a survey of AMI care (the critical access hospitals participating in this survey were not randomly selected but were among the larger critical access hospitals in the state). Of those hospitals approached, 12 (60%) of 20 urban hospitals and 45 (82%) of 55 rural hospitals completed the survey process. Hospitals were classified into urban and rural based on their location in metropolitan statistical areas defined by the Federal Office of Management and Budget.

Survey Development and Implementation. Based on previous work conducted by the AMI Working Group of the American Heart Association's First Scientific Forum on Quality of Care and Outcomes Research,[8] a conceptual framework for describing structural parameters[7] in the care of acute myocardial infarction was developed. This conceptual framework identified 4 loci of care: prehospital care, emergency room, inpatient, and discharge. Within each locus of care, 3 structural elements were considered: personnel, equipment, and organization. This conceptual framework was presented to a group of primary care physicians, cardiologists, emergency room physicians, emergency and critical care nurses, emergency medical technicians, and quality improvement specialists. Using a nominal group process,[10] crucial elements of AMI care were identified. Results from this process were used to develop a survey instrument that was pilot tested in 6 hospitals. Audiotapes of the survey and postsurvey discussions were used to revise survey elements.

Between January 1, 2002, and September 10, 2002, trained nurses administered the final 119-item survey instrument to a key informant at each hospital, usually a member of the quality improvement staff. This key informant completed the survey, and as needed, assisted the survey administrator to identify other individuals, either in the hospital or in the emergency services system, who could provide informed responses.

In addition to questions related to hospital size, location, and teaching status, the survey tool included questions in each of the 4 domains of prehospital care, emergency department care, inpatient care, and discharge planning and follow-up. Within each of these domains, questions were developed to elicit responses describing the personnel, equipment, and organizational structures of the hospital. The majority of these questions were closed-ended, either of a dichotomous nature such as yes/no or using a 4-point Likert scale describing the frequency of a process.

Data Analysis. Data were entered into a Microsoft Access database. Simple frequencies were calculated using SAS (version 8.02). The frequency of occurrence of selected hospital characteristics was compared by use of χ^2 analyses. Fisher exact test was used for those data that had at least 1 cell with counts less than 5. Because the majority of hospitals transferred a majority of patients to tertiary care centers directly from the emergency department, the analyses in this study were restricted to the domains addressing prehospital care, emergency department care, and organizational systems.

Results

Surveys on 45 rural and 12 urban hospitals in the state were completed. The rural hospitals surveyed in this study were much smaller than their urban counterparts (Table 1); the rural hospitals having a mean of 67 beds (range: 12 to 385) compared to the urban hospitals, which had a mean of 361 beds (range: 52 to 1532). Though all urban hospitals offered 24-hour physician coverage in their emergency department, the majority of rural hospitals did not and often relied on physicians to take calls from home. Similarly, rural hospitals were much less likely to be staffed by specialists in emergency medicine. Nevertheless, most rural and urban emergency departments were staffed by nurses certified in Advanced Cardiac Life Support (ACLS).

Only 7 (16%) of the rural hospitals had a cardiologist available for at least 5 days per week. Few of the rural hospitals offered emergent angioplasty, cardiac catheterization, or coronary artery bypass grafting, whereas 58%, 75%, and 42% of urban hospitals, respectively, offered these services ($P<.01$ for all comparisons). Only 53% of the rural hospitals had a dedicated intensive care unit (ICU) or coronary care unit (CCU).

Table 1. Rural-Urban Comparisons in the Availability of Services for the Care of Acute Myocardial Infarction in 57 Kansas Hospitals*

Facility Characteristics	Rural (N = 45)	Urban (N = 12)	*P* Value
Licensed beds (mean)	67	361	
24-hour physician in ED	24%	100%	<.0001
Emergency medicine specialist	2%	58%	<.0001
Most nurses ACLS certified	93%	100%	.56
Cardiologist ≥5days/week	16%	83%	<.0001
Emergency PTCA	7%	58%	<.0001
Catheterization capable	11%	75%	<.0001
CABG capable	7%	42%	<.01
Echocardiography ≥5 days/week	44%	100%	<.0001
Dedicated ICU/CCU	53%	92%	<.02

* ED indicates emergency department; ACLS, advanced cardiac life support; PTCA, percutaneous transluminal coronary angioplasty; catheterization, cardiac catheterization; CABG, coronary artery bypass graft; ICU, intensive care unit; CCU, coronary care unit.

Emergency 911 systems were available in almost all of the rural and urban settings alike (Table 2). Ambulances in rural settings were less likely to be staffed by paramedics and, in spite of the more limited resources in rural hospitals, most rural ambulances did not have protocols that allowed them to bypass a local hospital to directly transport the patient to an institution with greater resources. Though almost all ambulances in urban communities could administer advanced cardiac life support and aspirin, these services were much less likely to be available in rural communities.

Among the rural hospitals, 64% of them transferred more than 80% of their AMI patients, whereas only 22% of the urban hospitals did this. In such a transfer, the mean distances to a transfer facility were 78 miles in the former and 20 miles in the latter.

In all of the urban settings and most rural hospitals, nurses were empowered to obtain an EKG without a new physician order (Table 3). Many nurses in both rural and urban settings were authorized to administer aspirin to patients with acute chest pain, but this was not universal.

Both rural and urban hospitals commonly used standardized order sets for delivery of thrombolytics (Table 3). Standardized protocols that addressed issues other than thrombolysis were used for emergent AMI care in 67% of urban and 62% of rural hospitals. Fifty-three percent of all hospitals included aspirin and 28% included beta-blockers in either protocols or standing orders, with little differences between rural and urban hospitals in how these elements were addressed.

Table 2. Availability of Prehospital Care Surrounding 57 Rural And Urban Kansas Hospitals*

Prehospital Care	Rural (N = 42) (%)	Urban (N = 15) (%)	*P* Value
911 system	98	100	1.00
Paramedics (almost always/usually)	58	100	<.01
Ambulance allowed to bypass local facility	33	42	.59
Ambulance provides ACLS (almost always)	58	100	<.01
Can administer ASA	67	92	.15
Defibrillate on ambulance (almost always)	91	100	.56

* ACLS indicates advanced cardiac life support; ASA, aspirin.

Rural-urban differences in implementation of organizational systems were not statistically significant, with 83% of the urban hospitals and 61% of the rural hospitals implementing formal efforts to improve AMI care. Nevertheless, specific goals for improvement were

Table 3. Organizational Systems to Support Care for Acute Myocardial Infarction in 57 Rural and Urban Kansas Hospitals*

Organizational Systems	Rural (N = 42) (%)	Urban (N = 15) (%)	*P* Value
Nurse can get EKG	84	100	.32
Nurse can administer ASA	69	67	1.00
Usually use protocol for AMI patients	62	67	1.00
Standing orders for thrombolytics	73	83	.71
Standing orders (other than thrombolytics)	53	50	.84
ASA in ED protocol/SO	51	58	.66
Beta-blocker in ED protocol/SO	27	33	.72
Specific goals for AMI improvement	42	50	.63
Implemented formal AMI QI efforts	61	83	.19
Physician champion for AMI care	31	58	.08

* ASA indicates aspirin; SO, standing order; ED, emergency department; QI, quality improvement.

less common. Although 69% of rural hospitals could not identify a physician champion for AMI care, 42% of the urban hospitals could not identify one either.

Discussion

This study shows that difficulties in the care of rural AMI patients begin in the prehospital setting. Although 911 emergency systems were almost universal, the capabilities of the emergency response systems were highly variable, with many ambulance systems not staffed by paramedics and unable to provide advanced cardiac life support interventions. One third of the ambulances in rural communities could not even provide aspirin to cardiac patients prior to arrival at the hospital, although the difference between rural and urban ambulances in this regard was not statistically significant.

With recent studies demonstrating the benefits of rapid transfer of cardiac patients for emergent revascularization,[11-14] adequate staffing for emergency transport is crucial. Lack of paramedics may impede efforts to allow ambulances to bypass rural facilities for institutions that can provide percutaneous coronary interventions.

Many rural hospitals do not have the luxury of 24-hour physician coverage in their emergency department, and emergency department coverage is much less likely to be provided by an emergency medicine specialist. Nevertheless, nursing capabilities in rural emergency departments were quite similar to those in urban hospitals with almost all emergency nurses trained in advanced cardiac life support (ACLS) and capable of obtaining an EKG without a specific physician order. Most nurses also operated under protocols that allowed them to immediately administer aspirin. This expertise and empowerment of nurses may be particularly important in rural emergency departments that do not always have physicians in-house.

The findings show that few rural hospitals have the infrastructure to perform procedures like coronary artery bypass graft (CABG), catheterization, and echocardiography; cardiologists are unlikely to be nearby when an AMI patient presents. This lack of resources results in the transfer of many AMI patients to urban centers with more extensive cardiovascular capabilities. In the Kansas sample, the majority of rural hospitals transferred the majority of their AMI patients after initial stabilization in the emergency department. This need for transfers is not unique to Kansas. In a nationwide sample of Medicare patients hospitalized with AMI, 17% of hospital admissions occurred as the result of a transfer from another hospital or emergency department.[3]

With wide variations in the availability of specialist care, locally developed pathways or standardized order sets might assist rural hospitals in assuring rapid and appropriate delivery of care for AMI patients.[15,16] The use of these tools has been recommended by the National Heart Attack Alert Program[17] and has been included in national guidelines for the care of AMI patients.[18] Recent data from the American College of Cardiology's Guidelines Applied in Practice study have shown that implementation of standardized order sets can be highly effective in improving patient care.[5] It was disappointing to see that many of both the rural and urban hospitals included in this study were not using these tools. Furthermore, the authors discovered that even those that did have pathways, protocols, or standardized order sets frequently omitted crucial aspects of therapy, such as aspirin and beta-blockers.

With smaller numbers of staff available for quality improvement in rural hospitals,[19] it was not surprising that 39% of rural hospitals had not implemented formal quality improvement efforts to improve AMI care. With only a minority of rural hospitals having access to a physician champion for AMI care, implementing new approaches to assure appropriate care delivery may be particularly hard. One promising approach to address this barrier to quality improvement has been implemented recently in Minnesota where rural and urban physicians, community hospitals, and emergency medical services have partnered with a tertiary care hospital to adopt a common, community-wide, AMI protocol.[20] This type of urban-rural partnership may hold promise for rural hospitals with limited resources to develop and maintain their own quality improvement programs.

This study has several limitations. In particular, the study occurred exclusively in Kansas, and the authors were limited to respondents who were willing to complete a lengthy survey and provide potentially sensitive information. Also, the smallest of the rural hospitals (CAHs) were undersampled. Although the authors were dependent on the respondents' recall and interpretation of survey questions, physical examples of protocols, order sets, and other tools were collected whenever possible in order to validate responses. Finally, the scope of this study was limited to the emergent care of AMI patients, as many of the hospitals transferred patients to other institutions and had little role in ongoing inpatient care or discharge management.

The National Advisory Committee of Rural Health and Human Services indicated in its latest report[21] that there are important distinctions between the rural health care delivery system and its urban and suburban

counterparts and that those distinctions are important to understand within the larger debate of providing quality health care. In the setting of national initiatives to fill the quality chasm identified by the Institute of Medicine,[2] this study gives a closer look at the infrastructure for AMI care in rural and urban hospitals in Kansas, identifying their present quality improvement efforts and limitations that may hinder such efforts. As the health care system takes steps to improve patient safety and to ensure quality health care, it is important that national programs to improve AMI care take into account the unique circumstances of the rural health care providers.

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