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Review

Achieving regionalization through rural interhospital transfer☆,☆☆,★

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ABSTRACT

Regionalization of emergency medical care aims to provide consistent and efficient high-quality care leading to optimal clinical outcomes by matching patient needs with appropriate resources at a network of hospitals. Regionalized care has been shown to improve outcomes in trauma, myocardial infarction, stroke, cardiac arrest, and acute respiratory distress syndrome. In rural areas, effective regionalization often requires interhospital transfer. The decision to transfer is complex and includes such factors as capabilities of the presenting hospital; capacity at the receiving hospital; and financial, geographic, and patient-preference considerations. Although transfer to a comprehensive center has proven benefits for some conditions, the transfer process is not without risk. These risks include clinical deterioration, limited resource availability during transport, vehicular crashes, time delays for time-sensitive care, poor communication between providers, and neglect of patient preferences. This article reviews the transfer decision, financial implications, risks, and considerations for patients undergoing rural interhospital transfer. We identify several strategies that should be considered for development of the regionalized emergency health care system of the future and identify areas where further research is necessary.

1. Introduction

In 2006, the Institute of Medicine published a report on the *Future of Emergency Care in the United States Health System*, which recommended the development of a "coordinated, regionalized, accountable [emergency care] system" [1]. According to the conference, "regionalization is an active process by which patients are appropriately matched to appropriate resources" [2]. The goal of regionalization is to provide optimal care and enhance outcomes [3–6]. This should be compared to centralization, which is a more unplanned process in which patients are transferred to larger medical centers for a variety of medical, financial, and legal reasons. In many cases, centralization is the *de facto* result of limited service availability and outright closure of rural hospitals due to economic factors and population shifts. Typically, intentional regionalization and uncoordinated centralization processes occur concurrently. Both processes often involve interhospital transfer, and both can improve patient care, health outcomes, and economic efficiency (Fig. 1).

More than 125 million patients are treated in US emergency departments (EDs) annually. Nationally, 1.5% (8.5 million) of ED patients are transferred to another acute care hospital. In rural America, this transfer rate is doubled [7]. Patients are transferred for a myriad of medical diagnoses via networks of both established and *ad hoc* hospital relationships [8]. When these transfers match patient needs to necessary resources, then regionalization optimizes medical care; when needs and resources diverge, these transfers constitute waste.

Transfer partnerships between hospitals are both explicit (ie, formalized networks for specific conditions) and implicit (ie informal practices). Examples of both explicit and implicit regionalized health care networks are illustrated in Table 1. Explicit regionalized systems of care have improved outcomes for specific patient groups such as trauma and ST-elevation myocardial infarction (STEMI) [9,10]. Although these diseases have published triage criteria, many others do not, and identification of patients for transfer remains variable [11].

In this article, we will discuss the medical and financial implications of patient transfer, risks of interhospital transfer, and the future of regionalized emergency care. We will further identify areas for future research.

2. Factors affecting decision to transfer

The decision to transfer a patient to another hospital for emergency care is dependent on many factors including the capabilities of the presenting hospital, capacity at the receiving hospital, and financial factors.

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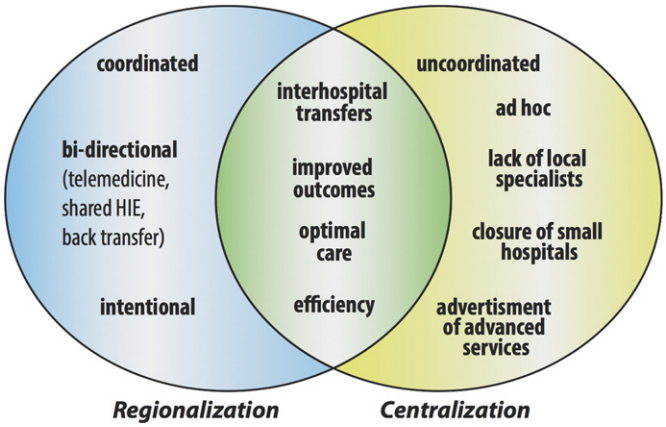

Fig. 1. Regionalization vs centralization. These processes occur concurrently and have both overlapping and unique effects.

2.1. Capability of presenting hospital

Most transfers are initiated either because of condition-specific recommendations [12,13] or because a provider assesses that a patient requires a level of care or specialized service not available at the local hospital [14]. Services frequently referred for interhospital transfer are cardiac revascularization, neurology and neurosurgery consultation, trauma surgery, and critical care [15]. The growing lack of specialty coverage available in rural US EDs and the concentration of specialty services to tertiary care centers have made interhospital transfer a critical component of patient management (Fig. 2) [16,17].

Transfer of patients occurs for a wide variety of medical problems, and regionalization of care has been demonstrated to have superior outcomes for several specific conditions. The first efforts at regionalization of emergency care involved patients with traumatic injuries. Established by the EMS Systems Act in 1973, trauma systems were seen as a method of "distributing resources more equitably while expanding access to health care systems" and improving national trauma care [18]. Multiple studies have demonstrated improved outcomes for patient treated at an American College of Surgeons–certified level I trauma center vs nontrauma centers [19–23]. Based partly on the effectiveness of developing robust trauma systems [24], STEMI care was regionalized into transfer networks locally to shorten the time to cardiac catheterization—another time-sensitive intervention. Mortality is reduced when percutaneous coronary intervention (PCI) is performed rapidly in STEMI patients [9,25–28], and guidelines recommend this therapy within 90 minutes of presentation [29,30]. In 2000, the Brain Attack Coalition published guidelines to establish Primary Stroke Centers to improve care of patients with acute ischemic stroke [31]. Organized systems of stroke care [32] and dedicated stroke units have both been shown to improve mortality and functional outcomes. Stroke center care is associated with decreased 1-year mortality of 11% to 38% [33–35]. Improved outcomes have also been demonstrated when patients with acute respiratory distress syndrome (ARDS) are transferred to a center capable of extracorporeal membrane oxygenation (ECMO). Interestingly, the clinical benefit of the transfer appeared to be independent of the use of ECMO, reinforcing that disease-specific care in high-volume centers may have intrinsic value [36]. Following the 2009-2010 H1N1 influenza pandemic, a cohort study of case-matched patients with H1N1-related ARDS demonstrated a significant mortality benefit to patients transferred from tertiary care hospitals to one of four ECMO centers in the UK [37].

2.2. Rural workforce

Many low-volume rural hospitals are unable to offer comprehensive procedural or medical specialty services. However, rural hospitals serve the role of stabilizing and beginning time-sensitive therapies (eg, tissue plasminogen activator and antibiotics) for critically ill patients who present to their facility. Many of these EDs lack residency-trained/board-certified emergency physicians (EPs). More than 70% of counties with less than 20 000 residents have no board-certified EPs [38]. Instead, physicians trained in family medicine, internal medicine, and advanced practice providers (eg, physician assistants and nurse practitioners) provide much of the care in EDs in these communities. In one rural state, only 12% of EDs were staffed exclusively by EPs, and 61% were staffed by advanced practice providers in solo practice for at least a portion of the week [39]. In addition, a recent report of ED care using a national data set reported 10% lower hospital mortality for patients admitted from high-volume EDs compared with low-volume departments [40]. This combination of non-EP staffing and a low volume of critically ill patients unveils a potential problem for patient safety, particularly for patients with critical illness with time-sensitive interventions.

2.3. Pharmacy services

Although not often identified as a primary reason for transfer, hospital-based services affect transfer decisions as well. For example, clinical pharmacy services have integrated themselves into all aspects of multidisciplinary teams across the nation. Prior reports have shown that clinical pharmacy services can significantly decrease hospital costs and improve mortality [41,42]. Unfortunately, few hospitals provide onsite 24-hour clinical pharmacists, and most have a pharmacist available for only a few hours per day [43]. With such limited availability of pharmacists, specialized clinical pharmacy services are rare in rural locations [44] and may represent 1 hospital resource that distinguishes high-volume hospitals from low-volume hospitals. Furthermore, rural hospitals that rarely use specialized or time-sensitive medications may not stock these medications for emergent use. Formulary restrictions may limit availability of costly medications, such as some rarely used toxicologic antidotes [45], antibiotics, antihemophilic factors, and anticoagulant reversal agents. Thus, medication availability can drive transfer of some patients.

Table 1
Transfer networks can be categorized based on their level of organization and support

Classification	Definition	Examples
Explicit transfer networks	A network established for a defined diagnosis or condition that recommends care through prehospital triage or interhospital transfer to a specific medical center based on a prespecified set of criteria and/or center designation. These networks require coordination by a central organization, surveillance and maintenance to optimize their function.	Trauma system STEMI networks Stroke networks
Implicit transfer networks	A network that exists in a region and drives regional practice for patients meeting general, informally defined criteria that lead to either prehospital triage or interhospital transfer of patients who exceed the capabilities or specialty resources of a local medical center. These networks are not centrally maintained or governed and may evolve over time based on the resources, capabilities, and ease of transfer of various organizations within the system.	Cardiac arrest Severe respiratory failure (ECMO) Neurosurgical emergencies Transplant centers Critical care services, including neonatal and pediatric