Commentary

Breathing easier - good news from air medicine

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Published: 10 July 2008
This article is online at http://ccforum.com/content/12/4/164

Critical Care 2008, **12:**164 (doi:10.1186/cc6934)

See related research by Seymour *et al*., http://ccforum.com/content/12/3/R71

Abstract

Safety in transport is a major concern. Air medical crashes are in the public eye, but a greater risk of transport may be in the clinical care provided along the way. While the media focuses on the drama of helicopters landing on scene, the greatest and most common risk actually occurs during inter-hospital transport. For too long, transport has been a black hole in clinical medicine and the real rate of adverse events is unknown. New work from the University of Pennsylvania should make us all breathe a little easier.

Dr Seymour and colleagues [1] present us with an important new look into adverse events in transport. While the majority of studies on safety of transport focus on the risk to patients of injury or fatality incurred by the transport modality itself [2-6], a less reviewed but probably more important risk profile is that of the actual care delivered to critically ill patients during transport. Transport is often a black hole in medicine. The transport interval, however, is among the least measured and highest risk time periods for patients. As noted in a recent publication of evidence on the safety of care by the Agency for Healthcare Research and Quality [7], the care of critically ill patients routinely requires both intra- and inter-hospital transport of high risk patients and "practices to reduce or minimize this necessary risk represent a potentially important area of patient safety research."

The study of Seymour and colleagues [1] is retrospective and thus limited to reported clinical events rather than all possible technical complications of transport, and, as noted by the authors, has some limitations resulting from the particular patient cohort studied (patients transferred by a single helicopter program from the University of Pennsylvania to a single referral center). It is, nonetheless, a valuable addition to help better our understanding of a particularly vulnerable population, mechanically ventilated medical patients undergoing inter-hospital transfer by helicopter, a growing subset of acutely ill patients.

Hospital care systems throughout the world are undergoing massive structural changes to concentrate tertiary care. Cost efficiency, low numbers of specialist physicians, increasing demand, and improving quality are all factors in this rapid transformation of hospital systems. The effects of these policy changes have only just begun to be analyzed. One result is the dramatic increase in the number and acuity of patients needing transfer to tertiary care. As an example, in our system of 36 acute care hospitals in the state of Maine, the number of Emergency Medical Services (EMS) records increased 26% in the 8 year period from 1998 to 2005, while the number of emergency inter-hospital transports increased by 56% [8]. Similar use rates are found throughout the world and it is expected that the numbers of patients needing time-dependent, high-acuity transfer will continue to grow rapidly.

The use of medical helicopters, as a strategy to overcome time and geographical barriers of access to care, will also continue to grow. The numbers of medical aircraft have doubled in the last decade in the United States, Canada, and Europe. While there is continuing debate on the appropriateness of medical helicopters, work by Branas and colleagues [9] has found that nearly 82 million Americans rely on access to helicopters to reach tertiary care within the 'golden hour' of time-dependent disease. Another 40 million cannot reach timely tertiary care. Of note, one of this study's findings was that "longer flight distances were associated with an increased incidence of minor physiologic adverse events." This highlights one of the challenges in centralizing tertiary care while working to improve access to care for distant populations. Understanding the risk benefit equation for these patients is extremely important in both the clinical and health-care policy realms. If we do not achieve safe mechanisms to transfer these vulnerable patients, any gains in efficiency of costs and effectiveness of care are for nought.

Secondly, the study of Seymour and colleagues offers insight into a unique group of patients with complex needs and at

significant risk of adverse events during care. Mechanically ventilated patients are, by definition, high risk and high acuity with substantial in-hospital mortality and morbidity [10]. Transfer of these patients even within hospitals (intra-hospital) subjects them to a wide range of increased risks for adverse events compared to continued care in an intensive care unit: these result from loss of airways, device failures, and hypoxia from inadequate supply of oxygen or ventilation effort, monitoring difficulties, barotrauma, and hypo-/hypercapnia, and care by *ad hoc* teams rapidly assembled to move a patient. Significant adverse event rates for intra-hospital transfer of adult patients have been identified in multiple studies [11-13]. Inter-hospital transfer of mechanically ventilated patients described in the study of Seymour and colleagues results in broad new risks in addition to those noted secondary to the substantial logistics involved in the transfer process. These risks, especially for medical patients, are justified, especially if the referring hospital has limited experience and capabilities in the management of critically ill patients [14]. Moving patients from bed to gurney and back, loading them in and out of vehicles, increased challenges in monitoring due to noise and vibration, transfer between bag valve mask and portable ventilators, unplanned time delays, difficulty in performing invasive interventions during transport, and, in the case of air transported patients, altitude are but some of the factors presenting increased risk. Helicopters present even more challenges, including limited work room, weight limitations requiring that only essential equipment is carried, and vibration. The paper of Seymour and colleagues, which incorporates a cohort larger than all published studies combined to date, is a welcome addition to our understanding of the complexities of transport.

As a recent review noted with regard to adverse events in critical care transport, "insufficient data exists to draw firm conclusions regarding the mortality, morbidity, or risk factors associated with interfacility transport…." [15]. Further work is necessary, but the paper of Seymour and colleagues covers some important ground in defining the range of adverse events and their incidence, and developing a predictive tool for patients at high risk during transport. While the authors properly note the limitations in their very useful study, they are to be commended for their important contribution to further our understanding of the complexities of managing what will continue to be a growing population of critically ill patients needing emergency transfer. If we are to deliver the promise we make to these patients, we must intensify our commitment to reducing adverse events during transport.

Competing interests

The author declares that they have no competing interests.

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