Urgent air–medical transport: Right patient, place and time

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∞∞ See related research article by Singh and colleagues, page 579

Key points

- For many patients, access to time-critical care at a trauma facility depends on air–medical transport.
- Although criteria for dispatch are widely available, the data needed to improve their accuracy and align resources with the needs of patients are limited.
- Large cohort studies, rather than randomized trials, will likely remain the main source of evidence to inform use of air–medical transport.

Transport of acutely injured and ill patients by air has become an integral part of regionalized systems of health care. Patient outcomes are improved with use of such trauma systems, which rely on well-trained crews and either fixed-wing aircraft or helicopters to rapidly manage and transport seriously ill patients from remote locations to the nearest appropriate trauma facility.[1] The development of effective time-critical interventions for non-traumatic illness, specifically ST-segment elevation myocardial infarction and ischemic stroke, has further improved outcomes.[2,3] For many patients, rapid access to such interventions depends on the unique capabilities of air–medical transport services. In the United States, for example, the only way 28% of the population can access care at a trauma centre within the "golden hour" is by such services.[4]

The decision to use urgent air–medical transport to transfer a patient from a rural hospital or the scene of a trauma to a specialized care centre is based on many factors. These factors include a determination that the level of care needed by the patient exceeds the capabilities of the health care facility in the locale; the need for a time-critical evaluation or intervention or for special monitoring, medication, equipment or expertise while in transit; excessive distance or rugged terrain that hinders transport to a care facility; unavailability of appropriate ground ambulance transport; weather conditions; and the patient's weight.[5]

The ideal criteria for air–medical dispatch would weigh all of these factors and provide decision-making support for emergency medical technicians, paramedics and community physicians, who must identify the patients who will benefit most from transfer by air. Appropriate use of this service is important. Its cost, safety and effectiveness are sources of debate. Few clinicians would dispute the life-saving benefit of airlifting a salvageable patient with retroperitoneal rupture of an abdominal aortic aneurysm from a remote community. But most air–medical dispatch decisions are simply not that easy.

Criteria for air–medical dispatch are widely available. However, the data needed to improve the accuracy of these criteria and better align urgent resources with the needs of patients are limited. In a recent systematic review of criteria for dispatch of air transport for severely injured patients, Ringburg and colleagues[6] found that the validity of the criteria varied widely. They noted, for instance, that 22 of 49 discrete launch criteria were driven primarily by reported mechanism of injury. However, they found that relying on mechanism of injury tends to result in overtriage (i.e., transport of patients whose condition does not warrant it). Criteria based on anatomy of injury and physiologic parameters alone lead to undertriage. Overtriage results in increased cost and may put transport crews and their patients at increased risk. Undertriage results in greater morbidity and mortality among patients who might have benefited from a life-saving intervention. Finding the right balance is challenging. By design, the criteria for triage of trauma in the field recommended by the National Expert Panel on Field Triage are intended to result in an overtriage rate of 35%–50% in order to limit the undertriage rate to 5%.[7] Ringburg and colleagues[6] encourage prospective evaluation of criteria to improve dispatch guidelines.

An important step in defining the optimal criteria for air–medical dispatch is the determination of parameters that identify patients most likely to benefit from transport. In this issue of *CMAJ*, Singh and colleagues[8] report on their study of the incidence of in-transit critical events and factors associated with these events among urgent air–medical transports during a 17-month period in the Canadian province of Ontario. Their study involved 19 228 transports of adult patients, making it the largest published cohort involving transports of patients by air. The authors defined in-transit critical events as death, a major resuscitative procedure, hemodynamic deterioration, or inadvertent extubation or respiratory arrest. They found that patients who experienced critical events during transport were older, were more likely to be female, to have baseline hemodynamic instability and to have received assisted ventilation before transport. There was a 70% increase in the odds of a

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critical event for patients transported from the scene. A 2% increase in the odds of a critical event was observed for every 10-minute increase in transport duration. The most common event was hemodynamic deterioration, followed by major resuscitative procedure. Critical events occurred in 1 in every 20 patient transports. The authors point out that this rate, although low, is noteworthy given the seriousness of the events and the out-of-hospital setting in which they were managed.

The study by Singh and colleagues may provide useful insight for the training of transport crews in scenarios involving in-flight medical management and may suggest markers for more robust stabilization of patients by hospital staff preparing patients for transport. It may also help in the development of evidence-based criteria for dispatch. The findings of Singh and colleagues suggest that patients who have hemodynamic instability or require assisted ventilation before transport are more likely to require in-transit intervention. The type of resuscitative procedure observed most frequently in this study was airway management. Other studies have reported an increase in mortality among patients with traumatic brain injury who are intubated in out-of-hospital settings but have observed no similar increase among patients administered airway management by air–medical crews.[9,10] Singh's data, in combination with such findings, may be useful in identifying evidence-based markers for patients who would benefit from management by air–medical services.

For patients with traumatic brain injury, understanding that patients transported by urgent air–medical transport were spared the increased mortality associated with out-of-hospital intubation performed by ground emergency medical crews may, in combination with Singh's data and those of others, drive evidence-based dispatch criteria.

Research on this topic is challenging given the lack of a population-based registry of patient outcomes. Randomized controlled trials involving use of urgent air–medical transport are seldom undertaken because of ethical concerns. Large cohort studies, as reported by Singh and colleagues, will likely remain the mainstay of efforts to inform optimal use of urgent air–medical transport.

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