

## New study examines cost-effectiveness of helicopter transport of trauma victims

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Researchers at the Stanford University School of Medicine have for the first time determined how often emergency medical helicopters need to help save the lives of seriously injured people to be considered cost-effective compared with ground ambulances.

The researchers found that if an additional 1.6 percent of seriously injured [patients](#) survive after being transported by helicopter from the scene of injury to a level-1 or level-2 [trauma center](#), then such transport should be considered cost-effective. In other words, if 90 percent of seriously injured trauma victims survive with the help of ground transport, 91.6 need to survive with the help of helicopter transport for it to be considered cost-effective.

The study, published online this month in the *Annals of Emergency Medicine*, does not address whether most helicopter transport actually meets the additional 1.6 percent survivorship threshold.

"What we aimed to do is reduce the uncertainty about the factors that drive the cost-effective use of this important critical care resource," said the study's lead author, M. Kit Delgado, MD, MS, an instructor in the Division of Emergency Medicine. "The goal is to continue to save the lives of those who need [air transport](#), but spare flight personnel the additional risks of flying - and patients with minor injuries the additional cost - when helicopter transport is not likely to be cost-effective." (Helicopter medical services generally bill patients' insurance providers directly, but patients may have to pay some of the bill out of pocket, or,

if they're uninsured, possibly all of it.)

The study comes at a time when finding ways to cut [medical costs](#) has become a national priority, and the overuse of helicopter transport has come under scrutiny. Previous studies have shown that, on average, over half of patients transported by helicopter have only minor, non-life threatening injuries. For these patients, transport by helicopter instead of ground ambulance is not likely to make a difference in outcomes, and the additional risk and cost of helicopter transport outweighs the benefit, Delgado said.

In 2010, there were an estimated 44,700 U.S. helicopter transports from injury scenes to level-1 and level-2 trauma centers, with an average cost of about \$6,500 per transport. The total annual cost is around \$290 million. (Level-1 and -2 trauma centers are hospitals equipped and staffed to provide the highest levels of surgical care to trauma patients; level-1 centers offer a broader array of readily available specialty care, and also are committed to research and teaching efforts.)

Yet emergency helicopter transport sits in a cost-efficiency conundrum: It is most needed in remote, rural areas where transport by ground can take far longer than by air. These areas also tend to have sparser populations and therefore fewer calls for aid, making it difficult to recoup the overhead costs of maintaining helicopter services, Delgado said.

In some areas of the country, however, helicopters are automatically launched based on the 911 call. "Once ground responders and the helicopter arrive, sometimes they may find patients who are awake, talking and have stable vital signs," Delgado said. "The challenge is getting helicopters to patients who need them in a rapid fashion so the flight team can intervene and make a difference, but also know based on certain criteria who isn't sick enough to require air transport."

Most health economists consider medical interventions that yield a year of healthy life - a measure known as a quality-adjusted life-year - at a cost of between \$50,000 and \$100,000 to be cost-effective in high-income countries, such as the United States, Delgado said. If society is willing to pay as much as \$100,000 toward helicopter transport for each QALY gained by the seriously injured patients, then helicopter transport needs to reduce the mortality rate of these patients by a modest 1.6 percent compared with ground transport to meet this threshold, the study says. Or it needs to improve long-term disability outcomes, the study says.

"If future studies find helicopter transport leads to improved long-term quality of life and disability outcomes, then helicopter transport would be considered cost-effective, even if no additional lives were saved," Delgado said. "Only a handful of studies have examined outcomes other than death, without definitive results."

For severely injured patients, helicopter evacuation to a trauma center is preferable if it is faster than ground transport. However, helicopter transport is more expensive and poses rare, but often fatal, safety risks - specifically, the risk of crashing. Plus, it is often difficult for emergency responders to discern which patients would actually benefit from being flown in a helicopter rather than driven in an ambulance to a high-level trauma center. Until this study, the survival benefit needed to offset these potential drawbacks hasn't been clear.

"More accurately determining which patients have serious injuries and need to be flown is the most promising way to ensure you are getting a good value by using helicopter transport," Delgado said. "To do this, we should promote diligent use of the Centers for Disease Control's field triage guidelines among EMS responders. This would help ensure that injured victims who are transported by helicopter to a trauma center actually require trauma care. Secondly, we need to figure out whether

the practice of autolaunching helicopters based on a 911 call makes sense. If the benefit of the faster response time outweighs the expenditure of resources on those patients who may not actually need helicopter transport, then autolaunching makes sense. If not, the practice should be reconsidered."

There is mixed evidence in the literature about the degree to which helicopter transport reduces mortality. It is therefore uncertain whether the routine use of helicopter transport is cost-effective for most patients in the United States when ground transport is also feasible. The study found that the cost-effectiveness also depends on regional variation in the costs of air and ground transport and the percentage of patients who are flown that have minor injuries.

"Of course, this study only applies to situations in which both ground and [helicopter transport](#) to a trauma center are feasible," Delgado added. "In situations where the only alternative is being taken by ground to a local nontrauma-center hospital or being flown to a trauma center, then clearly we want any patient with a suspicion of a serious injury flown to that trauma center."

Provided by Stanford University Medical Center

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