Journal Club Synopsis
Block 12: May 26th, 2015
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Scenario:
You are working a shift in the local rural hospital 70 miles from the local trauma center. There is an accident just outside the hospital and multiple causalities are brought to your ED for treatment. The driver of one vehicle was unrestrained. After evaluation and initial stabilization you determine he must be sent to the trauma center for further treatment. The unrestrained driver suffered a hemothorax and was intubated for airway protection with a head injury. The patient is now stable but you're concerned about how long he may remain stable. You talk with the trauma and neurosurgeons who accept the patient for transfer at the level 1 facility.

1. How will you send the patient? By ground or air?
2. Are there any guidelines that will help you decide?
3. What evidence is there to support your decision?

Background: This is an old question and there is a huge amount of literature about EMS transport options. As expected some of it is good and some not so much. The question is raised often enough that ACEP has a position statement which was reviewed. The statement emphasizes that the real benefit from air medical transport may fall into one of three categories: speed, expertise of crew, an otherwise inaccessible patient. The first two are directly relevant to our discussion. Unfortunately this statement does not provide much specific help in answering our above questions. It does state that the decision to transport from a medical perspective and safety from an aeronautic perspective are separate. Also acknowledged is the need for local/regional guidelines. These guidelines exist but due to variability, specifics are beyond the scope of this discussion. Guidelines are just that however and do permit "physician discretion". Research is limited by several factors. Chief among these is confounding of care provided. Is it the speed of transport or care provided that most benefits patients? The ethics of randomized control trials are debatable and variability across studies/providers/regions may be great.

Background article:
"Appropriate and safe utilization of helicopter emergency medical services: A joint position statement with resource document." Floccare DJ, Stuhlmiller DF, Braithwaite SA, Thomas SH, Madden JF, Hankins DG, Dhindsa H, Millin MG. Prehosp Emerg Care. 2013 Oct-Dec;17(4):521-5. doi: 10.3109/10903127.2013.804139.

This position was developed by: Air Medical Physician Association, American College of Emergency Physicians, National Association of EMS Physicians, American Academy of Emergency Medicine.

Article 1
"When birds can't fly: An analysis of interfacility ground transport using advanced life support when helicopter emergency medical service is unavailable." Borst GM, Davies SW, Waibel BH, Leonard KL, Rinehart SM, et al. J Trauma Acute Care Surg. 2014 Aug;77(2):331-7. PMID 25058262

A retrospective cohort analysis using the national trauma data bank. Specifically this looks at patients who were intended to be transported by air, and were either 1. transported by air or 2. denied transport due to aviation considerations and subsequently transported by ground. This is a clever way to create comparison groups as in both cases the intention was air medical transport. It is a single center analysis over 4 years, with transport provided by a single company. As such the care provided on both the EMS side and receiving hospital should be about the same.

Pts were similar across several major indicators including ISS, GCS, vitals and transfusion requirements. Of note transport times in this study were long, HEMS was over 2.5 hours average at 156 min. Ground was almost 4 hours at 233 min. In both groups there was large variability in transport times. This suggests that despite request for transport these patients weren't crashing or had excellent care. This seems to be a strength of the study; pts were under the care of EMS long enough to manifest a difference between air vs ground EMS providers if one exists. So the study sets up similar patients with similar EMS providers transported by ground vs air. Great! There are however several major flaws in this study. Specifically there is a huge difference between the number transported by HEMS 2190 vs only 233 by ground. Not surprising, given the preselection to air medical transport and grounding due to weather, but a huge disparity and indication of the overall lack of real data available on the subject. Further subgroup analysis is increasingly limited by numbers. Worse yet not all requests for trauma transfer fit criteria for analysis. Total requests during this time were 3901, leaving 1478 pts unaccounted for, 208 died awaiting transport, 49 went by BLS. This leaves 1221 pts without mention, were they so healthy that they didn't need transport after all, die during transport, transported directly from scene? Surprisingly this is not clarified. Primary endpoint was overall mortality defined as occurring at any time during admission. Despite these limitations this is one of the closest cohort comparisons I could find, and it almost directly asks our same question, is air vs ground transport beneficial to the patient? Results show that HEMS was faster, but overall no mortality benefit was demonstrated.

Article 2

"Air versus ground transport of the major trauma patient: a natural experiment." McVey J, Petrie DA, Tallon JM Prehosp Emerg Care 2010 Jan-Mar;14(1):45-50. doi: 10.3109/10903120903349788. PMID 19947867

The second article in this journal club also looks at patients who were selected for air transport and then ultimately transported by ground due to weather or other aviation reasons. It is also a retrospective cohort analysis, this time using the lifeflight HEMS database and Nova Scotia trauma registry. The data is from a 6 year period from 1997-2003, obviously from Canada and older in comparison to article 1. Numbers are not as robust with 397 patients flown, 57 intended to fly but transported by ground. Included for analysis is a third cohort of all adult trauma patients transported by ground during that period. This allows some comparison of pts selected for transport by air vs ground in general. The transport by air medical and air medical accept but aborted pts were again similar, as demonstrated by age, gender and injury severity scores. This paper includes both scene flights and interfacility flights. Scene flights were a minority, 20% of flown missions and 7% of accepted but aborted. This is important as only interfacility flight really help to answer our questions, still the inclusion of scene flights is unfortunate for our purposes. The primary endpoint was mortality. Further analysis of predicted mortality using TRISS and MTOS is provided to adjust for unmeasured confounders. Of note in this study there was no significant difference in transport time between groups, including air, air/abort and even primary ground. This is in stark contrast to article 1. Absolute survival to hospital discharge was higher in the air transport vs air accept and abort group, 83.1 vs 82.5%. This leaves one to wonder if the 0.6% difference is accurately measured in a study of this power. Using the TRISS/MTOS analysis authors reports a difference of 5.61 lives saved per 100 transported. Not exactly comparing apples to apples as more than 100 patients were transported. We must question then if the predicted mortality scores are indeed better than the measured values, given the low study numbers and other confounders. As an interesting aside the absolute survival in the primary ground transport group was higher than air at 85.5% vs 83.1%. Limitations of this article include low numbers gathered over greater time (variability), inclusion of scene flights and use of a predicted endpoint for analysis. However the article does show improvement in both an absolute and predicted survival benefit for air vs air accept and ground transport. There was no difference in transport times in this study.

Article 3

"Is it the H or the EMS in HEMS that has an impact on trauma patient mortality? A systematic review of the evidence."Butler DP, Anwar I, Willett K. Emerg Med J. 2010 Sep;27(9):692-701. doi: 10.1136/emj.2009.087486. Epub 2010 Aug 2. Review. PMID 20679422

This article is not original research but a review of literature. It was included as somewhat of a "cheat". There is so much literature on the subject that it is too much to include in a journal club of this scope. This article provides information from 23 articles and specifically looks at mortality between air transport (HEMS) vs ground transport in trauma patients. Unfortunately for our purposes it only looks at scene transports, and there is no mention if some studies included interfacility transports as in article 2 above (published after this studies search). It was included in the readings however; as it represents a large amount of data directly comparing air vs ground transport. 23 studies met inclusion criteria for review. Medline, Cinahl and Embase databases were searched over 28 years, from 1980-2008. Each of the 23 articles is summarized in a reference table and discussed generally. 14 of the 23 studies showed a mortality benefit with helicopter transport. 5 of the studies were considered to be level 2 evidence, all of which showed some benefit. The remaining studies were level 3 evidence. Much of the data is taken from urban areas. There was double the mortality when a patient was transported to a rural facility vs a "university hospital" (Trauma center?). A benefit of HEMS may be the ability to go directly to a trauma center vs the nearest facility as is often required of ground transport. On scene times were longer with HEMS, and notably longer when a physician is part of the HEMS response, Overall transport times varied some but were not significantly shorter with hems. This suggests skilled providers, and procedures such as intubation, as the source of benefit to the patient. Overall there appears to be a mortality benefit from air vs ground transport in studies with the highest level of evidence.

Summary

These three studies provide different end points and conclusions about the benefit of air vs ground transport. Background information suggests that our patients may benefit from the speed of transport and the skill of the transporting providers. There is a trend toward provider skill set as the root benefit. The actual difference in mortality may in fact be small when comparing air medical transport to similar provider level ground transport, but the evidence is mixed. There are guidelines for HEMS both nationally and locally.

Expert opinion suggests that ~35-45 minutes transport time is when HEMS becomes faster than ground locally. Residents polled at the end of the journal club voted to transport our patient by air, at a rate of approx 4:1.

Lagniappe (a little extra)

A recent article suggests that in order for HEMS to be cost effective it would need to provide a 17% mortality benefit. Almost none of the papers, if you include the 23 reviewed articles and articles 1 and 2 demonstrate this level of benefit.

Delgado MK, Staudenmayer KL, Wang NE, Spain DA, Weir S, Owens DK, Goldhaber-Fiebert JD. Cost-effectiveness of helicopter versus ground emergency medical services for trauma scene transport in the United States. Ann Emerg Med . 2013;62:351-364. PMID 23582619