Time is Money: The True Cost of Helicopter EMS (HEMS)

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Multiple studies have been published that attempt to examine the relevant benefits of utilizing helicopter transport (HEMS) over traditional ground-based emergency medical services (EMS). Unfortunately, these studies suffer from poor methodology and are confounded by substantial differences in training and expertise of the personnel involved in the medical transfer. Our EMS system in Central Massachusetts is unique in that when a physician from an outside hospital calls for an HEMS transport, the pilot determines if weather conditions permit a safe flight without having any further knowledge about the patient. If flying is deemed unsafe, the helicopter personnel will retrieve the patient by traditional ground ambulance. This allowed us to compare these two transfer modalities while eliminating the confounder of crew expertise.

**Objectives**

The goal of this study is to investigate whether the reduction in time to appropriate care through the use of Helicopter Emergency Medical Services (HEMS) reduces overall mortality over Ground Emergency Medical Services (GEMS). We hypothesize that the overall mortality of these inter-facility transfers is comparable, regardless of mode of transport and admitting diagnosis, if accompanied by highly-trained personnel. Furthermore, the appropriate use of HEMS may reduce the transfer time, cost of hospitalization and reduce long-term disability over transport via GEMS.

**Study Design**

This study was conducted as a retrospective chart review that met IRB exemption criteria. This study had two arms of enrolled patients. One arm consisted of patients who were transferred from an outside facility to the UMass University campus via Helicopter Emergency Services (HEMS). The other arm of the study contained individuals that would have been eligible for HEMS transport but were instead transported via Ground Emergency Medical Services (GEMS). We searched the UMass Electronic Medical Records and UMass Life Flight records for potential subjects in our study. We hoped for a case cohort size of ≥200 individuals. Based on previous literature, the expected change in mortality between HEMS and GEMS use is approximately 2%. Using this expected value, our study had a statistical power of 81% if ≥200 patients were enrolled into our case study cohort.

**Statistical Analysis**

Our group used the de-identified data to examine mortality data and conduct primary analyses. The primary endpoint for this study was overall mortality. Secondary endpoints included difference in transfer time, disability-adjusted life years saved through appropriate use of HEMS and quality-adjusted life years saved through appropriate use of HEMS.

These research endpoints of mortality and time of transport was reached by analyzing the categorical data with a Pearson’s X2 analysis. Scalar data was analyzed using a Student’s T-Test or ANOVA.

The primary outcomes were analyzed further as a subgroup analysis based on patient severity scores and admitting diagnosis. Severity was assessed based on their All Patient Refined Diagnosis Related Groups (APR-DRG) data. After a patient is admitted, they are assigned a number between 1 and 4 that corresponds to the severity of their illness based on their primary diagnosis. All analyses and statistical significance was done through Excel and PRISM software.

**Results**

Once IRB approval was obtained, we utilized an “Eligible Participant Sheet” to create a list of medical record numbers of eligible subject participants. This data collection sheet was designed so that subjects were not readily identifiable. Our research group chose a single subject’s medical record number, at random, and accessed the record. The relevant subject data will be copied to the “Data Collection Sheet.” The data was verified and the “Eligible Participant Sheet” was marked as complete for that subject. This process will be repeated until all of the medical records have been accessed in a random order. At the end of this process, we had one list of MRNs and a separate list of data with no link between the two. The following data were extracted from the included charts:

**Patient Inclusion and Exclusion Criteria**

- **2129 Patients**
- **655 Scene Calls**
- **1473 Transfers**
- **10%**
- **90%**
- **151**
- **1323**

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**Conclusions**

We conclude that the transfer times are very similar between the two transfer modalities examined. It is unclear to us at this point in our research whether these seemingly few minutes saved leads to improved patient outcomes or worth the additional cost of the helicopter service.

We also conclude that there was no statistical difference in the mean age or gender of the individuals transferred between the two modalities. However, we discovered that the mean Severity of Illness score and Mortality Risk were both statistically significantly higher for LifeDrive patients than LifeFlight patients. One of the reassuring findings of our data is that there is not a statistically significant difference in mortality despite the transport modality used. Our conclusion of this study is that mortality outcomes may have more to do with the level of skill and training of the transferring providers instead of the transfer modality itself.