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Wallace DJ, Kahn JM, Angus DC, Martin-Gill C, Callaway CW, Rea TD, Chhatwal J, Kurland K, Seymour CW. Accuracy of prehospital transport time estimation. Acad Emerg Med. 2014 Jan;21(1):9-16.

Clinical Question: What is the accuracy of three transport time estimation methods (linear arc distance, Google Maps, and ArcGIS Network Analyst) against observed prehospital transport times?

Introduction: Estimates of prehospital transport times are an important part of emergency care system research and planning. Time to definitive therapy is a benchmark for many conditions that the ED deals with daily, including: acute ischemic stroke, acute myocardial infarction, sepsis, and trauma. The accuracy of the transport time estimates in prehospital patient encounters has not been elucidated. This study evaluates the accuracy of three time-estimation methods: linear arc distance, Google Maps, and ArcGIS Network Analyst.

Methods:
STUDY POPULATION: Prehospital records from King County, Washington and southwestern Pennsylvania from 2002-2006 and 2005-2011. Exclusion criteria included: unable to code exact starting location, missing documented transport time, and patient age <18.
DESIGN: Retrospective cohort study.
OUTCOME MEASURE: Primary: Transport time estimate error (absolute difference between observed transport time and transport time estimate). Secondary: Estimate percent error (absolute percent difference between the observed transport time and transport time estimate).
STATISTICS: Mean absolute error (minutes) and median absolute error (%) were calculated. These were broken down further into transport time < 10 minutes and transport times >20 minutes.

Results: From 72,931 EMS transports to 67 hospitals, 29,935 transports to 44 hospitals were included. The overall mean absolute error (p<0.01) was 4.8 (±7.3) min for linear arc distance, 3.5 (±5.4) min for Google Maps, and 4.4 (±5.7) min for ArcGIS. All of these methods were more accurate for observed transport duration <10 min and less accurate for transports >20 min.

Discussion: This study demonstrates that rout-based transport time estimation is most accurate using Google Maps and least accurate using a linear arc method. Perhaps more importantly, it shows that there is a wide range of prediction errors by all methods for transport times that are longer than 20 minutes. Therefore, rural health care systems may want to invest in technology by which they can more accurately estimate transport times, which will inevitably impact hospital resource planning.

Limitations: The retrospective cohort study design is not ideal. Also, this study relied on potentially inaccurate time data for the criterion standard (manually entered by EMS crew). Also, the study did not include information on EMS crews who ran with lights and sirens versus those who did not.