Development of a Method to Determine Geolocations for Anesthesia Specialty Coverage and Standby Call Allowing Return to the Hospital within a Specified Time Interval

Presenting Author: Paul Potnuru, MD, Department of Anesthesia, Perioperative Medicine & Pain Management, University of Miami, Miller School of Medicine

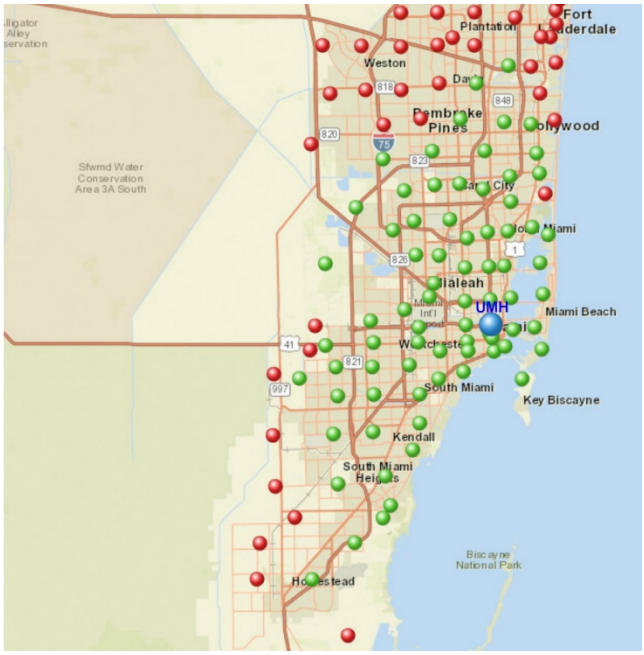
Co-Authors: Richard H. Epstein, MD, Department of Anesthesia, University of Miami, Franklin Dexter, MD, PhD, Division of Management Consulting, Department of Anesthesia, University of Iowa, Christian Diez, MD, MBA, Department of Anesthesia, University of Miami

Background: Staffing requirements during non-regular hours can be determined using historical data form anesthesia or operating room information systems.[1] For emergent procedures, in-house teams are required to provide patient care. However, for many procedures, there is time to bring in a call team from home without increasing patient morbidity. Anesthesia providers taking call from home or on backup call are required to return to the hospital within a designated interval. Driving times to the hospital during the hours of such call need to be considered when deciding where one can be located when taking such call. Distance alone is an insufficient criterion because of varying traffic congestion and difference in access to highways.

Objective: Our goal was to develop a simple, inexpensive, method of determining the areas around the hospital in which people taking standby call could be located and meet the requirement for a timely return to the hospital.

Methods: Pessimistic travel times and driving distances using the Google Distance Matrix Application Programming Interface[3] (API) were calculated for postal codes[2] ≤60 great-circle ("straight line") miles of the University of Miami Hospital (Miami, Florida). A postal code was considered acceptable if the longest estimated driving time was ≤ 60 minutes (the anesthesia department's requirement) among all 108 weekly call hours. Linear regression (with a zero-intercept) minimizing the mean absolute percentage difference between the distances (great-circle and driving) and the maximum of the longest pessimistic driving times among all 108 hours of standby call per week was performed among all 136 postal codes. The software was written in Python.

Results: Postal codes allowing return to the studied hospital within the allowable interval were identified (Figure). Driving distances correlated poorly with the return driving times to the hospital (mean absolute percentage error = 25.1% ± 1.7% standard error [SE]; *N* = 136 postal codes). Great circle distances also correlated poorly (mean absolute percentage error = 28.3% ± 1.9%).



Conclusions: The described method allows identification of postal codes surrounding a hospital in which personnel taking standby call could be located and be able to return to the hospital within a specified interval during all call hours of the week. For areas at the perimeter of the acceptability, the Google Maps application can be used to check driving times during the hours of standby call.

Figure. Map of centroid locations (green balls) from the United States Census Bureau zip code tabulation areas surrounding the University of Miami Hospital (blue ball) where a return to the hospital during all non-regular hours would be possible within 60 minutes. Areas outside this zone are noted with red balls.

References:

1. Dexter F, Epstein RH. *Anesth Analg*. 2006;103:1494–1498.
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3. Google. Distance Matrix API. https://goo.gl/Nmy71C Accessed 9/12/17