Reducing the environmental impact of residency interview travel through a traveling salesman approach

Aaron M. Kearney, M.D., Jennifer Bai, M.D., Sofia Aronson, M.D., Arun K. Gosain, M.D. Division of Plastic Surgery, Northwestern University, Chicago, IL

Background: Plastic surgery applicants are significant users of air travel for residency interviews. In 2018, matched applicants ranked on average over 13 programs. We have learned that this interview travel can have an impact on the environment. Americans flying 6+ round trips per year emit 3.1 tons of carbon dioxide per person due to flying. The traveling salesman problem was first described in the 1800's and seeks to find the shortest possible route that visits each city in a list. In this study, we consider the residency interview process to be a traveling salesman problem and seek to solve it via a simulated annealing approach. The ideal solution is then applied to actual resident interview itineraries, and the improvement in efficiency is calculated.

Methods: Statistics for this study were done in R version 3.6.1 with packages ‘shiny’, ‘maps’, and ‘geosphere’. The open source "shiny-salesman" app was modified to permit inclusion of all integrated programs. The locations of each training program were entered into the app and results were computed. Next, actual city-to-city interview routes for three residents were entered into Google Maps and the distance was calculated. The actual interview routes were rearranged according to the ideal route in Google maps. Actual and ideal mileage was compared by Student's t-test.

Results: The result of the simulated annealing calculation is given in Figure 1. The total distance of the route between all 67 cities was 11,544 miles. Three residents traveled an average of 13,662 miles between 15.3 cities for their interviews. When the most efficient route was applied to their schedules, the miles were reduced to an average of 6976 (p = .04). This corresponded to an average 50% reduction in miles traveled (range 46-55%).

Conclusion: Coordinating residency interviews requires significant effort on the part of both programs and applicants. As many successful applicants interview at over 10 programs, this process can become not only expensive for applicants but also costly to the environment. This study demonstrates the potential of a more efficient interview schedule to significantly reduce the carbon dioxide emissions generated by residency interview travel.