Comparing Driving Miles for Department of Veterans Affairs–delivered Versus Department of Veterans Affairs–purchased Cataract Surgery

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Background: The Veterans Choice Act of 2014 increased the number of Veterans eligible for Department of Veterans Affairs (VA)-purchased care delivered in non-VA community care (CC) facilities. Driving >40 miles from home to a VA facility is a key eligibility criterion for CC. It remains unclear whether this policy change improved geographical access by reducing drive distance for Veterans.

Objectives: Describe the driving distance for Veterans receiving cataract surgery in VA and CC facilities, and if they visited the closest-to-home facility or if they drove to farther facilities.

Results: A total of 61,746 Veterans received 83,875 cataract surgeries. More than 50% of CC surgeries occurred farther than the closest CC facility providing cataract surgery (median Closest CC facility 8.7 miles vs. Actual CC facility, 19.7 miles). Most (57%) Veterans receiving cataract surgery at a VA facility used the Closest VA facility (median Closest VA facility 28.1 miles vs. Actual VA facility at 31.2 miles). In all, 26.1% of CC procedures occurred in facilities farther away than the Closest VA facility.

Conclusions: Although many Veterans drove farther than needed to get cataract surgery in CC, this was not true for obtaining care in the VA. Our findings suggest that there may be additional reasons, besides driving distance, that affect whether Veterans choose CC and, if they do, where they seek CC.

Key Words: Veterans, geographic information systems, access to health care, cataract surgery, travel burden

The Veterans Access, Choice and Accountability Act of 2014 (Choice) was passed in response to long waitlists and delays in care. Choice increased care access by allowing Veterans meeting certain eligibility criteria to receive care through Department of Veterans Affairs (VA)-purchased care in the community. Two important eligibility criteria were: (1) having to wait more than 30 days for an appointment; and (2) having to drive more than 40 miles from a Veteran’s home to the nearest VA facility. In federal fiscal years (FYs) 2015 and 2016, about 90% of 1.28 million Veterans with Choice appointments qualified under wait-time eligibility, and ~10% were eligible for community care (CC) based on this 40-mile rule. There was no requirement that the CC facility be the Closest CC facility to the Veteran’s home, or that it be closer than the nearest VA facility. Relatively little is known about whether the changes implemented through the Choice Act improved geographical access to care. As increasing numbers of Veterans are likely to use CC due to expanded eligibility criteria through the Maintaining Internal Systems and Strengthening Integrated Outside Locally Operated Care System (MILS), it is important to understand the geographical access Veterans obtain with Choice.
We conducted a retrospective observational study using VA and CC datasets in the VA’s Corporate Data Warehouse (CDW) for FY2015. Data management and analyses were executed within Veterans Informatics and Computing Infrastructure (VINCI)9 using geographic and statistical software [see Supplemental Digital Content 1 for a list of data sources and expanded explanation of data preparation, http://links.lww.com/MLR/C159]. Our study was deemed to be quality improvement and therefore exempt from Institutional Review Board review.

Our study cohort included all Veterans living in the continental US, Alaska, Hawaii, and all US territories (Puerto Rico, Guam, US Virgin Islands, American Samoa) who had cataract surgery as identified by Current Procedural Terminology (CPT) codes 66982 (complex cataract surgeries) and 66984 (routine cataract surgeries) in FY2015. Study Veterans were on average 78.7 years old, 96.5% male, 78.7% White, and 59.4% lived in urban areas. (Additional descriptive details of our study cohort have been published elsewhere.10) We included only one surgery per eye per Veteran in our cohort, and each surgery formed the unit of analysis (rather than the Veteran) as it was exceptionally rare for Veterans (103 total) to have surgery on both eyes during a single day; in the case of multiple surgeries per eye, we included only the first surgery in FY2015 for each eye (1 right and 1 left).

Generating drive distances in Geographic Information System (GIS) software requires origin points (for Veteran homes), destination points (for VA or CC cataract surgery), and a road network dataset. For travel origins, we used geocoded Veteran home addresses that were current during the fiscal quarter in which they had their surgeries. For destinations (surgical facilities), we used geocoded VA facilities and geocoded CC provider practice addresses. We selected Streetmap North America for our road network dataset.

We designated all CC facilities where VA paid for cataract surgeries in FY2015 as possible CC facility locations. To be consistent, we made the same designation for VA facilities, based on records that cataract surgeries had occurred at the facility in FY2015.

We used the Closest Facility and Route procedures provided with the Esri GIS software Network Analyst extension11–13 for calculating drive distances (in miles) from Veterans’ home locations to four cataract surgery destinations: the Closest VA facility (Closest VA); the Closest CC facility (Closest CC); and the actual facility where a Veteran received care (either “Actual VA” or “Actual CC”). We placed no limits on where Veterans could travel, enabling them to cross state, national, and VA administrative boundaries (eg, Veterans from Alaska were able to drive to the lower 48 states using roads in Canada).

To visualize travel, we used inverse distance weighting to create heatmaps of miles for Closest VA, Closest CC, Actual VA, and Actual CC.14 We also created heatmaps for distance differences between Closest and Actual facilities.

RESULTS

Our study cohort included 61,746 Veterans who received 83,875 cataract surgeries in FY2015; of these, most Veterans (72.1%) sought cataract surgery in 123 VA facilities, while 27.9% received care in 2668 CC facilities (Table 1; see also Supplemental Table 1).
# TABLE 2: Driving Miles for Veterans to Receive Cataract Surgery in FY2015 by State to VA and to CC Facilities

| Facility Count | Procedure Count | For Veterans Who Visited a VA Facility to the Closest VA Facility | For Veterans Who Visited a CC Facility to the Closest CC Facility |
|----------------|----------------|---------------------------------------------------------------|---------------------------------------------------------------|
| National       | 123            | 2668                                                          | 58,050                                                        |
| Alabama        | 2              | 54                                                            | 643                                                           |
| Alaska         | 1              | 10                                                            | 62                                                            |
| Arizona        | 1              | 75                                                            | 765                                                           |
| Arkansas       | 2              | 43                                                            | 1130                                                          |
| California     | 9              | 119                                                           | 5244                                                          |
| Colorado       | 2              | 62                                                            | 814                                                           |
| Connecticut    | 1              | 13                                                            | 446                                                           |
| Delaware       | 1              | 2                                                             | 140                                                           |
| District of Columbia | 1     | 2                                                             | 132                                                           |
| Florida        | 8              | 194                                                           | 4852                                                          |
| Georgia        | 2              | 74                                                            | 1723                                                          |
| Hawaii         | 0              | 29                                                            | 2                                                             |
| Idaho          | 1              | 32                                                            | 233                                                           |
| Illinois       | 5              | 85                                                            | 2084                                                          |
| Indiana        | 2              | 67                                                            | 1251                                                          |
| Iowa           | 2              | 33                                                            | 902                                                           |
| Kansas         | 4              | 47                                                            | 716                                                           |
| Kentucky       | 2              | 31                                                            | 1231                                                          |
| Louisiana      | 3              | 1206                                                         | 195                                                           |
| Maine          | 1              | 42                                                            | 93                                                            |
| Maryland       | 1              | 12                                                            | 844                                                           |
| Massachusetts  | 1              | 840                                                           | 22                                                            |
| Michigan       | 3              | 104                                                           | 1318                                                          |
| Minnesota      | 2              | 103                                                           | 1683                                                          |
| Missouri       | 3              | 30                                                            | 587                                                           |
| Montana        | 3              | 37                                                            | 181                                                           |
| Nebraska       | 1              | 19                                                            | 358                                                           |
| Nevada         | 2              | 32                                                            | 548                                                           |
| New Hampshire  | 0              | 15                                                            | 190                                                           |
| New Jersey     | 3              | 41                                                            | 108                                                           |
| New Mexico     | 1              | 51                                                            | 529                                                           |
| New York       | 7              | 65                                                            | 2052                                                          |
| North Carolina | 4              | 102                                                           | 2738                                                          |
| North Dakota   | 1              | 11                                                            | 341                                                           |
| Ohio           | 5              | 17                                                            | 2762                                                          |
| Oklahoma       | 2              | 52                                                            | 985                                                           |
| Oregon         | 2              | 66                                                            | 1113                                                          |
| Pennsylvania   | 4              | 102                                                           | 1596                                                          |
| Rhode Island   | 1              | 3                                                             | 30                                                            |
| South Carolina | 2              | 37                                                            | 1609                                                          |
| South Dakota   | 2              | 22                                                            | 483                                                           |
| Tennessee      | 4              | 109                                                           | 1269                                                          |
| Texas          | 7              | 184                                                           | 3518                                                          |
| Utah           | 16             | 16                                                            | 649                                                           |
| Vermont        | 1              | 6                                                             | 85                                                            |
| Virginia       | 3              | 36                                                            | 1480                                                          |

(Continued)
TABLE 2. Driving Miles for Veterans to Receive Cataract Surgery in FY2015 by State to VA and to CC Facilities (continued)

| State           | Drive Miles by State to VA and CC Facilities Mean, Median (SD) | For Veterans Who Visited a VA Facility to the Closest VA Facility | Actual VA Facility | Closest CC Facility | Actual CC Facility |
|-----------------|---------------------------------------------------------------|---------------------------------------------------------------|-------------------|--------------------|-------------------|
| Washington      | Washington 3 83 1347 304 33.7, 18.1 (36.9) | 11.1, 6.6 (13.3) | 54.2, 37.2 (63.4) | 5.2, 3.5 (5.6) |
| West Virginia   | West Virginia 3 29 690 589 41.9, 37.2 (46.4) | 48.6, 38.3 (46.1) | 63.1, 38.3 (67.4) | 12.1, 11.9 (12.4) |
| Wisconsin       | Wisconsin 3 87 968 526 35.2, 27.6 (54.1) | 35.3, 26.6 (54.1) | 10.2, 7.0 (12.9) | 2.1, 1.9 (3.2) |
| US Territories  | US Territories 1 5 177 24 28.1, 22.7 (57.3) | 12.1, 11.9 (12.4) | 7.8, 6.8 (10.3) | 7.1, 7.0 (10.3) |
| Not Geocoded    | Not Geocoded 0 4 217 53 19.2, 16.5 (22.1) | 7.1, 7.0 (10.3) | 12.1, 7.0 (17.2) | 4.3, 3.3 (5.6) |

By US State, the median and SD for miles driven from home to the Closest VA facility, Closest CC facility, and to the actual facility where the Veteran received care. The distributions of the distances to the Closest VA facility, Closest CC facility, and the likely actual distance driven are displayed as box plots (by Census Division) in Figure 1. For those receiving CC care in all regions, Closest VA mileage (box plot’s lower hinge) was greater than the mileage to Closest CC (box plot’s upper hinge); median actual CC travel either exceeded or nearly exceeded 75% of Closest CC drives. By contrast, median Actual VA and Closest VA drives were relatively similar for all regions.

As shown in the heatmaps (Fig. 2, left), areas with excess travel to a VA facility (closest facility mileage minus actual facility mileage) were concentrated in a few, mostly rural areas. By contrast, heatmaps for those who traveled excess miles to one of the 2,668 CC facilities (Fig. 2, right) revealed a greater number of areas representing excess travel, and these were more evenly distributed across rural and urban areas. As compared with the left map (surgery in VA facility) which mostly shows excess miles in relatively rural areas, the map on the right (surgery in CC facility) reveals many urban locations where Veterans drove farther than necessary to receive care in a CC facility.

As shown in the Figure 3 heatmaps, there were markedly different patterns for Veterans traveling to the Closest VA facility or those receiving CC care.
(upper left) and Closest CC facilities (lower left) as compared with the Actual VA (upper right) and Actual CC facilities (lower right). Routes in the closest facility analyses tended to have a hub-and-spoke pattern around each of the VA and CC facilities, whereas actual facility analyses generated driving routes that appeared relatively disordered. The larger number of facilities and greater geographic spread is also apparent in the Figure 3 panels. If all Veterans had driven the shortest necessary distance to receive cataract care, the maps on the left (closest facility) and right (actual facility) sides would be identical. While there are differences between closest and actual facility for those who received care at a VA facility (upper maps), those differences are not as marked as they are for Veterans who visited CC facilities (lower maps).

**DISCUSSION**

Our study is the first to compare relative drive distances between VA and CC for cataract surgery. Both Veterans who sought care in VA and CC facilities frequently drove farther than a closer-to-home facility capable of providing cataract care. As illustrated by patterns in Figure 2 maps, the Veterans seeking cataract care in CC facilities traveled farther than necessary more frequently than did Veterans receiving care at VA facilities.

There may be many explanations for why a Veteran might not go to the closest facility. Choice of location is likely to depend on factors such as wait times, surgeons’ reputations, and perceptions of quality, factors that are often difficult to measure. There may be family caregivers who live...
close to the more distant surgical facility. Survey-based or qualitative studies that query Veterans about the types of factors that influence where they are likely to go to obtain care, and why they may choose not to go to the closest facility, would be a very useful next step for researchers.

We acknowledge several limitations. Our analysis used a road network published in 2010. We do not know the actual route Veterans drove to receive care. While our analyses allowed Veterans to seek care across state lines, we tabulated travel distance by state (tables) and Census Division (box plots) to generate answers having familiar geographic units. These different methods for aggregating data may have artificially lowered or raised measurements for routes crossing these geopolitical boundaries. We had no information on whether Veterans qualified for Choice based on distance or some other criteria. If Veterans relocated to warmer areas of the southeastern United States as part of the annual “significant seasonal fluctuation” (so-called, “sunbirds” or “snowbirds”), our measurements could be out-of-date. Finally, cataract surgery may have unique requirements that make it difficult to generalize these findings to other non-cataract VA versus CC comparisons.

Changes to federal policies aimed to reduce the travel burden for Veterans seeking medical care. This paper describes the driving distance associated with VA-purchased care in CC versus VA-delivered care for cataract surgeries in FY2015. Although many Veterans drove farther than needed to get cataract surgery in CC, this was not true for obtaining care in the VA. Our findings suggest the importance of studies that attempt to identify other reasons besides driving distance that affect where Veterans seek cataract surgery or other services in CC.

REFERENCES
1. Department of Veterans Affairs. Expanded Access to Non-VA Care Through the Veterans Choice Program (Vol 79, No 214). Washington, DC: Federal Register; 2014:65571–65587.
2. United States Government Accountability Office. Veterans Choice Program. GAO-18-281, ed. 2018:14.
3. French DD, Margo CE. Factors associated with the utilization of cataract surgery for veterans dually enrolled in Medicare. Mil Med. 2012;177:752–756.
4. VA Ophthalmology Services. Ophthalmology Services. Available at: https://www.patientcare.va.gov/Ophthalmology/Ophthalmology_Services.asp. Accessed July 5, 2019.
5. Wu AM, Wu CM, Tseng VL, et al. Characteristics associated with receiving cataract surgery in the US Medicare and Veterans Health Administration Populations. JAMA Ophthalmol. 2018;136:738–745.
6. Kauh CY, Blachley TS, Lichter PR, et al. Geographic variation in the rate and timing of cataract surgery among US communities. JAMA Ophthalmol. 2016;134:267–276.
7. Yahanda AT, Lafaro KJ, Spolverato G, et al. A systematic review of the factors that patients use to choose their surgeon. World J Surg. 2015;40:45–55.
8. Dueker JM, Khalid A. Performance of the Veterans Choice Program for improving access to colonoscopy at a tertiary VA facility. Fed Pract. 2020;37:224–228.

9. US Department of Veterans Affairs. VA Informatics and Computing Infrastructure (VINCI), VA HSR HIR 08-204 [database online]. 2008.

10. Rosen AK, Vanneman ME, O’Brien WJ, et al. Comparing cataract surgery complication rates in veterans receiving VA and community care. Health Serv Res. 2020;55:690–700.

11. Esri. Closest facility analysis. 2019. Available at: https://desktop.arcgis.com/en/arcmap/10.5/extensions/network-analyst/closest-facility.htm. Accessed November 22, 2019.

12. Esri. Route analysis. 2019. Available at: https://desktop.arcgis.com/en/arcmap/10.5/extensions/network-analyst/route.htm. Accessed November 11, 2019.

13. Esri. Esri Data & Maps 10. Redlands, CA. 2010.

14. Krivonischko K. Spatial Statistical Data Analysis for GIS Users. Redlands, CA: ESRI Press; 2011.

15. Kessler DP. Can Ranking Hospitals on the Basis of Patients’ Travel Distances Improve Quality of Care. Cambridge, MA: National Bureau of Economic Research; 2005. Available at: https://www.nber.org/bibliographic/w11419.bib.

16. Al-Haque S, Ceyhan ME, Chan SH, et al. Responding to traveling patients’ seasonal demand for health care services. Mil Med. 2015;180:111–117.