

Accessible Design in Rural Health Care: Usability Profile of Outpatient Health Care Facilities in Rural West Virginia

Jordan Elliott Miller, MS¹, Chris Haddox, PhD¹

ABSTRACT

The purpose of this research is to better understand the physical and environmental features of outpatient healthcare facilities that act as barriers to healthcare access in rural West Virginia and factors that contribute to non-compliance with the Americans with Disabilities Act (ADA). The research aims to explore the prevalence of barriers in rural West Virginian health facilities and the relationship between building characteristics (like the year of construction and original purpose) and accessibility. The researcher evaluated ten rural outpatient member-sites of the West Virginia Practice-Based Research Network using the Outpatient Health Care Usability Profile to measure essential features for a facility to be considered 'usable'. The results indicate that surveyed clinics scored an average of 73% in overall accessibility. Counters, restrooms, and exam rooms were the lowest scoring categories. The study found a moderate positive correlation between year of construction and mobility (Pearson $r = 0.765$) and overall score ($r = 0.637$). This research supports the notion that physical and environmental barriers to healthcare access still exist and that older clinical buildings run a higher risk of being non-compliant with essential ADA items and thus contribute to barrier creation. This research design was approved by the West Virginia University Institutional Review Board (IRB), protocol number 1802995833.

Author affiliations are listed at the end of this article.

Correspondence to:
Jordan Elliot Miller, MS
West Virginia University
jem0031@mix.wvu.edu

KEYWORDS

Disability, Health Care, Rural, West Virginia, Accessibility, Design, Accessible Design

INTRODUCTION

Equal access to public accommodations, including health care facilities, is a right afforded to everyone by the Americans with Disabilities Act (ADA) (1990).¹ Many outpatient health care facilities are often non-compliant with relevant items from the ADA Accessibility Guidelines (ADAAG).² As a result, patients with disabilities are less likely to participate in preventative care services and list physical access barriers as one of the many reasons.³ Rural facilities face an added barrier of distance, which is the most commonly identified barrier for rural patients receiving health care.⁴ The inherent remoteness of these facilities emphasizes the importance of quality care, as rural patients have less spatial access to health care alternatives.

In West Virginia, 43 of the state's 55 counties are considered rural with 38% of the population living in rural places.⁵ In addition, West Virginia has the highest rate of non-institutionalized working-age people with disabilities in the country and the second-highest population of adults age 65 years or older,⁶ a population expected to increase 22% by the year 2030.⁷

The purpose of this research is to better understand the usability profile of rural West Virginian outpatient health care facilities and factors that contribute to low levels of clinic physical accessibility. Facilities were evaluated using the Outpatient Health Care Usability Profile (OHCUP), a valid and reliable tool used to assess pertinent ADA items for people with disabilities.⁸ Researchers hypothesize a compliance rate not significantly different from 70% and



anticipate patient lift/transfer devices, restrooms, exam rooms and parking lots will be consistent areas of non-compliance and that year of construction will positively correlate with usability scores.⁹ The research additionally seeks to explore the role building retrofitting plays on health care facility usability scores. The results of this research serve to validate and identify factors related to poor ADA compliance and to build a framework in identifying important and commonly non-compliant ADA items in outpatient health care.

METHODS

The research employed a descriptive and correlational design. Health care clinics were selected as part of a purposeful sample of facilities that were rural, diverse in terms of the health care system, and offered outpatient primary care services. Clinical partnerships were made through the West Virginia Practice-Based Research Network (WVPBRN). The Network's membership is made up of primary care providers from clinical sites from across West Virginia. These sites are mainly Federally Qualified Health Centers (FQHCs) or Rural Health Clinics (RHCs) that are often in remote locations and serve rural populations with limited access to medical resources. Rural was defined by Rural Urban Commuting Area (RUCA) codes 7.0 – 10.0, which are considered small rural areas.¹⁰ Twenty locations out of the 107 member-sites of the WVPBRN qualified for the study. Ten agreed to participate between September and November of 2018. All sites were independently owned or members of various and diverse health care systems. Clinics were contacted to submit preliminary information about the characteristics of their building including the year of construction, type of practice and whether the facility had been retrofitted to house medical offices.

Each facility was visited by a researcher who conducted the Outpatient Health Care Usability Profile (OHCUP), a valid and reliable ($Kappa=0.89$) 159-item tool that measures the usability of outpatient health care facilities. The OHCUP tool produces categorical results for mobility, sensory and cognitive disorders by evaluating relevant ADA Accessibility Guideline (ADAAG) items. The entirety

of these items is considered the minimum threshold for a facility to be considered usable for people with disabilities. The tool evaluates 121 mobility items, 41 sensory items, and 8 cognitive items. Each item in the tool is evaluated and marked with a 0 or a 1. A 0 indicates that the facility demonstrated non-compliance with the ADA item and a 1 indicates that the facility was either fully compliant or that item was not applicable (N/A) in the facility (such as stairs or elevators in a single-story health clinic).⁸ The total score out of 159 items represents the facility's overall score or usability profile. OHCUP is divided into sections (parking, doors, stairs, etc.) that are described as sub-categorical results in this research. A fifth category was created to account for variations that resulted from points awarded to unavailable items. The fifth "N/A adjusted" category removes all inapplicable items from each facility, producing a new total in which the overall score can be recalculated.

The mean of all facility scores in each of the five major categories was used to assess the usability profile of the sampled health care clinics. Results from each section of the OHCUP were calculated to better understand more specific areas of non-compliance. Specific items were also aggregated and discussed in terms of commonly non-compliant items. The correlational analysis measured the relationship between all five final OHCUP scores and year of construction as well as how the OHCUP scores were affected by the original purpose of the building.

Shapiro-Wilks W tests were used to assess the distribution of all the factors. Relationships of normally distributed variables were analyzed using parametric correlations (Pearson r) and variables that included data not normally distributed were analyzed using nonparametric correlation (Spearman's ρ). In measuring the effect building purpose has on OHCUP scores, a t -test was used for parametric data and a nonparametric Wilcoxon-Mann-Whitney Ranked Sums Test was conducted for data with variables that were not normally distributed.

Data were analyzed using JMP and SAS software (JMP®, Version Pro 12.2, SAS Institute Inc., Cary, NC,



Copyright ©2015; SAS®, Version 9.3, SAS Institute Inc., Cary, NC, Copyright ©2002-2010). The significance criterion alpha for all tests was 0.05. In all statistical analyses, the significance criterion alpha for all tests was 0.05 and a statistical trend was declared when $p < 0.1$.

RESULTS

The ten rural facilities were normally distributed in terms of year of construction ($p=0.053$). Construction years ranged from 1919 to 2011, the sample mean construction year was 1982 and the sample median was 1994. All facilities offered outpatient health care services.

MAJOR CATEGORICAL RESULTS

Overall facilities averaged 83.08% (SD = 6.23) usable for people with mobility, sensory, or cognitive disabilities with a range from 70.44% to 93.71%. After items scored N/A were removed, the facilities were evaluated on an average of 101 items. These N/A adjusted scores were considerably lower. The average of the N/A adjusted score was 73.40% (SD = 9.90) with a range minimum of 52.00% and a maximum of 89.00%. By adjusting for N/A the total number of items removed from calculation was 576 or 36.23 percent of the total item evaluated in every facility. When inapplicable items were removed the mean score for mobility was 73.49%, sensory was 69.86%, and cognitive was 81.97%.

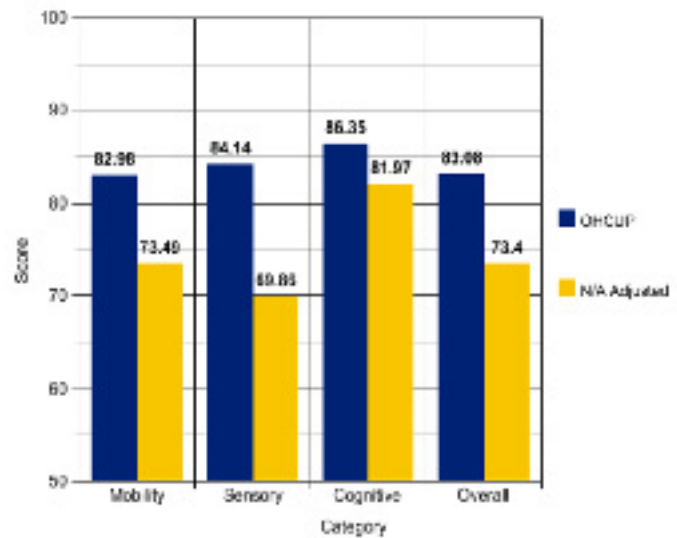
SUB-CATEGORICAL RESULTS

Sub-categorical results consisted of 19 individual features of the facility. When these results are unadjusted, the categories that scored below the 83.08% overall score average include counters, lab specimen rooms, restrooms, exam rooms, signage, parking, and seating. Sub-categories that fell below the mean N/A adjusted score of 73.40% are included in Table 2. All sub-categories featured in the first evaluation (not adjusted) are identified as highly non-compliant sub-categories in the N/A Adjusted evaluation

Table 1.

Building Demographics	n	%
Independently owned		
Yes	8	80
No	2	20
Type of practice		
Doctor's Office	5	50
Specialist Clinic	1	10
Hospital	1	10
General Outpatient	1	10
Originally built to house medical offices		
Yes	7	70
No	3	30

Figure 2: Major Categorical Results



Sub-Category	Total # of Applicable Items	Total # of Items in Compliance	%	CI 95%
Counters	13	4	30.76	10.36 - 61.12
Lab Specimen Rooms	199	132	65.34	59.25 - 75.37
Signage	98	65	66.33	55.99 - 88.73
Restrooms	181	122	67.40	59.99 - 74.06
Elevators	26	18	69.23	48.10 - 84.91
Parking	56	40	71.43	57.59 - 82.31
Exam Rooms	89	65	73.03	62.41 - 81.64

TABLE 2. Sub-Categorical Results (N/A Adjusted) (M < 73.40)



except for seating which remained at 80.00% since all items evaluated were applicable at every location. Elevators are the only item added to the list; however, only two locations evaluated featured elevators.

INDIVIDUAL ITEMS COMMONLY FOUND IN NON-COMPLIANCE

The following section evaluates individual items within the OHCUP to understand which items are most commonly found in non-compliance among surveyed facilities. Eighteen items are detailed in the table in order of how they appear in the OHCUP. Sub-categories that contained items most commonly found in non-compliance include parking, signage, doors, counters, restrooms, emergency egress, exam rooms, and lab specimen rooms which include restrooms designated for sample collection.

EFFECT OF BUILDING AGE ON USABILITY SCORES

The research also aimed to understand if the year of construction and original purpose correlate with facility usability profiles. Parametric correlations (Pearson r) were used to examine relationships of variables that were normally distributed (based on Shapiro-Wilk W test). Spearman's Rho was used to evaluate correlations for nonparametric data, which in this case only included cognitive scores. A Pearson correlation coefficient was computed to assess the relationship between year of construction and mobility, sensory, overall, and N/A adjusted scores of facilities.

Correlation between year of construction was statistically significant and moderately positively correlated with mobility scores [$r=0.765$, $n = 10$, $p = 0.009$], N/A adjusted scores [$r=0.6971$, $p=0.025$], and overall scores [$r = 0.637$, $n = 10$, $p = 0.048$]. The sensory score was not correlated with year of construction. For nonparametric data in cognitive scores, there was no correlation between building year of construction.

Figure 2: Medical Purpose effect on N/A Adjusted Score

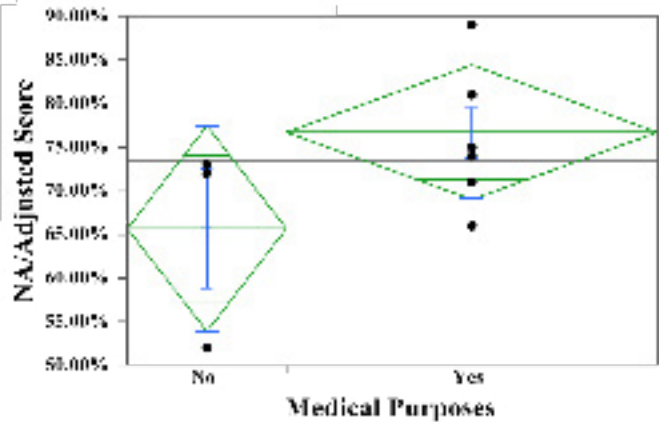


Figure 3: Medical Purpose effect on Overall Score

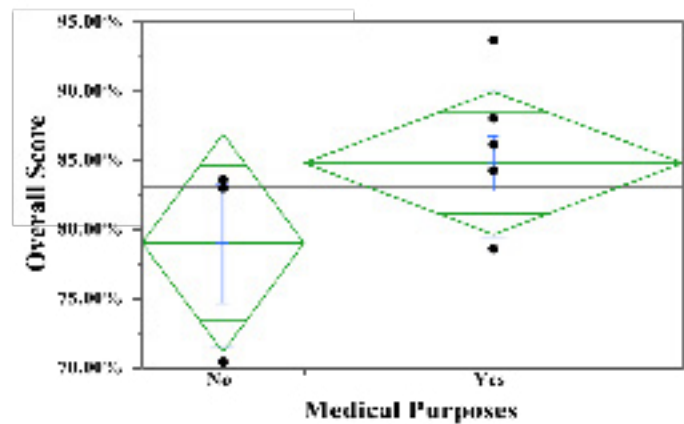
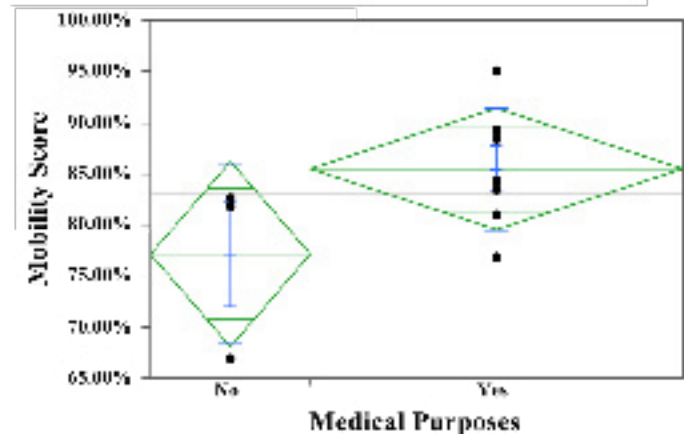


Figure 4: Medical Purpose effect on Mobility Score



Figures 2-4: Mean Diamond and X-Axis Proportional graphs are produced by JMP statistical software. The graphs contain two diamonds and black dots, one diamond represents facilities designed for the purpose of housing medical offices (yes) and the other represents the facilities that were retrofitted to facilitate medical offices (no). Each black dot represents the OHCUP results for the ten facilities evaluated. The width of the diamond represents the proportional sample size, the midline represents the mean of the respective results, the top and bottom of the diamond represent 95% confidence intervals, and the green lines are overlap marks indicating where the two groups overlap at the given confidence.



TABLE 3. Individual Items Commonly Found in Non-compliance⁸

Sub Category	Item #	OHCUP Item Text	# of Facilities in Non-compliance	CI 95% Lower and Upper For Item Non-compliance
Parking	2	At least one in every eight designated parking spaces is van accessible.	6	49.70 – 69.52
Signage	25	Signs are mounted on the wall adjacent to the latch side of the door and outside the door swing.	5	39.93 – 60.00
	36	A sign is present at the entrance to the clinic at a height of 60 inches to centerline and features high contrast, raised and Braille characters, and non-glare finish.	10	55.40 – 69.90
Doors	41	There is at least 18 inches of clear wall space on the latch side of doors (to get in and out).	6	49.70 – 69.52
Counters	55	The tops of tables or counters are between 28 and 34 inches high.	9	51.97 – 64.84
Restrooms	91	Signs are mounted on the wall on the latch side of the door, 60 inches from the floor to the middle of the sign.	9	51.97 – 64.84
	97	The entry is large enough for a wheelchair user to enter, turn around and exit.	6	49.70 – 69.52
	104	The highest operable part of all dispensers and hand dryers is no higher than 48 inches for a forward approach.	6	49.70 – 69.52
	105	All dispensers and hand dryers are operable with a single closed fist (pull down paper towel dispensers & many seal-over dispensers are usually not accessible by this criteria).	7	59.93 – 78.55
Emergency Egress	124	Where emergency alarms are provided, additional visual alarms are installed in general use areas such as meeting rooms, hallways, lobbies, and restrooms.	5	39.93 – 60.00
Exam Rooms/ Access to Primary Care	129	There is a method to weigh a wheelchair-user.	6	49.70 – 69.52
	131	There is at least one lift or transfer device available for use in the exam room.	10	55.40 – 69.90
Lab Specimen Room	137	Signs are mounted 60 inches to the centerline on the wall on the latch side of the door, out of the way of the door swing.	8	70.57 – 87.08
	143	The entry is large enough for a wheelchair user to enter, turn around, and exit.	8	70.57 – 87.08
	150	The highest operable part of all dispensers and hand dryers is no higher than 48 inches.	6	49.70 – 69.52
	151	All dispensers and hand dryers are operable with a single, closed fist.	7	59.93 – 78.55
	152	The mirror is mounted with the bottom edge of the reflecting surface no higher than 40 inches.	7	59.93 – 78.55
	155	There are at least 18 inches of clear space from the center of the toilet to the wall(s) on either side.	5	39.93 – 60.00



PARAMETRIC DATA

When testing if the original purpose of the building affected categorical scores, a t-test was conducted for parametric data including scores in mobility, sensory, overall, and N/A adjusted scores. Of the facilities evaluated, seven were built for the purposes of housing a medical office and three were retrofitted to house a medical office.

There was a statistical trend observed when comparing the means of the two groups that

tested, the mean of the two groups for the sensory score was inconclusive.

NONPARAMETRIC DATA

A separate test for nonparametric cognitive data was conducted using a Wilcoxon-Mann-Whitney Ranked Sums Test using the median of the results. A box plot is used to display these results. This test indicated significant differences between the ranked mean score of the two groups, suggesting that building built with the purposes of housing medical offices score better in the Cognitive Section of the OHCUP ($Z = -1.708, p = 0.044$).

Figure 5: Medical Purpose effect on Cognitive Score

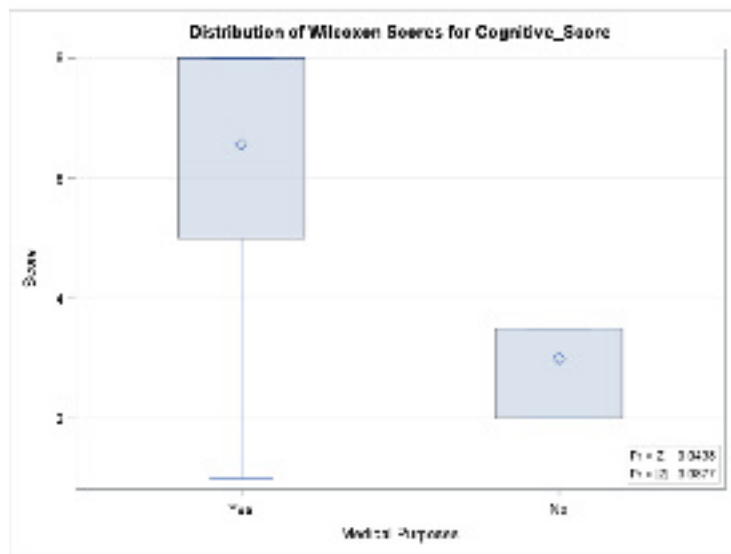


Figure 5: In the box plot the top and bottom lines represent the minimum and maximum values, the boxes represent 25-75% data ranges, and the diamond indicated the means of the respective results (SAS User's Guide: The NPAR1WAY Procedure, 2019).

indicated N/A adjusted scores, mobility score, and overall score was higher for building built with the purpose of housing a medical office. The mean for N/A adjusted score of buildings built for the purpose of housing medical offices was 76.71% (SD = 0.076) and the mean of N/A adjusted score for retrofitted medical offices was 65.66% (SD = 0.118); $t(8) = 1.81, p = 0.054$. The mean for mobility score of buildings built for the purpose of housing medical offices was 85.50% (SD = 0.060) and the mean of mobility score for retrofitted medical offices was 77.10% (SD = 0.088); $t(8) = 1.77, p = 0.057$. The mean overall score of buildings built for the purpose of housing medical offices was 84.80% (SD = 0.053) and the mean of overall scores for retrofitted medical offices was 79.00% (SD = 0.075); $t(8) = 1.42, p = 0.097$. Although

DISCUSSION

This study aimed to produce a usability profile among a sample of rural outpatient health care facilities. Once adjusted for inapplicable items, the mean mobility, sensory, and cognitive scores of the facilities were 73.49%, 69.86%, and 81.97%, respectively. The NA adjusted score of the facilities had a mean of 73.40%. These results are not significantly different ($p = 0.471$) from that of broader research on state-level ADA compliance. A South Carolina study found facilities to be 70.00% compliant on evaluated ADA items using a 93-item tool, which did not evaluate inapplicable items. Availability of patient lift/transfer devices, accessible restrooms, exam rooms and parking lots are

consistently found non-compliant in both this study and broader research on the topic.¹¹ This research also identified counters, lab specimen rooms, and signage as consistent areas of non-compliance.

This research confirms that year of construction is positively correlated with the facility usability and/or accessibility.¹² To understand the role that retrofitting plays on accessible design an additional factor, original purpose, was evaluated to measure the effect on usability. Results were inconclusive due to the lack of existing research on the topic and the small sample size of this research, although within the sample, retrofitted buildings exhibited significantly lower scores in cognitive accessibility and suggested a similar trend in mobility, N/A adjusted, and overall scores.

The OHCUP tool is a thorough evaluation comprised of 159 pertinent ADA items which takes two hours to complete.⁸ Understanding commonly non-compliant items from that tool, in the form of an abbreviated version, may serve as a practical evaluation for researchers and health care administrators. The results of this study confirm expected areas of ADA non-compliance and reveal additional item-level ADA non-compliance. Together these results provide a framework of pertinent and commonly non-compliant ADA items in rural outpatient health care facilities. Further research may seek to validate an abbreviated tool comprised of commonly non-compliant ADA features that are considered pertinent to usability. Additionally, research may seek to further understand whether rural facilities score significantly different from facilities generally.

The small sample size limits the ability of the study to produce conclusive results about the usability profile of outpatient health care clinics in rural West Virginia, the role retrofitting plays in accessibility scores, and the inference of overall similarity to broader research. In using the results of this study to conduct further research, the limited characteristics of rural health care facilities would be a limitation. For example, elevators were only present in two facilities and stairs only in three. Preliminary research on the usability of these unevaluated features would be necessary before building on these results. In addition, this study is subject to limitations inherent in the use of a research network. Although the WVPBRN has

no specific requirement to become a member, it is possible that the results are skewed by the fact that all participating clinics are consistently willing subjects of research activity.

In conclusion, a sample of rural outpatient health care facilities indicate results consistent with broader research on statewide ADA compliance. Facilities evaluated exhibit similar overall scores and the same general areas of non-compliance. This research highlights additional areas of concern, both generally and on an item-specific basis. Also, a relationship between accessibility and year of construction was further confirmed. Conclusions of how retrofitting affects health care usability require additional research. These results are a framework for answering questions about rural accessibility and risk factors of ADA non-compliance, as well as conducting succinct accessibility assessments to be used by researchers and health care administrators. Such research is needed to ensure health care is accessible for all citizens regardless of their level of ability.

AUTHOR AFFILIATIONS

1. West Virginia University, Morgantown, West Virginia

REFERENCES

1. Americans With Disabilities Act of 1990, Pub. L. No. 101-336, 104 Stat. 328 (1990).
2. Pharr J, Bungum T. Health disparities experienced by people with disabilities in the United States: a behavioral risk factor surveillance system study. *Glob J Health Sci.* 2012;4(6).
3. Morrison EH, George V, Mosqueda L. Primary care for adults with physical disabilities: perceptions from consumer and provider focus groups. *Fam Med.* 2008;40(9):645.
4. Buzza C, Ono SS, Turvey C, Wittrock S, Noble M, Reddy G, Reisinger HS. Distance is relative: unpacking a principal barrier in rural health care. *Journal of General Internal Medicine.* 2011;26(S2):648-654.
5. Rural health for West Virginia Introduction - Rural Health Information Hub. <https://www.ruralhealthinfo.org/states/west->



- [virginia](#). Published 2019. Accessed September 25, 2019.
6. U.S. Census Bureau QuickFacts: West Virginia. Census Bureau QuickFacts. <https://www.census.gov/quickfacts/WV>. Published 2019. Accessed September 25, 2019.
 7. Christiadi, Deskins J, Lego B. Population trends In West Virginia through 2030. Morgantown: WVU Research Corporation; 2014. <http://busecon.wvu.edu/bber/pdfs/BBER-2014-04.pdf>. Accessed September 25, 2019.
 8. Drum CE, Horner-Johnson W, Walsh ES. Construction and validation of the Outpatient Health Care Usability Profile (OHCUP). *Disability and Health Journal*. 2012;5(4):292-297.
 9. Graham CL, Mann JR. Accessibility of primary care physician practice sites in South Carolina for people with disabilities. *Disability Health Journal*. 2008;1:209–214.LVIII
 10. Skillman SM, Palazzo L, Keepnews D, Hart LG. Characteristics of registered nurses in rural versus urban areas: implications for strategies to alleviate nursing shortages in the United States. *The Journal of Rural Health*. 2006;22(2):151-157. LVIII
 11. Mudrick NR, Breslin ML, Liang M, Yee S. Physical accessibility in primary health care settings: results from California on-site reviews. *Disability and Health Journal*. 2012;5(3):159-167.
 12. Pharr J, Chino M. Predicting barriers to primary care for patients with disabilities: a mixed methods study of practice administrators. *Disability and Health Journal*. 2013; 6(2):116-123.

