

# Challenges Faced by Rural Health Care Providers Caring for Parkinson's Disease Patients in Neighbor Islands of Hawai'i

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<https://doi.org/10.62547/SGFP1367>

## Abstract

When compared to their urban counterparts, rural regions have worse health outcomes and more challenges in health care access. As the only island state in the US, Hawai'i's unique geographic layout may magnify these disparities. However, there are limited publications on the impact of urban-rural disparities in health care in Hawai'i. The study team aimed to identify the challenges rural health care providers face when managing treatment of Parkinson's disease (PD), a complex disease. A self-administered survey was sent to 247 eligible providers who practiced in Hawai'i and prescribed PD medications from 2017-2019. The survey assessed: provider's comfort level in PD management; utilization and accessibility of health care services; perspective on barriers to PD care; and perspective on telemedicine. Providers were categorized into O'ahu providers (OP, urban) and neighbor island (Hawai'i, Kaua'i, and Maui) providers (NIP, rural). The final sample size was 44 providers (18% response rate). NIP were significantly less likely than OP to report access to social workers ( $P=.025$ ), geriatric services ( $P=.001$ ), and psychologist/psychiatrist/mental health professionals ( $P=.009$ ). There were no statistical differences in: criteria used for PD diagnosis, resources utilized for PD education, and comfort in prescribing PD medications. The findings show that NIP are just as engaged and capable in providing PD care as OP. However, NIP encounter more limitations to accessibility, which can affect the quality of PD care that their rural patients receive. Further research is needed to understand how these limitations affect health-related outcomes in PD as well as other chronic diseases.

## Keywords

Parkinson's disease, Hawai'i, urban-rural disparities, health care barriers, accessibility

## Abbreviations

CMS = Centers for Medicare and Medicaid Services  
NIP = Neighbor Island Providers  
OMB = Office of Management and Budget  
OP = O'ahu Providers  
PD = Parkinson's Disease  
RUCA = Rural-Urban Commuting Area

## Introduction

Disparities between urban and rural communities is an ongoing issue within health care. Rural communities have higher rates of advanced-stage cancer,<sup>1</sup> diabetes,<sup>2</sup> and obesity,<sup>3,4</sup> and lower rates of cancer screening than urban communities.<sup>5,6</sup> As a chain of 8 islands isolated in the Pacific, Hawai'i's unique

geography may magnify these disparities. When compared to the urban county of Honolulu, the rural counties of Hawai'i, Maui, and Kaua'i have higher rates of: mortality, poverty, smoking, elderly population, and a greater shortage of primary care and mental health providers.<sup>7</sup> Often, flying or telemedicine are the only methods for neighbor island rural communities to access specialty care.

A recent study found that access to movement disorder specialists and general neurologists is limited in rural Hawai'i as most of these specialists practice in the urban areas on the island of O'ahu.<sup>8</sup> Parkinson's disease (PD) is a chronic neurodegenerative disease characterized by a variety of motor (eg, rest tremors, bradykinesia, and postural instability) and non-motor (eg, depression, cognitive impairment, and sleep disturbances) symptoms.<sup>9</sup> The severity and type of symptoms along with the progression rate of the disease can vary among PD patients, making PD management and treatment planning complex. Inclusion of specialty care (eg, neurologists and movement disorder specialists) in PD management is associated with improved quality of PD care<sup>10</sup> and health outcomes,<sup>11</sup> and lower risk of hospitalizations and re-hospitalizations for PD-related illnesses.<sup>12</sup> PD care is multifaceted, requiring education and goal setting for patients and families, complex medication/advanced therapy management, management of non-motor symptoms, involvement of rehabilitation discipline, and access to community resources for support. However, access to multidisciplinary care may be limited in rural communities in Hawai'i. There is limited literature identifying the disparities in health care access that neighbor island residents may face. There is also a gap in knowledge of rural provider's perspectives in the challenges they face when managing patient's health care in Hawai'i.

The goal of this study is to extend prior work examining urban-rural disparities in PD care by understanding the differences in health care providers' perceived challenges and barriers to PD care in urban and rural communities of the state of Hawai'i. Additionally, the team aims to analyze providers' satisfaction and comfort level in their ability to diagnose, assess, and treat PD, including their utilization of specialty care, ancillary services, and community resources. Using the rural-urban commuting area (RUCA) code and Office of Management and Budget (OMB) classification of O'ahu as urban and the neighbor islands as rural,<sup>13,14</sup> the study team hypothesizes that,

in comparison to O‘ahu providers, neighbor island providers will report less access to ancillary services, PD resources, and telemedicine equipment.

## Methods

### Study Population

This cross-sectional study was approved by the Institutional Review Board (IRB) at The Queen’s Medical Center in Honolulu, Hawai‘i (IRB number: RA-2022-018). The study used the National Medicare Provider Utilization and Payment Data: Part D Prescriber Public Use Files from 01/01/2017 to 12/31/2019, obtained from the Centers for Medicare and Medicaid Services (CMS). These datasets provide specific information on prescriptions by individual physicians and other health care professionals. From this, the team identified health care providers who practiced in the state of Hawai‘i and prescribed any of the following PD medications: carbidopa/levodopa, pramipexole, and ropinirole, during the study period. Providers’ office addresses were obtained through the same public files and verified with a Google search and phone calls to the provider’s office. A total of 252 providers were identified from the public files. Providers were excluded (n=5) if they had been convicted or elicited illegal acts, they no longer practiced in Hawai‘i, or the study team was unable to find the correct mailing address.

### Study and Survey Design

Eligible providers (n=247) were sent an information sheet that served as informed consent, a self-administered 20-item survey, and a self-addressed return envelope. The self-administered 20-item survey was comprised of 7 sections: (1) provider’s demographics, including age, gender, specialty, ethnicity, race, island of residence, and city of practice, (2) provider’s satisfaction and comfort level with their ability to diagnose and assess PD, (3) provider’s satisfaction and comfort in PD treatment, (4) provider’s comfort level with PD advanced treatment and therapy, (5) provider’s health care utilization and access to ancillary services and community resources, (6) provider’s perspectives on the barriers to health care utilization, and (7) provider’s comfort level with telemedicine. A 5-point Likert scale (ie, strongly agree=5, agree=4, neither agree or disagree=3, disagree=2, and strongly disagree=1) was used in each section, except demographics. Sections 2, 3, and 5 also included multiple choice questions.

All surveys were mailed in July 2022 and collected until September 2022. Completion and submission of the survey served as consent. To maintain anonymity, providers were instructed to not provide their name on the survey or a return address on the envelope. The final sample size consisted of 44 providers (18% response rate).

All providers who returned the survey (n=44) were included in the analysis. However, some providers did not complete the whole survey. Providers were excluded from test for significance calculations on questions that they did not report an answer to.

### Statistical Analysis

Survey participants were organized into O‘ahu providers (OP) and neighbor island (Hawai‘i, Kaua‘i, and Maui) providers (NIP) based on their self-reported island of residence. Demographic differences between OP and NIP were compared with Fisher’s Exact tests. Questions using Likert scaled responses were analyzed in 2 ways. First, they were treated as ordinal data (ie, strongly agree=5, agree=4, neither agree or disagree=3, disagree=2, and strongly disagree=1) and compared using Wilcoxon Rank Sum tests. Second, they were collapsed to dichotomous variables (ie, 1=agree/strongly agree, 2=neither agree or disagree/disagree/strongly disagree) and compared with Fisher’s Exact test. All significance test calculations were conducted using R Version 4.0.5 (R Core Team, Vienna, Austria). The statistical significance was set at  $P$  value <.05.

## Results

### Demographics

Demographic data is summarized in **Table 1**. A total of 41 physicians and 3 advanced practice providers completed the self-administered survey. These health care providers were categorized into OP (n=27, 61%) and NIP (n=17, 39%). Honolulu was the most cited practice location among OP (n=20, 74%) and Kailua-Kona, Hawai‘i (n=7, 41%) was the most common among NIP. Among the 44 providers, specialties included: internal medicine (n=22, 50%), family medicine (n=9, 21%), general neurology (n=9, 21%), physical medicine & rehabilitation (n=1, 2%), psychiatry (n=1, 2%), and unknown (n=2, 4%). Most providers (n=34, 77%) had been practicing for over 20 years.

### Satisfaction and Comfort Level to Diagnose, Assess, and Treat Parkinson’s Disease

Approximately 80% of OP and 60% of NIP strongly agreed or agreed that they “usually feel confident” diagnosing patients with PD ( $P=.31$ ) (**Table 2**). OP and NIP reported using similar criteria for PD diagnosis ( $P=.81$ ). The most reported criteria used for PD diagnosis was clinical history and exam (100% of OP and 100% of NIP), followed by magnetic resonance imaging (MRI) (33% of OP and 47% of NIP), Movement Disorder Society-Sponsored Revision of the Unified PD Rating Scale (MDS/UPDRS) (22% of OP and 18% of NIP), Dopamine Transporter (DaT) scan (19% of OP and 6% of NIP), and olfactory loss (7% of OP and 6% of NIP). Moreover, OP and NIP overall reported using similar resources for PD education ( $P=.23$ ).

Journals and textbooks were commonly used as recourses for both OP (74%) and NIP (71%), whereas industry sponsored conferences was a resource for only 15% of OP and 0% of NIP.

Provider's comfort level with prescribing PD medications is summarized in **Table 2**. The majority of OP (93%) and NIP (100%) strongly agreed or agreed that they are comfortable continuing a patient's medication that was prescribed by a neurologist. Almost two-thirds of the providers in each group stated that they are comfortable starting PD medications. However, there were variations in the comfort level of prescribing for different classes of medications. Majority of providers (85% of OP and 82% of NIP) felt comfortable prescribing carbidopa-levodopa ( $P>.99$ ), whereas 56% of OP and 65% of NIP felt comfortable prescribing dopamine agonists ( $P=.75$ ), 63 % of OP and 29% of NIP felt comfortable prescribing amantadine ( $P=.062$ ), 30% of OP and 18% of NIP felt comfortable prescribing trihexyphenidyl ( $P=.49$ ), 37% of OP and 24% of NIP felt comfortable prescribing monoamine oxidase-inhibitors ( $P=.51$ ), and 37% of OP and 12% of NIP felt comfortable prescribing catechol-O-methyltransferase-inhibitors ( $P=.090$ ). The survey also indicated variations in provider's comfort levels across advanced PD treatments. Approximately 30% of OP felt comfortable discussing DUOPA treatment while only 12% of NIP were comfortable ( $P=.27$ ). In addition, 41% of OP felt comfortable discussing Deep Brain Stimulation (DBS) surgery, whereas only 24% of NIP were comfortable ( $P=.33$ ).

### Health Care Utilization and Access to Ancillary Services and Community Resources

OP were significantly more likely than NIP to recommend local support groups (93% vs 50%,  $P=.003$ ) or exercise groups (74% vs 31%,  $P=.01$ ) to their patients with PD. In the survey, providers were asked if the ancillary services listed in **Table 3** (eg, social work, geriatric services, psychologists/psychiatrists/mental health professional, occupational therapist, speech therapist, and physical therapist) were accessible to their patients. Ninety-three percent of OP reported that all ancillary services were accessible. NIP were significantly less likely than OP to report access to social workers (71% vs 96%,  $P=.025$ ), geriatric services (47% vs 93%,  $P=.001$ ), and psychologists/psychiatrists/mental health professionals (65% vs 96%,  $P=.009$ ).

### Perceived Patient Barriers to Health Care Utilization

After dichotomizing the Likert items (1=strongly agree/agree, 2=neither agree or disagree/disagree/strongly disagree), the research team found that 81% of OP strongly agreed or agreed that their patients usually received recommended services compared to only 47% of NIP ( $P=.043$ ) (**Table 3**). For those who disagreed [OP (n=5, 19%) and NIP (n=8, 47%)], the authors further asked them to rate how they perceived the listed barriers to have contributed to their patients not receiving the recommended services. All NIP (100%) agreed that unavailability

**Table 1. Demographic Characteristics of O'ahu Providers (OP) and Neighbor Island Providers (NIP) in Hawai'i**

Characteristics	OP n=27	NIP <sup>a</sup> n=17	Total n=44
Age (Median [IQR], y)	59 [53,67]	60 [47,66]	59 [51,67]
<b>Sex, n (%)</b>			
Female	7 (26)	4 (24)	11 (25)
Male	20 (74)	13 (76)	33 (75)
<b>Race, n (%)</b>			
7 (26)	4 (24)	12 (71)	19 (43)
Asian	17 (63)	4 (23)	21 (48)
Mixed	3 (11)	0 (0)	3 (7)
Not reported	0 (0)	1 (6)	1 (2)
<b>Years of Practice, n (%)</b>			
<5	0 (0)	0 (0)	0 (0)
10-May	3 (11)	2 (12)	5 (11)
15-Oct	1 (4)	1 (6)	2 (5)
15-20	1 (4)	2 (12)	3 (7)
>20	22 (81)	12 (70)	34 (77)
<b>Specialty, n (%)</b>			
Internal Medicine	12 (44)	10 (59)	22 (50)
General Neurology	8 (30)	1 (6)	9 (21)
Family Medicine	5 (18)	4 (23)	9 (21)
Physical Medicine & Rehabilitation	1 (4)	0 (0)	1 (2)
Psychiatry	0 (0)	1 (6)	1 (2)
Unknown <sup>b</sup>	1 (4)	1 (6)	2 (4)
<b>City of Practice, n (%)</b>			
Honolulu	20 (74)	0 (0)	20 (46)
Aiea	3 (11)	0 (0)	3 (7)
Kailua	3 (11)	0 (0)	3 (7)
Kāne'ohe	1 (4)	0 (0)	1 (2)
Lihue	0 (0)	1 (6)	1 (2)
Wailuku	0 (0)	1 (6)	1 (2)
Kahului	0 (0)	1 (6)	1 (2)
Lahaina	0 (0)	1 (6)	1 (2)
Kailua-Kona	0 (0)	7 (41)	7 (16)
Hilo	0 (0)	2 (12)	2 (5)
Waimea	0 (0)	2 (11)	2 (5)
Honoka'a	0 (0)	1 (6)	1 (2)
Not reported <sup>c</sup>	0 (0)	1 (6)	1 (2)

<sup>a</sup> Includes the Islands of Hawai'i, Kaua'i, and Maui.

<sup>b</sup> Includes 1 physician assistant (O'ahu) and 1 nurse practitioner (neighbor islands).

<sup>c</sup> Provider from Kaua'i only reported their island of residence and not their city of practice.

Table 2. O'ahu Provider's (OP) and Neighbor Island Provider's (NIP) Comfort Level with Parkinson's Disease (PD) Diagnosis, Medication, and Treatment

	OP n=27	NIP n=17	P-value <sup>a</sup>
<b>Comfort level with Parkinson's disease diagnosis, n (%)</b>			
Have diagnosed patient with Parkinson's disease.			
Yes	26 (96)	15 (88)	.55
No	1 (4)	2 (12)	
I usually feel confident diagnosing patients with Parkinson's disease. <sup>b</sup>			
Strongly agree/Agree	21 (78)	10 (59)	.31
Neither agree or disagree/Disagree/Strongly disagree	6 (22)	7 (41)	
<b>Type of criteria used for Parkinson's disease diagnosis<sup>c</sup>, n (%)</b>			
Movement Disorder Society-Sponsored Revision of the Unified Parkinson's Disease Rating Scale (MDS/UPDRS)	6 (22)	3 (18)	.81
Clinical History and Exam	27 (100)	17 (100)	
Magnetic Resonance Imaging (MRI)	9 (33)	8 (47)	
Dopamine Transporter (DaT) Scan	5 (19)	1 (6)	
Olfactory Loss	2 (7)	1 (6)	
<b>Type of resources for Parkinson's disease education<sup>c</sup>, n (%)</b>			
Parkinson's Talks/Lectures	19 (70)	5 (29)	.23
Conferences	13 (48)	4 (24)	
Industry Sponsored Conferences	4 (15)	0 (0)	
Specialty Conferences	10 (37)	3 (18)	
Colleague Consultations	17 (63)	7 (41)	
Online	13 (48)	12 (71)	
Webinars	4 (15)	5 (29)	
Journals/Textbooks	20 (74)	12 (71)	
<b>Type of Parkinson's disease resources providers recommend to their patients<sup>c</sup>, n (%)</b>			
	OP n=27	NIP n=16 <sup>e</sup>	P-value <sup>a</sup>
Local support groups	25 (93)	8 (50)	.003
Local exercise groups	20 (74)	5 (31)	.01
Online resources for patient education	10 (37)	4 (25)	.51
Parkinson's Disease organizations <sup>d</sup>	13 (48)	6 (38)	.54
Other	1 (4)	0 (0)	>.99
Community events	5 (19)	3 (19)	>.99
<b>Comfort level with Parkinson's disease medications, n (%)</b>			
	OP n=27	NIP n=17	P-value <sup>a</sup>
I am comfortable starting dopamine replacement therapy with a patient that I diagnosed with Parkinson's disease. <sup>b</sup>			
Strongly agree/Agree	17 (65)*	11 (65)	>.99
Neither agree or disagree/Disagree/Strongly disagree	9 (35) <sup>f</sup>	6 (35)	
I am comfortable continuing a patient's medications that were prescribed by a neurologist. <sup>b</sup>			
Strongly agree/Agree	25 (93)	17 (100)	.51
Neither agree or disagree/Disagree/Strongly disagree	2 (7)	0 (0)	
Carbidopa-Levodopa <sup>g</sup>			
Very comfortable/comfortable	23 (85)	14 (82)	>.99
Neutral/Uncomfortable/Very uncomfortable	4 (15)	3 (18)	

Table 2. O'ahu Provider's (OP) and Neighbor Island Provider's (NIP) Comfort Level with Parkinson's Disease (PD) Diagnosis, Medication, and Treatment (Continued)

Comfort level with Parkinson's disease medications, n (%)			
	OP n=27	NIP n=17	P-value <sup>a</sup>
Dopamine Agonists (Pramipexole, Ropinirole, Rotigotine) <sup>g</sup>			
Very comfortable/comfortable	15 (56)	11 (65)	.75
Neutral/Uncomfortable/Very uncomfortable	12 (44)	6 (35)	
Amantadine <sup>g</sup>			
Very comfortable/comfortable	17 (63)	5 (29)	.062
Neutral/Uncomfortable/Very uncomfortable	10 (37)	12 (71)	
Trihexyphenidyl <sup>g</sup>			
Very comfortable/comfortable	8 (30)	3 (18)	.49
Neutral/Uncomfortable/Very uncomfortable	19 (70)	14 (82)	
Monoamine Oxidase-Inhibitors (Rasagiline, Selegiline) <sup>g</sup>			
Very comfortable/comfortable	10 (37)	4 (24)	.51
Neutral/Uncomfortable/Very uncomfortable	17 (63)	13 (76)	
Catechol-O-methyltransferase-Inhibitors (Entacapone, Opicapone) <sup>g</sup>			
Very comfortable/comfortable	10 (37)	2 (12)	.09
Neutral/Uncomfortable/Very uncomfortable	17 (63)	15 (88)	
Reasons for not being comfortable in starting Parkinson's disease medications <sup>h</sup> , n (%)			
Patients want to confirm the diagnosis with a neurologist before starting medications.	9 (33)	4 (24)	.74
I am unfamiliar with Parkinson's disease medication types/dose.	2 (7)	3 (18)	.36
I am uncomfortable providing Parkinson's disease education to patients and patient's family members.	2 (7)	2 (12)	.63
I feel it is beyond my expertise.	4 (15)	5 (29)	.27
Not applicable, I am comfortable starting Parkinson's disease medications.	17 (63)	9 (53)	.54
Comfort level with Parkinson's disease treatments <sup>h</sup> , n (%)			
I am familiar with the advanced treatment options with Parkinson's disease.			
Strongly agree/Agree	11 (41)	7 (41)	>.99
Neither agree or disagree/Disagree/Strongly disagree	16 (59)	10 (59)	
I feel comfortable discussing DUOPA treatment with a patient.			
Strongly agree/Agree	8 (30)	2 (12)	.27
Neither agree or disagree/Disagree/Strongly disagree	19 (70)	15 (88)	
I feel comfortable discussing Deep Brain Stimulation (DBS) surgery with a patient.			
Strongly agree/Agree	11 (41)	4 (24)	.33
Neither agree or disagree/Disagree/Strongly disagree	16 (59)	13 (76)	

<sup>a</sup> P-values were obtained from Fisher's Exact Test with significance being  $P < .05$ .

<sup>b</sup> Likert items were collapsed into dichotomous variables (1=strongly agree/agree, 2=neither agree or disagree/disagree/strongly disagree).

<sup>c</sup> Providers could choose multiple answers.

<sup>d</sup> Parkinson's Disease organizations include Michael J. Fox Foundation, Davis Phinney Foundation, National Parkinson's Disease Foundation, American Parkinson's Disease Association, and Hawai'i Parkinson's Association. Providers were counted if they recommended at least one of the organizations listed to their patients.

<sup>e</sup> One neighbor island provider (of the total 17) did not answer this specific question.

<sup>f</sup> Only 26 out of 27 O'ahu providers answered this question.

<sup>g</sup> Likert items were collapsed into dichotomous variables (1=very comfortable/comfortable, 2=neutral/uncomfortable/very uncomfortable).

<sup>h</sup> Providers were asked to choose all applicable reasons to why they are not comfortable starting Parkinson's disease medications.

Table 3. Perceived accessibility and barriers to ancillary services and telemedicine between O'ahu Providers (OP) and Neighbor Island Providers (NIP)

	OP n=27	NIP n=17	P-value <sup>a</sup>
<b>Yes, the following ancillary resources are accessible to my patients, n (%)</b>			
Social work	26 (96)	12 (71)	.025
Geriatric services	25 (93)	8 (47)	.001
Psychologists/Psychiatrists/Mental Health Professionals	26 (96)	11 (65)	.009
Occupational Therapists	27 (100)	15 (88)	.144
Speech Therapists	27 (100)	15 (88)	.144
Physical Therapists	27 (100)	16 (94)	.39
<b>My patients usually receive the services I recommended<sup>b</sup>, n (%)</b>			
Strongly agree/Agree	22 (81)	8 (47)	.043
Neither agree or disagree/Disagree/Strongly disagree	5 (19)	8 (47)	
Not reported	0 (0)	1 (6)	
<b>Barriers to utilization and access to services<sup>c</sup>, n (%)</b>			
	OP n=5	NIP n=8	P-value <sup>a</sup>
The services are not available in the patient's local community.			
Highly significantly/ Significantly	1 (20)	8 (100)	.007
Moderately/A little/ Not at all	4 (80)	0 (0)	
Not reported	0 (0)	0 (0)	
Patients are not interested in going despite discussion and referral.			
Highly significantly/ Significantly	0 (0)	1 (12)	>.99
Moderately/A little/ Not at all	5 (100)	7 (88)	
Not reported	0 (0)	0 (0)	
The services are too expensive.			
Highly significantly/ Significantly	2 (40)	1 (12)	.49
Moderately/A little/ Not at all	2 (40)	6 (75)	
Not reported	1 (20)	1 (13)	
Lack of transportation.			
Highly significantly/ Significantly	1 (20)	4 (50)	.56
Moderately/A little/ Not at all	4 (80)	4 (50)	
Not reported	0 (0)	0 (0)	



Table 3. Perceived accessibility and barriers to ancillary services and telemedicine between O’ahu Providers (OP) and Neighbor Island Providers (NIP) (Continued)

Barriers to telemedicine utilization <sup>b</sup> , n (%)			
	OP n=27	NIP n=17	P-value <sup>a</sup>
Patient doesn't have access to the appropriate equipment (ie, computer, phone).			
Strongly agree/Agree	18 (67)	12 (71)	.73
Neither agree or disagree/Disagree/ Strongly disagree	9 (33)	4 (23)	
Not reported	0 (0)	1 (6)	
The patient is unfamiliar with the technology used for telemedicine.			
Strongly agree/Agree	21 (78)	12 (71)	>.99
Neither agree or disagree/Disagree/ Strongly disagree	6 (22)	4 (23)	
Not reported	0 (0)	1 (6)	
Communication over telemedicine results in a lower level of comprehension from the patient.			
Strongly agree/Agree	14 (52)	9 (53)	>.99
Neither agree or disagree/Disagree/ Strongly disagree	13 (48)	7 (41)	
Not reported	0 (0)	1 (6)	
Perceived reduced rapport with provider.			
Strongly agree/Agree	14 (52)	7 (41)	.75
Neither agree or disagree/Disagree/ Strongly disagree	13 (48)	9 (53)	
Not reported	0 (0)	1 (6)	
Importance of physical examination.			
Strongly agree/Agree	20 (74)	10 (59)	.5
Neither agree or disagree/Disagree/ Strongly disagree	7 (26)	6 (35)	
Not reported	0 (0)	1 (6)	

<sup>a</sup> P-values were obtained from Fisher's Exact Test with significance being  $P < .05$ . Providers that did not report were excluded from the significant test calculation.

<sup>b</sup> Likert items were collapsed into dichotomous variables (1=strongly agree/agree, 2=neither agree or disagree/disagree/strongly disagree).

<sup>c</sup> If provider did not "strongly agree" or "agree" to the statement, "My patients usually receive the services I recommended," then they were asked to rate their perceived significance of the following barriers to utilization and access of services. Likert items were collapsed into dichotomous variables (1=Highly significantly/Significantly, 2=Moderately/A little/Not at all).

of services was a significant barrier to utilization and access to healthcare services, compared to only 20% of OP ( $P = .007$ ). Lack of transportation was perceived as a major barrier among 50% of NIP compared to 20% of OP ( $P = .56$ ).

### Comfort Level with Telemedicine

The author's findings indicate that both OP and NIP perceived several barriers to telemedicine use in their patients. The highest cited barrier was lack of familiarity with the technology used for telemedicine (78% of OP and 71% of NIP,  $P > .99$ ), followed by access to equipment (67% of OP and 71% of NIP,  $P = .73$ ), and importance of physical examination (74% of OP and 59% of NIP,  $P = .50$ ). Concerns over lower level of comprehension from the patient (52% of OP and 53% of NIP,  $P > .99$ ) and reduced rapport with providers (52% of OP and 41% of NIP,  $P = .75$ ) were also common perceived barriers.

### Discussion

The findings in this study document substantial disparities in accessibility to ancillary services between O’ahu (urban) and the neighbor islands (rural) of Hawai‘i. The results suggest that social workers, geriatric services, and psychologists/psychiatrists/mental health professionals were less accessible on the neighbor islands than on O’ahu. The complexity of PD care revolves around the variability in motor and nonmotor symptoms among PD patients. Limited accessibility to ancillary services can pose challenges in providing a multidisciplinary care that a PD patient would need, thus affecting the quality of PD care that patients in rural communities receive.

Rural communities often face more barriers to health care than their urban counterparts.<sup>15</sup> In this study, NIP perceived the unavailability of service in the local community as a significant barrier to utilization and access to health care services, which may contribute to why recommendations to local support groups and exercise groups by providers were greatly lower among NIP

than OP. In addition to service unavailability, lack of transportation was also perceived as a major barrier to the utilization and access to health care services among the NIP. Accessibility is often related to the inherent challenges that geography and transportation manifest. Distance, cost, transportation planning, and poor weather conditions are some of the common challenges that rural patients experience when accessing health care in urban areas.<sup>16,17</sup> For the state of Hawai‘i, these challenges can be exacerbated as flying is the only mode of transportation to get to the island of O‘ahu, where most specialists are located. Air travel adds additional burden and inconvenience to rural patients, especially those with disorders that induce mobility issues. In addition, the logistics of travel and the possibility of travel complications can reduce a patient’s willingness to seek care.<sup>17</sup> Similarly, a scoping review found that the lack of transportation was a major reason for not accessing mental health and other health care services among individuals with PD.<sup>18</sup>

In this study, no statistical differences in the type of criteria used for PD diagnosis, type of resources utilized for PD education, and comfort level in discussing advanced PD treatments to patients were seen between OP and NIP. This suggests that NIP are just as comfortable and knowledgeable in providing PD care to patients as OP, but the lack of specialty services in rural communities may impact the utilization of multidisciplinary care that a PD patient may need. While there were no statistical differences between OP and NIP in their comfort prescribing PD medications, there was a variation in provider prescription comfort across the different classes of medication, indicating a potential area of further exploration.

There has been a growing adoption of telemedicine in PD care, aiding in remote motor assessments, virtual monitoring of advanced PD therapies (eg, deep brain stimulation), and access to PD education and specialized health care.<sup>19</sup> PD patients have shown high satisfaction with remote consultations, disclosing that it has enhanced convenience, provided greater comfort, and reduced travel burden and cost.<sup>20,21</sup> However, the advantages of telemedicine are not always accessible to patients. Approximately 67% of OP and 71% of NIP in this study either strongly agreed or agreed that the lack of equipment (eg, computer, internet) and unfamiliarity with technology are perceived barriers to telemedicine utilization in their patient population. In a 2021 statewide survey, 64% (n=483) of Native Hawaiians and 65% (n=456) of non-Hawaiians reported challenges with household devices and adequate internet service.<sup>22</sup> This brings attention to the “digital divide” that was magnified in the state of Hawai‘i due to the COVID-19 pandemic. A scoping review identified that rural versus urban residence was one of the main determinants of disparities in internet access from a global perspective.<sup>19</sup>

The limitations in this study should be considered. First, the sample size (n=44) and response rate (18%) were low. The small sample size may be a result of selection bias. Although selecting for providers who have prescribed PD medications allowed the team to systematically identify which providers have provided PD care, it discounts other providers who have cared for PD patients but have not prescribed PD medications. Moreover, survey responses regarding comfort level in PD diagnosis, medication, and treatment are subjected to this selection criterion. Second, ascertainment bias was a limitation because the average age of providers was 59 years old and 77% of them had more than 20 years of practice in health care, showing that the study population lacks responses from younger health care providers. Third, response bias was a limitation because the study used a self-administered survey for providers and patients’ perspectives were not gathered. However, it is important to understand providers’ perspectives on the challenges to patient health care management. Fourth, as discussed in the introduction, the team chose to characterize O‘ahu as urban and the neighbor islands (Hawai‘i, Kaua‘i, and Maui) as rural, but there are other classifications for urban and rural regions in the state of Hawai‘i. Lastly, the results are not generalizable to the population of health care providers practicing outside of Hawai‘i.

Despite the limitations in this study, the results are still novel as they highlight urban-rural disparities in patient access to ancillary services. As there is limited literature regarding health care disparities between urban and rural communities in Hawai‘i, this study was sought to be a start in learning more about this field as well as how it affects PD care in Hawai‘i. Thus, the strength of the self-administered survey in this study was that it aimed to assess a variety of factors in rural health care in Hawai‘i such as providers’ comfort level in PD diagnosis and treatment, the barriers to PD health care utilization, and providers’ perception of telemedicine. Although the results provide additional knowledge on the differences in urban-rural health care in the state of Hawai‘i, further investigations on how accessibility disparities affect the quality of PD care and health outcomes in PD patients are needed. The research team hopes to further this line of research to investigate the patient’s perspective on the challenges to PD care and how it compares to the Hawai‘i providers. Furthermore, the research team suspects that urban-rural disparities exist in other diagnoses. The study’s methodology may be useful in unraveling broader urban-rural health care disparities in Hawai‘i and ultimately aid in devising policies to increase access to quality health care.



## Conclusion

The study analyses found no statistical differences between OP and NIP in their comfort level in diagnosing, assessing, and treating PD, suggesting that NIP are just as engaged and capable in PD care as OP. However, NIP seem to encounter more limitations in access to specific ancillary services, which can affect the quality of PD care that their rural patients receive. This study adds to the limited knowledge of urban-rural health care disparities in the state of Hawai'i. Future research is needed to understand the disparities between urban-rural communities' access to health care for other diseases/disorders in Hawai'i.

## Conflict of Interest

None of the authors identify a conflict of interest.

## Data Availability Statement

The data that support the findings of this study are available from the corresponding author, Michiko K. Bruno MD, upon reasonable request.

## Acknowledgements

The authors thank the Queen's Medical Center Summer Research Internship (SRI) 2022, Lori Tsue, Dr. Todd Seto, and Dr. Fay Gao for their support and guidance in this research project.

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