

Health Care Provider Behaviors and Characteristics that Are Associated with Issuing Nature Prescriptions

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Abstract

Nature prescriptions (NRx) can help address mental health issues, wellness, physical inactivity, and lack of time spent outdoors but have yet to become widespread in clinical practice. This study explores the behaviors and characteristics of health care providers (HCPs) who issue NRx; motivators and barriers to issuing them; health conditions for which HCPs issue NRx; the time it takes to issue a prescription; the satisfaction level; and perceptions of their effectiveness. A cross-sectional study of an online survey was conducted on 135 HCPs who had registered with *ParkRxAmerica.org* (aka *Natureprescribed.org*; PRA). We assessed prescribing behaviors, connectedness to nature (CNS), time spent in nature, burnout, motivators and barriers to and reasons for prescribing, and demographic variables with chi-square test, t-test, and analyses of variance. Half (56%) of respondents issued NRx. This group reported greater CNS and more frequent outdoor breaks. Within this group, frequency of issuing prescriptions, CNS, park visits, outdoor breaks, and less screen time were positively correlated ($p < 0.01$). Most prescriptions were written for mental and general health conditions, and physical inactivity. More than 80% thought prescriptions were effective for improving physical and mental health. Several barriers to issuing prescriptions existed. HCPs who wrote more prescriptions reported feeling greater CNS, visited greenspace and nature more frequently, took more frequent workday breaks, and reported less

screen time. This emphasizes the importance of frequent exposure to nature, both during and outside of work, to improve NRx writing. Key Words: Nature–Outdoors–Wellness–Nature prescriptions–Green prescriptions–Burnout.

Introduction

As Americans have become increasingly more sedentary and spend more time indoors, there has been a concomitant rise in physical and mental health conditions (Owen et al., 2010; Yang et al., 2019). Sedentary behaviors significantly increase the risk of chronic disease, morbidity, and mortality (Cunningham et al., 2020; Kerr & Booth, 2022; Smith & Smith, 2016; Wilmot et al., 2012). Currently, 42% of adults in the United States and 20% of children and teens live with obesity, a major risk factor for chronic disease (Centers for Disease Control & Prevention, 2023; Trust for America's Health, 2022). In 2021, 20% of U.S. adults were diagnosed with a mental health disease, while 15% of adolescents surveyed between 2018 and 2019 reported a major depressive episode (Centers for Disease Control & Prevention, 2022; National Institute of Mental Health, 2023). Medically underserved individuals are at greater risk of developing mental and physical chronic diseases (Buttorff et al., 2017; Centers for Disease Control & Prevention, 2023; Trust for America's Health, 2022).

Yang et al. performed a serial, cross-sectional analysis on individuals who participated in the U.S. National Health and Nutritional Examination Survey between 2001 and 2016. The 51,896 participants were stratified into three groups: 5–11 years, 12–19 years, and 20 years and older. They found that total sitting time in adolescents and adults increased significantly from 7.0 to 8.2 hours per day (h/day) from 2007 to 2016 in adolescents, from 5.5 to 6.5 h/day in younger adults and from 5.1 to 6.1 h/day in older adults.

Although differences were not seen in children over time, 65% reported watching TV or videos at least 2 h/day and 43% used computers at least 1 h/day (Yang et al., 2019). Furthermore, the 2021 National Survey of Children's Health reported that among 11,743 children aged 3–5 years, 37% played outdoors for ≤ 1 h on weekdays, and 24% played outdoors for ≤ 1 h on weekend days (Dahl et al., 2024).

Time in nature improves mental, physical, and social health. It is associated with increased physical activity (PA) and improvement and/or prevention of obesity, diabetes, cardiovascular disease, depression, anxiety, and other health conditions (Antonelli, et al., 2019; Fyfe-Johnson et al., 2021; Jimenez et al., 2021; Mygind et al., 2019; Thompson-Coon et al., 2011; Twohig-Bennett & Jones, 2018). Given these potential benefits, a national park prescription collaborative formed in 2013 to foster connections between health care providers (HCPs) and park agencies and to promote park prescription use among HCPs (Institute at Golden Gate, 2021). A park prescription is a written recommendation from an HCP encouraging people to spend time in nature, particularly in parks and other outdoor spaces, with the goal of improving their health and well-being.

Studies on the benefits of park or, more broadly, nature prescription (NRx) programs have mixed but promising results. In one study, 3 HCPs provided NRx to 38 children. A survey completed by parents at the study's end found no reported differences in children's PA, outdoor PA, time spent outdoors, or sedentary activities (Christiana et al., 2017). Other studies, however, reported that NRx increased weekly PA, park visits, and resiliency (Zarr et al., 2017). A randomized controlled trial showed that greater family park visits were associated with decreased parental stress (Razani et al., 2018). Adults who received park prescriptions in Singapore spent more time in parks, had more PA, and reported a significantly improved psychological quality of life (Müller-Riemenschneider et al., 2020).

A recent systematic review, evaluating the effects of NRx on health, concluded that more research is needed to delineate health benefits (Kondo et al., 2020). Another systematic review that evaluated effectiveness of NRx and factors important for their success found a reduction in systolic and diastolic blood pressure and large to moderate improvements in depression scores, anxiety scores, and daily step count (Nguyen et al., 2023).

The number of NRx programs is growing. The Institute at the Golden Gate estimates that there are >100 programs in the United States (Institute at the Golden Gate, 2021). Studies evaluating provider acceptance of these programs reported that those who actively

issued prescriptions thought the program was a useful counseling tool, and that both participating in the study and receiving reminders improved their counseling rate. Furthermore, reminders influenced prescription writing more than personal beliefs regarding nature (Coffey & Gauderer, 2016; James et al., 2017). However, adoption of NRx programs by HCPs has been slow. A study where 15 HCPs were interviewed found that most providers were aware of the health benefits of outdoor time but thought an assessment of the local PA environment, provider education on counseling, and development of a follow-up system were necessary before implementing an NRx program (Christiana et al., 2017). Similarly, a general survey of 278 HCPs reported that most offered PA counseling and were satisfied with their PA counseling knowledge, but few provided written PA prescriptions, and most were unsatisfied with their knowledge of prescribing PA. The most commonly cited barrier to prescribing PA was lack of time, more so among primary HCPs, such as physicians and nurses, than secondary HCPs, such as dietitians and health educators. Few HCPs knew about NRx programs, but most were interested in learning about local parks and community partnerships (Besenyi et al., 2020). To date, no known study has been conducted on NRx practices among HCPs who voluntarily registered to issue prescriptions through an NRx writing platform, such as ParkRxAmerica.org (PRA).

PRA, a nonprofit organization founded in 2017, provides a no-cost platform for providers to prescribe nature. Providers register with PRA and watch a short instructional video to begin issuing NRx. These providers send reminders to patients via text or email and follow how often their patients/clients fill their prescriptions. PRA also educates about the health benefits of nature via continuing medical education seminars (CMEs), webinars, and website articles; advises on program development; and conducts research.

The purpose of this study is to describe the NRx practices of 135 registered HCPs. We hypothesized that there would be a significant positive relationship between the frequency of issuing NRx and the time HCPs spent in nature and green spaces, lower screen time, lower burnout levels, and outdoor break habits. This study also identifies health conditions for which HCPs issue NRx, barriers and motivating factors, the time it takes to write a NRx, HCP satisfaction levels issuing NRx, and perceptions of the effectiveness of NRx in enhancing patients' physical and mental/social health. These results will aid in the enrichment and development of existing and future NRx programs.

Materials and Methods

Study design and sample

This cross-sectional study, conducted in Fall 2023, involved participants recruited from 1457 registered users via email. To incentivize participation, those who completed the questionnaire entered into a drawing for \$20 Amazon gift cards, one given to each of 25 participants. Ethical approval was granted by the Texas A&M University Institutional Review Board (IRB2023-0929M). Furthermore, the first question of the survey asked whether participants consented to completing the survey. If they did not, they were taken to the end of the survey and thanked for their time.

Instrument

The survey was developed by two senior physicians working with PRA, along with a senior researcher and doctoral student with expertise in nature and health. It contained both questions from validated instruments, as discussed below, and additional questions that best addressed the research goals. An online questionnaire, created on SurveyMonkey, gathered data on participants' perceived relationship with the natural environment, time spent in nature (TSN), screen time, burnout levels, work environment, nature prescription behavior, reasons for prescribing nature, barriers to and motivators for issuing NRx, additional resources provided to patients, and general demographic information. Participants accessed the survey by clicking on the provided link in the invitation emails, and reminder emails were sent 7 and 17 days after the initial request.

Measures

Connectedness to nature scale. This validated instrument assesses individuals' connection to the natural environment (Mayer & Frantz, 2004). The scale consists of a 14-item, a one factor scale, with responses rated on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). Total score is calculated by averaging all statements.

Time spent in nature. Frequency of visits to natural and green spaces was measured using adapted questions from the 2022 People and Nature Survey for England (GOV.UK, 2022). The question defined natural and green spaces and asked, "In the past 12 months, how often on average have you spent time in green spaces?" Response options were on a 1–4 scale, corresponding to once or twice a month, once or twice a week, more than twice a week but not every day, and every day. To assess the duration of TSN, questions from the Nature of Americans Study were used (Kellert et al.,

2017). Participants were asked, "In a typical week, how long on average do you spend outdoors in nature?" Response options were on a 1–8 scale, corresponding to none, some but <1 h, 1–2 h, 2–3 h, 3–4 h, 4–5 h, 5–7 h, and >7 h.

Screen time. This question was measured by asking, "On an average workday, how many hours do you spend in front of a screen?" Response options were presented on a 1–6 scale, corresponding to none, <2 h, 2–4 h, 5–7 h, 8–10 h, and >10 h.

Break habits. This question explores how frequently participants take breaks in natural settings. It asks, "On an average day, while working, how often do you take a break (lunch or otherwise) outside where there is some natural element (fresh air, water feature, fauna, flora, garden, etc.)?" Response options were on a 1–5 scale, corresponding to "never," "rarely," "sometimes," "usually," and "always."

Burnout levels and emotional exhaustion. A single item was used to measure burnout in HCPs (Dolan et al., 2015). Participants rated their burnout on a 5-point Likert scale, where 1 = "I enjoy my work. I have no symptoms of burnout"; 2 = "Occasionally I am under stress, and I don't always have as much energy as I once did, but I don't feel burned out"; 3 = "I am definitely burning out and have one or more symptoms of burnout, such as physical and emotional exhaustion"; 4 = "The symptoms of burnout that I'm experiencing won't go away. I think about frustration at work a lot"; and 5 = "I feel completely burned out and often wonder if I can go on. I am at the point where I may need some changes or may need to seek some sort of help." Additionally, providers described their feelings of emotional exhaustion due to work, with five frequency-based responses: "never," "rarely," "sometimes," "usually," and "always."

Working environment. Participants were presented with a list of nature-related items potentially present in their work setting, including windows with a view of nature, exposure to sunlight, indoor plants, an aquarium, living wall, photographs of nature, or "none." Additionally, there was an option to fill in unlisted elements. Participants could select all applicable options.

Prescribing behaviors. A one-question item assessed participants' experience with NRx, "Have you prescribed nature prescriptions before?" Participants could respond with either "yes" or "no." Furthermore, providers detailed the frequency they wrote NRx within the last month, selecting from options including "never," "once in

the past month,” “two to three times in the past month,” “one to four times weekly,” “almost daily,” and “daily.” Additionally, the time allocated to prescribing NRx, in minutes, was recorded using a drop-down menu ranging from 1 to over 20 min.

Reasons/conditions for NRx. Participants were presented with a comprehensive list of conditions/symptoms warranting prescribing nature, including anxiety, depression, chronic stress, acute stress, memory and/or concentration issues, attention-deficit/hyperactivity disorder, loneliness and/or social isolation, work/school performance, obesity/overweight, physical inactivity, diabetes, hypertension, maternal health/pregnancy, cardiovascular disease, technology addiction, drug or alcohol addiction, asthma or other respiratory conditions, PTSD/military, general health/well-being/preventive care, research, and an “other” category for additional conditions. Participants could select all applicable options.

Motivations to prescribe NRx. We asked participants to indicate which items would increase the likelihood they would start or continue to write NRx (e.g., embedding NRx into the electronic medical record [EMR], receiving a small bonus, identifying supportive organizations, receiving email reminders, displaying posters/photos in the office, collaborating with local parks, initiating nature prescriptions completion with others, and incorporating aspects of nature into the work setting) by checking all that apply.

Barriers to prescribe NRx. Participants were asked to identify barriers or challenges they may encounter or is keeping them from writing NRx (e.g., provider time constraints, the time-consuming of prescription, inadequate insurance reimbursement, barriers from patients/families, difficulty filling prescriptions, lack of awareness of the benefits of outdoor activities or where to direct patients outdoors, uncertainty about how to initiate the conversation, and any other barriers they may perceive) by checking all that apply.

Additional resources that are offered to patients. Participants indicated which additional resources they offer alongside NRx, including but not limited to maps of local parks and trails, suggested “green routes,” examples of activities to engage in at a park, motivational interviews, and information on specific programs. Providers could select all applicable options.

Demographics. Participants indicated their health care specialty, age, gender, race/ethnicity, and percentage of clinical time spent seeing patients and children.

Data analysis

The Cronbach’s α was calculated for all (Taber, 2018). Descriptive statistics provided summaries of demographics, specialty, and TSN among all participants. Chi-square tests were conducted to examine differences in provider specialties and time allocated to clinical care and pediatric patients between those who issued NRx and those who did not. Independent *t*-tests compared nature exposure and well-being indicators between the two groups. Additionally, the Spearman rank-order correlation coefficient was utilized to examine the association between TSN, screen time, burnout, connectedness to nature scale (CNS), and NRx frequency, as ordinal variables were considered. Crosstab analyses were also conducted to identify differences in age, gender, and practice settings among providers who frequently prescribed NRx. All statistical analyses were carried out using IBM SPSS (version 29.0; SPSS Inc., Chicago, IL), with the significance criterion set at $p \leq 0.05$.

Results

The survey was sent to 1580 registered participants, with 123 (7.8%) invalid email addresses removed, leaving a final sample of 1457. The response rate was 10.1% with 147 completing the survey. Twelve nonclinical respondents were excluded, resulting in an effective sample of 135. Random missing data occurred across the survey, ranging from 0 to 13 responses, and were excluded from chi-square and independent *t*-test analyses. Most respondents were female (67.4%), White (74.1%), and worked in outpatient settings (70.4%). Over half reported issuing NRx before. No significant demographic differences were found between those who did and those who did not issue NRx. Table 1 details the demographic breakdown.

Table 1 also shows the specialties and time allocated to clinical care and pediatric patients by HCPs who have and have not issued NRx. Within the entire group, 43% specialize in primary care, 22.2% in behavioral health or psychiatry, and 25.2% in other specialties and allied health. Nearly half dedicate 75% or more of their time to clinical patient care, and 65.9% are involved in pediatric care. There were no significant differences in specialties or time spent on clinical and pediatric patients between the two groups.

For nature-related items in the work setting, fewer than 10% reported that they had no items, and on average, HCPs reported 2.6 nature-related items at work, with a standard deviation (SD) of 1.3.

Table 2 and Figure 1 illustrate the findings regarding reasons/conditions, barriers, and motivators for issuing NRx. The most common conditions for issuing NRx include anxiety (43.7%), depression

Table 1. Descriptive Summary of Providers: Issuance of Nature Prescriptions, Specialties, and Time Allocation to Clinical Care and Pediatric Patients

DEMOGRAPHIC CHARACTERISTIC	N	%	ISSUED NATURE PRESCRIPTIONS		NOT ISSUED NATURE PRESCRIPTIONS		χ^2	df	p
			N	%	N	%			
Age							3.98	3	0.26
20–40 years	25	20.7	10	8.3	15	12.4			
41–50 years	31	25.6	18	14.9	13	10.7			
51–60 years	39	32.2	25	20.7	14	11.5			
60 years and older	26	21.5	16	13.2	10	8.3			
No response	14	10.4							
Gender							0.07	2	0.97
Female	91	67.4	52	42.6	39	32.0			
Male	29	21.5	16	13.1	13	10.7			
Nonbinary	2	1.5	1	0.8	1	0.8			
No response	13	9.6							
Race/ethnicity							4.21	4	0.38
American Indian or Alaska Native	1	0.7	0	0	1	0.8			
Hispanic White	4	2.7	4	3.3	0	0			
White	100	74.1	54	44.6	46	38.1			
Asian/Pacific Islander	5	3.7	4	3.3	1	0.8			
Black/African American	3	2.2	1	0.8	2	1.7			
Multiple races	8	5.9	6	5.0	2	1.6			
No response	14	10.4							
Practice setting							2.33	3	0.51
Outpatient	95	77.9	54	44.3	41	33.6			
Inpatient	4	3.3	2	1.6	2	1.7			
Both	12	9.8	5	4.1	7	5.7			
Other	11	9.0	8	6.6	3	2.4			
No response	13	9.6							

(continued)

Table 1. Continued

DEMOGRAPHIC CHARACTERISTIC	N	%	ISSUED NATURE PRESCRIPTIONS		NOT ISSUED NATURE PRESCRIPTIONS		χ^2	df	p
			N	%	N	%			
Specialty							.44	2	0.80
Primary care (including pediatrics, family medicine, internal medicine)	58	43.0	31	23.0	27	20.0			
Behavioral health/psychiatry	30	22.2	18	13.3	12	8.9			
Other specialty and allied health ^a	34	25.2	20	14.8	14	10.4			
No response	13	9.6							
% of time are seeing clinical patients							2.26	3	0.52
<25%	11	9.0	4	3.3	7	5.7			
25–49%	14	11.5	9	7.4	5	4.1			
50–74%	32	26.2	18	14.6	14	11.6			
75% or more	65	53.3	38	31.1	27	22.2			
No response	13	9.6							
% of time are seeing children							1.57	4	0.81
0%	32	23.7	16	13.2	16	13.2			
<25%	39	28.9	22	18.2	17	14.0			
25–49%	16	11.9	11	9.0	5	4.2			
50–74%	12	8.9	7	5.8	5	4.1			
75% or more	22	16.3	12	9.9	10	8.3			
No response	14	10.4							

^aIncluding obstetrician/gynecologist, physical therapy/occupational therapy, urgent care/emergency, cardiology, naturopathic physician, nurse, midwifery, orthopedic, optometry, dental hygienics, dietician, public health, researcher, pelvic health, patient experience and child life specialist, nurse coach, massage therapist, correctional medicine, chiropractic, and acupuncture.

(43%), general health/well-being (43%), physical inactivity (41.5%), and chronic stress (40.7%). Providers commonly offer additional support with 31.1% conducting motivational interviewing and 28.1% providing examples of park activities. Regarding barriers/challenges to implementing NRx, nearly 50% cite time constraints, while one-third struggle with patient and family-related obstacles, including lack of readiness, parental time constraints, or residing in unsafe neighborhoods. Notably, 13.3% included unlisted barriers such as forgetfulness, website/app usability, the need for social group support, needed training, and a preference for recommendations over

prescriptions. Regarding motivators to continue or initiate issuing NRx, 60.7% expressed interest in integrating NRx into EMRs, 55.6% wanted to collaborate with local parks regarding programs, and 44.4% mentioned displaying nature or PRA posters/photos in their offices.

Table 3 compares nature exposure and well-being indicators among providers who have and have not issued NRx. Indicators include frequency and duration of TSN, screen time in an average workday, burnout level, emotional exhaustion, and frequency of taking breaks outside. Significant findings are indicated in bold.

Table 2. Reasons/Conditions, Barriers, and Motivations for Issuing Nature Prescriptions

	PERCENTAGE (%)
Reasons and/or conditions for nature prescription	
Anxiety	43.7
Depression	43.0
General health/well-being/preventive care	43.0
Physical inactivity	41.5
Chronic stress	40.7
Obesity/overweight	32.6
Acute stress	29.6
Loneliness and/or social isolation	27.4
Hypertension	22.2
Diabetes	19.3
Technology addiction	19.3
Extra support offered to patients	
Motivational interviewing for park visits	31.1
Examples of activities to do in a park	28.1
Information on specific programs/activities at a local park or recreation center	20.7
Maps of local parks and trails	11.9
"Green route" suggestions	10.4
Other (e.g., Park passes, books, outdoor activities, forest bath)	8.1
Barriers or challenges to implementing nature prescription	
Provider time constraints	48.9
Patient/family barriers	31.9
Inadequate insurance reimbursement to justify time	17.0
Do not know how to start the conversation	17.0
Takes too long	16.3
Prescription is not easy to fill	13.3

(continued)

Table 2. Continued

	PERCENTAGE (%)
Other (e.g., forgetfulness, not been trained)	13.3
Lack of awareness of where to send patients outdoor	12.6
Lack of awareness of benefits of outdoor	7.4
Motivations to begin to write nature prescription	
Embedding nature prescription writing into EMR	60.7
Collaborating with local park systems to provide specific programs	55.6
Hanging posters or nature prescription in my office	44.4
Receiving a small bonus for writing NRx	28.9
Having someone work with me on writing and maintaining nature prescriptions	23.0
Receiving regular email reminders to issue NRx	22.2
Having aspects of nature in my work setting, such as plant or desktop video photo frame	22.2
Starting an NRx challenge with other health care providers or clinics	20.0
Identifying an organization, including my clinic, for a bonus based on my nature prescription writing.	20.0
EMR, electronic medical record; ENRx, nature prescription.	

There were no significant differences between the two groups for most indicators, including frequency and duration of nature visits, screen time, burnout level, and emotional exhaustion. However, significant differences were found in the frequency of taking breaks outside and in individuals' CNS. Providers who issued NRx took more frequent breaks outside, $t(133) = -2.7$, $p < 0.01$, and had a greater CNS, $t(130) = -2.4$, $p < 0.05$.

Table 4, which focuses on providers who have issued NRx, presents data on time it takes to write a NRx, HCP satisfaction levels issuing NRx, and perceptions of the effectiveness of NRx in enhancing patients' physical and mental/social health. Over half indicated that issuing a prescription takes 5–8 min, and 10.8% completed it in



Fig. 1. Reasons, barriers, and motivators for issuing nature prescriptions.

3 min or less, averaging about 7 min with an SD of 4 min. Forty percent were neither satisfied nor dissatisfied with issuing NRx, 11.1% were satisfied, and 40.3% were very satisfied. Regarding

NRx's efficacy in improving physical health, almost 60% found NRx somewhat effective, and 30.6% very effective. For mental/social health, 44.4% rated them as somewhat effective, 40.3% as

Table 3. Comparison of Nature Exposure and Well-Being Indicators Among Providers Who Issued Nature Prescriptions and Those Who Did Not

	ISSUED NATURE PRESCRIPTIONS (<i>N</i> = 76)		NOT ISSUED NATURE PRESCRIPTIONS (<i>N</i> = 59)		<i>df</i>	<i>t</i>	<i>p</i>
	<i>M</i> ^a	<i>SD</i>	<i>M</i> ^a	<i>SD</i>			
Time spent in green and natural places in the last 12 months	3.3	0.7	3.2	0.9	133	−0.9	0.35
Duration of green and natural place visits in a typical week	5.2	2.2	4.9	2.0	133	−0.8	0.40
Connectedness to nature scale	4.2	0.6	3.9	0.5	130	−2.4	0.02*
Number of nature items	2.6	1.4	2.5	1.3	133	−0.46	0.65
Screen time on an average workday (hours)	4.2	0.9	4.2	1.0	133	−0.02	0.98
Level of burnout	2.4	0.8	2.3	0.7	133	−1.1	0.28
Emotionally exhausted	3.0	0.7	3.1	0.7	133	1.0	0.32
Taking breaks outside	3.3	1.1	2.7	1.3	133	−2.7*	0.008**

Bolded values are significant.

^aMeans were calculated by averaging across each scale.

p* < 0.05. *p* < 0.01.

SD, standard deviation.

very effective, and 11.1% as extremely effective. Notably, none of the providers reported the NRx as ineffective.

We next analyzed HCP responses in those who had issued NRx regarding possible correlations between the CNS and the following variables: frequency and duration of visits to natural and green spaces, screen time, burnout levels, frequency of issuing NRx, and outdoor break habits. The Cronbach's α for CNS was 0.84, indicating good reliability, with a mean score of 4.15 and an *SD* of 0.55. Results are shown in Table 5, with significant findings indicated in bold. Frequency of green and natural space visits had a significant association with individuals' CNS, $r(74) = 0.42$, $p < 0.01$. Furthermore, screen time exhibited a negative correlation with individuals' CNS, $r(74) = -0.38$, $p < 0.01$. Issuing NRx in the past month also showed a significant positive relationship with providers' CNS, $r(71) = 0.42$, $p < 0.01$. Additionally, the habit of taking breaks outdoors was positively associated with higher CNS scores, $r(76) = 0.31$, $p < 0.01$. Moreover, we examined differences

in the frequency of issuing NRx with respect to gender, age, and practice settings. Significant age-related differences in the frequency of issuing NRx were noted between the 20–40 and 51–60 age groups, and between the 51–60 and over 60 age groups, for providers who did not prescribe any NRx in the past month, $F(6, 16.17)$, $p < 0.05$. Similarly, among those who issued NRx at least once in the past month, significant differences were observed between the 51–60 and 60 and older age categories, $F(6, 16.17)$, $p < 0.05$.

Discussion

In this study, we surveyed a group of HCPs who registered to issue NRx through an online platform, PRA, in order to identify various characteristics, including CNS, time spent in green space or other natural settings, and burnout level, that might positively influence issuing NRx. We hypothesized that HCPs who had greater CNS and were exposed to natural areas more often would also be more likely to issue NRx and that HCPs who had a greater number

Table 4. Nature Prescription Time, Provider Satisfaction, and Effectiveness of Nature Prescription Writing

	<i>N</i>	%
Prescribing nature time (average 7 min)		
1–4 min	10	14.1
5–8 min	41	57.7
9–12 min	13	18.3
13–16 min	4	5.6
17–20 min	3	3.9
Satisfied with prescription writing		
Very dissatisfied	1	1.3
Dissatisfied	4	5.3
Neither satisfied nor dissatisfied	30	39.5
Satisfied	8	10.5
Very satisfied	29	38.2
Improve physical health		
Not at all effective	0	0
Not so effective	5	6.6
Somewhat effective	43	56.6
Very effective	22	28.9
Extremely effective	2	2.6
Improve mental/social health		
Not at all effective	0	0
Not so effective	3	3.9
Somewhat effective	32	42.1
Very effective	29	38.2
Extremely effective	8	10.5
<i>N</i> = 76.		

of nature enhancements in their workspace would be more likely to issue NRx.

Fifty-six percent of respondents reported issuing NRx. This differs from the PRA database where 32% of HCPs have prescribed

nature through our portal. This could merely be reflective of those who have issued NRx being more likely to complete the survey. While survey results found no significant differences between those who have and have not issued NRx in terms of time and days spent in nature, screen time, and burnout level, we did find that those who issued NRx reported taking breaks outside significantly more often ($p < 0.01$) and had a greater CNS ($p < 0.05$). Among HCPs who issued NRx, there was a positive correlation between CNS and frequency of issuing NRx, visits to natural/green spaces, and taking workday outdoor breaks. Interestingly, taking workday outdoor breaks was also positively correlated with frequency of natural/green space visits, frequency of issuing NRx, and number of nature items in the workplace. To our knowledge, this is the first time that both CNS and taking workday outdoor breaks have been shown to be positively correlated with issuing NRx.

There are very few studies that have evaluated NRx from an HCP perspective. Our results are contrary to a pilot study that found no significant relationship between nature relatedness and issuing NRx (Kellert et al., 2017). However, the authors noted that their sample size, 24 HCPs, may have been too small to detect a correlation. In addition, their HCPs were pediatricians actively recruited to participate in a study through the American Academy of Pediatrics local chapter, while the HCPs participating in our survey had registered with PRA of their own accord.

Our findings on HCP prescribing habits are generally consistent with other research on HCP habits and counseling. The mean CNS for HCPs was significantly greater for those who had issued NRx. Studies have shown that HCPs' own lifestyle habits can influence patient counseling in certain health-related areas, such as with PA (Belfrage et al., 2018; Lobelo et al., 2009) and vaccinations (Wang et al., 2017). Furthermore, physicians are more likely to counsel on preventive topics with which they are familiar (Frank et al., 2013), whereas those who do not practice certain behaviors are less likely to provide such counseling (Sagner et al., 2017). It is conceivable that HCPs who score high on CNS, spend time outdoors more often, are more familiar and comfortable with nature and presumably more aware of local green space would also be more likely to counsel their patients on the benefits of spending time in nature and to issue NRx. Based on our results, we suspect that by providing opportunities for and encouraging HCPs to connect with nature more often (i.e., guided nature walks, access to local nearby nature) and by fostering relationships with local park systems, HCPs might be more likely to counsel patients on spending time in nature and to issue NRx. A reasonable next step, therefore, would be to evaluate whether increasing HCP

Table 5. Descriptive Statistics and Correlations for Study Variables Among Providers Who Issued Nature to Nature Scale Prescriptions

VARIABLE	N	M	SD	1	2	3	4	5	6	7	8
1. Connectedness to nature scale	74	4.15	0.55	—							
2. Frequency of natural and green space visits in the last 12 months	76	3.3	0.73	0.42**	—						
3. Duration of natural and green space visits in the typical week	76	5.2	2.2	0.16	0.10	—					
4. Screen time	76	4.2	0.9	−0.38**	−0.21	−0.17	—				
5. Burnout level	76	2.4	0.8	−0.11	−0.04	−0.16	0.15	—			
6. Frequency of writing nature prescriptions	71	2.5	1.3	0.42**	1.0**	0.10	−0.21	0.04	—		
7. Breaks outdoor	76	3.3	1.1	0.31**	0.31**	0.14	−0.19	−0.16	0.31**	—	
8. Emotionally exhausted	76	3.0	0.7	0.05	−0.24	−0.05	0.14	0.68**	−0.03	−0.23*	—
9. Number of nature items	76	2.6	1.4	0.16	0.11	0.12	−0.09	−0.09	0.10	0.25*	−0.05

Bolded values are significant.

* $p < 0.05$. ** $p < 0.01$.

access to and familiarity with nearby nature increases the likelihood of issuing NRx.

We also hypothesized that HCPs in green spaces and other natural settings more frequently would have lower burnout rates, which would be associated with the frequency of issuing NRx and CNS. However, we found no correlation between either burnout level or emotional exhaustion and CNS or issuing NRx. However, taking workday outdoor breaks was correlated with the frequency of issuing NRx and CNS and varied significantly between groups. Workday outdoor breaks might have a temporary effect on burnout, not measured by the survey questions. In a previous study, workday outdoor breaks was associated with lower burnout levels in HCPs (Cordoza et al., 2018), and a systematic review of nature elements and their effects on worker stress found that access to outdoor environments or creating outdoor areas reduces workplace stress (Ríos-Rodríguez et al., 2023). Employees with a greater connection to nature spend more time in it, are happier, and have a greater sense of well-being (Cordoza et al., 2018; Twohig-Bennett & Jones, 2018). This, in turn, is related to lower burnout levels (Wang et al., 2017).

Thus, providing opportunities for HCPs to spend more time in nature and promoting workday outdoor breaks might increase CNS and the frequency of issuing NRx.

Decreasing the time to issue NRx, such as through ancillary staff and/or having patients answer questions regarding nature in advance, might improve NRx frequency, as might integration of NRx into the EMR. Furthermore, breaking through cultural and patient barriers, perhaps through offering regular guided walks from the clinic, should be explored.

The study had limitations, foremost that this is a cross-sectional, self-reported study, and we cannot show causality, only correlation. Results may be subject to social desirability. Also, only about 10% of registered users with valid email addresses responded. While this is not atypical of HCP surveys without incentives, it may bias the results to individuals who were more likely to prescribe nature. Nonrespondents may differ systematically from responders. Most responders were White and female; thus, we cannot generalize the results to other populations. Future research should be conducted to better understand people who

registered but did not prescribe and HCPs who did not even register. Improving our understanding of barriers to NRx, especially in low-resource settings, will be essential to get widespread adoption of NRx programs.

Conclusions

HCPs who wrote more NRx reported feeling greater CNS, visited green space/nature, took workday breaks more frequently, and reported less screen time. This emphasizes the importance of frequent exposure to nature among HCPs, both during and outside of work, to improve issuing NRx.

Most were written for mental and general health conditions, and physical inactivity. Most HCPs thought prescriptions were effective for improving physical and mental health. This demonstrates potential targeting of specific HCPs to write NRx and the general acceptability of NRx as a health care tool for a variety of health conditions.

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Matthew Scribner, Chief Technology Officer, PRA, developed Figure 1.

Authors' Contributions

S.B.S. conceived, designed, and implemented the survey; collected the data; participated in analysis discussion; wrote most of the article; and edited the article. Y.C. performed the analyses and participated in analysis discussions; wrote the Sections "Methods and Results" of the article; designed and made the tables; and edited the article. R.Z. conceived and designed the survey; participated in analysis discussions; edited the article; and provided general article guidance. J.E.M. obtained Institutional Review Board approval; participated in analysis discussions; provided guidance and support on appropriate analyses and article submission; and edited the article.

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