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Telehealth use among registered nurses: A national sample survey analysis

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ABSTRACT

Background: Telenursing utilization fluctuated during the COVID-19 pandemic response and recovery.
Purpose: To determine United States nationally representative estimates in telenursing and ascertain disparities by practice rurality, patient population, and nurse racial identity.
Methods: Applied epidemiological analysis of the 2022 National Sample Survey of Registered Nurses (RNs) with weighting for national representativeness.
Findings: Weighted estimates represented 2,789,399 RNs. Limited telenursing use (22%) for inpatient and outpatient care was reported; the forms most frequently used were live videoconferencing (67%), audio calls (66%), and text or live chat (31%). Disparities by practice rurality and patient population were observed, but none by nurse racial identity.
Discussion: Limited adoption of telenursing practice for inpatient and outpatient care was reported, despite pandemic conditions. Proactive policy development is needed to advance equal access to health services through telenursing use in rural areas, older adult practices, and pediatric nursing.

Background

With the easing of regulatory restrictions and the expansion of telehealth reimbursement, telehealth grew considerably during the height of the COVID-19 pandemic (Doraiswamy et al., 2020). Although telehealth services in outpatient settings have since waned, utilization remains above prepandemic levels and continues to be an important component of patient care. Consequently, nurse-delivered telehealth is increasingly integrated into clinical areas across inpatient and outpatient settings, including chronic disease management, ambulatory care, mental health care, acute care, and end-of-life care (AkbariRad et al., 2023; American Academy of Ambulatory Care Nursing [AAACN] et al., 2018; American Association of Critical Care Nurses [AACN], 2022; Cameron & Munyan, 2021; Guzman-Clark et al., 2020; Kappes et al., 2023; Lee et al., 2022; Miyamoto et al., 2021; Öz et al., 2024). Motivations to substitute in-person visits with telehealth are also galvanized by environmental sustainability factors (World Health Organization, 2025). However, variations in telenursing adoption have been observed related to geography and nurse racial identity (O'Hara & Reid, 2024).

Outpatient telehealth services reduce no-show rates, increase patient satisfaction, show high provider satisfaction, and can reduce costs while increasing revenue (Shao et al., 2022; Sumarsono et al., 2023). For underserved and rural populations, outpatient telehealth can be a vital resource that eliminates many barriers to healthcare

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Table 1
Nursing Practice Telehealth Functions

Function	Overarching Goal	Example Roles
Collaborative care (provider consultation)	Connect with other healthcare professionals to provide virtual consultation or coordinate the delivery of care between providers and settings	Care transition coordination Teleconsultation (e.g., teleSANE [Sexual Assault Nurse Examiner])
Direct-to-consumer consultation	Patient consultation to promote optimal wellness. When a higher level of care is needed, assess and refer patients to the appropriate place for in-person treatment	Teletriage remote health education/coaching
Inpatient care delivery	Collaboration with on-site members of the care team to deliver in-person nursing care	Virtual nursing care Telesitting Bedside patient rounding
Ambulatory/home care	Deliver nursing care at home or in the community, such as remote monitoring and support for chronic disease management	Postdischarge follow-up Telehospice Telemental health Telerehabilitation Remote symptom management
Family-centered empowerment	Provide caregivers with knowledge, skills, and resources to promote health, manage illness, or support a family member at the end of life	Family education and follow-up

services, such as a lack of transportation, time off from work, or child care. Similarly, inpatient telehealth, which uses videoconferencing and remote patient monitoring to provide patient care and support hospital care teams at the bedside, is rapidly on the rise. In 2024, 46% of hospitals reported implementing inpatient telehealth nursing, up from 38% in 2023 (AvaSure, 2024). Inpatient telehealth allows a virtual nurse to provide a range of services remotely, including assessments, admissions and discharges, patient and family education, counseling, and care support. One observational study found that the deployment of inpatient telehealth during COVID-19 did not decrease or replace nursing time at the bedside, but was instead complementary (Vilendrer et al., 2022). This growing aspect of telehealth supports the bedside care team by creating more time to provide direct hands-on care, reducing nurse turnover and patient readmissions, and increasing throughput of patient flow and patient satisfaction.

Models of telenursing care vary by setting and type of encounter across the care continuum (see Table 1 and Figure 1) (AkbariRad et al., 2023; Fashaei et al., 2024; Guzman-Clark et al., 2020; Kappes et al., 2023; Lee et al., 2022; Sitammagari et al., 2020). The role and scope of practice for licensed registered nurses (RNs) in telehealth

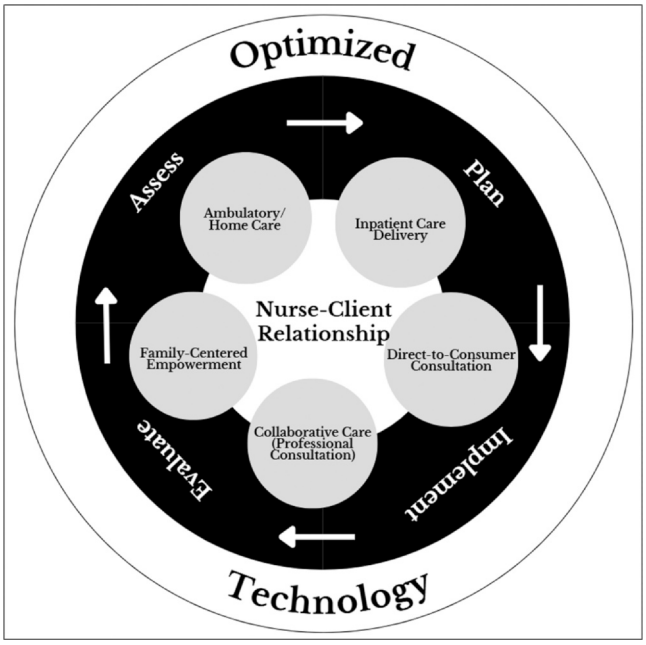

Figure 1. Telenursing across the care continuum.

services vary by state and organization; these responsibilities range from patient triage and care coordination with other healthcare providers to postacute care follow-up and leadership of chronic disease management for conditions such as diabetes and hypertension. Using optimized technologies (synchronous videoconferencing or remote monitoring), nurses can independently and collaboratively assess, plan, implement, and evaluate the outcomes of care within a remote virtual environment. Telehealth roles in which nurses independently lead care include direct-to-consumer consultation, postdischarge follow-up, home-based remote patient monitoring and telerehabilitation, and family-centered empowerment. Nurses also remotely consult with on-site inpatient teams and community-based service providers to deliver collaborative care across all settings (AACN, 2022; Meunier-Sham et al., 2019; Miyamoto et al., 2021).

Members of our research team had previously quantified geographic differences in individual clinical practice telehealth use, as well as differences among emergency nurses (36%) compared with other hospital nurses (15%), using the 2018 National Sample Survey of Nurses (NSSRN) data (Castner et al., 2021, 2022). O'Hara and Reid (2024) analyzed the National Council of State Boards of Nursing's 2022 National Nursing Workforce Survey (a survey instrument separate from that analyzed in this study) and found that 23.7% of RNs utilized telehealth >25% of the time. When grouped with licensed practical nurses and advanced practice registered nurses (APRNs), O'Hara and Reid found higher rates of telehealth adoption (>25% of nursing work time) among urban nurses and nurses of color.

The purpose of this study was to determine nationally representative estimates of telehealth nursing utilization and ascertain disparities by practice rurality, patient population, and nurse racial identity. We hypothesized that telehealth nursing utilization patterns would demonstrate significant disparities across rural vs. nonrural practice settings and among different patient populations and nurse racial identities, thus reflecting healthcare access challenges and workforce variations.

Methods

Design

We used complex survey sample weighting to generate national estimates from the NSSRN data. The design was guided by principles of applied epidemiology, specifically that analytics choices are best suited to communicate scientific evidence on population and subpopulation distributions with policy-making stakeholders in order to inform policy development. The study was structured using the

Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (von Elm et al., 2007).

Setting and Data Source

The NSSRN survey uses a population sampling frame and is administered by the U.S. Census Bureau to RNs in all U.S. states and territories (Health Services and Research Administration [HRSA], 2022). The methodology for the survey development and administration is reported elsewhere by the Health Services and Research Administration (HRSA, 2024). This study utilized the publicly available dataset from the 2022 survey.

Participants

Inclusion criteria were (a) licensed RNs, (b) employed in nursing on December 31, 2021, and (c) working part or full time in inpatient or outpatient settings. We did not include APRNs in this analysis. This study was not considered human subjects research according to the U.S. Code of Federal Regulation as it was an analysis of a publicly available dataset provided by the government on an open website.

Variables

Telehealth use was the main outcome variable of interest for this study. The specific variable names, survey item questions, and response options analyzed for this study are detailed in Supplementary Table 1. Due to the branching logic of the survey, telehealth use format questions were completed only by those who reported individual use of telehealth in their nursing practice.

We analyzed population differences in telehealth use by rurality of nurse practice, nurse racial identity, and practice population served. Rurality of practice was determined using a binary classification ("rural" or "non-rural") derived by the U.S. Census Bureau from the Department of Agriculture's Rural-Urban Commuting Area (RUCA) Codes (US Census Bureau, 2024). RUCA codes classify geographic areas based on population density, urbanization, and patterns of daily commuting to larger urban centers. Rural areas are defined as territories with populations of fewer than 2,500 people, which are not adjacent to urbanized areas, or areas with populations between 2,500 and 49,999 people, which have limited daily commuting connections (typically involving less than 30% of residents) to larger urban centers. Areas defined as nonrural include urbanized areas with populations of 50,000 or more, urban clusters of 2,500 to 49,999 people, which are adjacent to larger urban areas, or smaller communities where 30% or more of residents commute daily to urban centers for work. For this study, rurality classification was based on the geographic location (city/town, state, and zip code) of each participant's primary nursing position on December 31, 2021.

Race was analyzed as a binary variable of White or Other (a derived variable provided with the dataset). As an applied epidemiology analysis, this binary racial variable analysis was justified as a needs assessment to inform educational programming for general nursing audiences and professional nursing organizations that focus on the needs of nurses with ethnic minority identities, such as those affiliated with the National Council of Ethnic Minority Nurse Associations. Methodologically, this was also justified due to small sample sizes for several RN racial identities.

Patient population data were collected in response to the following survey question: "For the primary nursing position you held on December 31, 2021, please estimate the percentage of your patient care time spent with each population below." The response options for this question were 0%, 1% to 25%, 26% to 50%, 76% to 99%, and 100% in reference to the following population categories: Neonatal, Newborn, or Infant; Pediatric; Adolescent; Adult; and Geriatric populations. The survey utilized branching logic, with data for the patient population question gathered only from participants with direct patient care duties. We used the term "older adult" rather than "geriatric" in our results. For this analysis, population served was scored as a binary indicator, with a cutoff based on the RN reporting that at least 76% of their time was spent with the patient population. Other demographic variables for age, marital status, veteran status, household income, and educational attainment were included for descriptive purposes.

Statistical Methods

Data were analyzed using STATA 17.0 (College Station, TX). Population-weighted estimates were generated using successive difference replication (SDR) as recommended by HRSA (2024). Details on the methodology to create the weights are available elsewhere (US Census Bureau, 2024). Missing or undefined responses were included in the overall weighted analyses of the population but not in the defined subpopulation estimates reported by rurality or racial identity groupings. As a result, the subpopulation estimates are based on the survey responses and are generalizable to the national subpopulation. Sensitivity analysis was performed with and without missing data for the patient population-served analyses. Population proportion estimate differences were observed by the 95% confidence interval. We reduced publication bias by reporting the results of all planned analyses.

Results

Detailed characteristics of the overall sample analyzed (n = 2,789,399) can be found in a previous publication (Castner et al., 2024). Although 43% of participants reported that telehealth was used in the practice setting at their primary place of employment, only 22% reported that they individually utilized telehealth in their practice of nursing. More specifically, an estimated 1,186,792 RNs (95% CI = 1,153,320–1,220,264) reported that there was telehealth use in their practice setting, and an estimated 613,830 RNs (95% CI = 589,110–638,551) reported that they individually used telehealth in their nursing practice. The form of telehealth that participants reported using most frequently in their individual nursing practice was live videoconferencing (67%; n = 408,593, 95% CI = 387,986–429,200), followed by audio calls (66%; n = 403,573, 95% CI = 379,417–427,730), text message or live chat (31%; n = 188,079, 95% CI = 172,628–203,531), and remote patient monitoring (17%; n = 102,820, 95% CI = 92,499–113,141). Supplementary Table 1 provides a detailed list of telehealth survey items aligned with these results.

Table 2 summarizes participants' demographic characteristics as well as differences by rurality in their practice settings. Due to missing or undefined responses in rurality of practice setting, this analysis included 15,341 survey responses for a weighted population estimate of 2,557,768 nurses. Subpopulation estimates remained the same when surveys with missing or unclassifiable rurality responses were included in the analysis.

The demographic characteristics of nurses in rural compared with nonrural practice settings were as follows: female (90% vs. 87%), non-Hispanic White (86% vs. 62%), married (76% vs. 68%), and associate degree educational attainment (38% vs. 21%). As noted in Table 2 and Supplementary Table 2, the demographic characteristics of nurses in nonrural compared with rural practice settings were as follows: Hispanic (11% vs. 3%), non-Hispanic Black (12% vs. 4%), non-Hispanic Asian (11% vs. 2%), never married (19% vs. 10%), bachelor's degree attainment (61% vs. 50%), and master's degree attainment (14% vs. 8%). A higher proportion of nurses in rural practice settings reported an annual household income between $50,000 and $100,000; however, a higher proportion of those in nonrural practice settings reported annual household incomes over $150,000. Although no significant differences were found in the proportion of

Table 2
National Estimates of Demographic Characteristics and Telehealth Use by Rurality of Practice Setting (n = 2,557,768)

	Rural				Nonrural			
	n	%	95% CI lb	95% CI ub	*n*	%	95% CI lb	95% CI ub
Sex								
Male	**32,100**	**10.21**	**8.79**	**11.82**	**301,202**	**13.43**	**12.91**	**13.96**
Female	**282,444**	**89.79**	**88.18**	**91.21**	**1,942,021**	**86.57**	**86.04**	**87.09**
Grouped racial identity*								
White	**270,750**	**86.08**	**83.49**	**88.32**	**1,379,730**	**61.51**	**60.72**	**62.28**
Other combined	**43,795**	**13.92**	**11.68**	**16.51**	**863,493**	**38.49**	**37.72**	**39.28**
Marital status								
Married or in domestic partnership	**238,439**	**75.80**	**73.11**	**78.31**	**1,515,235**	**67.55**	**66.22**	**68.85**
Widowed, divorced, or separated	45,141	14.35	12.13	16.89	295,729	13.18	12.32	14.10
Never married	**30,965**	**9.84**	**8.38**	**11.54**	**432,259**	**19.27**	**18.13**	**20.46**
Annual household income								
$50,000 or less	17,163	5.46	4.43	6.70	98,815	4.41	3.90	4.97
$50,001 to $100,000	**143,018**	**45.47**	**42.86**	**48.10**	**850,052**	**37.89**	**36.48**	**39.33**
$100,001 to $150,000	102,244	32.51	29.98	35.14	680,654	30.34	29.08	31.64
More than $150,001	**52,120**	**16.57**	**14.35**	**19.05**	**613,702**	**27.36**	**26.09**	**28.67**
Educational attainment								
Diploma	8,737	2.78	1.99	3.87	63,472	2.83	2.48	3.22
Associates	**120,298**	**38.25**	**35.66**	**40.90**	**473,480**	**21.11**	**20.12**	**22.13**
Bachelors	**156,857**	**49.87**	**47.41**	**52.33**	**1,376,851**	**61.38**	**60.10**	**62.64**
Masters/Post-Masters certificate	**25,301**	**8.04**	**6.75**	**9.55**	**307,071**	**13.69**	**12.75**	**14.69**
Doctorate	3,057	0.97	0.63	1.50	22,058	0.98	0.79	1.22
Missing	294	0.09	0.01	0.69	292	0.01	< .01	0.05
Practice setting								
Hospital	**191,537**	**60.89**	**58.78**	**62.97**	**1,474,792**	**65.74**	**64.44**	**67.02**
Other inpatient	**34,238**	**10.88**	**9.48**	**12.47**	**167,602**	**7.47**	**6.80**	**8.20**
Outpatient	87,551	27.83	25.71	30.06	593,843	26.47	25.31	27.67
2+ Settings	1,219	0.39	0.21	0.70	6,986	0.31	0.18	0.53
Telehealth use								
Telehealth use at practice	**159,244**	**50.63**	**48.03**	**53.22**	**939,252**	**41.87**	**40.59**	**43.16**
Individual use of telehealth	**90,117**	**28.65**	**25.91**	**31.56**	**477,548**	**21.29**	**20.34**	**22.27**
Telehealth use format								
Asynchronous video	4,305	1.37	0.89	2.10	15,426	0.69	0.50	0.94
Videoconference	**71,162**	**22.62**	**20.09**	**25.37**	**307,781**	**13.72**	**12.99**	**14.49**
mHealth	**8,868**	**2.82**	**2.15**	**3.69**	**35,151**	**1.57**	**1.31**	**1.87**
Other	1,810	0.58	0.32	1.04	7,868	0.35	0.22	0.55
Calls	54,477	17.32	15.07	19.82	324,029	14.44	13.48	15.46
Remote monitoring	15,130	4.81	3.70	6.24	77,797	3.47	3.06	3.93
Text	23,294	7.41	6.07	9.01	148,235	6.61	6.02	7.25

Bold variables and results demonstrate rural/nonrural group differences in observed 95% confidence interval for the population estimate.
* Derived racial identity grouping variable from the National Sample Survey of Nurses (NSSRN). Details by racial identity groups aggregated here into "Other Combined" are presented in Supplementary Table 2.

nurses working in ambulatory care settings, a larger proportion of rural nurses worked in nonhospital inpatient settings (skilled nursing, rehabilitation centers, freestanding hospice, or inpatient mental health facilities) (11% vs. 7%); alternately, more nonrural nurses worked in hospital practice settings (66% vs. 61%). No rurality differences were observed by age, veteran status, widowed status, divorced status, or other separated demographics (Supplementary Table 2).

Differences were observed in the overall telehealth use by rurality, with a greater percentage of telehealth use in rural practices vs. nonrural practices (51% vs. 42%) and in individual RN practice use (29% vs. 21%), use of live videoconferencing (22% vs. 14%), and mHealth (3% vs. 2%) among individual RNs was also higher for rural practice nurses.

Our analysis observed no racial identity disparities among RNs when grouped as White or Other. Supplementary Table 3 depicts differences in the use of telehealth by RN racial identity. Figure 2 and Supplementary Table 4 present differences in RN telehealth use by the main patient population served. Compared with all other nurses in the sample, (a) nurses who worked with newborn patients reported a lower proportion of telehealth use at their practice site (28% vs. 41%), (b) fewer pediatric nurses reported telehealth use at their practice site (13% vs. 41%) or individual use of telenursing (11% vs. 22%), and (c) more nurses who worked with older adults reported telehealth use at their practice site (51% vs. 40%) as well as individual use of telenursing (33% vs. 21%). Due to small sample sizes and missing data, telehealth use format results and interpretations were not replicated between the analysis with and without missing responses.

Discussion

This study reports national estimates of (a) telehealth use in RNs' practice settings, and (b) RNs' individual use of telehealth in their nursing practice, with subpopulation estimates by rurality of nurse practice, RN racial identity, and patient population served. Our analysis uniquely contributes to the body of published literature by quantifying national telehealth use among RNs employed in both inpatient and outpatient settings. These findings provide an important benchmark for telehealth proliferation in RN practice as of December 31, 2021 (within the COVID-19 pandemic response). Despite pandemic conditions, roughly one in five RNs reported individual adoption of telehealth in inpatient or outpatient settings, well below prepandemic estimates of 36% for the emergency nursing specialty (Castner et al., 2022).

Using a different survey instrument, O'Hara and Reid (2024) report 24% of RNs utilized telehealth often (> 25% of time). We found lower rates of individual telehealth use in nursing practice at 22% from the NSSRN data. The population frames and study samples may explain this difference. O'Hara and Reid included licensed practical nurses and APRNs in their analyses of group differences, whereas our study considered RNs (who are not APRNs) in inpatient and

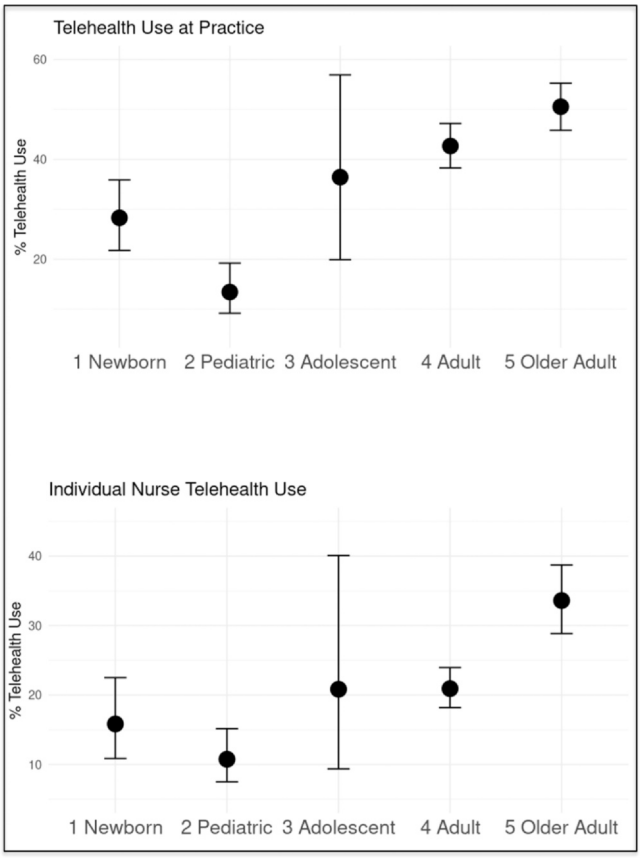

Figure 2. National estimates of telehealth use by patient population.

outpatient settings in additional detail. Further, the NSSRN did not ascertain the frequency of telehealth use. We further quantified disparities in telehealth use by rurality and patient population served (no disparities were observed by nurse racial identity).

Disparities by Rurality

Rural patient populations experience disparities in leading causes of death and major mortality indicators (Anzalone et al., 2022; Cross et al., 2021). Telehealth is an important equalizing modality to improve healthcare access and reduce rural health disparities (Tao et al., 2024). In this study, a higher proportion of RNs working in rural settings reported use of telehealth in their practice setting and their individual practice, and used live videoconferencing. Similarly, O'Hara and Reid (2024) found that rural nurses averaged more telehealth use than their urban counterparts, though urban nurses demonstrated pockets of more specialized telehealth practice (> 25% of work time). Although rural telenursing is an important intervention to improve healthcare access, particularly for patients who otherwise would need to travel long distances to an in-person facility, ongoing research and innovation are needed to address multifaceted rural mortality and morbidity disparities. In the meantime, states and organizations should evaluate whether the nursing role, scope of practice, and understanding of related technologies enables optimized telehealth services across both rural and nonrural practice settings.

Disparities by Patient Population Served

We observed higher rates of telehealth adoption in the practice sites for RNs serving older adults, with a corresponding higher rate of individual telenursing. Conversely, we observed lower rates of telehealth adoption at pediatric practice sites, with a lower corresponding rate of individual telenursing. Our findings are corroborated by a March to April 2020 pandemic snapshot (EPIC Health Research Network, 2020) that showed less than one-third of pediatric visits, and 48% to 52% of adult visits, conducted via telehealth; the highest volume of telehealth visits were completed for patients ages 55 to 74. In contrast, O'Hara and Reid (2024) observed the most frequent use of telehealth adoption among nurses in pediatric settings (31.0%), a difference in findings that may be attributed to their inclusion of APRNs and school health settings in their analysis. Our findings support the need for further research and interventions to improve access equity to telehealth for RNs practicing in pediatric care. Alternately, our findings indicate that nursing practice among older adult populations is heterogeneous and may serve as an access equity model for care in other populations. Contextualized within government healthcare financing, it is important to note that Medicare telehealth reimbursement policies and waivers for older adults are provided nationwide, but Medicaid telehealth reimbursement policies, which disproportionately impact the pediatric population, vary by state.

Disparities by Nurse Racial Identity

Our results do not indicate a disparity in telehealth adoption by nurse racial identity in the NSSRN's binary grouping of White and Other. Conversely, O'Hara and Reid (2024) found that nurses of color reported higher telehealth adoption rates when APRNs were included in the analysis. Had disparities been observed, our analysis would have had relevance to inform the educational needs assessments of the National Council of Ethnic Minority Nurse Associations and their five affiliate national ethnic minority nursing associations of the Asian American/Pacific Islander Nurses Association, Inc.; National Alaska Native American Indian Nurses Association, Inc.; National Association of Hispanic Nurses, Inc.; National Black Nurses Association, Inc.; and Philippine Nurses Association of America, Inc. When combined with O'Hara and Reid's (2024) findings, our results indicate that telehealth adoption educational programming is needed for general nurse audiences of all racial identities and not indicated specifically as an equalizing remedy for ethnic minority-focused organizations.

Implications for Digital Health Innovation

The strikingly low adoption rate (< 2%) of mHealth applications among RNs who are not APRNs reflects both a critical technology gap and implementation challenges in nursing practice. Bakker et al. (2023) found that nurses were well-represented in design and prototyping (71.3%) and requirements gathering (62.4%), but their involvement dropped significantly in critical phases like software development and planning (21%), thus contributing to solutions that do not align with clinical realities. Implementation costs present another significant barrier: research shows that recurring implementation expenses, including personnel, travel, and infrastructure support, account for 91% of total program costs, with only 9% attributed to initial startup expenses for mHealth development (Prinja et al., 2018). Additionally, insufficient investment in training has led to documented instances of discomfort with technology and suboptimal patient interactions (Rutledge & Gustin, 2021). Success in mHealth adoption requires the restructuring of development processes to include clinical nurses from inception, creation of sustainable implementation funding models, and establishment of dedicated support for change management.

Policy Implications

Policy implications for telenursing and its expansion relate to reimbursement models, workforce barriers, and restrictions on clinical scope of practice. Current reimbursement models are largely shaped by federal legislation. For example, telemental health has demonstrated federal cost savings, leading to reimbursement provisions under the Consolidated Appropriations Act of 2021. Reimbursement for nonmental health telehealth services, including most telenursing models (see Figure 1), has been extended only temporarily through measures such as the American Relief Act of 2025 (The American Telemedicine Association, 2024) and continuing resolution waivers, which are currently approved through September 30, 2025. The temporary nature of these extensions creates uncertainty for health systems and nurse leaders, potentially discouraging long-term investment in telenursing models and service lines, despite their potential to improve care quality and access. Although several permanent federal telehealth reimbursement bills have been sponsored and introduced by members of Congress (e.g., 119th Congress H.R. 1349; H.R. 1867; H.R. 1407; H.R. 1650; S. 763; H.R. 1899 [audio-only]; H.R. 2263; H.R. 2639; H.R. 290; H.R. 1614; H.R. 3419), none have passed committee or been slated for vote in the house or senate at the time of this writing (Library of Congress, 2025). Most of these sponsored bills are currently under consideration by the Committee on Energy and Commerce and the Committee on Ways and Means, with one bill referred to the Commodity Markets, Digital Assets, and Rural Development subcommittee of the House Committee on Agriculture (Audio-Only, 2025; Permanent Telehealth from Home Act, 2025; Rural Telehealth, 2025; Telehealth Access for Tribal Communities Act, 2025; Telehealth Coverage Act, 2025; Telehealth Expansion Act, 2025a, 2025b; To amend the Public Health Service, 2025; To amend title XVIII of the Social Security Act to expand, 2025; To amend title XVIII of the Social Security Act to remove, 2025; Women's Protection in Telehealth Act, 2025).

Beyond rural access, legislative progress depends on the Congressional Budget Office's determination that the preponderance of evidence demonstrates fiscal responsibility through accountable care models in practice. Sustainable telenursing demonstration projects must show evidence that virtual care can substitute for in-person care without increasing costs with added utilization. Alternatively, effective telenursing models should demonstrate preventive value by reducing high-cost downstream utilization (e.g., emergency department visits for chronic disease exacerbation).

Fees for service reimbursement models add to the risk of increasing costs by incentivizing additional utilization. In contrast, value-based models, in which risk and savings are shared between insurers and providers, encourage high-quality telenursing as a cost-saving substitute. Nurse leaders and health systems are well-positioned to innovate, test, and disseminate telenursing models of care, thereby ensuring that policymakers are informed of evidence of cost savings and quality outcomes. Continued policy codevelopment is essential to establish permanent reimbursement commitments and strategies that support robust telenursing model development, intervention testing, and evaluation to enhance quality care and cost savings.

Another barrier to telenursing expansion is that many virtual nursing activities (e.g., chronic disease management, medication adherence support, health coaching, and patient education) are either not reimbursed or reimbursed at lower rates than in-person equivalents. Although this practice may appear fiscally prudent to policymakers, it stifles innovation and sustainability. In contrast, the establishment of clear, standardized billing codes and reimbursement parity for telehealth-delivered nursing care across both public and private payers could enhance financial viability of telenursing programs and recognition of the value of nursing contributions to virtual care models.

A significant implementation challenge concerns the variations in nurse licensing, regulation, and scope of practice across state lines (American Academy of Nursing, 2024). Nurses who are fully capable of delivering safe, effective care via telehealth are often limited by regulatory requirements that prevent them from practicing across political borders. O'Hara and Reid (2024) found that nurses who qualified for interstate compact licensing had higher rates of telehealth adoption. Expanding interstate licensure compacts or introducing waivers for telehealth nursing access in rural and other underserved areas is critical for reaching patients and ensuring surge capacity during public health emergencies.

Finally, we recommend expanding and clearly defining the scope of practice for virtual nursing through direct, state-level, Nurse Practice Act policy action. Current scope-of-practice regulations often limit RN and APRN autonomy in delivering virtual care. Explicitly including telehealth responsibilities (e.g., care coordination, remote monitoring, triage, and patient counseling) within scope-of-practice definitions would empower nurses to participate fully in virtual care delivery. This policy shift would enhance workforce flexibility and address provider shortages, particularly in primary and chronic care.

The Future and the Rise of Virtual Care Nursing

Our finding of low individual telehealth use among RNs (who are not APRNs) working in inpatient and outpatient care settings may be attributable both to the enduring hands-on and in-person nature of nursing practice and to the limited access to funding incentives and structures for telehealth integration within RN practice. In comparison, telehealth adoption for office-based physicians skyrocketed from 16% in 2019 to 81% in 2020 (Peters et al., 2024); more recent reports indicate a proliferation of telenursing in inpatient settings.

Since the most recent wave of the NSSRN survey, the integration of telehealth into systems of care has grown considerably and continued to grow during the COVID-19 pandemic recovery (The American Telemedicine Association, 2024). The integration of virtual nurses into inpatient care improves workflow, minimizes discharge delay, and streamlines documentation, thereby contributing to shorter length of stay (Bruce et al., 2024; Savitz et al., 2023). Models that partner a virtual nurse with a bedside nurse can address resource constraints such as limited staffing and high patient volumes while maintaining care standards (Roberson et al., 2023). For example, in recent organization case studies with self-reported administrative data to Becker's Hospital Review, virtual RN support for nearly 5,000 inpatient admissions was associated with improved benchmarks in voluntary RN turnover (Twenter, 2024). Individual organizational reports correlate virtual nursing programs with the following benchmarks: decreased RN turnover and vacancy, decreased patient readmissions, reduced sepsis mortality, improved safety, increased support to manage high-acuity cases, and savings in nursing workforce finances. Of note, organizational-level case reports highlight the need for implementation science research to strengthen causal inferences and generalizability of telenursing with these promising outcomes.

Implementing innovative telenursing models involves key management and leadership considerations (American Hospital Association, 2019; Lin et al., 2018; Tilhou et al., 2024). Telehealth care models must fit within a sustainable business model and allow integration with the electronic health record (EHR). Efficient telehealth workflows should complement existing clinical processes and begin with comprehensive training for healthcare providers. Telehealth requires specialized nurse training and competencies (AAACN et al., 2018; AACN, 2022). The creation of a robust and patient-

centered telehealth care model involves establishing performance metrics to evaluate the effectiveness and quality of telehealth services and regularly refining practices based on feedback and performance data. Telehealth adoption must align with operational policies to ensure available staffing to support telehealth services and seamless integration of telehealth care with clinical services. Patient engagement and accessibility must be tailored for telehealth platforms through assessing and supporting patient digital literacy, offering technical support, and ensuring equity in access to services. It is important to note that telehealth can also improve staff work-life balance and the work environment by providing more flexible work hours and less physical labor, as well as flexible opportunities for experienced RNs and RNs who need work accommodations.

Expansion of telenursing also aligns with sustainability goals. Telehealth lowers carbon emissions associated with transportation by reducing the need for patient and clinician travel, offering one solution to trim energy waste and carbon footprint of healthcare-related transportation. In a systematic review, findings indicated carbon footprint savings ranged between 0.70 and 372 kg of CO_2e per consultation (Purohit et al., 2021). Telehealth visits during the first 2 years of the COVID-19 pandemic eliminated the need for patients to commute approximately 53.7 million miles at one site, resulting in a reduction of about 21,466 metric tons of CO_2 emissions—the equivalent of a year's worth of CO_2 emissions from the electricity use of 4,177 homes (Sharma et al., 2022). Widespread telehealth adoption, where it can serve as a replacement for in-person care, decreases the need for physical spaces, electricity, and other resources that can worsen energy waste metrics. While telehealth programs require use of devices and large resources for connectivity, studies report that the emissions generated by the telemedicine systems themselves were minimal compared with the substantial reductions achieved through decreased patient travel (Holmner et al., 2014). In rural areas, where distances traveled for health are access are increased, using telehealth has reduced carbon emissions, decreased costs, and decreased excess deaths (Madison et al., 2024).

Limitations

The NSSRN is a self-report survey study, thus, it may be subject to response, recall, social desirability, and other common self-report biases. Additionally, survey participants may have interpreted the survey questions differently than the survey developers intended. Nurse racial identity on the NSSRN is collected and grouped in multiple ways. Due to the small group sizes for several racial and ethnic identities, and possible indications of ethnic minority-focused nursing professional organizational programming, we tested group differences using the binary White and Other rather than White race variables. This choice may oversimplify racial identity groupings and differences by racial identity, but we felt the use was justified given the potential to inform minority nursing professional organization coalitions focused on nurse ethnic identity and belonging. Limited precision, as observed in wide confidence intervals in the results, may be due to small group sizes among those who use telehealth by population served (Supplementary Table 2). Although subpopulation estimates are unchanged whether missing data were included or excluded from the analysis due to population weighting estimates, our results should be interpreted with caution where missing data are noted.

Conclusion

We generated nationally representative estimates of telenursing in the United States for an estimated population of 2,789,399 RNs. Limited adoption of telenursing practice (22%) for inpatient and outpatient care was reported, despite pandemic conditions. The most frequent forms of telehealth reported were live videoconferencing (67%), audio calls (66%), and text or live chat (31%). Increased telenursing use in rural and older adult practices may advance health equity, but additional attention is needed in pediatric nursing to advance access equity. No disparities were observed by nurse racial identity. This analysis adds to the body of published literature through a uniquely detailed examination of telehealth utilization among RNs who are not APRNs. Proactive policy development and competency training continues to be warranted to advance equitable telenursing access and optimize patient outcomes.

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CRediT Statement

Jessica Castner: Writing – review and editing, Writing – original draft, Supervision, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. *Aditi U. Joshi*: Writing – review and editing, Witing – original draft, Investigation. *Ryan J. Shaw*: Writing – review and editing, Writing – original draft, Investigation. *Taryn Amberson*: Writing – review and editing, Writing – original draft, Supervision. *Breanna Hetland*: Writing – review and editing, Writing – original draft, Investigation. *Gyasi Moscou-Jackson*: Writing – review and editing, Writing – original draft, Project administration, Investigation, Formal analysis.

Declaration of Competing Interest

Jessica Castner is President and Principal of Castner Incorporated. Breanna Hetland is the CEO of FamilyRoom. The remaining authors declare no conflict of interest.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this work, one author used claudi.ai in order to solicit editorial suggestions for their contribution to the discussion. After using this tool/service, this individual author reviewed and edited the content and takes full responsibility for the content of the publication. Subsequently, there was another iteration in which all authors reviewed and edited the content and take full responsibility for the content of the publication.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.outlook.2025.102522.

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