Rural rehabilitation disparities and strengthening strategies: umbrella review

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Acknowledgments: None

Declaration of conflicting interest: The authors declare no conflicts of interest.

Funding statement: No funding was used for this work.

Ethics and Consents: Not applicable (review)

Data availability: Not applicable (review).

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Abstract

Background: Rural residents with disabilities often experience healthcare disparities versus urban counterparts.

Objective: To meta-synthesize the rural rehabilitation disparities, including access barriers, and the strategies for improving rehabilitation access for rural underserved populations.

Methods: Umbrella review of the contemporary (2015-2024), English-language reviews focused on rural rehabilitation service-delivery gaps or strategies for adults or children with disabilities, with no country restrictions. Six scientific databases (Medline/PubMed, Scopus, CINAHL, Cochrane Library, PDQ-Evidence, REHABdata) were searched, supplemented by snowballing. Two independent reviewers performed full-text assessments and quality appraisals of the systematic reviews on intervention effects, using the Measurement Tool to Assess Systematic Reviews-2.

Results: Of the 530 records identified, 366 were unique references and 16 reviews were finally included, including 8 systematic reviews, two of them with meta-analyses. The 16 reviews included collectively synthesized information from 484 studies. Rural rehabilitation-access disparities were identified. For instance, those derived from supply shortages in low-density markets, workforce recruiting and retention issues, long travel requirements and costs, waiting times or low intervention intensity, and generalist versus specialist skills of the therapist workforce. Rural rehabilitation strengthening strategies were also identified. These include telehealth service options – benefits and challenges; outreach, home and community-centered approaches; navigator programs; and finally, task-sharing with (remote) specialist support.

Conclusion: This umbrella review provides a meta-synthesis of the issues affecting equitable access to rehabilitation by rural populations and of the strengthening strategies to address those disparities. Alone or combined, these strategies might be tailored to and with local communities and interested parties for effective co-implementation.

Keywords: Rural Health Services; Rehabilitation; Healthcare Disparities

Introduction

Rural residents with disabilities are often at risk of experiencing significant health and healthcare disparities compared to their urban counterparts.[1] Rural populations are more frequently older,[2, 3] have higher rates of chronic conditions,[4] and have greater mortality rates than urban counterparts.[5, 6] Besides, rural populations experience healthcare access disparities,[1, 7, 8] arising from rural health workforce shortages, long travel distances to healthcare facilities, lower insurance rates, and lower income to afford out-of-pocket costs.[1] This situation has been exacerbated by the rise of rural hospital closures, from the economic disincentives to operate in low-density markets with fixed costs.[9, 10]

Rural residents also have higher rates of disability than their urban counterparts.[11, 12] In the USA, rural residents are 9% to 24% more likely to have any disability or multiple disabilities, and 18% more likely to experience long-term disabilities compared to urban residents, even when controlling for factors such as age, sex, race, education, and poverty.[11, 13] Furthermore, individuals with disabilities, and more so rural ones, more often live in poverty,[14] have higher costs of living due to their disability,[15] and often forego healthcare due to cost,[16, 17] even though they more often have poor health status and chronic conditions.[18]

Rural-urban disparities in healthcare access may apply to people with disabilities' access to rehabilitation services.[8, 19, 20] These services, including but not limited to occupational, speech & language and physical therapy, are vital for improving functional independence and quality of life following disability,[8, 21, 22] and should be equally accessible to individuals regardless of their geographic location.[23-25] Yet, these supports are less available or accessed by those in rural or remote areas.[8, 26, 27] Long travel distances to obtain necessary rehabilitation services can also provide obstacles to rural residents with disabilities, especially those whose mobility impairments.[16, 28] Long travels for care can also be costly, especially for the intensive, periodic or long-term scope of many rehabilitation interventions.[29]

Growing evidence, including systematically reviewed,[8, 30] has been pointing to the risk of rural residents with disabilities receiving fewer or less intensive rehabilitation services than their urban counterparts.[8, 19] For instance, rural older adults with disabilities received fewer home rehabilitation visits, especially when living alone and with comorbidities.[19] Those gaps in rehabilitation access put rural individuals at risk of not achieving the same health outcomes as those in urban settings.[8, 19, 31]

A number of strategies, including but not limited to telerehabilitation, may apply to improve rural equity in the access to rehabilitation services, including as pointed by some systematic reviews[32-35] or practice guidelines.[36-39] However, lower access to high-speed internet in rural contexts may slow down the rural uptake of telehealth options.[38, 40-43] All of this emphasizes the need to appraise these and other service-delivery strategies when applied in rural contexts.

In sum, there is a growing body of evidence pointing to rural-urban disparities or barriers to the access to rehabilitation services by people with disabilities, and for possible strategies to address

these disparities. However, to our knowledge, there is no meta-synthesis of these disparities or strategies, including facilitators and barriers, to improve equitable access to rehabilitation services for rural underserved populations. This review aims to address this knowledge synthesis gap.

Methods

Design

This study was an umbrella review[44-46] of traditional systematic reviews, scoping reviews, and other review methods in the broader family of systematic review approaches.[47] The protocol for this umbrella review was a priori registered in the PROSPERO database: CRD42024550234. We included contemporary (2015-2024), English-language peer-reviewed literature with no country restrictions.

Searches

We searched six scientific databases (MEDLINE/PubMed, Scopus, CINAHL, Cochrane Library, PDQ-Evidence. REHABdata) focused on the family of systematic reviews.[47] Additionally, the search strategy captured keywords or indexed terms of the respective databases that cumulatively address rehabilitation-related and rural-related topics. The **Supplementary Appendix 1** provides the full search strategies for the six databases. Moreover, we conducted snowballing strategies (e.g., author-tracking, citation-tracking) over the final included articles, to identify additional eligible reviews.

Study types included

We included formal reviews in the family of systematic reviews, including scoping, integrative reviews, rapid reviews, or realist.[47] However, we excluded editorials, review protocols, conference abstracts, papers without full text availability, letters to the editors, or perspective, conceptual or review papers that did not report on the methods used to obtain, compile, or synthesize evidence-based information. Consistent with an umbrella review,[44-46] empirical papers were excluded.

Service and populations

We included all reviews with health-based rehabilitation as a domain of service delivery. The services might be provided by credentialed rehabilitation professionals including but not limited to physical therapists, occupational therapists, or speech and language pathologists. We also included services provided by therapy assistants, community health agents, and other non-professional or non-credentialed workers if trained in rehabilitation or supervised by

rehabilitation professionals. Rehabilitation services were understood as those focused on the recovery, maintenance, or promotion of health-based functioning, including environmental modification. Cardiac and pulmonary rehabilitation services addressing secondary or tertiary prevention were included, as well.

Regarding rehabilitation service recipients, there were no exclusions based on age or disabling health conditions as our review focus was a general examination of disparities and strategies and not specific disease considerations. We also included people at risk of acquiring disabilities (e.g., aged population) when the goal was to prevent or reduce functional decline. Informal caregivers of any target patient population were also included as eligible rehabilitation service recipients. We excluded healthy populations without known risks of functional decline.

Interventions/programs and location

We included rehabilitation services, including telehealth formats, if there was a rehabilitation provider for the in-person or remote service delivery, either synchronous or asynchronous. We excluded interventions based on self-management apps or programs not monitored by a human resource.

For the locations, we included reviews on rural areas defined by low population density or remoteness. Additionally, to capture underserved geographic areas that were not necessarily rural, we included reviews that contained areas designated as being medically underserved or with shortages of healthcare providers compared to other areas within a state or nation. We excluded rehabilitation services targeted at reducing disparities in suburban or urban areas or when the focus was on whole-nation underservice such as a focus on an underserved low-income country without it being specific to its rural areas. We also excluded papers that may have included rural disparities but were focused on other disparities (e.g., involving gender or minority disparities).

Comparator(s) and outcome(s)

The comparators were the urban, suburban, or overall well-serviced geographic areas within nations. Included outcomes refer to disparities or reduced disparities in the access to and quality of rehabilitation service delivery in domains such as disparities in healthcare utilization or in clinical or functional outcomes. Additionally, implementation outcomes (e.g., improved uptake, outreach) of new service delivery models toward addressing documented disparities for needed health services were also included. We also included reviews with outcomes such as community integration, health-related quality of life, efficiency or economic benefit, or addressing client and provider experience and satisfaction with the rural service-strengthening strategy. We included synthesized results for feasibility and acceptability outcomes and any determined facilitators or barriers.

Selection and data extraction

One reviewer (SA) conducted the title-and-abstract screening, with a second reviewer (PM) randomly confirming 10% of these. In turn, two independent reviewers (SA, PM) conducted full-text screening and selection decisions against the eligibility criteria. The reviewers reached a consensus on the disagreements, facilitated by an experienced third reviewer (TJ). From the reviews, we extracted the context and methods information such as population, rehabilitation service delivered, comparators, and outcomes addressed. We also extracted their synthesized findings that responded to the "problem", "challenges", opportunities and "strategies" for the delivery of rehabilitation services in rural areas, according to the operational definitions for each of these categories within this review protocol (PROSPERO database: CRD42024550234). Data extractions were performed by one reviewer (SA), with 100% of them confirmed by a second reviewer (PM). **Supplementary Appendix 2** provides the final data extractions for each included review.

Quality assessment

The A Measurement Tool to Assess Systematic Reviews-2 (AMSTAR) tool was applied to traditional systematic reviews that assessed the effectiveness or satisfaction of programs or interventions. The AMSTAR was applied by two independent reviewers (SA, ND) who then reached a consensus.

Data synthesis

We performed a narrative synthesis of the extracted findings under two main categories: 1) disparities: i.e., extractions pertaining to the "problem" and "challenges" for delivering care in rural areas, and 2) strengthening strategies: i.e., extractions pertaining to the "opportunities" and "strategies", including barriers or facilitators to the implementation of these strategies. We did not perform a meta-analysis of the systematically reviewed information on this large and heterogeneous scope of literature.

Results

Figure 1 provides a PRISMA flowchart of the umbrella review. Of the 530 records initially identified, 78 full texts were screened, and 16 reviews were included in the final analysis. The 16 reviews included collectively synthesized information from 484 studies (i.e. counting the reviews of the two-part synthesis just once). **Table 1** provides the bibliographic details of the included reviews, including the review type and number of included studies. Among the 16 inclusions, there were eight systematic reviews,[8, 48-54] seven scoping reviews,[20, 25, 29, 55-58] and one integrative review.[30] Among the systematic reviews, three were on intervention effects[48-50] - including two with meta-analysis.[48, 49] **Supplementary Table 1** provides the quality appraisal of the three systematic reviews on intervention effects based on the Measurement Tool to Assess Systematic Reviews-2 (AMSTAR 2). Not surprisingly, the two systematic reviews with meta-analyses had

greater AMSTAR 2 scores,[48, 49] with one of them also including a higher compliance with methodological items elements such a protocol registration.[48]

The included reviews represented a range of populations, and interventions. For the timing, the year of the publication of the reviews ranged from 2018 to 2024. Context-wise, most reviews (*n*= 11 out of 16) addressed high-income nations, including two focused in Australia, one in the USA, and one in both Australia and the USA. In turn, five papers addressed both high and low- and middle-income countries. For age groups of the client population, eight reviews addressed both adults and children, four adults alone, and four children alone. For health conditions, 10 reviews addressed a full range of disabilities, four focused on neurological conditions, one addressed cardiac rehabilitation, and one cancer rehabilitation. For rehabilitation providers, two reviews (i.e., a two-part synthesis derived from the same set of included studies) focused on occupational therapy; all others focused on rehabilitation or allied health professionals more generally.

Authors	Title	Journal	Year	Review type	Included studies
(Gosse et al., 2024)[55]	Exploring Allied Health Models of Care for Children with Developmental Health Concerns, Delays, and Disabilities in Rural and Remote Areas: A Systematic Scoping Review	International Journal of Environmental Research and Public Health	2024	Scoping review	25
(Nikolaisen et al., 2024)[29]	Rehabilitation models for community integration of adults with acquired brain injury in rural areas: a scoping review	Rural Remote Health	2024	Scoping review	27
(Bohanna et al., 2022)[51]	A systematic review of disability, rehabilitation and lifestyle services in rural and remote Australia through the lens of the people-centred health care	Disabil Rehabil	2023	Systematic review, not on intervention effects	19
(Hayes et al., 2023)[20]	Profile of occupational therapy services in non-urban settings: A global scoping review	Aust Occup Ther J	2023	Scoping review	117
(Hayes et al., 2023)[25]	Extension, austerity, and emergence: Themes identified from a global scoping review of non-urban occupational therapy services	Aust Occup Ther J	2023	Scoping review	117
(Finak et al., 2023)[58]	Therapy services for children and youth living in rural areas of high-income countries: a scoping review	Disabil Rehabil	2023	Scoping review	37
(Yue et al., 2023)[54]	Update on Pediatric Mild Traumatic Brain Injury in Rural and Underserved Regions: A Global Perspective	J Clin Med	2023	Systematic review, not on intervention effects	15
(Quigley et al., 2022)[8]	Systematic Review of Rural and Urban Differences in Care Provided by Home Health Agencies in the United States	J Am Med Dir Assoc	2022	Systematic review, not on intervention effects	12
(Moreno-Chaparro et al., 2022)[53]	Telehealth interventions aimed at parents and caregivers of children living in rural settings: A systematic review	Child Care in Practice	2022	Systematic review, not on intervention effects	9
(Mama et al., 2021)[48]	Effectiveness of Physical Activity Interventions among Rural Cancer Survivors: A Systematic Review and Meta-Analysis	Cancer Epidemiol Biomarkers Prev	2021	Systematic review on intervention effects with meta-analysis	7
J. Campbell; D. Theodoros; N. Hartley; T. Russell; N. Gillespie[56]	Implementation factors are neglected in research investigating telehealth delivery of allied health services to rural children: A scoping review	J Telemed Telecare	2020	Scoping review	23
(Harkey et al., 2020)[50]	Patient Satisfaction with Telehealth in Rural Settings: A Systematic Review	Int J Telerehabil	2020	Systematic review on intervention	4

				effects, without meta-analysis	
(O'Sullivan & Worley, 2020)[57]	Setting priorities for rural allied health in Australia: a scoping review	Rural & Remote Health	2020	Scoping review	120
(Zhou & Parmanto, 2019)[52]	Reaching People With Disabilities in Underserved Areas Through Digital Interventions: Systematic Review	J Med Internet Res	2019	Systematic review, not on intervention effects	10
(Field et al., 2018)[30]	Cardiac rehabilitation services for people in rural and remote areas: an integrative literature review	Rural Remote Health	2018	Integrative review	16
(Speyer et al., 2018)[49]	Effects of telehealth by allied health professionals and nurses in rural and remote areas: A systematic review and meta-Analysis	Journal of Rehabilitation Medicine	2018	Systematic review on intervention effects with meta-analysis	43

Table 1: Reviews included in the umbrella review as ordered by publication date.

Below, we synthesize the content of the included reviews regarding the 1) rural rehabilitation disparities, including access barriers, and then the 2) rural rehabilitation strengthening strategies, including implementation determinants.

1- Rural rehabilitation disparities:

Across the included reviews, rural disparities in access to rehabilitation services were frequently noted. These disparities stem from issues such as rehabilitation service shortages in low population-density markets, long travel distances and associated costs, wait times, low service intensity, workforce recruitment and retention challenges, and generalist versus specialist skills of the therapist workforce. Additionally, two reviews focused on unique barriers faced by Indigenous populations.

1.1 Rehabilitation service shortages in low-density markets

Rural areas often experience shortages of rehabilitation services. For example, a recent global scoping review of 117 publications found that an undersupply of occupational therapy services in rural areas was reported nearly across all included publications.[25] Other reviews identified disparities in home and community services provided after discharge from (post-)acute care.[8, 25] For instance, a review of home-health rehabilitation in the USA found that rural older patients with disabilities consistently used rehabilitation services at significantly lower rates than their urban counterparts, even after controlling for individual- and agency-level covariates.[8] Additionally, rural-urban disparities were commonly reported in referrals to cardiac rehabilitation programs.[30] These disparities are partly driven by geographic factors such as low population density and remoteness,[25, 54, 58] leading to low-density markets that cannot economically sustain specialty rehabilitation services in rural areas.[25, 57]

1.2 Long travel requirements and costs:

Persons living in remote or service shortage areas often have to travel long distances to specialist services. These high-cost trips can be especially problematic for patients with long-term support needs such as those with neurological conditions.[29] For cardiac rehabilitation programs, the frequent trips and associated travel costs can pose substantive financial barriers to rehabilitation access. Additionally, these travel obligations also lead to potential loss of income from missed work commitments.[30]

1.3 Waiting times and low intensity

Service shortages, large service areas, and long travel distances lead to inequitable therapy time delivered to rural rehabilitation recipients and treatment delays. Long wait times for rural clients were often reported, including for the outreach options.[25, 58] Even when outreach services (e.g., for assistive technology needs) are provided, the rural or remote rehabilitation recipients often need to wait until a rehabilitation provider is available to travel, sometimes taking months.[25] Extensive travel distances also reduce the amount of time provided in direct care to rural patients.[25] When rehabilitation service access is granted after waitlisting, the rehabilitation services are often limited in duration and, due to supply-need shortages, clients are placed again on wait lists: a vicious cycle of delay and low service dose.[58] Rural rehabilitation recipients often need to choose between suboptimal in-person service (e.g., lower service amounts; waiting for the outreach), long travels and associated costs, or alternative service delivery (e.g., telehealth, self-managed rehabilitation programs) as a necessity, not an option.[25] Finally, within service shortage areas, therapists in more rural locations are expected to offer services to community health centers and primary healthcare clinics in addition to a district hospital level.[25] This not only increases wait list times and treatment delays but also adds to therapist stress and burnout.[25]

1.4 Workforce recruiting and retention issues

In rural and remote areas, recruitment, availability, and retention of skilled rehabilitation providers is low, which compounds the service delivery disparities.[25, 52, 57, 58] It is difficult to refer rural clients to therapists after acute events or for post-acute care since there are insufficient therapists in rural contexts. [25, 57, 58] Difficulties retaining skilled staff lead to high turnover rates, hence affecting the quantity and quality of services provided to rural clients.[58]

1.5 Generalist versus specialist and rural-specific skills

Rural rehabilitation providers may have a variety of conditions on their caseload. This contrasts with an urban, specialized inpatient neurorehabilitation unit, for example, that only treats stroke

survivors. Hence, while rehabilitation providers in rural areas need wide breadths of practice and rural-specific skills,[57] they are sometimes described as lacking the specialist skills of urban-based rehabilitation providers, necessitating urban service intervention or provider-provider consultation.[20]

Additionally, context-sensitive challenges have been reported by transplanted or outreach rehabilitation services directly provided by urban-based providers to rural communities. For example, urban rehabilitation providers may not address rural-specific functional activities like a return to farming or they might prescribe wheelchairs unsuitable for rural environments.[25] Further, one of the reviews found that studies in high-income country contexts lack consideration of context-sensitive, culturally-appropriate care.[25]

1.6 Unique barriers experienced by Indigenous populations

Indigenous populations may experience unique or additional rehabilitation barriers. For instance, in Australia their barriers to participation in cardiac rehabilitation result in part from the lack of culturally-appropriate services; in turn, this is derived from low levels of involvement of local communities and staff.[30, 58] Reduced program attendance may also result from ineffective referral pathways and the overall cultural bias of professionals and communities that cardiac rehabilitation is not needed or unsuitable for this subpopulation.[30]

2- Rural rehabilitation service strengthening strategies:

The included reviews pointed out strategies that include telehealth options; outreach, home and community-centered approaches; navigator programs; and local capacity building, task-sharing, and remote support.

2.1 Telehealth can be feasible and effective

In rural and remote areas, telehealth approaches (e.g., electronic messaging, telephone calls, websites, and videoconferencing) were used to deliver self-management, education, and therapeutic interventions.[29, 49] In a systematic review with a meta-analysis on the effectiveness of these approaches in rural areas, cognitive and physical rehabilitation have shown to have at least noninferior effectiveness relative to in-person interventions.[49]

In a review focused on pediatric patients with brain injury, telehealth protocols for triage/ consultation were found to be feasible for post-concussion care and rehabilitative services, either intensive or long-term.[54] Focused on cardiac rehabilitation, another review found that tele-

enhanced home-based programs were as effective as in-person, hospital-based programs.[57] Finally, a review of support for physical activity in rural cancer rehabilitation found that most cancer rehabilitation interventions were provided remotely (e.g., print, phone, or mail) without a face-to-face component; those resulted in physical activity increases and improved access for underserved rural populations.[48]

2.2 Telehealth is travel- and time-efficient and avoids life disruption

Reviews focused on children with disabilities found that online therapy services were associated with decreased costs and time of travel and fewer lost school days.[25, 52, 55, 58] Also, the removal of travel requirements, including for specialty appointments, increased families' access to therapy[55] and reduced family stress.[25] Timeliness of the responsiveness to client questions was seen positively by care recipients too.[50]

Telehealth can lead to client and provider satisfaction

A systematic review on satisfaction with telehealth found that most rural clients reported positive experiences with telehealth-delivered therapy.[50] They also found that most participants, in 2 of the 4 studies, reported a preference for telehealth over in-person services, and were willing to use telehealth again (e.g., videoconferencing).[50] Overall, satisfaction ratings related to ease of travel, quality of care, and reduced costs.[50] Similarly, another review found that most patients and caregivers viewed telehealth interventions positively.[52]

From the rehabilitation provider perspective, satisfaction was positive overall due to the increased patient contact time, comparable results, and reduced travel time and costs.[52] Nonetheless, some providers and participants still preferred face-to-face services.[57] For instance, telehealth benefits and satisfaction may be dependent on the quality of the technology and the care recipients' and providers' comfort with it.[57, 58]

2.3 Challenges with telehealth in rural contexts (e.g., internet connectivity)

A review of rural children and youth with disabilities found some concerns related to telehealth services.[58] These aspects included technical difficulties (i.e., access to password); discomfort with wearables; tasks sometimes being tedious; poor image, video or audio quality,.[50] Some of these issues relate to inadequate internet connection in rural areas.[55, 58] Use of analog phone lines when the internet is unavailable and daily testing of best connection methods can help;[56] yet, testing and switching between the best connection methods requires additional time, cost, and burden for clinicians.[56] Issues with the technology without local information technology support

were also reported as a concern,[58] in addition to not having appropriate treatment materials at the point of delivery.[55]

When these technical challenges apply, establishing communication, rapport, and providing quality service is more complex.[58] Barriers related to older age and lack of familiarity with technology (i.e., technology literacy) were less of an issue when prior training was provided.[52] Finally, one review focused on implementations pointed to the dearth of information about telehealth implementation factors; only 1 of 23 included papers referred to a clear telehealth implementation framework.[56]

2.4 Outreach, home, and community-centered approaches

Rehabilitation services' outreach to rural communities or the people's homes (e.g., through mobile rehabilitation units, staff travelling, home-based agencies with add-ons to support their larger travels) can help address rural service gaps.[25, 51, 58] Yet, outreach services with large catchment areas, high patient loads, and without situational and cultural sensitivity for the rural context may not provide timely or context-sensitive services.[25] In the USA, rural add-on payments for home health agencies from 2002 to 2017 made a significant difference in rural home health coverage, when these payments were larger (5%-10%); however, those were reduced and recently had their sunset.[8] In Australia, funding solutions included the use of pooled funding to fly in needed professionals to offer individualized services in a rural community.[58]

A review using a people-centred framework found that high-performing rural rehabilitation and disability services focused on community-based delivery, providing holistic care, and in enhancing the participation of individuals in their community life.[51] These services empower people to have a say in the care they receive.[29, 51] Community-level participatory approaches (e.g., community engagement, consultation, and local needs assessments) are also deemed appropriate for local service (re)designs.[25, 51, 58] Doing so might involve working with local client groups,[51] community councils,[58] local providers, and referral agents,[30] and establishing a partnership between various stakeholders (e.g., university, hospital, and government),[58] including for improving coordination of services across service professions, sectors, or other silos.[51, 58]

Finally, community-level education on disability, underlying health conditions, rehabilitation, and community integration may dispel myths and promote a supportive community environment.[29, 54] That can also help translate the population 'need' into service 'demand' (e.g., increased attendance and self-referrals for cardiac rehabilitation programs).[30] With special populations (e.g., Indigenous), community-wide participatory requirements are key for developing and deploying culturally appropriate and trustful rehabilitation programs, sometimes integrated into the mainstream health services, towards developing attendance, cultural adequacy, and trust.[25, 30]

2.5 Navigator programs

In reviewing rehabilitation models for community integration of rural adults with acquired brain injury, navigation and transition strategies stood out as the most recently applied.[29] Navigators in those programs performed a range of tasks, including coordinating services, advocating for resources, and providing education.[29] Navigators typically had a background as healthcare professionals with experience in rehabilitation, except in one included study where lay community health workers were trained as navigators.[29] Lay health workers, with less expertise but with local knowledge, assisted with the transitions from hospital to home, and is an alternative or complement to the recruitment of rehabilitation professionals, which is a challenge in rural areas.[29] The navigators were integrated with a regional community rehabilitation team, collaborated with inpatient rehabilitation teams, and linked community and specialist care teams.[29]

2.6 Local capacity building, task-sharing, and remote support

Capacity-strengthening initiatives are commonly reported, including building capacity in the local communities to fill service gaps, while providing employment and education to local people.[25, 51] That includes paid positions for community members within a task-sharing model, building local expertise, and employment.[25, 57] Paid task shifting/sharing was noted to develop community knowledge, resilience, and employment.[25] For outreach visits of therapists, local community workers can act as a mediator with clients, providing the therapists with a nuanced understanding of local contexts as well as promoting follow-up care when therapists are not in town.[25] Overall, virtual and physical outreach increased access, yet required strong community engagement and ongoing coordination by distal staff who might trained local workers.[57]

In turn, the scope of practices can be extended to address community needs,[57] including training therapy assistants to implement intervention programs.[58] Therapist assistants and local therapists or staff can also be provided with remote mentoring and support from urban-based, specialist therapists; this may increase rural access to specialty services as well as increase the skills/confidence of the local services available.[55]

Discussion

This umbrella review provides an overarching synthesis of the findings from the family of systematic reviews that addressed rural rehabilitation disparities and access barriers as well as service-strengthening strategies. The 16 reviews included synthesized information from 484

studies. Collectively, this meta-synthesized body of knowledge pointed out that rural residents with disabilities experience disparities in the access to rehabilitation services when compared to urban counterparts. These disparities and access barriers, as synthesized here, were derived from rural rehabilitation service shortages and workforce recruitment and retention issues, and were reflected in long travel requirements and costs, long waiting times, and a broad rural underutilization of rehabilitation services by rural rehabilitation service recipients. In turn, rural rehabilitation facilitators revolved around: telehealth service options – with a range of benefits and challenges; outreach, home, and community-centered approaches; navigator programs; and task-sharing with (remote) support. These strategies can be among the options to help reduce the disparities in access to rehabilitation experienced by rural residents with disabilities. This set of findings is worth discussing.

It was not surprising to observe that rural-urban disparities or barriers in access to rehabilitation services emerged as a common thread across literature, given the context at the outset of this umbrella review. Nonetheless, these results might be put in context. Many of the included reviews pointed to the common challenge of operationally defining rurality, which may have impacted the entification of rural disparities.[8, 20, 48, 49, 53, 55] Beyond the struggles of setting uniform criteria of rurality applicable across country contexts,[48, 49, 53] most of the empirical studies included were not clear on what they meant by rural or remote.[20, 48, 55] The overall literature points out that rural disparities can be prevalent especially in the most rural and remote areas and better detected with graded classifications of rurality versus binary rural-urban classifications.[8, 59] Even within a nation (e.g., the USA), different classifications and/or definitions were used by the underlying studies which affected the consistency of the results.[8] Therefore, our umbrella review results need to be understood in the context of a lack of uniform definition of rurality or remoteness across this reviewed body of literature. Future empirical studies on rural-urban disparities or service delivery might provide clear operational definitions or classifications of what rurality entailed for their context, enabling more precise knowledge syntheses. Merely using the keyword “rural” might not be enough for a definition at face value.

Our umbrella review also identified a range of strategies to address the rural-urban rehabilitation disparities. Telehealth was one of them, with the benefits of no travel or local supply being required; those same benefits for telehealth were among the barriers associated with in-person options for rural and remote areas. While telehealth options showed overall effectiveness, efficiency, and both client and provider satisfaction,[49, 50] all of that may depend on the specifics, such as the quality of technology as well as the rehabilitation service recipients’ and providers’ comfort with it.[58] It also may depend on how barriers related to lower internet availability and bandwidth in rural areas are identified and dealt with,[38, 40-42] and the level of a priori training involved with the use of the telehealth technology.[52] These specifics may account for the finding here that some providers and rural rehabilitation service recipients still preferred face-to-face services, when available.[57] That finding is consistent with a larger scope of literature, with some empirical studies observing a large variability in the uptake of telehealth by rehabilitation professionals and care recipients, accounting for both personal and contextual factors such as

attitudes toward telehealth of both the therapists and clients.[40, 42] Finally, a review included here pointed to the dearth of studies in telerehabilitation implementation, which may be a key factor for the success of telehealth options or lack thereof.[56] Further studies may point out which implementation factors and strategies might better impact the delivery of telerehabilitation in rural areas, including accounting for lower internet connectivity.

Perhaps more importantly, no one-size-fits-all solution – among those meta-synthesized here - may apply to all rural and remote contexts. Local rural communities, including their culture, resources, and service delivery options, might substantially vary within and across country contexts. Hence, it might be important to combine and tailor service-delivery options for each rural community. Some of the synthesized literature here pointed out the need to develop community-centered approaches.[25, 29, 30, 51, 58] These approaches might be culturally sensitive, inclusive of local subpopulations (e.g., including but not limited to Indigenous populations), and overall might be participatory in nature to be locally sensitive and locally appropriate. Hence, community-based participatory research approaches[60-64] can be important for local codesign and codelivery of tailored access-of-care strategies in rural contexts.

The service delivery strategies synthesized in this review might be seen as possibly complementary, rather than standalone and mutually exclusive. Even some of the reported options reflected a form of strategy blend, such as the use of remote specialists (i.e., tele-based) to support to local, non-specialist providers in the provision of care to local care-recipients or provider-to-provider remote education and consultation combined with task-sharing and community empowerment of local agents. In turn, the provider-to-provider remote education and consultation could align with the Project ECHO® model, which has been widely applied in the broader healthcare field to help ‘move the knowledge instead of moving people’ in serving rural and remote populations.[65, 66] In such an approach applied to rehabilitation,[67] rural therapists and other local service providers (who may have local and rural-specific knowledge and skills) may be remotely supplemented with specialized skills, continuing education, and support on more complex cases. In turn, trained assistants, community health workers, or lay community agents may provide a level of in-person support, therapist-client mediation, and overall navigation support to rural rehabilitation service recipients. That can be part of a task-sharing solution suitable to the many under-resourced contexts[68] when roles are a priori clarified.[69] Finally, virtual communities of practice, among rural therapists of under-resourced contexts including in low- and middle-income countries, can provide both support and professional development opportunities for rural-based therapists who may otherwise be isolated from peer-based learning and support processes.[70]

Overall, not all rural and remote areas and communities are built the same, so the solutions might be selected, blended, tailored, and even codesigned accordingly.

Limitations:

This review has the following limitations. First, the umbrella review focused on reviews that had rural-specific results; those with a broader spectrum (e.g., on telerehabilitation but not providing rural-specific results in the abstract) were not included. Therefore, we synthesized effectiveness, satisfaction, or challenges that are rural-specific and not necessarily common across the rural-urban spectrum. Second, while two independent reviewers were used in key parts of the review process (e.g., full-text assessments; quality appraisals), that was not applicable throughout (e.g., a second reviewer with confirmation roles for the data extraction). Third, we conducted quality appraisals only for reviews on the effects of interventions, including for the meta-analytic process. Fourth, we did not consult key informants as another form of snowballing for the search strategy. The other snowballing strategies indeed executed (e.g., author-tracking, citation-tracking) showed that potential additions referred to papers also found by the database searches, reinforcing the searchers' sensitivity to detect relevant review papers. Finally, this umbrella review addressed a wide range of disparities and service delivery approaches, hence a quantitative meta-analysis was not appropriate.

Conclusion:

This umbrella review provides a meta-synthesis of the issues affecting equitable access to rehabilitation by rural populations and of a range of strategies being used to address those inequities. Alone or combined, these strengthening strategies need to be tailored to local community contexts, while engaging the interested parties in their local co-development and co-deployment.

References

1. Centers for Medicare & Medicaid Services. The CMS Framework for Advancing Health Care in Rural, Tribal, and Geographically Isolated Communities. 2022.
2. Jensen L, Monnat SM, Green JJ, et al. Rural Population Health and Aging: Toward a Multilevel and Multidimensional Research Agenda for the 2020s. *Am J Public Health* 2020; 110: 1328-1331. 20200716. DOI: 10.2105/ajph.2020.305782.
3. Cohen SA and Greaney ML. Aging in Rural Communities. *Curr Epidemiol Rep* 2023; 10: 1-16. 20221109. DOI: 10.1007/s40471-022-00313-9.
4. Schopfer DW. Rural health disparities in chronic heart disease. *Preventive medicine* 2021; 152: 106782. 2021/09/10. DOI: 10.1016/j.ypmed.2021.106782.
5. James WL, Brindley C, Purser C, et al. Conceptualizing rurality: The impact of definitions on the rural mortality penalty. *Frontiers in public health* 2022; 10: 1029196. 2022/11/22. DOI: 10.3389/fpubh.2022.1029196.
6. Cross SH, Califf RM and Warraich HJ. Rural-Urban Disparity in Mortality in the US From 1999 to 2019. *Jama* 2021; 325: 2312-2314. 2021/06/09. DOI: 10.1001/jama.2021.5334.
7. Okoro CA, Zhao G, Fox JB, et al. Surveillance for Health Care Access and Health Services Use, Adults Aged 18-64 Years - Behavioral Risk Factor Surveillance System, United States, 2014. *Morbidity and mortality weekly report Surveillance summaries (Washington, DC : 2002)* 2017; 66: 1-42. 2017/02/24. DOI: 10.15585/mmwr.ss6607a1.
8. Quigley DD, Chastain AM, Kang JA, et al. Systematic Review of Rural and Urban Differences in Care Provided by Home Health Agencies in the United States. *J Am Med Dir Assoc* 2022; 23: 1653.e1651-1653.e1613. 20220913. DOI: 10.1016/j.jamda.2022.08.011.
9. Kaufman BG, Thomas SR, Randolph RK, et al. The Rising Rate of Rural Hospital Closures. *The Journal of rural health : official journal of the American Rural Health Association and the National Rural Health Care Association* 2016; 32: 35-43. 2015/07/15. DOI: 10.1111/jrh.12128.
10. McCarthy S, Moore D, Smedley WA, et al. Impact of Rural Hospital Closures on Health-Care Access. *The Journal of surgical research* 2021; 258: 170-178. 2020/10/05. DOI: 10.1016/j.jss.2020.08.055.
11. Zhao G, Okoro CA, Hsia J, et al. Prevalence of Disability and Disability Types by Urban-Rural County Classification-U.S., 2016. *Am J Prev Med* 2019; 57: 749-756. DOI: 10.1016/j.amepre.2019.07.022.
12. Del Brutto OH, Mera RM, Recalde BY, et al. On the Association Between Social Determinants of Health and Disability in Stroke-Free Older Adults Living in Rural Settings. The Three Villages Study. *Journal of primary care & community health* 2020; 11: 2150132720961265. 2020/10/02. DOI: 10.1177/2150132720961265.
13. Sage R, Ward B, Myers A, et al. Transitory and Enduring Disability Among Urban and Rural People. *J Rural Health* 2019; 35: 460-470. 20181122. DOI: 10.1111/jrh.12338.

14. Okoro CA, Hollis ND, Cyrus AC, et al. Prevalence of Disabilities and Health Care Access by Disability Status and Type Among Adults - United States, 2016. *MMWR Morb Mortal Wkly Rep* 2018; 67: 882-887. 20180817. DOI: 10.15585/mmwr.mm6732a3.
15. Mitra S, Palmer M, Kim H, et al. Extra costs of living with a disability: A review and agenda for research. *Disabil Health J* 2017; 10: 475-484. 20170424. DOI: 10.1016/j.dhjo.2017.04.007.
16. Boehle SG. Aging in place as a non-driver in Appalachian Ohio. *The Gerontologist* 2015; 55: 555-555. DOI: 10.1093/geront/gnv268.05.
17. Wong JL, Alschuler KN, Mroz TM, et al. Identification of targets for improving access to care in persons with long term physical disabilities. *Disabil Health J* 2019; 12: 366-374. 20190120. DOI: 10.1016/j.dhjo.2019.01.002.
18. Prevention; CfDCa. Disability and Health Data System (DHDS), http://dhds.cdc.gov (2004).
19. Falvey JR, Murphy TE, Gill TM, et al. Home Health Rehabilitation Utilization Among Medicare Beneficiaries Following Critical Illness. *J Am Geriatr Soc* 2020; 68: 1512-1519. 20200318. DOI: 10.1111/jgs.16412.
20. Hayes K, Dos Santos V, Costigan M, et al. Profile of occupational therapy services in non-urban settings: A global scoping review. *Aust Occup Ther J* 2023; 70: 119-141. 20220810. DOI: 10.1111/1440-1630.12835.
21. Ohio Department of Aging. *State Plan on Aging, 2023-2026*. 2022.
22. Hong I, Goodwin JS, Reistetter TA, et al. Comparison of Functional Status Improvements Among Patients With Stroke Receiving Postacute Care in Inpatient Rehabilitation vs Skilled Nursing Facilities. *JAMA network open* 2019; 2: e1916646. 2019/12/05. DOI: 10.1001/jamanetworkopen.2019.16646.
23. Jesus TS, Arango-Lasprilla JC, Kumar Kamalakannan S, et al. Growing physical rehabilitation needs in resource-poor world regions: secondary, cross-regional analysis with data from the global burden of disease 2017. *Disabil Rehabil* 2022; 44: 5429-5439. 20210604. DOI: 10.1080/09638288.2021.1933619.
24. Jesus TS, Landry MD, Dussault G, et al. Human resources for health (and rehabilitation): Six Rehab-Workforce Challenges for the century. *Hum Resour Health* 2017; 15: 8. 20170123. DOI: 10.1186/s12960-017-0182-7.
25. Hayes K, Dos Santos V, Costigan M, et al. Extension, austerity, and emergence: Themes identified from a global scoping review of non-urban occupational therapy services. *Aust Occup Ther J* 2023; 70: 142-156. 20221003. DOI: 10.1111/1440-1630.12844.
26. Weaver RH and Roberto KA. Location Matters: Disparities in the Likelihood of Receiving Services in Late Life. *Int J Aging Hum Dev* 2021; 93: 653-672. 20200824. DOI: 10.1177/0091415020948205.
27. Kosar CM, Loomer L, Ferdows NB, et al. Assessment of Rural-Urban Differences in Postacute Care Utilization and Outcomes Among Older US Adults. *JAMA Netw Open* 2020; 3: e1918738. 20200103. DOI: 10.1001/jamanetworkopen.2019.18738.
28. Siconolfi D, Shih RA, Friedman EM, et al. Rural-Urban Disparities in Access to Home- and Community-Based Services and Supports: Stakeholder Perspectives From 14 States. *J Am Med Dir Assoc* 2019; 20: 503-508.e501. 20190301. DOI: 10.1016/j.jamda.2019.01.120.

606 29. Nikolaisen M, Arntzen C, Eliassen M, et al. Rehabilitation models for community
607 integration of adults with acquired brain injury in rural areas: a scoping review. *Rural*
608 *Remote Health* 2024; 24: 8281. 20240319. DOI: 10.22605/rrh8281.
609 30. Field PE, Franklin RC, Barker RN, et al. Cardiac rehabilitation services for people in
610 rural and remote areas: an integrative literature review. *Rural Remote Health* 2018; 18:
611 4738. 20181107. DOI: 10.22605/rrh4738.
612 31. Rahman M, White EM, Thomas KS, et al. Assessment of Rural-Urban Differences in
613 Health Care Use and Survival Among Medicare Beneficiaries With Alzheimer Disease and
614 Related Dementia. *JAMA Netw Open* 2020; 3: e2022111. 20201001. DOI:
615 10.1001/jamanetworkopen.2020.22111.
616 32. Laver KE, Adey-Wakeling Z, Crotty M, et al. Telerehabilitation services for stroke.
617 *Cochrane Database Syst Rev* 2020; 1: Cd010255. 20200131. DOI:
618 10.1002/14651858.CD010255.pub3.
619 33. Chagnon M, Levasseur M and Boissy P. Telehealth interventions in occupational
620 therapy with older adults: Results from a scoping review targeting better health
621 promotion. *Aust Occup Ther J* 2024; 71: 190-208. 20231027. DOI: 10.1111/1440-1630.12910.
622 34. Alwadai B, Lazem H, Almoajil H, et al. Telerehabilitation and Its Impact Following
623 Stroke: An Umbrella Review of Systematic Reviews. *J Clin Med* 2024; 14 20241226. DOI:
624 10.3390/jcm14010050.
625 35. Rogante M, Kairy D, Giacomozzi C, et al. A quality assessment of systematic reviews
626 on telerehabilitation: what does the evidence tell us? *Ann Ist Super Sanita* 2015; 51: 11-18.
627 DOI: 10.4415/ann_15_01_04.
628 36. Hildebrand MW, Geller D and Proffitt R. Occupational Therapy Practice Guidelines
629 for Adults With Stroke. *Am J Occup Ther* 2023; 77. DOI: 10.5014/ajot.2023.077501.
630 37. Feigin VL and Owolabi MO. Pragmatic solutions to reduce the global burden of
631 stroke: a World Stroke Organization-Lancet Neurology Commission. *Lancet Neurol* 2023
632 20231009. DOI: 10.1016/s1474-4422(23)00277-6.
633 38. Salbach NM, Mountain A, Lindsay MP, et al. Canadian Stroke Best Practice
634 Recommendations: Virtual Stroke Rehabilitation Interim Consensus Statement 2022. *Am J*
635 *Phys Med Rehabil* 2022; 101: 1076-1082. 2022/06/30. DOI:
636 10.1097/phm.0000000000002062.
637 39. Winstein CJ, Stein J, Arena R, et al. Guidelines for Adult Stroke Rehabilitation and
638 Recovery: A Guideline for Healthcare Professionals From the American Heart
639 Association/American Stroke Association. *Stroke* 2016; 47: e98-e169. 2016/05/06. DOI:
640 10.1161/str.0000000000000098.
641 40. Kringle EA, Skidmore ER, Baum MC, et al. Stakeholders' Experiences Using
642 Videoconferencing for a Group-Based Stroke Intervention During COVID-19: A Thematic
643 Analysis. *The American journal of occupational therapy : official publication of the American*
644 *Occupational Therapy Association* 2023; 77 2023/06/14. DOI: 10.5014/ajot.2023.050111.
645 41. Zhu C, Tran PM, Dreyer RP, et al. Disparities in Internet Use Among US Stroke
646 Survivors: Implications for Telerehabilitation During COVID-19 and Beyond. *Stroke* 2022;
647 53: e90-e91. 2022/02/04. DOI: 10.1161/strokeaha.121.037175.

42. Gately ME, Quach ED, Shirk SD, et al. Understanding Variation in Adoption of Video Telehealth and Implications for Health Care Systems. *Med Res Arch* 2022; 10 2022/11/22. DOI: 10.18103/mra.v10i5.2751.
43. Graves JM, Abshire DA, Amiri S, et al. Disparities in Technology and Broadband Internet Access Across Rurality: Implications for Health and Education. *Family & community health* 2021; 44: 257-265. 2021/07/17. DOI: 10.1097/fch.0000000000000306.
44. Lazaros B, Vanesa B and John PAI. Conducting umbrella reviews. *BMJ Medicine* 2022; 1: e000071. DOI: 10.1136/bmjmed-2021-000071.
45. Cant R, Ryan C and Kelly MA. A nine-step pathway to conduct an umbrella review of literature. *Nurse Author & Editor* 2022; 32: 31-34. DOI: https://doi.org/10.1111/nae2.12039.
46. Papatheodorou SI and Evangelou E. Umbrella Reviews: What They Are and Why We Need Them. *Methods Mol Biol* 2022; 2345: 135-146. DOI: 10.1007/978-1-0716-1566-9_8.
47. Moher D, Stewart L and Shekelle P. All in the Family: systematic reviews, rapid reviews, scoping reviews, realist reviews, and more. *Syst Rev* 2015; 4: 183. 20151222. DOI: 10.1186/s13643-015-0163-7.
48. Mama SK, Lopez-Olivo MA, Bhuiyan N, et al. Effectiveness of Physical Activity Interventions among Rural Cancer Survivors: A Systematic Review and Meta-Analysis. *Cancer Epidemiol Biomarkers Prev* 2021; 30: 2143-2153. 20211007. DOI: 10.1158/1055-9965.Epi-21-0871.
49. Speyer R, Denman D, Wilkes-Gillan S, et al. Effects of telehealth by allied health professionals and nurses in rural and remote areas: A systematic review and meta-analysis. *J Rehabil Med* 2018; 50: 225-235. DOI: 10.2340/16501977-2297.
50. Harkey LC, Jung SM, Newton ER, et al. Patient Satisfaction with Telehealth in Rural Settings: A Systematic Review. *Int J Telerehabil* 2020; 12: 53-64. 20201208. DOI: 10.5195/ijt.2020.6303.
51. Bohanna I, Harriss L, McDonald M, et al. A systematic review of disability, rehabilitation and lifestyle services in rural and remote Australia through the lens of the people-centred health care. *Disabil Rehabil* 2022; 44: 6107-6118. 20210825. DOI: 10.1080/09638288.2021.1962992.
52. Zhou L and Parmanto B. Reaching People With Disabilities in Underserved Areas Through Digital Interventions: Systematic Review. *J Med Internet Res* 2019; 21: e12981. 20191025. DOI: 10.2196/12981.
53. Moreno-Chaparro J, Parra Esquivel EI, Santos Quintero AL, et al. Telehealth Interventions Aimed at Parents and Caregivers of Children Living in Rural Settings: A Systematic Review. *Child Care in Practice* 2022: 1-24. DOI: 10.1080/13575279.2022.2083075.
54. Yue JK, Krishnan N, Andrews JP, et al. Update on Pediatric Mild Traumatic Brain Injury in Rural and Underserved Regions: A Global Perspective. *J Clin Med* 2023; 12 20230506. DOI: 10.3390/jcm12093309.
55. Gosse G, Kumar S, Banwell H, et al. Exploring Allied Health Models of Care for Children with Developmental Health Concerns, Delays, and Disabilities in Rural and Remote Areas: A Systematic Scoping Review. *Int J Environ Res Public Health* 2024; 21 20240419. DOI: 10.3390/ijerph21040507.

56. Campbell J, Theodoros D, Hartley N, et al. Implementation factors are neglected in research investigating telehealth delivery of allied health services to rural children: A scoping review. *J Telemed Telecare* 2020; 26: 590-606. 20190619. DOI: 10.1177/1357633x19856472.
57. O'Sullivan BG and Worley P. Setting priorities for rural allied health in Australia: a scoping review. *Rural Remote Health* 2020; 20: 5719. 20200620. DOI: 10.22605/rrh5719.
58. Finak P, Hastings-Truelove A, Fecica A, et al. Therapy services for children and youth living in rural areas of high-income countries: a scoping review. *Disabil Rehabil* 2023; 45: 1893-1915. 20220524. DOI: 10.1080/09638288.2022.2074552.
59. Long JC, Delamater PL and Holmes GM. Which Definition of Rurality Should I Use?: The Relative Performance of 8 Federal Rural Definitions in Identifying Rural-Urban Disparities. *Med Care* 2021; 59: S413-s419. DOI: 10.1097/mlr.0000000000001612.
60. County Health Rankings and Roadmaps. What Works for Health - Access to care, https://www.countyhealthrankings.org/strategies-and-solutions/what-works-for-health/strategies?f%5B0%5D=health-factor%3AAccess%20to%20Care (2024).
61. Administration for Community Living. Aging and Disability Evidence-Based Programs and Practices, https://acl.gov/programs/strengthening-aging-and-disability-networks/aging-and-disability-evidence-based-programs (2018).
62. Rural Health Information Hub. Evidence-Based Toolkits for Rural Community Health.
63. Rural Health Information Hub. Access to Care for Rural People with Disabilities Toolkit, https://www.ruralhealthinfo.org/toolkits/disabilities.pdf (2016).
64. Institute UoWPH. *What Works? Strategies to Improve Rural Health*. 2015. Madison, WI.
65. Osei-Twum JA, Wiles B, Killackey T, et al. Impact of Project ECHO on Patient and Community Health Outcomes: A Scoping Review. *Acad Med* 2022; 97: 1393-1402. 20220524. DOI: 10.1097/acm.0000000000004749.
66. Moss P, Hartley N and Russell T. Project ECHO(®): a global cross-sectional examination of implementation success. *BMC Health Serv Res* 2024; 24: 583. 20240503. DOI: 10.1186/s12913-024-10920-5.
67. Marshall J, Moss P, Raatz M, et al. Experiences of Allied Health Clinicians Accessing a Pilot Project ECHO® Program to Support Learning in Pediatric Feeding. *J Contin Educ Health Prof* 2024 20240430. DOI: 10.1097/ceh.0000000000000557.
68. Kumurenzi A, Richardson J, Thabane L, et al. Effectiveness of interventions by non-professional community-level workers or family caregivers to improve outcomes for physical impairments or disabilities in low resource settings: systematic review of task-sharing strategies. *Hum Resour Health* 2023; 21: 48. 20230621. DOI: 10.1186/s12960-023-00831-7.
69. Bhattacharjya S, Curtis S, Kueakomoldej S, et al. Developing a Global Strategy for strengthening the occupational therapy workforce: a two-phased mixed-methods consultation of country representatives shows the need for clarifying task-sharing strategies. *Hum Resour Health* 2024; 22: 62. 20240905. DOI: 10.1186/s12960-024-00948-3.

70. van Stormbroek K, O'Brien L, van der Merwe TR, et al. Virtual communities of practice for novice occupational therapists: a vehicle for learning, support and professional identity strengthening? *Rural Remote Health* 2024; 24: 8555. 20240522. DOI: 10.22605/rrh8555.