

## REVIEW ARTICLE

## Rehabilitation models for community integration of adults with acquired brain injury in rural areas: a scoping review

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## ETHICS APPROVAL

As this is a review of previously published literature, no ethics approval was required.

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## ABSTRACT:

**Introduction:** Community integration (CI) is recognised as an overarching goal for the rehabilitation of individuals with acquired brain injury (ABI). However, adults with less severe ABI often experience a lack of support when they return home after

discharge from hospital or inpatient rehabilitation, despite having persistent impairments and ongoing needs. Individuals living in rural areas are even less likely to receive adequate support during this period, which is often marked by challenges and uncertainty.

This review aims to map and explore the research literature to identify existing models for rehabilitation service provision aimed at promoting the CI of home-dwelling adults with ABI living in rural areas.

**Methods:** A scoping review of the research literature was conducted. The study followed the Joanna Briggs Institute guidelines for scoping reviews and the PRISMA extension for scoping reviews. The databases searched were MEDLINE, Embase, AMED, CINAHL, Web of Science, Cochrane Library, PsycInfo, and Google Scholar. No limitations were set for the study design, time of publication, or country of origin, but only literature in English, Danish, Norwegian, or Swedish was considered for inclusion.

**Results:** Twenty-seven articles were included. All of them originated from four Western and predominantly English-speaking countries: Australia, Canada, the UK, and the US. A thematic analysis identified six model categories that reflect different strategies for providing rehabilitation that promote CI in adults with ABI in rural areas. Sorting the model categories into micro (individual, interpersonal), meso (organisational, community), and macro (policy, society) levels highlighted that most of the included literature concentrates on microlevel issues at the individual or interpersonal level. Microlevel model categories encompass self-  
**Keywords:**

brain injuries, community integration, Norway, rehabilitation, scoping review.

management and education, the use of navigators, and the incorporation of everyday life activities into rehabilitation. Far fewer articles addressed mesolevel issues such as service development in rural areas or the development of inclusive rural communities, and only a single article addressed policy development at the macro level.

**Conclusion:** The relatively low number of included articles and limited geographical distribution of studies indicate that more research is needed on rehabilitation models aimed at promoting CI in adults with ABI in rural areas. Although we identified several existing approaches to rehabilitation service provision in rural areas, there is still a need to develop models that fully consider the complexity and long-term nature of CI after ABI. The results also demonstrate that CI in rural areas not only is dependent on professional service delivery aimed at the individual with ABI but also can be promoted by supporting significant others, developing inclusive communities, and improving policies. More knowledge on such issues may facilitate a wider reorganisation of care systems to enhance the CI of adults with ABI in rural areas. However, this will require more research with a wider scope than microlevel service delivery.

## FULL ARTICLE:

### Introduction

Acquired brain injury (ABI) includes conditions like stroke and traumatic brain injury (TBI), and is one of the leading causes of disability in working-age adults worldwide<sup>1-7</sup>. Depending on the extent and location of the injury, individuals with ABI may experience a complex combination of deficits in functional domains such as the motor, sensory, cognitive, perceptual, and emotional domains. These deficits often lead to long-term disabilities that limit activities and restrict participation in life situations<sup>8</sup>.

Healthcare professionals can play a key role in supporting individuals with ABI, not only in the acute phase but also in the longer term and in the re-establishment of everyday life<sup>9</sup>. However, individuals living in rural areas are less likely to receive adequate rehabilitation, as rural areas are known to be a challenging context due to distances from healthcare centres, travel time, lack of specialised services, and maldistribution of personnel<sup>10,11</sup>. Furthermore, individuals with ABI who are discharged to their homes tend to 'fall through the cracks' of healthcare systems, even in high-income countries<sup>12-14</sup>. In particular, there is considerable evidence that individuals with less severe ABI often experience a lack of professional support<sup>15-21</sup>. This is probably related to a tendency to discharge individuals with less severe ABI from hospital without conducting thorough assessments, offering inpatient rehabilitation, or planning for long-term care<sup>22,23</sup>. For instance, individuals without significant motor or language impairments may mistakenly be assumed to lack impairments<sup>24-26</sup>. Although more subtle impairments may go undetected in inpatient settings, it is common for ABI-related difficulties such as concentration difficulties, fatigue, depression, and psychosocial issues to become more apparent with the transition to everyday life in the community<sup>27,28</sup>. During this transitional phase, individuals with ABI and their significant others,

such as spouses, partners, family members, and close friends, tend to become more aware of the lasting impact that the injury has on their daily lives<sup>29-37</sup>. However, many individuals with ABI and their significant others experience a sharp decline in support from the health and social care systems after hospital discharge<sup>12,21,22,38,39</sup>.

Numerous studies have highlighted the need to develop rehabilitation services that support individuals with ABI in the process of adapting to the consequences of ABI and returning to their valued roles and activities<sup>25,29-32,34-37,40-44</sup>. Working-age adults with ABI face unique challenges in terms of responsibilities and social roles<sup>8,45</sup>. Thus, they may have distinct rehabilitation goals and support needs. Previous studies have shown that the greatest long-term threats to the wellbeing and quality of life of working-age adults with ABI are social isolation, depression, inactivity, exclusion from work, and limited participation in leisure activities<sup>24,27,36,46,47</sup>.

Studies have reported that adults with ABI and their significant others require proactive services and persistent professional support after discharge home to help them overcome the diverse challenges related to family life, social participation, the return to work, and finances<sup>13,20</sup>. These aspects of life are included in the broad, multifaceted concept of community integration (CI), which also includes aspects such as being independent, belonging, having a home, and being involved in meaningful occupational activity<sup>48,49</sup>. Additionally, the CI process is characterised by inherent uncertainties, phase transitions, and adjustments that may occur over extended periods of time<sup>49</sup>. Although CI is increasingly recognised as the overarching goal of rehabilitation after ABI<sup>31,48-51</sup>, the concept of CI also challenges current rehabilitation practices to increasingly consider the multifaceted nature, non-linearity, and long-term perspective inherent to the CI process.

It is recommended that individuals with ongoing needs after ABI have access to appropriate and adequate outpatient or

community-based services to achieve CI<sup>8,52,53</sup>. To provide comprehensive and cost-effective care for individuals with ABI, it has been proposed that rehabilitation services should be organised in coordinated regional networks and that needs that cannot be met locally should be directed to specialist services<sup>54,55</sup>. However, implementing such solutions in rural areas is complex for two interrelated reasons. First, the heterogeneous, multifaceted nature of impairments after ABI makes it necessary to tailor rehabilitation efforts to the specific needs of each person, which requires a coordinated involvement of practitioners, typically achieved through multidisciplinary teams<sup>34,56-59</sup>. However, such structures are unlikely to be locally available in rural areas. Second, it is generally accepted that rehabilitation efforts have the greatest impact when they are provided in a relevant context. Contextual knowledge and relevance appear to be particularly important for rehabilitation efforts aimed at promoting CI, as these processes are tied to specific individuals living in specific communities. Hence, there is a need for rehabilitation models that can resolve the tension between providing professional expertise on ABI and maintaining contact with the rural everyday context in which CI occurs.

In this context, the objective of this scoping review is to map and explore the current research literature to identify existing models for the provision of rehabilitation services that promote CI in home-dwelling adults with ABI living in rural areas.

## Methods

This study was conducted in accordance with the Joanna Briggs Institute guidelines for scoping reviews<sup>60,61</sup> and the PRISMA

extension for scoping reviews<sup>62</sup>. The guidelines were developed on the basis of the framework first suggested by Arksey and O'Malley<sup>63</sup> and later elaborated by Levac et al<sup>64</sup>. Prior to the study, a protocol to guide the process was developed and registered online in the Open Science Framework<sup>65</sup>.

### Inclusion criteria

To be included, sources must describe models for rehabilitation service provision that promote the CI of home-dwelling adults with ABI living in rural areas. As recommended for scoping reviews, the development of the research question was guided by the Population, Concept, and Context mnemonic<sup>61</sup> (Box 1).

'Model' is an ambiguous term that is often used without further explanation in the research literature. In this review, the point of departure was to consider the concept of 'model' in a broad sense as a simplified and systematic representation of certain aspects of the world. We concentrated on identifying models that express certain ways of organising the activities of individuals, organisations, or systems involved in the provision of rehabilitation services to home-dwelling adults with ABI living in rural areas. To identify relevant studies, the search strategy included related terms such as 'framework', 'program', and 'service'.

This study considered all peer-reviewed sources that met the inclusion criteria, with no limitations on the study design, publication timeframe, or country of origin. Conference abstracts, grey literature, book chapters, editorials, and opinion pieces were not included. Only literature in English, Danish, Norwegian, and Swedish was considered for inclusion.

### Box 1: Population, Concept, and Context elements guiding the research question

<b>Population</b>
Home-dwelling adults with acquired brain injury
<b>Concept</b>
Models for rehabilitation service provision that promote community integration
<b>Context</b>
Rural areas

### Search strategy

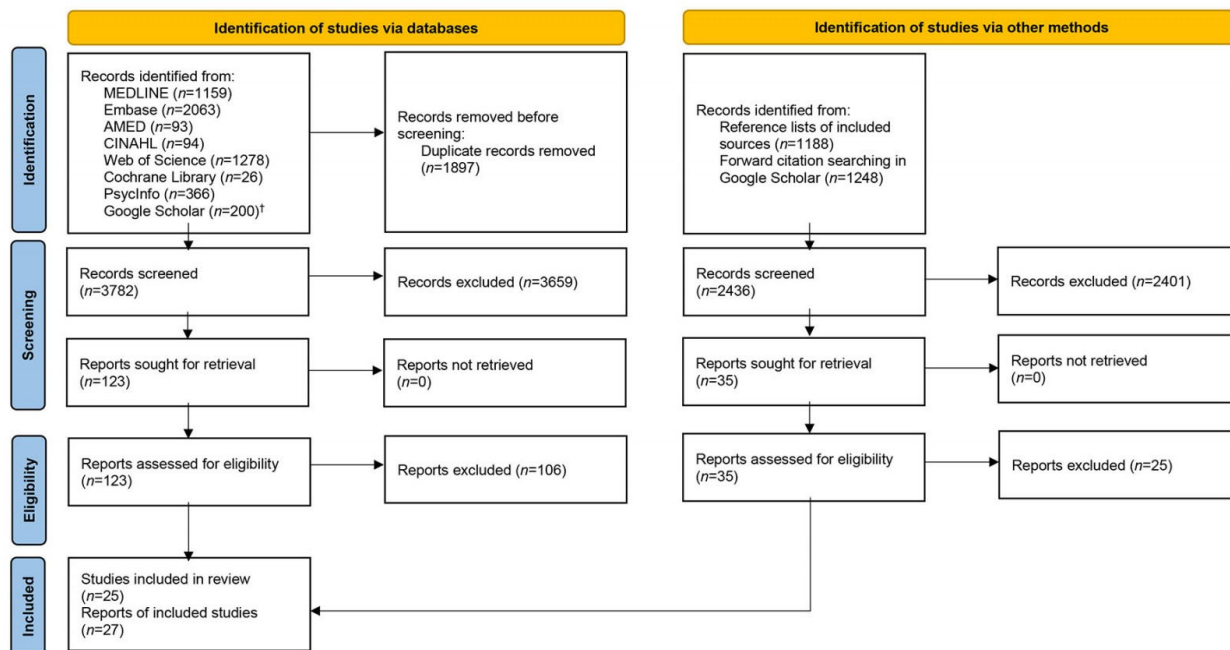
The searches were conducted in February 2022 in seven electronic databases: MEDLINE, Embase, AMED, CINAHL, Web of Science, Cochrane Library, and PsycInfo. The same searches were repeated in January 2023 to discover new publications. The search strategy was developed by the research team in collaboration with an experienced research librarian. The development process followed the three steps recommended by Peters et al<sup>61</sup>. First, an initial limited search of MEDLINE and CINAHL was undertaken to identify relevant sources on the topic. Titles, abstracts, and index terms from these sources were screened to identify key words that were incorporated in a preliminary concept map.

Second, a full search strategy was developed. The search strategy was initially tailored to MEDLINE and then to the characteristics of the other databases. The complete search strategies for all databases are detailed in **Supplementary material 1**. The search strategy was also applied to Google Scholar to discover sources that were published after 2020 and may not have been indexed and available through the conventional databases.

Third, the reference lists of all included sources were screened. Furthermore, Google Scholar was used to locate and screen all sources that had cited the included sources (forward citation searching).

### Source selection

The initial search results were exported into Endnote software where duplicates were removed manually. After an initial pilot test to ensure consistency in the application of the eligibility criteria, two reviewers (MN and AG) screened all titles and abstracts independently using the Rayyan web-based application<sup>66</sup> and excluded sources that did not meet the inclusion criteria. Full texts of potentially relevant sources were retrieved and assessed against the eligibility criteria. This process is outlined in a flow diagram (Fig1). The main reasons for exclusion of full-text sources were that they targeted the wrong population or wrong context, did not address CI, or lacked sufficient descriptions of model(s). A list of all sources that were excluded after full-text screening is provided in **Supplementary material 2**.



\* The first 200 of an estimated 33 200 records were identified for screening.

Figure 1: PRISMA flow diagram of study selection process.

### Data extraction

Data from the included articles were extracted using a data extraction form (Appendix I). A preliminary form based on the Joanna Briggs Institute template<sup>61</sup> was developed for the protocol<sup>65</sup>. This form was piloted and revised by MN and AG individually by applying five data sources to assess and evaluate its usability and appropriateness. After making only minor adjustments and agreeing on a final version, MN continued to extract data from each of the remaining articles in close collaboration with AG. Both researchers read the full-text versions of all included articles repeatedly and continued to meet regularly during data extraction to ensure agreement throughout the process.

### Data analysis and presentation

As recommended, the data analysis incorporated a numerical summary and qualitative thematic analysis<sup>63,64</sup>. The analysis was initiated by summarising the characteristics of each included article in a table to gain an overview and facilitate completion of the numerical summary.

The completed data extraction forms and the table provided a point of departure for the identification, mapping, and

categorisation of the approaches to rehabilitation presented in the literature. The thematic analysis was iterative and evolved in response to the preliminary findings and research question. Agreement on the final categories was reached during discussions between the authors and rereading of the included articles. A critical decision during this process was to organise the identified rehabilitation model categories into micro, meso, and macro levels based on their primary sphere of influence.

### Ethics approval

This study is a review of previously published literature and did not engage any human participants or collect primary data. Accordingly, no research ethics approval was required.

### Results

The database searches produced a total of 5679 references. After the removal of duplicates, screening of titles and abstracts, and review of full-text sources for eligibility, 17 articles were included. A total of 2436 additional references were identified via other methods. After the screening of titles and abstracts and review of full-text sources of the additional references, another 10 articles were included, resulting in 27 total included articles. The characteristics of the included articles are outlined in Table 1.



**Table 1: Characteristics of included articles<sup>67-93</sup>**

Author (year); country [ref] Study design	Study aim	Model/intervention characteristics	a. Initiation of care b. Duration of care
Bell et al. (2008); USA [84] Randomised controlled trial	To investigate whether scheduled telephone counselling for symptom management and encouragement to resume everyday activities decreases symptoms and improves functioning in adults with ABI.	A series of scheduled telephone contacts was designed to facilitate recovery from symptoms and resumption of normal activities. An initial phone call is made within 2 days after injury, followed by calls at 2, 4, 8, and 12 weeks. Calls follow a script that included review of previously noted problems, new problems, and a review of physical, cognitive, emotional, and activity status.	a. <u>Initiation</u> : Within 2 days after the injury. b. <u>Duration</u> : 12 weeks after the injury.
Bell et al. (2011); USA [83] Randomised controlled trial	To investigate whether scheduled telephone counselling for individuals with TBI and their significant others would result in improved function and quality of life.	A series of scheduled telephone contacts was designed to identify and meet the needs in individuals who may not have sufficient access to rehabilitation services. Calls are carried out by trained counsellors at gradually increasing intervals, starting 3 or 4 days after discharge, and ending 21 months after the injury. The conversations consist of problem-solving training, education, and/or referral.	a. <u>Initiation</u> : Within the first week after hospital discharge. b. <u>Duration</u> : 21 months after the injury.
Bergquist et al. (2009); USA [91] Pilot for randomised controlled trial	To investigate whether cognitive rehabilitation interventions delivered over the internet were associated with improvements in functioning in adults with TBI.	Two interventions are delivered via internet for memory function improvement after TBI: a calendar acquisition approach (main intervention) and a diary approach (control intervention). Both approaches include scheduled sessions with a therapist delivered by instant messaging, but only the calendar approach includes systematic use of compensatory strategies to improve memory functioning and use of the calendar in everyday activities.	a. <u>Initiation</u> : A minimum of 1 year after the injury. b. <u>Duration</u> : All participants completed 30 sessions for 10–15 weeks, with two or three sessions per week.
Bergquist et al. (2022); USA [85] Randomised controlled trial	To investigate whether a remotely delivered intervention designed to connect adults with TBI to clinical resources improved their quality of life and participation after discharge from hospital to the community.	Key elements of the remotely delivered intervention are as follows: (1) coordination of care; (2) clinical guidance and educational support; (3) connecting individuals with TBI, significant others, and local providers with TBI experts. The intervention is multidisciplinary but is delivered mainly by nurses. Multiple modes of communication are used, with cellphone and personal computers as the most predominant.	a. <u>Initiation</u> : Unclear, but participants were enrolled a mean of 18 weeks after injury. b. <u>Duration</u> : Not specified, but study outcome was assessed at 0, 6, and 18 months.
Cadilhac et al. (2018); Australia [86] Formative program evaluation	To describe the development of a messaging system to support people with stroke who were discharged from hospital to their homes.	'Inspiring Virtual Enabled Resources following Vascular Events' (IVERVE) is a SMS messaging system that provides scheduled, tailored, and personalised self-management support and promotes health behaviour change. The system addresses a broad scope of needs and align with the person's disability level and health and recovery goals.	a. <u>Initiation</u> : Unclear, but the intervention is intended to improve support up to 12 weeks after discharge. b. <u>Duration</u> : 12 weeks.
Cadilhac et al. (2021); Australia [67] Protocol for randomised controlled trial	To compare the effectiveness of a combined goal-setting and electronic messaging intervention to standard care in individuals with stroke who were discharged directly home from hospital.	'The Recovery-focused Community support to Avoid readmissions and improve Participation after Stroke' (ReCAPS) couples the IVERVE messaging system (see above) with a standardised person-centred goalsetting selection and prioritisation process supported by a trained clinician. Based on their goals, participants receive messages that contain embedded hyperlinks to relevant additional online information.	a. <u>Initiation</u> : Within 7–14 days of discharge from hospital. b. <u>Duration</u> : 12 weeks.
Cameron et al. (2014); Canada [79] Protocol for randomised controlled trial	To determine if a family stroke support program that was appropriately timed across the care continuum contributed to positive outcomes in family caregivers for individuals with stroke who are discharged to their homes.	The Timing it Right Stroke Family Support Program organises the evolving support and informational needs of caregivers for individuals with stroke into five phases. The phases span from the acute event through returning home and adapting to community life. The program is delivered over a 6–12-month period by face-to-face/telephone contact with a support person (full intervention) or by a self-directed approach based on a written educational guide (self-directed intervention).	a. <u>Initiation</u> : During the acute care phase of stroke. b. <u>Duration</u> : 6–12 months.
Clark et al. (2002); USA [76] Case report	To describe a telerehabilitation program in Oklahoma, USA, and present a case to illustrate its provision of skilled multidisciplinary care to home-dwelling adults with stroke in a rural setting.	The telerehab concept involves videoconferencing to deliver specialised stroke care in a home- and community-based setting. It provides skilled therapy to individuals who would otherwise have limited service to no access. Services provided include physical therapy, speech language therapy, psychology, and vocational rehabilitation.	a. <u>Initiation</u> : Before discharge from hospital. b. <u>Duration</u> : 17 months.
Coetzer et al. (2003); UK [77] Case report	To describe the development of a community-based neurorehabilitation service in a rural area (North Wales).	The North Wales Brain Injury Service (NWBIS) is a community-based, multidisciplinary brain injury rehabilitation service that assesses patients, develops comprehensive management plans, and provides rehabilitation interventions in North Wales.	a. <u>Initiation</u> : Not applicable. b. <u>Duration</u> : Not applicable.
Danzl et al. (2016); USA [71] Interview study	To examine the experiences of individuals with stroke and caregivers receiving education from health care providers and use it to develop education for an underserved, rural population.	A model of patient and caregiver education constructs illustrates how providers and receivers of education interact with each other and educational (1) content, (2) timing, and (3) delivery modes. Improvements within all three domains are suggested, including improved access, proactive needs identification, caregiver inclusion, and varied delivery.	a. <u>Initiation</u> : Not applicable. b. <u>Duration</u> : Not applicable.
Gan et al. (2010); Canada [72] Interview/focus group	To understand the needs of caregivers to individuals with ABI and propose key elements to include in a service delivery model to support them.	A framework based on the perspectives from those receiving, providing, and researching caregiver interventions following ABI is presented. Based on current needs and barriers, future service recommendations are provided. This includes services that are comprehensive, accessible, and long-term; encompass educational, emotional, and instrumental support; and transcend geographical boundaries.	a. <u>Initiation</u> : Not applicable. b. <u>Duration</u> : Not applicable.
Gauld et al. (2011); Australia [82] Participatory action research	To explore factors affecting service utilisation for Aboriginal people with ABI and their families and discuss how a community-based rehabilitation service model for this population could be integrated into their communities.	Based on the principles of community-based rehabilitation, partnerships are formed between remote communities and service providers to develop inclusive communities and more accessible services for Aboriginal people with ABI and their caregivers. Key elements include employing local brain injury workers, increasing the cultural competency of the services, and developing educational resources aimed at community members.	a. <u>Initiation</u> : Not applicable. b. <u>Duration</u> : Not applicable.
Hoffman et al. (2010); USA [78] Case report	To describe the Assisted Living Pilot Project at the 'Defense and Veterans Brain Injury Center' in Johnstown, US.	The Assisted Living Pilot Project (ALPP) is a rehabilitation program with a care continuum consisting of (1) the ALPP, (2) transitional living, and (3) independent living. Independence levels and community integration increase through the continuum. The ALPP was designed for individuals who are unable to live independently.	a. <u>Initiation</u> : Not specified. b. <u>Duration</u> : Anticipated ALPP stay time is 6–12 months.
Jaglal et al. (2014); Canada [73] Interview study	To understand existing health and community service needs and gaps in care and develop a multisystem level model that specify factors and processes that may improve the quality of care, health, and wellbeing for individuals with neurological conditions.	The Chronic Care Model for Neurological Conditions (CCN-NC) maintains the need for intersectoral cooperation across (1) health system, (2) community, and (3) policy to develop a system that enables individuals with neurological conditions to live better lives. The model spans three domains encompassing components such as 'availability and access to services' (health system domain), 'caregiver support' (community integration domain), and 'need for acceptance and openness to neurological conditions' (socioeconomic and political context domain).	a. <u>Initiation</u> : Not applicable. b. <u>Duration</u> : Not applicable.
Kitzman et al. (2017); USA [89] Program assessment	To determine the effectiveness of using community health workers to support individuals with stroke and their caregivers in the transition back to rural low-resource communities.	The Kentucky Care Coordination for Community Transitions (KC <sup>3</sup> T) utilises trained lay community health workers as navigators to support individuals with stroke and their family caregivers in the transition from acute care to underserved rural communities. Navigators cooperate with inpatient teams to provide continuous service access. Tasks include performing needs assessment, advocating for services access, providing education, and supporting communication across care environments.	a. <u>Initiation</u> : Before hospital discharge. b. <u>Duration</u> : Up to 6 months after discharge.
Marsden et al. (2010); Australia [68] Pilot for randomised controlled trial	To explore whether a group program combining education, physical activity, and social interaction for individuals with stroke and their caregivers was feasible in a rural setting and measure its impact on health-related quality of life and functional performance.	The Community Living After Stroke for Survivors and Carers program (CLASSIC) is a once-a-week, 2.5-hour, 7-week group program combining physical activity, education, and social interaction. It was carried out at local public hospital in the three towns in a rural region in New South Wales, Australia. Sessions included a 1-hour physical activity component followed by a 1-hour education component covering a wide range of topics.	a. <u>Initiation</u> : Not specified, but mean time since last stroke in participants was approx. 3 years. b. <u>Duration</u> : 7 weeks.
Mitchell et al. (2014); Australia [90]	To determine whether participation in a leisure intervention program targeting adult age individuals with ABI in rural	Pushing the Boundaries is a week-long, group-based, residential leisure intervention program designed to provide adult-age individuals with ABI with the opportunity to trial a range of creative and recreational activities. The	a. <u>Initiation</u> : All participants but one (n=11) had suffered ABI 4 years



[24] Pre- and postintervention study	adults with ABI in rural areas improves leisure participation and satisfaction, self-esteem, and quality of life.	the opportunity to trial a range of sporting and recreational activities. The intervention includes sessions on social communication skills and provides a supportive and structured environment in which to develop achievable leisure goals and trial activities.	survived ABI 1–4 years ago. b. <u>Duration:</u> 1 week.
Montgomery et al. (2015); Canada [80] Protocol for a mixed-methods study	To examine and evaluate a navigation intervention supporting the CI of individuals with stroke in small urban and rural communities.	A newly implemented community navigation arrangement for individuals with stroke intended to promote timely access to a coordinated delivery of individualised services to support CI.	a. <u>Initiation:</u> 6 weeks after hospital discharge. b. <u>Duration:</u> Up to 12 months after hospital discharge.
Montgomery et al. (2020); Canada [90] Cohort study	To describe two cohorts of community-dwelling adults with stroke who accepted or declined a navigation service in terms of profiles and changes in CI and to identify predictors of service acceptance.	A system navigation service developed with individuals with stroke, family members, and healthcare providers is presented. It is delivered by trained community navigators with a professional background and stroke care experience. Contact is initiated face-to-face and continue by face-to-face meetings or via telephone, email, or videoconference. Tasks include assessment, education, psychosocial support, advocacy, service coordination, and evaluation of plans for CI.	a. <u>Initiation:</u> Before or shortly after hospital discharge. b. <u>Duration:</u> Up to 12 months after acute hospitalisation.
Newell et al. (2009); Canada [87] Interviews and a 3-day forum	To discuss the development of two low-cost interventions designed to address the informational and psychosocial support needs of individuals with stroke and their caregivers in rural settings.	Intervention 1: Community Resources for Living with Stroke, a written community guide based on assessment of client needs and mapping of community assets. It is intended to enable individuals with stroke to access community-specific resources by providing information. Intervention 2: the collection and publication of stories from individuals who experienced a life-	a. <u>Initiation:</u> Not specified. b. <u>Duration:</u> Not specified.
Newell et al. (2009); Canada [87] Interviews and a 3-day forum	To discuss the development of two low-cost interventions designed to address the informational and psychosocial support needs of individuals with stroke and their caregivers in rural settings.	Intervention 1: Community Resources for Living with Stroke, a written community guide based on assessment of client needs and mapping of community assets. It is intended to enable individuals with stroke to access community-specific resources by providing information. Intervention 2: the collection and publication of stories from individuals who experienced a life-altering stroke. The stories are designed to provide emotional support to individuals with stroke and their caregivers.	a. <u>Initiation:</u> Not specified. b. <u>Duration:</u> Not specified.
Ng et al. (2013); Canada [93] Three-case pilot study	To investigate the feasibility of implementing an executive dysfunction rehabilitation approach in a telerehabilitation format and examine its impact on executive dysfunction and CI for adults with TBI.	Cognitive Orientation to daily Occupational Performance' (CO-OP) is an approach to rehabilitation of executive dysfunction after TBI. It is a meta-cognitive approach that enables skill acquisition through strategy use, guided discovery, and problem-solving training related to goals that are self-identified and related to everyday life. Significant others are involved. This study adapted the CO-OP to be delivered by videoconferencing to reach rural areas.	a. <u>Initiation:</u> Time since injury in the study participants was 11–30 years. b. <u>Duration:</u> 10 weeks.
Rochette et al. (2010); Canada [69] Protocol for randomised controlled trial	To assess the effectiveness of two support interventions aimed at individuals who experienced a first mild stroke: (1) information, education, and telephone support compared to (2) a passive intervention providing the name and phone number of a resource person to contact.	We Call and You Call are interventions intended to help individuals with stroke cope, adapt, and resume daily life. We Cal is based on the Family Intervention Telephone Tracking (FITT) model. It focuses on problem-solving skills, adapting to a new life situation, utilising community resources, and secondary prevention. It is delivered via telephone, internet, and paper and consists of information, education, and telephone support. Individuals are contacted by a trained healthcare professional for regular 15–20-minute conversations. You Call is a similar but more passive intervention where participants may contact healthcare professionals.	a. <u>Initiation:</u> Unclear, but study participants are assessed during the first month after stroke. b. <u>Duration:</u> 6 months.
Rochette et al. (2013); Canada [70] Randomised controlled trial	To assess the effectiveness of information, education, and telephone support compared to the availability of a resource person after a mild stroke to reduce unplanned healthcare use and improve quality of life.	We Call and You Call (see Rochette et al. (2010) above).	a. <u>Initiation:</u> Unclear, but study participants were assessed during the first month after stroke. b. <u>Duration:</u> 6 months.
Simpson et al. (2018); Australia [81] Survey	To investigate three components of community-based case management: (1) organisational context, (2) principles informing case management, and (3) case management roles.	A comprehensive rehabilitation case manager (CM) role that combines tasks like assessment, goal setting, referral, and service coordination. The role also includes individual client and family support, education, advocacy, and community development. The CMs work within the context of the Brain Injury Rehabilitation Program in New South Wales, Australia, consisting of 14 specialist services with rehabilitation teams.	a. <u>Initiation:</u> Not specified. b. <u>Duration:</u> Several years, if needed.
Sullivan et al. (2014); Australia [74] Interview study	To explore the experience of young men with TBI from rural areas of participating in 'real life activity rehabilitation' to determine whether it contributed to rehabilitation engagement and return to pre-injury activities.	Real-life activities are used as a part of inpatient rehabilitation to address lack of engagement in young men with TBI from rural areas. Activities are based on self-identified preinjury interests, such as cooking, sports, fishing, shopping, and woodwork. Activities run for approx. 2–3 hours per day over 1 week. This provides opportunities to assess task completion and identify cognitive, perceptual, or behavioural deficits.	a. <u>Initiation:</u> Not specified. Time since injury in the study participants varied from very recent to more than 1.5 years ago. b. <u>Duration:</u> 1 week.
Taylor et al. (2009); Canada [88] Feasibility study	To explore the feasibility of using videoconferencing to deliver a group self-management program to individuals with stroke in rural areas.	Moving On after STroke (MOST) Telehealth Remote is a group-based self-management program for individuals with stroke and caregivers that was adapted for videoconference delivery to rural areas. It consists of 18 sessions delivered over 9 weeks. Sessions consist of 1 hour of information sharing and discussion followed by 1 hour of exercise.	a. <u>Initiation:</u> Not specified, but mean time since stroke in study participants was 16 months. b. <u>Duration:</u> 9 weeks.
Taylor et al. (2012); Canada [75] Interview study	To explore the experiences of individuals with stroke and their caregivers with receiving a group-based self-management program delivered via videoconference to remote communities.	Moving On after Stroke (MOST) Telehealth Remote (see Taylor et al. (2009) above).	a. <u>Initiation:</u> Not specified, but mean time since stroke in study participants was 19 months. b. <u>Duration:</u> 9 weeks.

ABI, acquired brain injury. CI, community integration. TBI, traumatic brain injury.

The numerical summary (Table 2) shows that the included articles consisted of 85% empirical research and 15% study protocols. The studies utilised a wide range of research methodologies, including randomised controlled trials<sup>67-70</sup>, qualitative interviews<sup>71-75</sup>, case reports<sup>76-78</sup>, mixed methods<sup>79,80</sup>, a survey<sup>81</sup>, and a participatory action research project<sup>82</sup>. All the included articles were published between 2002 and 2022. The most frequent condition targeted

was stroke, followed by TBI and ABI (which may encompass both stroke and TBI). One of the included articles targeted not only ABI but all neurological conditions<sup>73</sup>. In terms of geographical distribution, all the included studies originated in Western and predominantly English-speaking countries with advanced healthcare systems (Fig2).

**Table 2: Distribution of included articles by year of publication, publication type, targeted condition, country of origin, duration of follow-up, initiation of follow-up, and type of rehabilitation model categories<sup>67-93</sup>**

Year of publication	2002–2004	2005–2007	2008–2010	2011–2013	2014–2016	2017–2019	2020–2022
<b>Publication type</b>	Empirical research <i>n</i> =23 [68,70-78,81-93]	Study protocol <i>n</i> =4 [67,69,79,80]					
<b>Targeted condition</b>	Stroke <i>n</i> =14 [67-71,75,76,79,80,86-90]	TBI <i>n</i> =8 [74,78,81,83-85,91,93]	ABI <i>n</i> =4 [72,77,82,92]	All neurological conditions <i>n</i> =1 [73]			
<b>Country of origin</b>	Canada <i>n</i> =11 [69,70,72,73,75,79,80,87,88,90,93]	US <i>n</i> =8 [71,76,78,83-85,89,91]	Australia <i>n</i> =7 [67,68,74,81,82,86,92]	UK <i>n</i> =1 [77]			
<b>Duration of follow-up</b>	1 week or less <i>n</i> =2 [74,92]	1 week – 3 months <i>n</i> =8 [67,68,75,84,86,88,91,93]	3–6 months <i>n</i> =4 [69,70,79,89]	More than 6 months <i>n</i> =5 [76,80,81,83,90]	Not specified <i>n</i> =4 [78,82,85,87]	Not applicable <i>n</i> =4 [71-73,77]	
<b>Initiation of follow-up</b>	Within the first week after injury <i>n</i> =5 [76,83,84,89,105]	Within 1 month after hospital discharge <i>n</i> =3 [67,86,90]	1–12 months after injury <i>n</i> =4 [69,70,80,85]	More than one year after injury <i>n</i> =6 [68,75,88,91-93]	Not specified <i>n</i> =4 [74,78,81,87]	Not applicable <i>n</i> =5 [71-73,77,82]	
<b>Rehabilitation model category</b>	Self-management and education <i>n</i> =15 [67-72,75,76,79,83-88]	Navigation, coordination, and case management <i>n</i> =9 [71-73,80,81,85,87,89,90]	Incorporation of everyday life activities into rehabilitation <i>n</i> =5 [74,78,91-93]	Establishment of neurorehabilitation services in rural areas <i>n</i> =2 [77,78]	Development of inclusive rural communities <i>n</i> =4 [72,73,81,82]	A comprehensive care model for individuals with neurological conditions <i>n</i> =1 [73]	

ABI, acquired brain injury. TBI, traumatic brain injury.



**Figure 2: Map illustrating global distribution of included articles.**

We identified six categories of models in the reviewed literature, each reflecting a distinct strategy for providing rehabilitation to promote CI in home-dwelling adults with ABI in rural areas. We

further organised the models into three levels: micro (individual, interpersonal), meso (organisational, community), and macro (policy, society) (Table 3).

**Table 3: Six model categories distributed across the micro, meso, and macro levels**

Level	Model category
Micro (individual, interpersonal)	Self-management and education
	Navigation, coordination, and case management
	Incorporation of everyday life activities into rehabilitation
Meso (organisation, community)	Establishment of neurorehabilitation services in rural areas
	Development of inclusive rural communities
Macro (policy, society)	A comprehensive care model for individuals with neurological conditions

## ***Self-management and education***

A substantial number of the included articles described approaches to promoting CI by enhancing self-management and providing education<sup>67-72,75,76,79,83-88</sup>. Six articles targeted individuals with ABI exclusively<sup>67,69,70,76,85,86</sup>, five targeted significant others alongside individuals with ABI<sup>68,71,75,87,88</sup>, and two targeted significant others exclusively<sup>72,79</sup>. Thus, the reviewed literature acknowledged that living with an ABI is a challenge not only for the person with brain injury but also for individuals close to that person. Challenges such as increased domestic workloads, reduced work participation, stress, loneliness, and uncertainty are common for significant others and may decrease their quality of life and hamper their ability to support the injured individual<sup>71,72,79,87,88</sup>.

Several studies examined the use of information and communications technology (ICT) to deliver self-management and education interventions to rural areas, including electronic messaging<sup>67,86</sup>, telephone calls<sup>69,70,79</sup>, video-conferencing<sup>75,76,88</sup>, and websites<sup>69,70</sup>. Other studies suggested the use of ICT to facilitate access to rehabilitation in rural areas, including web-based distribution of educational content<sup>71,87</sup> and the establishment of online support networks<sup>72,85</sup>.

Some of the articles on self-management and education acknowledged that CI after ABI is a non-linear and long-term process, with support needs evolving over months or years<sup>71,79</sup>. Accordingly, they outlined rehabilitation approaches reflecting the importance of proactive identification of needs and appropriate individualisation, timing, and repetition of education. However, many of the articles on self-management and education did not describe or recommend follow-up beyond the first 3 months post-injury<sup>67,68,71,84-87</sup>.

## ***Navigation, coordination, and case management***

Using individual service providers to coordinate services and deliver care was one of the most common approaches identified in the reviewed literature. For simplicity, we decided to use the term 'navigator' here, as it appeared most frequently<sup>71,80,87,89,90</sup>. However, terms such as 'case manager'<sup>72,81,90</sup>, 'coordinator'<sup>71,73</sup>, 'guide'<sup>81</sup>, and 'advocate'<sup>80,81,85,89,90</sup> were also used to describe similar types of service delivery. While some studies evaluated existing navigator approaches<sup>80,81,85,89,90</sup>, others were limited to making recommendations for future service design<sup>71-73,87</sup>. Interestingly, all articles describing existing navigator approaches were recent, having been published between 2017 and 2022<sup>80,81,85,89,90</sup>. This may indicate that the use of navigators to promote CI in rural areas is an emerging approach.

The existing navigator approaches<sup>81,85,89,90</sup> shared many traits. All emphasised individualised assessment to determine needs and goals as the basis for care provision. These approaches were also characterised by the involvement of the individual with ABI and significant others alongside service providers in the rehabilitation process. Furthermore, navigators performed a comprehensive range of tasks, including coordinating services, advocating for resources, and providing education<sup>81,85,89,90</sup>. However, only two articles explicitly discussed the initiation and duration of navigator support<sup>81,89</sup>.

The various navigator approaches operated within different organisational contexts: local communities<sup>89</sup>, a stroke outpatient

clinic<sup>90</sup>, a regional network of brain injury services<sup>81</sup>, and a rehabilitation hospital<sup>85</sup>. All navigators had a background as healthcare professionals with experience in ABI rehabilitation<sup>81,85,90</sup>, except in one study where lay community health workers were trained as navigators<sup>89</sup>. The lay health workers had less expertise in ABI but used their local knowledge to assist with transitions from hospital to home. Reliance on lay health workers was described as an alternative to the recruitment of healthcare professionals, who can be expensive to employ and difficult to recruit in rural areas<sup>89</sup>.

Although team-based approaches to rehabilitation provision were not the main issue in any of the reviewed articles, several of the navigator approaches were associated with multidisciplinary teams. This included navigators integrated with regional community rehabilitation teams<sup>81</sup>, navigators linking community and specialist care teams<sup>85</sup>, and community-based navigators collaborating with inpatient rehabilitation teams<sup>89</sup>.

## ***Incorporation of everyday life activities into rehabilitation***

Five articles presented different approaches to incorporating everyday life activities into rehabilitation to promote CI<sup>74,78,91-93</sup>. One article described the integration of 'real life activities' into inpatient rehabilitation to address a lack of engagement in conventional rehabilitation activities among young men with TBI from rural areas<sup>74</sup>. Another article outlined a week-long program designed to provide individuals with ABI living in rural areas with the opportunity to try a range of leisure activities based on their own interests<sup>92</sup>. Two studies evaluated interventions addressing cognitive dysfunction following TBI. The first was delivered via telerehabilitation to rural areas and facilitated problem-solving training in everyday situations<sup>93</sup>, while the other was delivered via an instant messaging platform and trained participants in compensatory strategies for impaired memory in everyday situations<sup>91</sup>. Finally, one article described how vocational rehabilitation and social interaction could be integrated into a rehabilitation program focusing on gradual transitions to independent living for individuals with TBI returning to everyday life in rural areas<sup>78</sup>.

## ***Establishment of neurorehabilitation services in rural areas***

While many studies were conducted within the context of rural rehabilitation services<sup>68,74,76,81,82,85,87,89,90</sup>, only three articles described the development of neurorehabilitation services in specific rural regions<sup>77,78,82</sup>. One described the establishment of public brain injury rehabilitation services in North Wales starting in the 1990s<sup>77</sup>. A second outlined an 'assisted living pilot programme' at a rurally located rehabilitation centre that aimed to promote CI and self-supported living for US military veterans with TBI<sup>78</sup>. The third described the development of more accessible services for Aboriginal people with ABI by forming partnerships with remote communities in a region in Australia<sup>82</sup>.

## ***Development of inclusive rural communities***

Four articles emphasised community development to enhance the CI of individuals with ABI in rural areas<sup>72,73,81,82</sup>. One of the reasons stated for this strategy was the lack of public awareness and understanding of ABI<sup>72,73</sup>. Educating the general public and community members on ABI is suggested to dispel myths and promote acceptance, which can contribute to a more supportive environment for individuals with ABI<sup>72,73</sup>.



Increasing the capacity of rural communities to take care of their residents was suggested to alleviate some of the challenges posed by the long-term nature of support needs and long travel distances to specialist services. For example, one article presented a navigator approach that was not limited to matching client needs to existing services but extended to engaging in community development and finding new ways to utilise local resources<sup>81</sup>. Another example is the establishment of long-term partnerships between a regional rehabilitation service and remote communities to enhance the care capacity of the communities and adjust the services to match local needs<sup>82</sup>. These partnerships led to several improvements, including an increase in knowledge about ABI within the communities and improved ability of individuals with ABI and their families to voice their support needs. Additionally, the regional rehabilitation service enhanced its cultural competency and understanding of client needs and modified its methods for service delivery.

### ***A comprehensive care model for individuals with neurological conditions***

One article presented a comprehensive macrolevel care model for individuals with neurological conditions and their families<sup>73</sup>. The Chronic Care Model for Neurological Conditions (CCM-NC)<sup>73</sup> is a further development of the Expanded Chronic Care Model<sup>94</sup>. The development of the CCM-NC was informed by user needs and service gaps as reported by policymakers and service providers across Canada. The model was not designed exclusively for home-dwelling adults with ABI in rural areas but rather represents a macrolevel view of the rehabilitation ecosystem. Nevertheless, CI is a key theme of the model, which has the overarching aim of creating an environment in which people with neurological conditions can live better lives.

The previous article<sup>73</sup> also discussed specific challenges in rural areas, such as lack of access to specialist services, long travel times, and high transportation expenses. Suggestions to improve care include the increased use of telehealth and care coordinators, which is similar to solutions found in other reviewed articles, as well as the concept of mobile clinics.

The micro- and mesolevel model categories identified in this review seem to fit into subcomponents of the CCM-NC<sup>73</sup>. For example, the subcomponent 'Acceptance and openness to neurological conditions' within the CCM-NC addresses issues such as fighting stigma, which relates to the model category 'Developing inclusive communities'. The subcomponent 'Caregiver support' in the CCM-NC emphasises support from significant others to promote the CI of the injured individual, which is similar to the model category 'Self-management and education'.

### **Discussion**

The aim of this review was to map and explore the research literature to identify existing models for the provision of rehabilitation services aimed at promoting CI in home-dwelling adults with ABI in rural areas. The overall results demonstrate that relatively few research articles have been published on this topic. The results also highlight the uneven geographical distribution of studies, with all 27 articles originating from only four Western and predominantly English-speaking countries. In part, this may be explained by the decision to exclude literature in languages other than English or Scandinavian, but it may also indicate a general need for more research on this topic in other countries and

regions of the world.

Although the number of included articles was fairly low, the articles still described a heterogeneous range of approaches to rehabilitation. Despite this heterogeneity, we were able to identify six distinct model categories distributed across the micro, meso, and macro levels.

### ***Uneven distribution of studies across the micro, meso, and macro levels***

Strikingly, most of the included articles concentrated on microlevel issues such as intervention effects or perceived support needs. Far fewer articles addressed mesolevel issues such as organising services for rural areas or developing inclusive rural communities, and only one article addressed policy and society dimensions at the macro level. This suggests that research funders as well as the research community prioritises research on service delivery at the individual level rather than research that addresses issues at the meso and macro levels. This interpretation is consistent with previous claims that research on service provision to individuals with complex and long-term needs generally tends to focus on microlevel elements in overall care rather than more comprehensive efforts that are needed to develop or reorganise care systems<sup>95</sup>. The imbalance in research efforts is noteworthy because solely focusing on knowledge about individual-level service provision falls short in addressing the current healthcare system fragmentation. To enhance rehabilitation in rural areas there is a need for knowledge production that targets all organisational levels, including the gaps in meso- and macrolevel models identified in this study. Increasing research efforts targeting these levels may be particularly important to develop models for rural areas, where there is still a need for innovative ways of organising service delivery, developing inclusive communities, and creating policies that promote the CI of adults with ABI.

### ***A need for increased awareness of support time and duration***

With one notable exception<sup>79</sup>, there is a general absence of discussions on the timing and duration of support in the reviewed literature. This is surprising, as all the included articles to some degree were oriented towards CI after ABI, which in many cases is a long-term process with support needs that evolve over months or years<sup>33,37,49,96</sup>. The lack of explicit considerations of support timeframe is noteworthy because rehabilitation approaches that fail to consider the long-term nature of CI may fall short of promoting it. This indicates a need to continue to develop rehabilitation models that reflect the evolving nature of the support needed to promote CI.

### ***Use of information and communications technology to reach rural areas***

The use of ICT is widely promoted as a solution to some of the issues with care provision in rural areas<sup>97</sup>. Our findings indicate an increase in interest in and use of ICT to reach individuals with ABI in rural areas. This was particularly noticeable regarding approaches to self-management and education, perhaps because these kinds of interventions are relatively well suited to provide via ICT.

A further increase in the use of ICT to reach rural areas is to be expected with the continued spread and maturation of digital

technology, simplification of user interfaces, and improvement in internet connectivity. With these developments, it will be crucial to support the use of ICT in individuals with ABI, as it may be complicated by their residual impairments. It is also important to acknowledge that the use of electronic social networks (ie social media, video-link services, and email) is currently regarded as an aspect of CI and should be supported in its own right<sup>49,98</sup>.

### ***Team-based approaches are lacking, but navigators are prevalent***

The lack of team-based solutions in the reviewed literature was surprising, as multidisciplinary teams are widely regarded as a primary structure for the provision of coordinated and compressive care to individuals with ABI<sup>57-59</sup>. However, a recent literature review demonstrated that access to multidisciplinary teams after hospital discharge is limited, not only in rural areas but also more generally<sup>33</sup>. It was concluded that there is a need to develop team-based approaches for long-term care provision to individuals with ABI<sup>33</sup>. Additionally, a recent Australian study suggested that the lack of access to multidisciplinary teams in a rural region may explain the increased use of navigators to provide long-term support to adults with ABI<sup>99</sup>. This is reminiscent of the findings in this review, in which team-based approaches to rural service delivery were found to be lacking, while navigator approaches were found to be plentiful.

The prevalence of navigator solutions in the reviewed literature corresponds with a considerable amount of evidence that indicates that individuals with ABI and their significant others want to be supported by someone who can provide care, coordinate services, and act as their advocate over time<sup>13,15,16,23,96,100-103</sup>. Navigators seem to be a response to the challenges created by the combination of complex support needs and fragmented care systems that are not designed to meet those needs, particularly in rural contexts. Although navigators may be an in-demand and appropriate model for service provision, this raises the question of whether their prevalence is a symptom of a wider system that fails to deliver coordinated and integrated care. Navigators may be a suitable first step to 'glue the services together' and harness existing resources to meet individual needs, but more comprehensive system changes may be desired in the long run.

### ***The significance of supporting significant others***

The importance of supporting and involving significant others alongside the individual with ABI was evident across model categories. This finding is consistent with extensive evidence of informal caregivers' care needs as well as their significance for the long-term support of individuals with ABI<sup>13,19-21,103-109</sup>. Involving and empowering significant others may be particularly important in rural areas, where dependence on family and friends is likely to be greater due to a lack of available professionals with expertise in ABI. Although support from family and friends cannot be taken for granted or expected to replace professional care providers, support for informal caregivers seems crucial. This is important not only to prevent stress, burnout, and other negative health outcomes in caregivers but also to contribute to better outcomes for the injured individual<sup>13,105</sup>. However, support from health and social services is known to diminish in the later phases of rehabilitation<sup>21,31,33,38,105</sup>. Recent studies have reported that caregivers in rural areas experience substantial gaps in support when providing care for their home-dwelling family members with

ABI, which contributes to a feeling of being isolated with their responsibilities<sup>15,110</sup>.

### ***Community-service collaboration to co-produce care***

To define 'development of inclusive rural communities' as a distinct model category may seem counterintuitive in a literature review that is not primarily oriented towards community development but rather towards service provision. However, our findings indicate that the interaction between health services and local communities may be vital to increase the capacity for care in rural communities as well as to drive service improvement. This was particularly striking in one of the included articles describing a community-service collaboration project that not only contributed to more inclusive rural communities but also enhanced regional rehabilitation services<sup>82</sup>. The prospect of mutual service and community development points towards an interesting interconnection between the two mesolevel model categories identified in this review: establishing rehabilitation services in rural areas and developing inclusive rural communities.

It has been argued that informal care provided by non-professionals in the community already represents a major source of care for individuals with complex and long-term needs. However, the current lack of integration and communication between professional and non-professional providers is suggested to increase care fragmentation<sup>111</sup>. Proponents of people-centred and integrated care have suggested that local communities can and should take more prominent roles as co-designers and co-producers of care and that their contributions are particularly valuable for promoting CI<sup>111,112</sup>. Increased recognition of community members' contributions may be particularly valuable for improving care in rural areas, where formal providers tend to be 'thin on the ground'<sup>113</sup>. However, the current debate on service delivery models has received criticism for excluding considerations of the role of informal carers by being too professional-dominated and service-centric<sup>111-113</sup>. Thus, increased involvement of community members alongside professional service providers may require a redefinition of their respective responsibilities<sup>111,113</sup>.

Increased community involvement in the coproduction of care may have significant potential to increase the rural capacity for care by drawing on existing community strengths, promoting local ownership of the solutions, and enhancing the professional support of informal carers<sup>113</sup>. Hopefully, future initiatives can harness the synergies and interactions between rehabilitation services and local communities to a greater extent. This may be a path towards improved alignment between services and communities, which can enhance the care for individuals with ABI living in rural areas.

### ***Strengths and limitations***

To our knowledge, this is the first study that has attempted to map and explore the research literature to identify models for rehabilitation service provision that promote CI in home-dwelling adults in rural areas. A strength of this review is the comprehensiveness of the literature searches, including the number of databases searched, the use of alternative terms to capture relevant literature, and the lack of time restrictions for publication.

A limitation is that the review concentrated exclusively on peer-reviewed published research literature. Although this strategy

permitted a global scope, it precluded the identification of models described in other sources. Despite conducting comprehensive searches, we may have been unable to identify all relevant articles. For instance, some articles may have described solutions relevant for rehabilitation in rural settings without stating so explicitly and, thus, were not included in the review. Likewise, due to the broad and multifaceted nature of CI, it is possible that articles that address aspects of CI have used a different terminology and were not identified.

## Conclusion

Models for the provision of rehabilitation services that promote the CI of home-dwelling adults with ABI in rural areas are a relatively unexplored topic in terms of research volume and the geographical spread of studies. It is striking that most of the included articles concentrate on microlevel issues relating to service delivery and perceived needs at the individual level. Far fewer studies address service organisation, community development, or policy and society dimensions, signifying a gap in existing models at the meso and macro levels. The results also indicate a need for more research that fully considers the long-term and evolving nature of CI after ABI, as this will increase the likelihood of developing solutions that adequately support it. Nevertheless, the existing research literature contains several models for service delivery, including self-management and education, the use of navigators, and the incorporation of everyday life activities into rehabilitation. Hopefully, the overview

and analysis provided here can contribute to the spread, adaptation, implementation, and further development of the existing solutions in new contexts.

Our findings also suggest that the CI of adults with ABI in rural areas not only depends on professional individual-level service delivery but also can be promoted by supporting significant others, developing inclusive communities, and improving policies. More knowledge on these issues may facilitate a wider reorganisation of care systems to enhance the CI of individuals with ABI in rural areas. To produce this kind of knowledge, there is a need for more research that moves beyond the focus on microlevel service delivery.

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## Conflicts of interest

The authors declare no conflicts of interest.

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## Appendix I: Data extraction form

<b>Eligibility criteria</b>	
Population	Home-dwelling adults with acquired brain injury (ABI)
Concept	Models for rehabilitation service provision that promote community integration (CI)
Context	Rural areas
<b>Source details and characteristics</b>	
Citation details (e.g., author/s, date, title, journal/publisher, volume, issue, pages)	
Country of origin	
Context	
<b>Details/results extracted from source</b>	
Study design	
Study aim	
Population characteristics (age, sex, ABI subclassification/diagnosis)	
Description of model or intervention (including content, timing, duration, and outcome measures, if applicable)	
Underlying theory, rationale, or philosophy (if applicable)	
Rurality perspectives	
Community integration perspectives	

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