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Abstract

This qualitative study explored the potential to deliver cognitive rehabilitation for post-stroke cognitive impairment (PSCI), with a specific focus on barriers and facilitators to its delivery from the perspective of Irish stroke rehabilitation professionals. Sixteen semi-structured interviews were completed with healthcare professionals in both hospital and community settings. The sample comprised physiotherapists, occupational therapists, nurses, a stroke physician, a psychologist, a neuropsychologist, a speech and language therapist, a dietician and a public health nurse. Interviews were audio-recorded and analysed in *NVivo* using inductive Thematic Analysis. Barriers and facilitators to the delivery of cognitive rehabilitation were identified and described under four key themes: (i) Cognitive screening; (ii) Cognitive rehabilitation: no one size fits all; (iii) Psychology: the lost dimension of stroke rehabilitation; and (iv) Joining the dots in the community. Staffing required to deliver cognitive rehabilitation for PSCI was highlighted as under-resourced in the Republic of Ireland. Inadequate resourcing of neuropsychology and stroke-related psychological services, in particular, has had negative implications for the delivery of cognitive rehabilitation. Stroke-specific cognitive rehabilitation expertise is virtually inaccessible in the community, highlighting an urgent need for investment in specialist rehabilitation teams to deliver cognitive rehabilitation in this setting.

Keywords: stroke; cognitive impairment; cognitive rehabilitation; neuropsychology; qualitative research; thematic analysis.

Word count: 6354 words

Introduction

Stroke is the second most common cause of death worldwide and is a leading cause of acquired disability (1). Post-stroke cognitive impairment affects between 30% and 50% of stroke survivors (2, 3), with up to a quarter progressing to dementia within three years of initial stroke (4). Despite these figures, cognitive rehabilitation has received less research attention relative to rehabilitation of physical post-stroke deficits (5, 6). While limited, the evidence for the potential effectiveness of cognitive rehabilitation in stroke is emerging (7).

Cognitive rehabilitation is defined as "a systematic, functionally orientated service of therapeutic activities that is based on assessment and understanding of the patient's brain-behavioural deficits" (8). Therapy usually involves a combination of restorative and compensatory approaches, which are individualised to a patient's specific rehabilitation needs (9). Restorative techniques utilise neuroplasticity and focus on re-training impairments in particular cognitive domains, such as memory and attention. Compensatory approaches teach patients to use alternative strategies in place of those impaired by the cognitive deficits (9). The overall aim of cognitive rehabilitation is to improve everyday functioning by addressing areas of concern identified by the patient and the stroke multidisciplinary team (MDT) (8, 10). Where available, cognitive rehabilitation is often delivered by occupational therapists (9). In some settings, speech and language therapists (11, 12) or neuropsychologists (13-15) deliver cognitive rehabilitation.

Several aspects of stroke rehabilitation can constrain, or alternatively, facilitate the delivery of cognitive rehabilitation. First, the initial identification of post-stroke cognitive impairment can present challenges in practice. Although stroke rehabilitation guidelines recommend that all stroke patients receive early screening for cognitive impairment (16-20), selecting an appropriate cognitive assessment can be challenging, considering the range of screening tools available and

their limitations (20-24). The Montreal Cognitive Assessment (MoCA) is commonly recommended for assessing post-stroke cognitive impairment (21, 25-29), as well as the Oxford Cognitive Screen which is suitable for patients with communication and visual neglect problems (20, 23, 30, 31)

Second, access to clinical psychology is often inconsistent and inadequate, hence stroke guidelines strongly recommend improved provision of clinical psychology (16, 18, 19, 32, 33) and neuropsychology services (19, 29, 32-34) for stroke patients. Although neuropsychologists are not traditionally part of the stroke MDT in the Republic of Ireland, these professionals have a role in the assessment of more complex cognitive impairment and the delivery of cognitive rehabilitation (11, 13-15, 33, 35). While clinical psychologists focus primarily on the emotional sequelae of stroke, neuropsychologists focus on the impact of brain injury and cognitive impairment on behaviour (36). A full neuropsychological evaluation is recommended for patients with persisting cognitive difficulties 3-months post-stroke (16-20) and these assessments are ideally administered by trained psychologists or neuropsychologists (13-15, 37, 38). Screening for cognitive impairment followed by full neuropsychological evaluation, where appropriate, with a view to cognitive rehabilitation is not part of standard post-stroke care in the Republic of Ireland.

Third, nationally and internationally, there is evidence of inadequate resourcing that constrains the capacity of healthcare teams to deliver cognitive rehabilitation (32, 39, 40). Many services across Europe struggle to provide recommended levels of rehabilitation (16, 17, 41) and access to stroke rehabilitation professionals can vary (32, 42, 43), such that the quantity of rehabilitation in the physical, psychological, and speech domains, as well as cognitive rehabilitation, may not adhere to guidelines. A substantial number of stroke survivors report an ongoing need for cognitive rehabilitation (44-46). These challenges are also reflected in the

community, where stroke-specific expertise is not easily accessible (32, 39, 47). Consequently, follow-up cognitive assessments are not routinely administered by community therapists (47). It is unclear to what extent inadequate resourcing and access to stroke-specific expertise influences the delivery of cognitive rehabilitation in different rehabilitation settings. This study aimed to explore the views of healthcare professionals on the facilitators and challenges involved in the delivery of post-stroke cognitive rehabilitation.

Materials and methods

This study is a secondary analysis of data collected to explore the suitability of the cardiovascular rehabilitation model for patients with post-stroke cognitive impairment (PSCI) (48). A qualitative descriptive approach was employed in this study to examine barriers and facilitators to the delivery of cognitive rehabilitation post-stroke, from the perspective of Irish stroke rehabilitation professionals (49). This research is underpinned by the constructivist paradigm, where reality and knowledge is assumed to be socially constructed and interpreted differently by those who experience it (50, 51). An individual's understanding of the world is constructed based on their own "lived experience", making this qualitative paradigm particularly suitable for exploring health professionals' perspectives with regard to the delivery of cognitive rehabilitation. This study follows the Consolidated criteria for reporting qualitative studies (COREQ) guidelines (52).

Sampling procedure

A purposive sampling strategy was employed in this research to identify experienced stroke rehabilitation professionals (51, 53). Semi-structured interviews were conducted with these professionals until a sufficient amount of rich data had been obtained to address the research questions (54). In total, twenty-seven stroke and cardiac rehabilitation professionals from the Republic of Ireland (n =20) and Switzerland (n=7) were interviewed by the lead author (IJ). This current analysis does not include feedback from cardiac rehabilitation professionals and focuses exclusively on the data from sixteen hospital and community-based stroke healthcare professionals, interviewed in the Republic of Ireland. Participants were identified through existing contacts and recruited using a snowball sampling approach. Participants were contacted by email and prior to the interview, each participant was sent an information leaflet explaining the purpose

of the research study, in addition to a copy of the interview topic guide and the consent form. These materials were also reviewed on the day of the interview to ensure that procedures were understood before participants signed the consent form.

Data collection

The interview topic guide (Appendix 1) was informed by systematic review of the literature completed by the same authors (5, 6), in addition to consultation with members of the research team who possess clinical and research expertise in relation to stroke and cognitive rehabilitation. To ensure that a sufficient amount of rich data was generated in this study, the interview topic guide was structured to promote depth of discussion and was tailored as appropriate to the participant, depending on the participant's area of expertise (54, 55). The interview topic guide was pilot tested and explored a number of areas including stroke rehabilitation planning and provision, the resourcing of stroke services and the potential to address the rehabilitation of post-stroke cognitive impairment. The sample comprised physiotherapists, occupational therapists, nurses, a stroke physician, a clinical psychologist, a neuropsychologist, a speech and language therapist, a dietician, and a public health nurse. Table 1 presents the participant characteristics.

Table 1. Healthcare professional demographics (n=16)

ID	Professional group	Years in role	Setting
HCP01	Physiotherapist	20	Community
HCP02	Physiotherapist	14	Acute
HCP03	Speech and Language Therapist	11	Community
HCP04	Psychologist	8	Acute
HCP05	Occupational Therapist	16	Rehabilitation
HCP06	Physiotherapist	8	Rehabilitation
HCP07	Occupational Therapist	11	Rehabilitation
HCP08	Clinical Nurse Specialist	8	Acute
HCP09	Stroke Physician	17	Acute
HCP10	Dietician	11	Acute
HCP11	Clinical Nurse Specialist	15	Acute
HCP12	Physiotherapist	4	Community
HCP13	Physiotherapist	11	Rehabilitation
HCP14	Occupational Therapist	5	Community
HCP15	Liaison Public Health Nurse	16	Community
HCP16	Neuropsychologist	17	Hospital

Interviews were audio-recorded and conducted privately in the participant's workplace (n=13), by phone (n=2), or online (n=1). Interviews were carried out with participants individually, except in the case of one interview where two individuals participated simultaneously. Interviews ranged in duration from 25 minutes to 78 minutes and were transcribed verbatim, anonymised and imported into NVivo (Version 12) for qualitative analysis.

Ethical considerations

Ethical approval was granted by the Royal College of Surgeons in Ireland (RCSI) Research Ethics Committee (REC 1712). Participants could withdraw from the study at any time and they were given the opportunity to review and approve their transcript. Two participants availed of this option, however no amendments were requested. Data integrity and strict confidentiality were maintained throughout this study.

Data analysis

The data were analysed using Thematic Analysis (56) based on Braun and Clarke's six phase approach (57, 58), which involved: (i) familiarisation with the data; (ii) development of an initial set of codes; (iii) review and merging of codes, construction of themes and conceptual mapping; (iv) theme review in the context of the interview data; (v) final refinement and naming of themes; (vi) results write-up. NVivo 12 was used to manage and analyse the interview data. The process involved reflection on field notes, written memos and annotations recorded during the study. Contextual factors (e.g., interruptions) and non-verbal communication cues were recorded in field notes. Annotations and memos were created in NVivo to link participant quotes to existing literature, to document similarities and differences in opinion, and to identify patterns across interviews. Along with conceptual mapping, this process made it possible to develop and link themes in the data.

The coding framework was developed based on initial open coding. One transcript was randomly selected and coded inductively by the first author (IJ) and a second coder (KH), to ensure consistency (59). Both coders met beforehand to discuss the process and to review the conceptual mind maps developed by IJ, demonstrating the coding rationale. The two coded transcripts were compared and the findings discussed. This process permitted identification of the most important codes for development of the coding framework. The initial codes were then reviewed and themes were developed inductively from the data. Several interview transcripts were also reviewed by a second author (NAM) to ensure consistency in the interpretation of findings. Once the initial codes had been identified, one author (IJ) categorised these codes and developed a conceptual map of preliminary themes (step 3, Braun and Clarke). At this point, the research team provided feedback on the proposed themes and together we explored how the themes integrated and made sense in

the context of existing literature. These themes were then reviewed against the interview data and the final four themes were developed through consultation with the research team.

Results

Stroke rehabilitation professionals described facilitators and barriers to the delivery of post-stroke cognitive rehabilitation in the Irish context. Following thematic analysis, four key themes were identified (Figure 1).

Theme 1 Cognitive screening 1.1 Cognitive screening: barriers to practice 1.2 Cognitive screening: the importance of expertise
Theme 2 Cognitive rehabilitation: no one size fits all 2.1 Cognitive rehabilitation for a diverse patient population 2.2 Promoting patient engagement: a MDT responsibility
Theme 3 Psychology: the lost dimension of stroke rehabilitation 3.1 The importance of psychological support after stroke 3.2 Where are all the neuropsychologists? 3.3 An integrated approach to cognitive rehabilitation
Theme 4 Joining the dots in the community 4.1 No continuity of care after stroke 4.2 Lack of stroke-specific expertise in the community

Figure 1. Concept map of themes

Theme 1 Cognitive screening

Cognitive screening was identified by participants as the first barrier to delivery of cognitive rehabilitation. Barriers to effective screening practice included inadequate resources, lack of consistency in the type of screening measures used and the perceived suitability of these tests for

patients with post-stroke deficits. Participants emphasised the importance of expertise in the interpretation of cognitive assessment scores, and the benefits of working as part of a multidisciplinary team (MDT) of stroke rehabilitation professionals.

Subtheme 1.1 Cognitive screening: barriers to practice

Although most participants believed that stroke patients were screened for cognitive impairment in their service, they also indicated that stroke services around the country struggle to meet the recommendations for appropriate staffing:

> *I don't think anyone is going to tell you they have enough staff anywhere…there are international guidelines, the RCP [Royal College of Physicians] guidelines[1] are the best…I don't know of anywhere that matches up to that level in the country. (HCP11)*

Participants frequently discussed lack of standardisation in cognitive screening as a barrier to effective practice. Due to the wide range of screening measures available and the perceived suitability of these tests, there is little consistency in the cognitive screening measures employed in practice:

> *...most often it is either the Addenbrooke's [cognitive examination] or the Oxford Cognitive Screen. Some people are appropriate for the MoCA...that can be a little bit difficult for people…over a certain age. (HCP07)*

Many cognitive screening measures were considered unsuitable for patients with post-stroke communication deficits or low levels of literacy. Occupational therapists often work closely with

[1] Intercollegiate Stroke Working Party. National Clinical Guideline for Stroke. London: Royal College of Physicians, 2016.

speech and language therapists to identify appropriate cognitive screening tools, highlighting the importance of MDT support in the delivery of stroke rehabilitation:

> *…the assessments involved in getting somebody back driving are quite…linguistically-loaded, cognitively-loaded…a lot of my work involves liaising with them [the occupational therapist]…'listen that assessment is not gonna be appropriate for this person because they have severe comprehension problems.' (HCP03)*

More recently, the *Oxford Cognitive Screen* has gained favour among occupational therapists (23). According to participants, this measure is preferable for patients with post-stroke aphasia and neglect:

> *…we're using that a little bit more now because that doesn't give a numerical score really, it gives a pie chart and you kinda shade out the areas that have shown to be more difficult. (HCP07)*

Although cognitive screening was considered a useful indicator of cognitive difficulties, occupational therapists in this study did not rely exclusively on standardised cognitive screening measures. Instead, a more holistic approach to cognitive assessment which included functional tests, patient observation and feedback from family, was considered optimal for the appropriate evaluation of post-stroke cognitive function:

> *…screening, we do it as kind of routine standardised care…but I will always follow through with a function-based cognitive assessment and that gives me much richer information…and then linking in with the family. (HCP05)*

Subtheme 1.2 Cognitive screening: the importance of expertise

The aim of cognitive screening is to identify patients who may require a comprehensive cognitive assessment, therefore these tests are not diagnostic. However, many participants were concerned that healthcare professionals place too much emphasis on the cognitive score:

> *I suppose sometimes the medical team want a figure...they want a number…does it mean impaired? Does it mean ok? Does it mean dementia? …that isn't the way we like to work because…it labels people (HCP07)*

According to participants, less experienced therapists are more likely to inappropriately label patients with cognitive impairment based on the results of a cognitive screening test:

> *…looking at some of the reports…primary care colleagues would…mislabel people as cognitively impaired. So too would…hospital therapists not working that long. That wouldn't happen in this setting…where you have experienced therapists. (HCP03)*

Psychologists described the negative psychological impact of labelling, emphasising the importance of comprehensive cognitive assessment by experienced healthcare professionals, who possess the requisite skills to interpret and communicate the results:

> *…they've been told they've got a cognitive impairment and that has shattered them…in Ireland there's very limited access to neuropsychological assessments, there would be a lot of people traumatised by a crude cognitive screening score. (HCP04)*

Theme 2 Cognitive rehabilitation: no one size fits all

The capacity of patients to engage in rehabilitation was identified as a major challenge, in addition to the lack of resources for patients with more complex cognitive impairments. Individualised rehabilitation plans and interdisciplinary collaboration between professionals on the stroke MDT were considered important facilitators for the effective delivery of cognitive rehabilitation.

Subtheme 2.1 Cognitive rehabilitation for a diverse patient population

Due to the potential heterogeneity of post-stroke cognitive deficits, individualised cognitive rehabilitation plans are developed for each patient depending on their needs and rehabilitation goals:

> *…it's very much tailored and individualised to the person and their presenting impairments…I have two patients…one has huge information processing difficulties that are having an impact on memory…the other individual, it's a lot more, almost disinhibited...no two strokes are the same. (HCP 05)*

In the absence of an evidence-based cognitive intervention, occupational therapists in this study were required to develop a repertoire of cognitive rehabilitation approaches, which suitably challenged patients. Identifying appropriate activities for previously high-functioning patients was considered particularly difficult, and participants felt restricted by the lack of available resources:

> *...they're the trickiest patients to treat because you're almost limited by what resources are out there...I'm really using all my clinical skills...to find out the nuts and bolts of what is involved in their work or role, to try and replicate activities…of equal cognitive stimulation or challenge. (HCP05)*

Subtheme 2.2 Promoting patient engagement: a MDT responsibility

Participants agreed that the complexity of stroke-related deficits often requires input from several disciplines. There was consensus among participants as regards the important role of the stroke MDT in rehabilitation planning:

> *…of all the areas I've worked, stroke definitely has the best MDT structure…at ward level we all work really closely together, but then those meetings are just so brilliant for helping focus everybody. (HCP10)*

Participants described how stroke MDT meetings provide an opportunity to identify barriers to rehabilitation engagement. The team work together to establish whether other post-stroke deficits, such as depression, may be exacerbating cognitive impairment:

> *…we have to differentiate between what's mood and what's a cognitive issue…and we have to figure that out as a team sometimes. (HCP04)*

Post-stroke cognitive impairment, which affects concentration, attention, planning and memory processes, was described as a significant barrier to engagement in rehabilitation:

> *Maybe the reason why they don't rehabilitate as well is because they can't engage in the rehabilitative process…there is no point in explaining exercises to a patient if they can't remember how to do them. (HCP09)*

Participants indicated that many stroke survivors affected by cognitive impairment are unable to comprehend their cognitive deficits. While a substantial part of occupational therapy is helping patients to recognise these impairments, poor awareness was considered a major impediment to

rehabilitation:

> *You could be working on their cognition as part of your rehab goal, and their cognition can be a barrier to their rehab, so it's kind of a catch twenty-two…it's very difficult to get them on board…if they can't fully understand it in the first place (HCP07)*

According to participants, patients who lack awareness of their post-stroke deficits are often deemed poor candidates for rehabilitation. A patient who has difficulty engaging in rehabilitation may be perceived as "unmotivated" or "unwilling" to participate, thus creating an additional barrier to rehabilitation. Occupational therapists in this study emphasised that the entire stroke team are responsible for engaging patients in rehabilitation:

> *I've heard people in the past say 'no, they're not a candidate for rehab because they don't have the insight' ...I would disagree with that…we absolutely have a responsibility to address that impairment to better enable that person to...engage in rehab. (HCP05)*

Theme 3 Psychology: the lost dimension of stroke rehabilitation

Inadequate access to psychology, as part of stroke rehabilitation, was perceived as a barrier to the effective delivery of cognitive rehabilitation. According to participants, poor resourcing of psychology has also led to a shortage of neuropsychologists in the Republic of Ireland, hence access to neuropsychological assessment is extremely restricted. This has had negative implications for patients with more complex cognitive impairments, where a more detailed evaluation and diagnosis could be used to inform rehabilitation planning (16-20).

Subtheme 3.1 The importance of psychological support after stroke

Stroke rehabilitation is typically delivered by a multidisciplinary therapy team of health professionals, usually comprising a physiotherapist, occupational therapist, and speech and language therapist (16-19). Although stroke guidelines recommend the inclusion of a clinical psychologist on the MDT, participants reported that access to psychology was extremely limited or unavailable:

> *We don't have a clinical psychologist, which obviously is a big gap in most services you will probably find, but it would be of great benefit to have it. (HCP11)*

Participants described taking on the role of the psychologist during rehabilitation, again highlighting a strong need for support from this discipline:

> *I often have to spend time…trying to be a psychologist…but you can't separate the psychological factors and impact of a stroke from what's going on cognitively and physically and emotionally…they are intertwined. (HCP07)*

According to participants, psychological support after stroke is essential considering the high prevalence of post-stroke cognitive impairment, and of anxiety and depression. Participants felt it was important to identify and treat psychological distress, which can exacerbate cognitive impairment:

> *…they are extremely anxious and their anxiety precludes them from paying attention…therefore they don't retain information…it's all about teasing out where is the problem. (HCP03)*

Returning to work after stroke also presents many challenges. Participants described how vocational interventions and psychological support is required at different points in a patient's recovery, to ensure a safe transition back into the workplace:

> *…people see going back to work as the marker of recovery…if not done carefully, it can be a total disaster…you've got depression and anxiety setting in, and the whole thing falls apart…they definitely need interventions at different stages… (HCP16)*

Subtheme 3.2 Where are all the neuropsychologists?

In many settings, neuropsychologists are part of the stroke MDT. According to participants in this study however, access to neuropsychology in the Republic of Ireland is extremely limited and these professionals are not integrated as members of the stroke rehabilitation team. Participants reported that a lack of funding for psychology posts has resulted in a shortage of psychologists and neuropsychologists in Ireland. This has had direct implications for the provision of neuropsychology services, which are not integrated with stroke services:

> *There's a handful of neuropsychologists that are properly trained in Ireland…we need a minimum of probably two neuropsychologists per acute hospital, not just for the country...we tend to work in silos unfortunately, we tend to do our bit and then we're feeding back to the other colleagues. (HCP16)*

For patients with enduring cognitive difficulties, full neuropsychological assessments, administered by trained psychologists or neuropsychologists, are recommended 3-months post-stroke (16-20). However, participants highlighted that inadequate resourcing of psychology has resulted in very limited access to comprehensive neuropsychological assessment:

...lots of our patients don't have direct access at all to neuropsychology, so that's a challenge and it would be of great benefit to the service if we did have access. (HCP08)

Given the appropriate resources, participants believed that it would be feasible to implement neuropsychological assessments for stroke patients in the Republic of Ireland:

...if we had the same resourcing as the UK, Europe, and the States, they do it all the time. Patients are given routine assessments, that's fed into their community neurorehab team, it's used as a basis for cognitive rehabilitation...So yes it's feasible, it's very workable, but we need to invest in providing services for patients. (HCP16)

Subtheme 3.3 An integrated approach to cognitive rehabilitation

Many participants in this study described how cognitive rehabilitation interventions were delivered primarily by the occupational therapist:

...I think it's an OT role here in this hospital. And again that's probably a gap, that we don't have psychology... (HCP02)

Occupational therapists highlighted the potential benefits of working in collaboration with neuropsychologists to deliver cognitive rehabilitation:

...it would be great to have better links with the neuropsychologist, but I appreciate that they're a scarce resource and are probably best suited to deal with the more complex persistent psychological changes...but then we could work together...from a cognitive rehab point of view... (HCP05)

According to participants, occupational therapists and neuropsychologists could work together to develop suitable cognitive rehabilitation programmes, informed by neuropsychological evaluation. Participants highlighted the potential benefits of an integrated approach to cognitive rehabilitation:

> *…they [the occupational therapist] would tend to focus on rehabilitation through functional tasks…we should be overlapping and sharing that knowledge…we should both be coming at the problem from a slightly different angle… (HCP16)*

Theme 4 Joining the dots in the community

Stroke rehabilitation services in the community were described as poorly developed, fragmented, and inadequately resourced, with no clear pathway for continuing rehabilitation once a patient leaves hospital. Participants indicated that the delivery of cognitive rehabilitation in the community is further constrained by long delays to accessing services and the absence of stroke-specific expertise. Stroke survivors are frequently referred to voluntary services for vocational and psychological support, indicating that existing health services are unable to address these needs.

Subtheme 4.1 No continuity of care after stroke

According to participants, post-stroke cognitive impairment presents significant challenges for stroke survivors living in the community, especially for those living alone.

> *A lot of the issues we would have with stroke patients would be around cognition. They're going home possibly alone, maybe have no family support around medication management, diet, safety in the home. (HCP15)*

While participants agreed that stroke rehabilitation would ideally be delivered in the community,

the challenge remains as to how best to integrate these services into the hospital system. Many participants were not familiar with the community services available to stroke patients, highlighting a need for clearer pathways of rehabilitative care:

> *…when referring patients out to the community…it's hard to know exactly what person to phone and say, 'where do these go?'…they might be seen in so many weeks in one area and it might be so many months in another…it depends on where you're from. (HCP13)*

Improved coordination of services would support a more seamless transition of patients between services. The majority of participants agreed that a stroke coordinator could facilitate access to required services in the community:

> *…having that networked would be brilliant, with a stroke coordinator and formal links to vocational rehab and assessment services and employment services. (HCP04)*

A "postcode lottery" was frequently discussed, where access to services is determined by geographical location as opposed to rehabilitation need. Participants frequently noted delays in accessing community rehabilitation, where long waiting lists prevented patients from accessing necessary services at an appropriate time in their recovery:

> *…the big barrier would be the waiting lists that almost render the service useless…an acute stroke with acute impairments and they're gonna be waiting 12 weeks to see someone? It's just not good enough. (HCP02)*

Participants identified that the needs of younger stroke survivors in particular were not being met by existing stroke rehabilitation services. Many of these patients relied on voluntary organisations

for ongoing support after stroke:

> *…you try so hard to get them into [name of Rehabilitation Hospital] because it's probably the only place that will take under 65's. It's as if they are in this bubble of 'you're not important' …you've got Headway[2], you've got Quest[3], but we, as a health service shouldn't be relying on not-for-profits to do the job…. (HCP12)*

Subtheme 4.2 Lack of stroke-specific expertise in the community

A major barrier to the effective delivery of stroke rehabilitation in the community is the lack of stroke-specific expertise available in this setting. The delivery of cognitive rehabilitation appears to vary between settings. While occupational therapists in hospitals have stroke-specific expertise to carry out cognitive assessments and deliver cognitive rehabilitation, stroke-specific experience in the community is extremely limited. Consequently, occupational therapists in the community were less confident in the delivery of cognitive rehabilitation, particularly in the absence of specific training and MDT support:

> *…we don't really know what works…if we had a very clear pathway and treatment resources, that would allow us to research and show the efficacy of certain treatment practices…we don't have that framework, we don't have any leading person or team who is giving us very concrete guidance…so it's down to you to pool your resources and figure out what you want to do…and that doesn't work. (HCP14)*

[2] Headway is an Irish registered charity and internationally accredited brain injury services organisation that supports adults (18+) who are affected by brain injury: https://headway.ie/

[3] Quest Brain Injury Services is a community rehabilitative service for adults (18+) who have sustained an acquired brain injury: https://www.rehab.ie/national-learning-network/find-out-more-about-nln/brain-injury-services-quest-/

The capacity to provide cognitive rehabilitation appears to depend on the expertise available in a given rehabilitation setting. Participants reported that community services are often reluctant to take on stroke patients:

> *…I referred a patient to my community OT and got a very irate colleague calling me saying; 'You know we don't do this, I'm not staffed, I do not have the experience to be providing stroke rehab'. (HCP05)*

Participants based in the community described an urgent need for more support in the delivery of cognitive rehabilitation:

> *…physios and OTs would be more comfortable working with musculoskeletal conditions…I would say most people don't go there…you really need to know your stuff as far as that cognitive rehab piece, it's very complex...that's a real flaw in the system, that it's [cognitive rehabilitation] not just standardised. (HCP14)*

Access to cognitive rehabilitation in the community was considered to be imperative, given the high prevalence of post-stroke cognitive impairment and associated unmet need. Participants recommended increased investment in community-based stroke multidisciplinary teams to deliver stroke rehabilitation:

> *…we need something like they have in the UK, in which every local area has neurological rehabilitation, fully staffed with MDT… (HCP16)*

Discussion

To ensure consistency in the delivery of cognitive rehabilitation, it is important to understand the factors which impede practice to specifically target these for intervention. At the same time, existing facilitators to stroke rehabilitation could be optimised to better support the delivery of cognitive rehabilitation. This study aimed to address this gap by examining Irish healthcare professionals' views in relation to facilitators and barriers to the delivery of post-stroke cognitive rehabilitation.

Cognitive screening was identified as an important first step in the identification of post-stroke cognitive impairment, and a key indicator of cognitive deficits that require further investigation. Hence, screening was considered a gateway to more comprehensive cognitive assessment, which can inform the development of individualised cognitive rehabilitation plans, based on the specific needs of the patient. However, participants highlighted a number of barriers to practice. Firstly, although early cognitive screening for cognitive impairment is recommended (16-20), there is evidence to suggest that routine cognitive screening and access to more comprehensive neuropsychological assessment varies across services (20, 22, 42, 60, 61). Secondly, a wide range of screening measures are used in practice, with little standardisation across stroke services (62). The choice of screening tool often depended on the patient and their presenting impairments, and participants indicated that these measures provided limited information where post-stroke deficits (e.g., Aphasia, anxiety) interfered with assessment. These challenges made it difficult to screen for cognitive impairment and to identify patients requiring more detailed cognitive assessment, with a view to rehabilitation. Accordingly, several participants identified the Oxford Cognitive Screen as a preferable screening tool to commonly used measures such as the Mini-Mental State Examination (MMSE) or the MoCA, as it can be administered to

patients with communication and visual neglect problems (20, 23, 30, 31). Thirdly, participants identified misinterpretation of cognitive test scores as a barrier to effective cognitive screening practices. Cognitive screening tests are not intended to be diagnostic, rather they are indicators of cognitive difficulties, which require further investigation through neuropsychological evaluation. Nonetheless, participants were concerned that cognitive test scores were being used inappropriately, to categorise patients as "impaired" or "unimpaired". These findings suggest that the objective of cognitive screening is not always fully understood by health professionals and more clarity as regards the limitations of cognitive test scores is needed. To enhance understanding of post-stroke cognitive impairment, stroke MDT members might benefit from additional training in this area.

Neuropsychological assessment is recommended for patients with persistent cognitive difficulties (16-20). Due to the complexity of these assessments, the interpretation of test results requires the expertise of a trained psychologist or a neuropsychologist (13, 14, 33, 38). Although a detailed assessment would better inform rehabilitation planning (20), neuropsychologists are not usually part of the stroke multidisciplinary team in the Republic of Ireland, and access to neuropsychology is extremely limited in many countries (19, 29, 32, 34, 36, 37, 42, 43). In this study, the occupational therapists and the neuropsychologist highlighted the potential benefits of a collaborative relationship between these two disciplines, in both the assessment of cognitive impairment and the design of appropriate interventions, which is also reflected in the literature (11, 13-15, 35). In hospitals where neuropsychology has been integrated as part of the stroke MDT, this approach has resulted in earlier access to neuropsychological assessment and enhanced rehabilitation planning (63). Several authors recommend a holistic approach to rehabilitation

which acknowledges that cognitive, emotional, psychosocial and behavioural aspects of functioning are often intertwined, and need to be considered as part of rehabilitation (8, 64-66).

The majority of participants noted the advantages of working as part of a multidisciplinary team of stroke professionals, which was perceived as a facilitator to the delivery of cognitive rehabilitation. Regular stroke MDT meetings were identified as providing an opportunity to identify barriers to rehabilitation and to address these difficulties as a team, ensuring that all patients have equal access to rehabilitation (67). However, access to psychological support as part of stroke rehabilitation is extremely limited in the Republic of Ireland (39, 42, 43, 47, 68) despite the fact that international literature highlights that over one third of stroke survivors are affected by post-stroke depression (12, 20, 63, 69, 70). A national survey of post-acute stroke rehabilitation facilities reported that less than a third of facilities provided psychological support of any kind to stroke patients (43). Participants in the present study identified similar inadequacies, many reported a complete absence of psychological services.

Delays to accessing rehabilitation were identified as a prominent barrier to the effective delivery of cognitive rehabilitation in the community. A substantial number of stroke patients are never referred for community rehabilitation (47, 71), while others are unable to access services (44, 45, 72, 73). Participants highlighted a heavy reliance on non-profit organisations and charities to address the ongoing unmet needs of stroke survivors. This further highlights the fragmented nature of stroke rehabilitation delivery in the Republic of Ireland (74). However, such practice is not unique to Ireland and many countries are dependent on voluntary organisations for support (32). To facilitate a more seamless transition between hospital and community services, participants recommended that a stroke coordinator manage this process. This is in line with the recommendations of the *National Strategy and Policy for the Provision of Neuro-rehabilitation*

Services in Ireland Implementation Framework 2019-2021 (71, 74), which proposes a similar plan with the introduction of rehabilitation coordinators, case managers, and rehabilitation assistants (74). These coordinators would liaise with patients and their families, providing information on available services and organising referrals to in-patient care, specialist rehabilitation and community services. A similar approach could be introduced to support stroke survivors returning to the workplace (75); up to 70% of working age stroke survivors experience long-term difficulties in social and cognitive functioning, indicating an urgent need for return to work support (76).

Despite the high prevalence of post-stroke cognitive impairment (2, 3), cognitive rehabilitation has received considerably less research attention than rehabilitation of post-stroke physical impairment (5, 6). Although a recent systematic review reported some promising data in support of cognitive interventions (7), the efficacy of cognitive rehabilitation requires further investigation (5, 6). The prevalence of cognitive impairment after stroke highlights the need to prioritise resourcing to enable routine cognitive screening of all acute stroke patients and neuropsychological testing of those patients identified through screening as having impairment (16-20, 29, 33, 34). Investing in the development of stroke rehabilitation teams in the community and rehabilitation coordinators specific to stroke, as recommended by participants in this study, would serve to improve the coordinated provision of stroke rehabilitation in this setting.

Strengths and limitations

This study has identified existing facilitators and barriers to the delivery of cognitive rehabilitation post-stroke, which can be targeted for future intervention to facilitate the implementation of a formal cognitive rehabilitation programme. Inadequate resourcing of neuropsychology and stroke-related psychological services has had negative implications for the delivery of cognitive

rehabilitation, and this is an area of cognitive rehabilitation practice not yet examined in the Irish healthcare context. Another key strength of this study is the inclusion of a diverse range of healthcare professionals, specialising in different areas of stroke rehabilitation.

There were some limitations to this research. There were fewer community rehabilitation professionals involved than hospital-based rehabilitation professionals, therefore the findings may be less generalizable to other settings. Due to the very small pool of stroke psychologists and neuropsychologists in the Republic of Ireland, only one participant from each of these disciplines was interviewed. Many of the stroke rehabilitation professionals in this study may have had superficial engagement with neuropsychological assessment and rehabilitation, hence the findings may not generalise to clinicians experienced in working with neuropsychologists. It is also unclear if all participants were familiar with the trial-based literature on cognitive interventions, and this lack of engagement with the literature may have influenced findings. A final limitation of this study is that only one interview transcript was dual-coded during data analysis.

Conclusion

Participants voiced concerns relating to the assessment of post-stroke cognitive impairment and the delivery of cognitive rehabilitation, which could be greatly facilitated by improving access to psychology and neuropsychology services. Future studies could explore these resourcing issues with policy-makers and funders, to determine whether increased investment in psychology and neuropsychology can be addressed in a systematic and cost-effective manner. Ideally, community stroke rehabilitation services would include specialist stroke rehabilitation teams, competent in the delivery of cognitive rehabilitation. Increased resourcing of hospital and community stroke rehabilitation services is needed to facilitate routine cognitive screening practices and consistency in the delivery of cognitive rehabilitation interventions.

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