

# **NATIONAL CLINICAL GUIDELINE FOR STROKE**

for the United Kingdom and Ireland

**2023 edition**

Chapter 4

Rehabilitation and recovery

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## 4 Rehabilitation and recovery

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### Principles of rehabilitation

#### 4.0 Introduction

This section addresses the core principles of rehabilitation and its delivery. All subsequent sections of this chapter should be read keeping these overarching principles and recommendations in mind. It is acknowledged that rehabilitation, recovery, and adjustment are different albeit linked concepts that may take place over differing time frames and require differing levels of support. Where necessary and appropriate, community rehabilitation may be delivered by combined stroke and neuro-therapy teams; however, these teams should have the skills and resources (including staffing) to be able to meet the standards within this guideline. Interventions and support provided by rehabilitation and life after stroke services should span these varying needs and timescales to fulfil the requirement of the United Nations Convention on the Rights of Persons with Disabilities (United Nations, 2022) to deliver “effective and appropriate measures, including through peer support, to enable persons with disabilities to attain and maintain maximum independence, full physical, mental, social and vocational ability, and full inclusion and participation in all aspects of life”. [2023]

#### 4.1 Rehabilitation potential

Decisions about rehabilitation potential have far-reaching consequences for individual patients, including the withdrawal of active rehabilitation. The term ‘rehabilitation potential’ is viewed negatively by stroke survivors and can be inappropriately used by clinicians as justification for rationing access to services. Access to rehabilitation should be driven by the presence of stroke-specific goals. These should not be limited to functional improvement and should include domains such as adjustment, psychological well-being, education regarding stroke, social participation, management of complications, and the management of care needs. All domains should be considered as aspects of rehabilitation and therefore the term ‘no rehabilitation potential’ is not appropriate and should not be used. [2023]

Given the dynamic nature of stroke recovery, fixed decisions around appropriateness of rehabilitation should not be made too early after stroke. Co-existent conditions such as dementia, sensory impairments, or other comorbidities can complicate delivery of rehabilitation, but they should not be the sole reason for not pursuing a rehabilitative approach. [2023]

Selection of an appropriate rehabilitation pathway (e.g. inpatient rehabilitation, early supported discharge) should be determined by the patient’s goals coupled with an understanding of their impairments, abilities, prognosis and the evidence base, informing access to the right service at the right time, at an appropriate intensity. Information should be shared with the person with stroke and their carer(s), to ensure goals and expectations are informed and achievable. There are predictive tools (such as the Orpington Prediction Scale (Mohapatra & Jones, 2015), PREP2 (Stinear et al, 2017a), and TWIST (Smith et al, 2017)) that give useful information at a population level and can be used to inform such discussions. [2023]

Decisions regarding discharge from rehabilitation should be made with involvement of the person with stroke (shared decision making) when stroke-related goals have been met. This should never be an irrevocable decision, but should include the opportunity for review and access back into services at any

time via self referral or professional referral. The decision should relate to the person's rehabilitation needs at a single point in time. It should be understood that a person with stroke may have stroke-related needs or goals at any point following their stroke. Life after stroke services should be available to support and advise during, between, and following different phases of rehabilitation ([Section 5.27 Further rehabilitation](#)). **[2023]**

#### **4.1 Recommendations**

- A People with stroke should be considered to have the potential to benefit from rehabilitation at any point after their stroke. **[2023]**
- B People with stroke and their carers should be involved in a collaborative process with healthcare professionals to agree rehabilitation options, guided by the person's own needs, goals and preferences. **[2023]**
- C The multidisciplinary team should consider all available rehabilitation options and recommend the service that is most likely to enable the person with stroke to meet their goals and needs.
  - For those people for whom standard rehabilitation services (such as early supported discharge, or community stroke teams) may not be appropriate, collaborative local decision making should ensure that a stroke-skilled multidisciplinary team works with the person with stroke and their family towards achievable and meaningful goals, which may be in conjunction with other statutory or voluntary provision;
  - People with stroke involving the spinal cord should be referred to specialist spinal injuries service for advice and support and/or to provide rehabilitation. **[2023]**
- D Stroke rehabilitation should be needs-led and not time-limited, and available to those people with stroke for whom:
  - ongoing needs have been identified by the person with stroke, their carer(s) or the multidisciplinary team across all areas of stroke recovery, e.g. functional abilities, mental health, cognitive function, psychological well-being, education regarding stroke, social participation, management of complications and care needs;
  - and their needs remain related to the stroke and/or are best met by the skills of the stroke team. **[2023]**
- E Clinicians should facilitate shared decision making and communicate the likelihood of the individual achieving their goals in an informed, compassionate, and individualised manner. **[2023]**
- F From an early stage in rehabilitation, clinicians should prepare people with stroke and their carer(s) that discharge from the service will occur and ensure an adequate transition plan is created collaboratively. Discharge information should include how to re-access services if required. **[2023]**
- G Statistically derived tools which predict future functional capacity should be considered to guide expectations of treatment or to predict risk:
  - Tools should only be applied in the population and phase of stroke within which the tool was developed;
  - Clinicians need to be trained to understand the limitations of tools, and how to use the tools effectively. **[2023]**
- H The multidisciplinary team should complete weekly reviews whilst providing rehabilitation in any setting, considering the needs, goals and progress of the person with stroke, and their treatment and discharge plans. The choice of rehabilitation pathway should be regularly reviewed to ensure rehabilitation continues to best meet the person's needs.

- I For people with stroke who are no longer receiving stroke rehabilitation at 6 months, a primary focus of the 6 month review should be to identify and redirect those with ongoing needs and/or goals back into stroke services. Reviews should be holistic in nature and be completed by a stroke specialist with appropriate skills and expertise. **[2023]**
- J People with stroke should receive a holistic annual review conducted by a professional with a broad range of skills and knowledge across physical, psychological and social domains. Those for whom new or ongoing stroke rehabilitation goals can be identified and agreed should be referred to stroke services for further rehabilitation. **[2023]**

#### **4.1 Source**

A-J Guideline Development Group consensus

#### **4.1 Evidence to recommendations**

This section has been written by an expert group reaching consensus on the topic of rehabilitation potential, its definition, appropriateness of use and implications for people with stroke and the stroke pathway. More research is needed to identify which people with stroke will gain the most from different approaches and intensities of rehabilitation, and how to reliably identify those people who will not benefit from such interventions. Provision of six month reviews is currently inequitable (Sentinel Stroke National Audit Programme, 2022) and continues to be a focus for improvement to ensure unmet need is identified and people are redirected back into stroke specialist services appropriately. **[2023]**

## **4.2 Rehabilitation approach – intensity of therapy (motor recovery and function)**

Rehabilitation is an adaptive process, and the practice and repetition of functional tasks for months or years is a key component of optimal recovery. The evidence for intensity of therapy within this chapter mainly relates to physical and functional rehabilitation after stroke. Less is known about the intensity of therapy required for psychological, cognitive or sensory effects of stroke; however, some principles regarding practice and training may be relevant. **[2023]**

Greater amounts of physical therapy (i.e. dose) are associated with better recovery (Kwakkel et al, 1999; Kwakkel & Wagenaar, 2002; Bhogal et al, 2003a; Bhogal et al, 2003b; Kwakkel et al, 2004). The dose of therapy is multi-faceted, encompassing not only the number of treatment sessions, but also their duration and frequency. It is unclear whether therapy needs to be more intense (i.e. the same amount of therapy over a shorter time) but there is evidence that motor learning is best accomplished with challenging, motivating tasks and variable training schedules (Krakauer, 2006). In reality, stroke therapy is rarely delivered intensively or in high doses. Studies have shown that therapy sessions commonly feature low numbers of repetitions, low cardiovascular activity, and with the patient frequently inactive (Bernhardt et al, 2004; Lang et al, 2009; Scrivener et al, 2012; West & Bernhardt, 2012; Hayward & Brauer, 2015). This is a particular issue in the UK, where many services are unable to deliver guideline-recommended levels of activity. In the year April 2021-22 the Sentinel Stroke National Audit Programme (SSNAP) reported that 16.8% of patients received more than 45 minutes of occupational therapy 7 days a week, 11.9% received more than 45 minutes of physiotherapy 7 days a week and 6.6% received at least 45 minutes of speech and language therapy 7 days a week in participating UK hospitals. In recent years other countries such as Australia (Stroke Foundation, 2022), Canada (Teasell et al, 2020) and the Netherlands (Veerbeek et al, 2014a) have significantly progressed this target to the expectation that patients receive at least three hours of therapy per day. **[2023]**

The content of therapy is also important. An ineffective therapy will not benefit patients whatever the dose or intensity. As detailed in this chapter, the most effective therapy for promoting motor recovery

after stroke is based on exercise and practice of functional tasks augmented as necessary by technological and priming techniques (Veerbeek et al, 2014b; French et al, 2016b; Wattchow et al, 2018; Scrivener et al, 2020). The main points of post-stroke therapy aimed at motor recovery are understanding the impairments, activity, and individualised goals, leading to a high number of repetitions of relevant exercise and functional tasks. The amount of activity that patients are able to undertake during rehabilitation is more important than how much time patients spend in face-to-face therapy with qualified therapists. These principles apply to inpatient, outpatient and community settings. Commissioners/service planners, service managers and clinicians must drive improvements in the culture and processes of rehabilitation to maximise both therapist-delivered therapy and opportunities and support for practice and activity outside formal therapy sessions, recognising that rehabilitation can be delivered in a number of ways including supervised practice, group work and self practice. Delivery methods should be considered to ensure both effective delivery for patients and efficient use of resources. **[2023]**

## **4.2 Recommendations**

- A** People with motor recovery goals undergoing rehabilitation after a stroke should receive a minimum of 3 hours of multidisciplinary therapy a day (delivered or supervised by a therapist or rehabilitation assistant focused on exercise, motor retraining and/or functional practice), at least 5 days out of 7, to enable the range of required interventions to be delivered at an effective dose.
- Rehabilitation programmes should be individualised to account for comorbidities, baseline activity levels, post-stroke fatigue, tolerance, goals and preferences. Therapy can be paced throughout the day, to accumulate at least 3 hours of motor/functional therapy;
  - For people unable to tolerate 3 hours of therapy a day, the barriers to doing so should be fully assessed and actively managed with strategies to ensure they are able to participate in therapy and be active as far as possible;
  - People undergoing rehabilitation after a stroke should be supported to remain active for up to 6 hours a day (including therapist-delivered therapy), for example through the use of open gyms, self-practice, carer-assisted practice, engaging in activities of daily living, and activities promoting cardiovascular fitness. **[2023]**
- B** Services delivering rehabilitation for people after stroke should:
- deliver a range of individualised one-to-one therapies, structured semi-supervised practice and group work (including rehabilitation gym sessions and a range of exercise and activity groups relevant to the person's needs);
  - have access to adequate rehabilitation space such as a gym and areas for functional practice (e.g. kitchen and bathroom), appropriate space to accommodate group work, and quiet space for psychological assessment and sensitive discussions;
  - ensure that delivery of rehabilitation intensity includes education for both the person with stroke and their family/carers to better understand their difficulties, and their recovery and rehabilitation;
  - be organised to encourage and support people with stroke to remain active outside of therapist-delivered sessions. **[2023]**
- C** In the first two weeks after stroke, therapy targeted at the recovery of mobility should consist of frequent, short interventions every day, typically beginning between 24 and 48 hours after stroke onset. **[2016]**
- D** Multidisciplinary stroke teams should incorporate the practice of functional skills gained in therapy into the person's daily routine in a consistent manner, and the care environment

should support people with stroke to practise their activities as much as possible.

Functional activities should be individualised to the person's goals and interests. **[2023]**

- E Healthcare staff who support people with stroke to practise their activities should do so under the guidance of a qualified therapist. **[2016]**

## 4.2 Sources

- A, B Veerbeek et al, 2014a; Stroke Foundation, 2022; Teasell et al, 2020; Guideline Development Group consensus
- C AVERT Trial Collaboration group, 2015; Bernhardt et al, 2016
- D Smith et al, 1981; Langhorne et al, 1996; Kwakkel et al, 1994, 2004; Lincoln et al, 1999; Kwakkel and Wagenaar, 2002
- E Working Party consensus

## 4.2 Evidence to recommendations

The large international AVERT trial (AVERT Trial Collaboration group, 2015; Bernhardt et al, 2016) suggested that in the first two weeks after stroke, therapy targeted at the recovery of mobility should be redesigned around frequent, short interventions, except for those people who require little or no assistance to mobilise ([see Section 3.12 Early mobilisation](#)). Therapy targeted at other activities of daily living should be task-specific, progressive and practised frequently. Practice should be incorporated into routine activities on the stroke unit by the entire healthcare team every day of the week, rather than confined to lengthy therapy sessions separated by long periods of inactivity. The objective is for rehabilitation to be a pervasive activity, combining time spent with therapists in assessment and treatment with time spent practising with other professional and/or support staff, or with family/carers or alone. Rehabilitation intensity in both acute and longer-term settings remains an area which requires more research. **[2016]**

The recommendation for people with stroke to receive 45 minutes of each therapy per day in previous editions of this guideline was set pragmatically as a minimum through consensus by the Working Party at the time. The Guideline Development Group has debated this further and has increased the recommended amount of therapy in this edition to stimulate much-needed transformation of rehabilitation to improve clinical outcomes. This is supported by evidence regarding the effects of greater amounts of therapy (dose) (Kwakkel et al, 1999; Kwakkel & Wagenaar, 2002; Bhogal et al, 2003a; Bhogal et al, 2003b; Kwakkel et al, 2004) and is reflected in other clinical guidelines around the world (Australia (Stroke Foundation, 2022), Canada (Teasell et al, 2020) and the Netherlands (Veerbeek et al, 2014a)). The revised recommendation is based on the cumulative evidence that the interventions recommended within this chapter need to be delivered in a significant dose to be effective, and this dose is rarely provided in clinical practice. Progress implementing the previous recommendation (at least 45 minutes/day) has been incomplete, not least because it is commonly considered a target rather than a minimum dose and many clinicians underestimate the dose of therapy that people with stroke can tolerate. Increasing time in therapist-delivered sessions allows effective delivery of these interventions, with the added focus on self-directed or semi-supervised practice aimed at shifting the culture of rehabilitation. **[2023]**

## 4.3 Rehabilitation approach – goal setting

Goal setting can be defined as a behavioural target that is central to rehabilitation, but is also effective in secondary risk factor reduction such as weight loss, smoking cessation or alcohol consumption reduction. Goal setting is the process by which the person with stroke (and their family or carers if they wish) and members of the stroke team identify individual treatment goals which are meaningful,



challenging and have personal value. Goals are worked towards over a specified period of time, both short and long term. Traditionally goals have been therapy-led and orientated to specific therapy targets which are realistic and measurable. This method has proved to be an effective and efficient rehabilitation tool when used flexibly to reflect that the person's ability and motivation to participate may fluctuate over time. A balance should be made between practicality, working in a stepwise approach and supporting the aspirations of the person with stroke. Recently a move towards self-management and self-efficacy has been promoted as a more person-centred approach to goal setting. **[2016]**

### **4.3 Recommendations**

- A People with stroke should be actively involved in their rehabilitation through:
- having their feelings, wishes and expectations for recovery understood and acknowledged;
  - participating in the process of goal setting unless they choose not to, or are unable to because of the severity of their cognitive or linguistic impairments;
  - being given help to understand the process of goal setting, and to define and articulate their personal goals. **[2016]**
- B People with stroke should be helped to identify goals that:
- are meaningful and relevant to them;
  - are challenging but achievable;
  - aim to achieve both short-term (days/weeks) and long-term (weeks/months) objectives;
  - are documented, with specific, time-bound and measurable outcomes;
  - have achievement measured and evaluated in a consistent way;
  - include family/carers where this is appropriate;
  - are used to guide and inform therapy and treatment. **[2016]**
- C People with stroke should be supported and involved in a self-management approach to their rehabilitation goals. **[2016]**

### **4.3 Sources**

- A, B Malec et al, 1991; Wressle et al, 2002; Stein et al, 2003; Hurn et al, 2006; Levack et al, 2006; Holliday et al, 2007a, b; Working Party Consensus
- C Rosewilliam et al, 2011; Sugavanam et al, 2013; Taylor et al, 2012

### **4.3 Evidence to recommendations**

Recent literature includes one systematic review of qualitative and quantitative studies (Sugavanam et al, 2013) which examined 17 trials and concluded that no consistent approach was used and there were difficulties implementing a self-management approach. A qualitative paper by Jones et al. (2013) highlighted a lack of training and awareness of the self-management approach. A Cochrane review of 39 RCTs in 2846 subjects participating in rehabilitation with a variety of conditions including acquired brain injury (Levack et al, 2015) concluded there was low-quality evidence that goal setting may improve health-related quality of life and other psychosocial outcomes such as emotional status and self-efficacy. Goal setting should involve the person with stroke and their family/carers where appropriate, and be measured and evaluated in a consistent and standardised way. **[2016]**

## 4.4 Self-management

There is increasing evidence of psychological factors that influence confidence and adjustment to life after stroke. Self-efficacy has been defined as an ‘individual’s belief in their own capability’ and has been found to be positively associated with mobility, activities of daily living, and quality of life and negatively associated with depression after stroke (Korpershoek et al, 2011). Self-efficacy is closely related to mood and self-esteem, and there are relations between self-efficacy and emotional states (depression, anxiety) and quality of life. **[2016]**

Self-efficacy may mediate self-management skills such as problem solving and goal setting and is used as an outcome measure in some self-management programmes (Korpershoek et al, 2011; Lennon et al, 2013; Parke et al, 2015; Warner et al, 2015). There is emerging evidence on the utility of changing self-efficacy to influence independence and the promotion of self-management after stroke. Self-management has been defined in various ways but many programmes refer to the ‘actions and confidence of individuals to manage the medical and emotional aspects of their condition in order to maintain or create new life roles’ (Corbin, 1998; Parke et al, 2015). Programmes mainly focus on supporting the knowledge and skills required to self-manage, and range from educational approaches to interventions to support behaviour change. **[2016]**

### 4.4 Recommendations

- A People with stroke should be offered self-management support based on self-efficacy, aimed at the knowledge and skills needed to manage life after stroke, with particular attention given to this at reviews and transfers of care. **[2016]**
- B People with stroke whose motivation and engagement in rehabilitation appears reduced should be assessed for changes in self-esteem, self-efficacy or identity and mood. **[2016]**
- C People with significant changes in self-esteem, self-efficacy or identity after stroke should be offered information, support and advice and considered for one or more of the following psychological interventions:
  - increased social interaction;
  - increased exercise;
  - other psychosocial interventions, such as psychosocial education groups. **[2016]**

### 4.4 Sources

- A Lennon et al, 2013; Parke et al, 2015; Warner et al, 2015; Working Party consensus
- B Working Party consensus
- C Kendall et al, 2007; Watkins et al, 2007; De Man-van Ginkel et al, 2010; Jones et al, 2010

### 4.4 Evidence to recommendations

Evidence suggests that self-management programmes based on self-efficacy can influence functional capability and social participation. Recent systematic reviews support self-management interventions after stroke although meta-analysis was not possible because of heterogeneity in the methods of delivery, clinical outcomes and stroke severity (Lennon et al, 2013; Parke et al, 2015; Warner et al, 2015). Not all studies in these reviews used self-efficacy as a mediator nor explicitly used self-efficacy outcome measures. A recent feasibility cluster RCT showed it was feasible to integrate stroke self-management into community rehabilitation and provided data to design future definitive trials (Jones et al, 2016). More research is needed to understand the role of self-efficacy in rehabilitation, the skills required by professionals, and how participants perceive the impact of self-management interventions on their self-efficacy. **[2016]**

#### **4.4 Implications**

These recommendations serve to emphasise the important interaction between newly-recognised psychosocial concepts of self-efficacy and self-management, and functional outcomes and social participation after recovery from stroke. Stroke services need to consider how to develop the knowledge and skills in rehabilitation staff to support self-management, and how to provide psychological interventions as an adjunct to more familiar physical treatments, including in community stroke services. [2016]

#### **4.5 Remotely delivered therapy and telerehabilitation**

Remotely delivered therapy is rehabilitation delivered using technology, with a remote therapist personalising a programme or tasks to specifically address identified impairments or goals. This may take place with a therapist present during the session remotely to adapt and give feedback in real time, or asynchronous practice, when the therapist gives and receives feedback offline. Therapy can be delivered via videoconferencing, and can be individual or in a group. The term is used synonymously with telerehabilitation, which has been defined as “the use of telecommunication, by either direct video or audio, to deliver rehabilitative interventions” (Appleby et al, 2019). Telehealth or telemedicine often uses similar technologies but focuses on risk factors, secondary prevention, behaviour or lifestyle modifications (Bashshur, 1995). [2023]

Telerehabilitation saw significant advances during the COVID-19 pandemic, with programmes such as N-ROL (Neuro Rehab On-Line) and the Bridges community of practice ([Bridgesselfmanagement.org.uk](https://bridgesselfmanagement.org.uk)) providing examples and guidance to assist patients and therapists to engage in remotely delivered rehabilitation. [2023]

A range of technologies can be used for communication between the patient and therapist, such as telephone, videoconferencing, apps, sensors (e.g. pedometers, wearable devices) and virtual reality (Laver et al, 2020). Technological innovations such as telerehabilitation may help address barriers to accessing face-to-face rehabilitation, such as time and resource limitations, geographical isolation and compliance with rehabilitation (Appleby et al, 2019). There are potential advantages of remotely delivered therapy in terms of patient satisfaction (although studies are affected by selection bias), motivation, agency, the patient and therapist not needing to travel, and efficiency for multidisciplinary teams. Barriers to use by patients and therapists can include difficulties with equipment set up, connectivity and problems with the interface (Tyagi et al, 2018) and lack of privacy in the home setting. Additional barriers may impact on ability to engage with telerehabilitation for those with reduced comprehension, cognitive processing difficulties, or visual deficits. [2023]

Local systems should consider digital inequities and digital literacy, as well as socio economic impact on availability of equipment. Careful consideration should be taken as to whether remotely delivered therapy is best placed to meet the needs of individuals (particularly those with cognitive or language deficits), and which programs and equipment may be most accessible. For those unable to access remotely delivered therapy, a face-to-face alternative should be available. Support such as volunteers or peer support should be considered for those who are keen to trial technology-based options. [2023]

#### **4.5 Recommendations**

- A People undergoing rehabilitation after stroke should be considered for remotely delivered rehabilitation to augment conventional face-to-face rehabilitation. Telerehabilitation programmes should:
- be personalised to the individual’s goals and preferences;
  - be used when it is considered to be the most beneficial option to promote recovery

- and should not be used as a substitute for essential in-person rehabilitation;
  - be monitored and adapted by the therapist according to progress towards goals;
  - be supplemented with face-to-face reviews and include the facility for contact with the therapist as required. **[2023]**
- B** People receiving rehabilitation after stroke should have an assessment of their ability to use assistive technology and programmes and equipment should be adapted accordingly. **[2023]**
- C** Stroke services should ensure adequate technology is available to enable access to telerehabilitation for people with stroke (this could be resourced via grants, community health services, library loan services etc.). **[2023]**
- D** People with stroke receiving telerehabilitation should be trained and supported in the use of the appropriate technology. **[2023]**
- E** Stroke rehabilitation staff who are recommending the use of telerehabilitation devices should be trained in their use, technological specification and limitations. This should include the review of technologies for appropriateness, safety and information governance (storage of personal data). **[2023]**
- F** Therapists should promote engagement and adherence to telerehabilitation through a coaching style relationship with the person with stroke. **[2023]**

#### **4.5 Source**

A-F Guideline Development Group consensus

#### **4.5 Evidence to recommendations**

The evidence base for remotely delivered therapy is new and developing. The evidence reviewed was heterogeneous in terms of the types of remote therapy, location (hospital versus home), comparison group and the selection of patients, which makes synthesis challenging. A systematic review of 31 studies showed high levels of adherence to telerehabilitation, interventions observed were comparable to in-person rehabilitation and no safety concerns related to the delivery of telerehabilitation interventions were reported. A systematic review and meta-analysis of 13 studies of technology-based distant physical rehabilitation interventions found comparable effects to traditional treatments on ADL but not walking, although there was heterogeneity in the interventions and people with cognitive impairments were often excluded (Rintala et al, 2019). A Cochrane review of 22 RCTs of telerehabilitation in stroke found evidence of variable quality from heterogeneous studies suggesting no difference between telerehabilitation and conventional rehabilitation (Laver et al, 2020). Limited data were reported on safety and economic analyses. Many studies were small, pilot and/or non-randomised and did not account for attrition from the intervention. Few studies had long-term follow-up and there was variability in the level of detail provided about the intervention, including personalisation and adherence. The evidence base is therefore of insufficient quality to strongly recommend specific remotely delivered therapy approaches. Therefore, the Guideline Development Group has made consensus recommendations for this topic. **[2023]**

Consideration needs to be given to the person with stroke being cognitively able to manage the approach being used, being motivated to participate, having appropriate privacy and physical space where required, and their technological proficiency. **[2023]**

Telehealth has the potential to decrease the burden of treatment for patients with long-term and multiple conditions. It also has the ability to introduce inequities (Eddison et al, 2022). **[2023]**

## 4.6 Self-directed therapy

Self-directed rehabilitation (or self-practice) refers to approaches for promoting independent therapeutic activity away from a clinical setting (Da-Silva et al, 2018). Self-directed rehabilitation can be considered as an option alongside other rehabilitation approaches to increase overall therapy time and dose. Personalising programmes to the individual's health beliefs, situation, preferences and needs is important for facilitating adherence to self-practice (Vadas et al, 2021). Self-directed rehabilitation is often part of a comprehensive rehabilitation approach rather than a separate entity. **[2023]**

### 4.6 Recommendations

- A People with stroke should be offered training and resources to support them to carry out appropriately targeted self-directed therapy practice in addition to their standard rehabilitation, in accordance with the individual's goals and preferences. Self directed therapy should be monitored and reviewed regularly. **[2023]**
- B People with stroke who are able to follow regimes independently or with the support of a carer should be considered for self-directed rehabilitation to increase practice in addition to standard rehabilitation; for example, patients undergoing constraint-induced movement therapy, electrical stimulation or computerised speech and language therapy. **[2023]**
- C For people undergoing rehabilitation after stroke, the use of competition (with self or others) may be considered to give people motivation to practise self-directed rehabilitation. **[2023]**

### 4.6 Sources

- A Guideline Development Group consensus
- B Da-Silva et al, 2018; Palmer et al, 2019; Working Party consensus
- C Guideline Development Group consensus

### 4.6 Evidence to recommendations

Self-directed rehabilitation is a new topic for this edition of the guideline. There is limited high quality evidence available on the particular groups of people with stroke who may benefit most from self-directed rehabilitation and the optimal timing for these interventions. It is also important that further research identifies those who may not benefit from this approach. **[2023]**

A systematic review of 40 studies evaluated the effectiveness of self-directed interventions for arm rehabilitation after stroke (Da-Silva et al, 2018). Self-directed interventions using constraint-induced movement therapy and electrical stimulation were found to have a beneficial effect on arm function, although studies had a risk of bias and used different types of stimulation, dose, timing and outcome measures. Constraint-induced movement therapy and therapy programmes which increase practice without using additional technology improved independence in activities of daily living assessed on a self-perceived outcome measure. **[2023]**

Results of a proof-of-concept study (Studer et al, 2016) suggest that experimental or perceived competition may be beneficial in enhancing self-directed cognitive training but more robust evidence is required to guide practice. **[2023]**

## Activity and participation

### 4.7 Introduction

This section covers difficulties that can occur after stroke affecting personal, domestic and extended activities of daily living (e.g. work and driving), and recommendations to help the person with stroke to engage in independent living and social participation. These activities can be affected by a range of difficulties (e.g. cognition ([Sections 4.28 Psychological effects of stroke – general](#), [4.29 Cognitive screening](#), [4.30 Cognitive assessment](#)), [Section 4.18 Arm function](#), [Section 4.25 Fatigue](#) and the guideline user should refer to all relevant sections. **[2016]**

### 4.8 Independence in daily living

Personal activities of daily living (PADL) refer to a range of basic activities such as washing, dressing, bathing, going to the toilet, eating and drinking; these activities usually depend on the ability to transfer and the use of at least one hand. After a stroke PADL can be difficult due to both physical and cognitive impairments. The resultant loss of function can have implications on a person's ability to live independently at home and is therefore a key part of stroke rehabilitation. **[2016]**

#### 4.8 Recommendations

- A People with stroke should be formally assessed for their safety and independence in all relevant personal activities of daily living by a clinician with the appropriate expertise, and the findings should be recorded using a standardised assessment tool. **[2016]**
- B People with limitations of personal activities of daily living after stroke should:
  - be referred to an occupational therapist with knowledge and skills in neurological rehabilitation. Assessment should include consideration of the impact of hidden deficits affecting function including neglect, executive dysfunction and visual impairments;
  - be assessed by an occupational therapist within 24 hours of admission to a stroke unit;
  - be offered treatment for identified problems (e.g. feeding, work) by the occupational therapist, in discussion with other members of the specialist multidisciplinary team. **[2023]**
- C People with stroke should be offered, as needed, specific treatments that include:
  - dressing practice for people with residual problems with dressing;
  - as many opportunities as appropriate to practise self-care as possible;
  - assessment, provision and training in the use of equipment and adaptations that increase safe independence;
  - training their family/carers in how to help them. **[2016]**

#### 4.8 Sources

- A Working Party consensus
- B Legg et al, 2006; Guideline Development Group consensus
- C Walker et al, 2011; Working Party consensus

#### 4.8 Evidence to recommendations

There is limited new research in this area since the 2012 edition of this guideline. The main evidence is summarised in a Cochrane systematic review (Legg et al, 2006) which found that people with stroke who received occupational therapy targeting PADL performed better and had a reduced risk of a poor



outcome (dependency in PADL, deterioration or death) compared to those without occupational therapy input. **[2016]**

However, there was limited information on the content of the therapy and research investigating the specific interventions that improve PADL is still required. A feasibility RCT has shown potential benefits of a systematic neuropsychological approach to dressing therapy after stroke (Walker et al, 2011) but more robust evidence is required to guide practice. A recent Cochrane review (Elsner et al, 2016) found low to moderate quality evidence that transcranial direct current stimulation (tDCS) was effective in eliciting short-term improvements in ADL, but it is unclear whether these effects are lasting and benefits were not seen in an analysis confined to high quality RCTs. There are ongoing trials of tDCS which may improve the quality of the evidence. Informal carers often provide support with PADL but, as described elsewhere ([Section 2.16 Carers](#)), how and when to train informal carers remains unclear despite a large RCT (Forster et al, 2012). **[2016]**

## 4.9 Hydration and nutrition

This section should be considered in conjunction with [Section 4.26 Swallowing](#). **[2023]**

Dehydration and malnutrition are common in hospital inpatients with stroke and associated with poor outcomes (Foley et al, 2008; Rowat et al, 2012). Malnutrition is associated with increased mortality and complications, as well as poorer functional and clinical outcomes (Davalos et al, 1996; Yoo et al, 2008). Up to one quarter of patients become more malnourished in the first weeks following stroke, and the risk of malnutrition increases with increasing hospital stay (Davalos et al, 1996; Yoo et al, 2008). **[2016]**

Poor nutritional intake, weight loss, and feeding and swallowing problems can persist for many months (Finestone et al, 2002; Perry, 2004; Jonsson et al, 2008). Multiple factors may contribute to a high risk of dehydration and malnutrition after stroke including physical, social and psychological issues. These include swallowing problems ([Section 4.26 Swallowing](#)), reduced ability to self-feed, cognitive impairment ([Section 4.28 Psychological effects of stroke - general](#)), anxiety or depression ([Section 4.39 Anxiety, depression and psychological distress](#)), fatigue ([Section 4.25 Fatigue](#)), and unfamiliar foods. **[2016]**

The assessment of dehydration is complex, and when used in isolation many common assessment methods are inaccurate (Hooper et al, 2015). Structured screening tools for malnutrition (e.g. the Malnutrition Universal Screening Tool [MUST]) have been validated in stroke (Gomes et al, 2016). **[2016]**

All measures considered should be in line with the Restraint Reduction Network training standards (Ridley & Leitch, 2021) and the relevant mental capacity legislation. **[2023]**

### 4.9 Recommendations

- A Patients with acute stroke should have their hydration assessed using a standardised approach within four hours of arrival at hospital, and should be reviewed regularly and managed so that hydration is maintained. **[2023]**
- B Patients with acute stroke should be screened for the risk of malnutrition on admission and at least weekly thereafter. Screening should be conducted by trained staff using a structured, standardised, validated tool. **[2023]**
- C Patients with acute stroke who are at low risk of malnutrition on admission, and are able to meet their nutritional needs orally, should not routinely receive oral nutritional supplements. **[2023]**
- D Patients with acute stroke who are at risk of malnutrition or who require tube feeding or

- dietary modification should be referred to a dietitian for specialist nutritional assessment, advice and monitoring. **[2023]**
- E Patients with stroke who are at risk of malnutrition should be offered nutritional support. This may include oral nutritional supplements, specialist dietary advice and/or tube feeding in accordance with their expressed wishes or, if the patient lacks mental capacity, in their best interests. **[2023]**
- F Patients with stroke who are unable to maintain adequate nutrition and hydration orally should be:
- referred to a dietitian for specialist nutritional assessment, advice and monitoring;
  - be assessed for nasogastric tube feeding within 24 hours of admission;
  - assessed for a nasal bridge if the nasogastric tube needs frequent replacement, using locally agreed protocols;
  - assessed for gastrostomy feeding if they are unable to tolerate a nasogastric tube with nasal bridge. **[2023]**
- G People with stroke who require food or fluid of a modified consistency should:
- be referred to a dietitian for specialist nutritional assessment, advice and monitoring;
  - have the texture of modified food or fluids prescribed using internationally agreed descriptors;
  - be referred to a pharmacist to review the formulation and administration of medication. **[2023]**
- H People with stroke should be considered for gastrostomy feeding if they:
- need but are unable to tolerate nasogastric tube feeding, including a trial with a nasal bridge if appropriate and other measures such as taping the tube or increased supervision;
  - are unable to swallow adequate food and fluids orally by four weeks from the onset of stroke and gastrostomy feeding is considered to be required long-term;
  - reach the point where shared decision making by the person with stroke, their family/carers, and the multidisciplinary team has agreed that artificial nutrition is appropriate due to the high long-term risk of malnutrition. **[2023]**
- I People with difficulties self-feeding after stroke should be assessed and provided with the appropriate equipment and assistance including physical help and encouragement, environmental considerations, and postural support to promote independent and safe feeding. **[2023]**
- J People with stroke discharged from stroke services with continuing problems meeting their nutritional needs should have a documented care plan to ensure their dietary intake and nutritional status are monitored at a frequency appropriate to their needs and which identifies who will be responsible for ongoing monitoring (such as district nurses or family/carers). **[2023]**
- K People with stroke receiving end-of-life (palliative) care should not have burdensome restrictions on oral food and fluid intake, if those restrictions would exacerbate suffering. **[2023]**
- L The carers and family of those with a gastrostomy tube should receive training, equipment and ongoing support from a specialist team, e.g. a home enteral feeding team. **[2023]**

#### **4.9 Sources**

- A, B Guideline Development Group consensus  
C, D NICE, 2017b, 2022e; Geeganage et al, 2012



- E Geeganage et al, 2012; Guideline Development Group consensus
- F NICE, 2023b; Beavan et al, 2010; Guideline Development Group consensus
- G British Dietetic Association, 2009; Carnaby et al, 2006; National Patient Safety Agency et al, 2011
- H Dennis et al, 2005; NICE, 2017b
- I Guideline Development Group consensus
- J NICE, 2017b
- K Royal College of Physicians, 2021 Royal College of Speech and Language Therapists, 2021; Guideline Development Group consensus
- L Guideline Development Group consensus

#### 4.9 Evidence to recommendations

There is little RCT evidence to guide the management of hydration in people with acute stroke. A Cochrane review by Hooper et al (2015) of the signs and symptoms of impending and current dehydration in older people concluded that there is little evidence that any one symptom, sign or test, including many that clinicians customarily rely on, has any diagnostic utility for dehydration. **[2016]**

A Cochrane review (Geeganage et al, 2012) included eight trials of the effectiveness of nutritional support in people with acute and subacute stroke (less than six months) who were non-dysphagic. Although nutritional supplementation resulted in significantly reduced pressure sores, increased energy intake and increased protein intake, this did not affect length of hospital stay, dependency or mortality. Studies included people with variable baseline nutritional status, not just those who were malnourished or at risk of malnutrition. The effects of the nutritional composition of nutritional support warrants further study, including the role of leucine supplementation (Yoshimura et al, 2019). **[2023]**

Since the 2012 edition of this guideline, two Cochrane reviews have compared routes of enteral tube feeding. One reviewed 11 RCTs comparing gastrostomy versus nasogastric tubes in adults with swallowing difficulties (Gomes Jr et al, 2015), including four trials in people after stroke (Norton et al, 1996; Bath et al, 2000; Dennis et al, 2005; Hamidon et al, 2006). Although gastrostomy reduced intervention failure, there was no difference between the interventions in weight change, pneumonia or mortality. Most studies were small with considerable heterogeneity and methodological limitations. Geeganage et al (2012) reviewed five RCTs comparing gastrostomy with nasogastric tube feeding in people with acute and subacute stroke. Although gastrostomy feeding was associated with fewer feeding failures, less gastrointestinal bleeding and fewer pressure sores, there was no significant difference in length of hospital stay, dependency or mortality. **[2016]**

Beavan et al. (2010) conducted a multicentre RCT in people with stroke who required nasogastric tube feeding due to dysphagia ([Section 4.26 Swallowing](#)). In a sample of 104 people, those who had a nasogastric tube secured using a nasal bridle received a higher proportion of prescribed feed and fluid compared to the control group who had tubes secured using standard practice. Mahoney et al (2015) identified the need for training and protocols in confirming the placement and securing of nasogastric tubes. **[2016]**

There is insufficient evidence to determine the effectiveness and acceptability of hand mittens or other measures used to prevent nasogastric tube dislodgement. The impact of practical strategies and environmental modifications to support people after stroke who are at risk of malnutrition are recommended areas for future research. **[2023]**

## 4.10 Mouth care

Mouth care (also referred to as oral care) refers to the promotion and maintenance of a clean oral cavity including the teeth, gums, cheeks, tongue and palate. A clean mouth requires the removal of traces of food and debris and dental plaque. A clean mouth is pleasant for the person with stroke and maintains the health of the mouth, teeth and gums. Poor oral hygiene can lead to dental caries, periodontal gum disease, the development of ulceration, soreness, cracked lips and fungal infections, and is associated with increased bacteria in the mouth and in saliva. In people with dysphagia ([Section 4.26 Swallowing](#)) this may increase the risk of aspiration pneumonia. People with problems chewing and swallowing and soreness of the mouth report a decrease in the range of food they are able to eat. A clean and healthy mouth can prevent discomfort and help to achieve good nutrition ([Section 4.9 Hydration and nutrition](#)). Maintaining good oral hygiene can be difficult following a stroke because of cognitive impairment, dysphagia or arm weakness, and can be made worse by inadequate control of saliva and medication side effects such as xerostomia (dry mouth). Members of the multidisciplinary team should be trained to ensure provision of adequate mouth care. **[2023]**

### 4.10 Recommendations

- A People with stroke, especially those who have difficulty swallowing or who are tube fed, should have mouth care at least three times a day (particularly after mealtimes), which includes removal of food debris and excess secretions, and application of lip balm. **[2023]**
- B People with stroke, including those who have full or partial dentition and/or wear dentures and especially those who have difficulty swallowing or who are tube fed, should have mechanical removal of plaque at least twice a day by the brushing of teeth and cleaning of gums and tongue with a low foaming, fluoride-containing toothpaste. Chlorhexidine dental gel may be prescribed short term and requires regular review. A powered toothbrush should be considered. **[2023]**
- C People with stroke who have dentures should have their dentures:
  - put in during the day, using a fixative if required;
  - cleaned regularly using a denture cleansing agent or soap and water;
  - checked, and the individual referred to a dental professional if ill-fitting or replacement is required.
 Any remaining teeth should be cleaned with a toothbrush and fluoride-containing toothpaste. **[2023]**
- D Staff delivering mouth care in hospital or in a care home or domiciliary setting should receive training on mouth care, which should include:
  - assessment of oral hygiene;
  - selection and use of appropriate oral hygiene equipment and cleaning agents;
  - provision of mouth care routines;
  - awareness and recognition of swallowing difficulties. **[2023]**
- E People with stroke and their family/carers should receive information and training in mouth care and maintaining good oral hygiene before transfer of their care from hospital. This information should be clearly communicated within and across care settings, e.g. within a care plan which includes regular dental reviews. **[2023]**

### 4.10 Sources

- A Guideline Development Group consensus
- B, D Campbell et al, 2020; Guideline Development Group Consensus
- C, E Brady et al, 2006; Guideline Development Group Consensus

#### 4.10 Evidence to recommendations

A Cochrane systematic review (Campbell et al, 2020) compared the effectiveness of oral health care interventions with usual care or other treatment options. There was low quality evidence suggesting oral health care interventions can improve the cleanliness of patient's dentures. There was very low quality evidence that such interventions can improve the knowledge and attitudes of people after a stroke and healthcare providers. The review acknowledged that maintenance of oral health care after a stroke should be a priority in clinical care and research. It also noted that co-ordination of future research is required to address the wide range of outcome measures and associated measurement tools. **[2023]**

Establishing locally agreed roles and responsibilities for oral health care is regarded as important to enable the delivery of high quality oral health care, the efficacy of which should be evaluated to improve practice. A care plan for oral health, including for people with stroke in care homes, would support information sharing and emphasise the importance of oral health care. **[2023]**

### 4.11 Continence

Loss of bladder and bowel control is common in the acute phase of stroke and may persist. Incontinence of urine greatly increases the risk of skin breakdown and pressure ulceration. Incontinence of faeces is associated with more severe stroke and is more difficult to manage. Constipation is common, occurring in 55% of people within the first month of stroke, and can compound urinary and faecal incontinence. Incontinence has a detrimental effect on mood, confidence, self-image and participation in rehabilitation and is associated with carer stress. Incontinence is an area of stroke that has received little research interest, despite its substantial negative impact. It needs to be managed proactively to allow people with stroke to fully participate in their own care and recovery both in the acute phase and beyond, for example people with mental capacity ([Section 4.35 Mental capacity](#)) should be involved in decisions around the use of catheters and sheaths. **[2016]**

#### 4.11 Recommendations

- A Stroke unit staff should be trained in the use of standardised assessment and management protocols for urinary and faecal incontinence and constipation in people with stroke. **[2016]**
- B People with stroke should not have an indwelling (urethral) catheter inserted unless indicated to relieve urinary retention or when fluid balance is critical. **[2016]**
- C People with stroke who have continued loss of bladder and/or bowel control 2 weeks after onset should be reassessed to identify the cause of incontinence, and be involved in deriving a treatment plan (with their family/carers if appropriate). The treatment plan should include:
  - treatment of any identified cause of incontinence;
  - training for the person with stroke and/or their family/carers in the management of incontinence;
  - referral for specialist treatments and behavioural adaptations if the person is able to participate;
  - adequate arrangements for the continued supply of continence aids and services.**[2016]**
- D People with stroke with continued loss of urinary continence should be offered behavioural interventions and adaptations prior to considering pharmaceutical and long-term catheter options, such as:
  - timed toileting;

- prompted voiding;
  - review of caffeine intake;
  - bladder retraining;
  - pelvic floor exercises;
  - external equipment. **[2016]**
- E People with stroke with constipation should be offered:
- advice on diet, fluid intake and exercise;
  - a regulated routine of toileting;
  - a prescribed medication review to minimise use of constipating medication;
  - oral laxatives;
  - a structured bowel management programme which includes nurse-led bowel care interventions;
  - education and information for the person with stroke and their family/carers;
  - rectal laxatives if severe problems persist. **[2016]**
- F People with continued continence problems on transfer of care from hospital should receive follow-up with specialist continence services in the community. **[2016]**

#### **4.11 Sources**

- A, B Working Party consensus
- C Thomas et al, 2008; Working Party consensus
- D NICE, 2013, NICE, 2015
- E NICE, 2007; Coggrave et al, 2006; Working Party consensus
- F Working Party consensus

#### **4.11 Evidence to recommendations**

A 2013 review of bowel management strategies (Lim & Childs, 2013) identified three small studies of varying quality, and concluded that the evidence was limited but a structured nurse-led approach may be effective. In a review of therapeutic education for people with stroke, Daviet et al (2012) concluded from small non-randomised studies that a nurse-targeted education programme may improve longer-term continence. A small RCT by Moon et al (2012) provided no evidence for bladder reconditioning with intermittent clamping. A small study by Guo et al (2014) examined the use of transcutaneous electrical nerve stimulation for the treatment of urinary incontinence over six months and found an improvement in nocturia, urgency and frequency. Thomas et al (2015) demonstrated the feasibility of a systematic voiding programme for urinary incontinence in a cluster RCT and proposed a definitive trial. Recommendations are therefore largely based on NICE guidance and Working Party consensus. **[2016]**

### **4.12 Extended activities of daily living**

Extended activities of daily living (EADL) encompass both domestic and community activities such as shopping, cooking and housework that allow complete or virtually complete independence. These activities also enable community and social participation. See [Section 4.14 Driving](#), and [Section 4.15 Return to work](#). **[2016]**

#### **4.12 Recommendations**

- A People whose activities have been limited by stroke should be:
- assessed by an occupational therapist with expertise in neurological disability;
  - trained in how to achieve activities safely and given as many opportunities to practise

as reasonable under supervision, provided that the activities are potentially achievable;

- provided with and trained in how to use any adaptations or equipment needed to perform activities safely. **[2016]**

**B** People with stroke who cannot undertake a necessary activity safely should be offered alternative means of achieving the goal to ensure safety and well-being. **[2016]**

#### **4.12 Sources**

**A** Legg et al, 2004

**B** Working Party consensus

#### **4.12 Evidence to recommendations**

New evidence in this area is problematic and has not changed the recommendations since a systematic review (Legg et al, 2004) found that therapy improved EADL. Although several studies have included EADL as a secondary outcome, the interventions did not plausibly target EADL. For example, a systematic review of transcranial direct current stimulation found only limited evidence of any effect on EADL (Elsner et al, 2016). The Working Party excluded for methodological reasons one small, non-randomised trial of community-dwelling people with stroke which substituted a portion of physiotherapy time with virtual reality games (Singh et al, 2013). **[2016]**

One large multi-centre RCT included people with stroke who wanted to get out of the house more often. It compared an intervention to increase outdoor mobility (e.g. exercise, activities and confidence-building, provided by a therapist over an average of seven sessions) with a single session of personalised advice and leaflets on transport and mobility (Logan et al, 2014). This increased the number of journeys made and had a lasting effect, but practical limitations in collecting the data on the number of journeys may have limited the reliability of the outcome measure. The intervention did not affect the primary (quality of life) or any other outcome, and was not cost-effective. More appropriate and reliable outcome measures are needed in future trials. **[2016]**

### **4.13 Sex**

The physical and psychological impact of stroke can affect role identity and relationships with sexual partners, and sexual dysfunction can amplify these problems. Sexual dysfunction is common after stroke, affecting both the person with stroke and their partner (Korpelainen et al, 1999; Thompson & Ryan, 2009; Rosenbaum et al, 2014). It is typically multifactorial including other vascular disease, altered sensation, limited mobility, the effects of medication, mood changes and fear of precipitating further strokes. Regaining intimacy with partners can have a positive effect on self-esteem and quality of life and help to strengthen relationships. Discussion of sex and sexual dysfunction after stroke can be overlooked - healthcare professionals are often reluctant to raise the issue, and people with stroke are unlikely to raise the subject without encouragement (Rosenbaum et al, 2014). **[2016]**

#### **4.13 Recommendations**

**A** People with stroke should be asked, soon after discharge and at their 6-month and annual reviews, whether they have any concerns about sex. Partners should also have an opportunity to raise any problems. **[2016]**

**B** People with sexual dysfunction after stroke who want further help should be:

- assessed for treatable causes including a medication review;
- reassured that sexual activity is not contraindicated after stroke and is extremely

- unlikely to precipitate a further stroke;
- assessed for erectile dysfunction and the use of a phosphodiesterase type 5 inhibitor (e.g. sildenafil);
- advised against the use of a phosphodiesterase type 5 inhibitor for 3 months after stroke and/or until blood pressure is controlled;
- referred to a professional with expertise in psychosexual problems if sexual dysfunction persists. **[2016]**

#### **4.13 Sources**

- A Thompson and Ryan, 2009; Schmitz and Finkelstein, 2010; Rosenbaum et al, 2014; Working Party consensus
- B Cheitlin et al, 1999; Melnik et al, 2007; Lorberboym et al, et al, 2010; Song et al, 2007

#### **4.13 Evidence to recommendations**

The Working Party found no new evidence that could inform a recommendation. A narrative literature review (Rosenbaum et al, 2014) identified the need for staff training and a structured approach to assessment. There is little evidence of the risks and benefits of phosphodiesterase type 5 inhibitors after stroke (e.g. sildenafil), as people within 6 months of stroke or with ischaemic heart disease were excluded from the original trials. There is no reason to suspect that people are at increased risk of side effects after stroke but the consensus of the Working Party is to wait for 3 months after stroke before prescribing sildenafil, once blood pressure is controlled. **[2016]**

### **4.14 Driving**

Being able to drive is important to people with stroke for practical reasons and because it influences self-esteem and mood. However, there are potential risks associated with driving after stroke. Healthcare professionals therefore need to discuss and give advice on fitness to drive. The current UK regulations regarding driving are available online at <https://www.gov.uk/guidance/general-information-assessing-fitness-to-drive> and for the Republic of Ireland at [https://www.ndls.ie/images/PDF\\_Documents/Slainte\\_agus\\_Tiomaint\\_Medical\\_Fitness\\_to\\_Drive\\_Guidelines.pdf](https://www.ndls.ie/images/PDF_Documents/Slainte_agus_Tiomaint_Medical_Fitness_to_Drive_Guidelines.pdf). **[2016]**

#### **4.14 Recommendations**

- A People who have had an acute stroke or TIA should be asked about driving before they leave the hospital or specialist outpatient clinic. **[2016]**
- B People with stroke who wish to drive should:
  - be advised of the exclusion period from driving and their responsibility to notify the DVLA, DVA or NDLS if they have any persisting disability which may affect their eligibility;
  - be asked about or examined for any absolute bars to driving e.g. epileptic seizure (excluding seizure within 24 hours of stroke onset), significant visual field defects, reduced visual acuity or double vision;
  - be offered an assessment of the impairments that may affect their eligibility, including their cognitive, visual and physical abilities;
  - receive a written record of the findings and conclusions, copied to their general practitioner. **[2016]**
- C People with persisting cognitive, language or motor disability after stroke who wish to return to driving should be referred for on-road screening and evaluation. **[2016]**



- D People who wish to drive after a stroke should be informed about eligibility for disabled concessions (e.g. Motability, the Blue Badge scheme). **[2016]**

#### **4.14 Sources**

- A, B Working Party consensus  
C Devos et al, 2011; Working Party consensus  
D Working Party consensus

#### **4.14 Evidence to recommendations**

A Cochrane review of four small trials of interventions to improve on-road driving skills after stroke concluded there was insufficient evidence to guide practice (George et al, 2014). No trials evaluated on-road driving lessons, and one study investigated simulator training. This showed promise but is not sufficient to recommend routine use in rehabilitation after stroke. **[2016]**

Observational studies of the predictive value of neuropsychological tests and screening tools for on-road driving performance suggest several that may support decision making when referring people with stroke for on-road driving tests (Korner-Bitensky et al, 2011; Aslaksen et al, 2013; Devos et al, 2014). A systematic review suggested that the Road Sign Recognition and Compass subtests of the Stroke Drivers Screening Assessment, together with Trail Making Test B, may be indicators of those at risk of failing an on-road assessment (Devos et al, 2011). Many cognitive tests are not valid for people with aphasia ([Section 4.43 Aphasia](#)) for whom on-road assessment may be needed. Studies investigating fitness to drive often exclude people with visual impairments and therefore clinicians should ensure that they assess all relevant impairments including vision ([Section 4.48 Vision](#)) and cognition ([Sections 4.28 Psychological effects of stroke – general](#), [4.29 Cognitive screening](#), [4.30 Cognitive assessment](#)). **[2016]**

### **4.15 Return to work**

Returning to work is an important goal for many people after a stroke, and people should be asked about their work at the earliest opportunity to enable staff to better understand their role in society. ‘Work’ comprises different forms of occupation, including paid employment, vocational training, sheltered, therapeutic or voluntary work, and adult education (Tyerman, 2012). The UN Convention on the Rights of Persons with Disabilities (United Nations, 2022) discusses the importance of work and education and recreation in equal measure. Specifically, Article 27 identifies “the right of persons with disabilities to work, on an equal basis with others”. The average rate of return to work after stroke is 56% at 1 year (Duong et al, 2019). Not being in work after stroke is associated with health risks (Waddell & Aylward, 2005) reduced quality of life and poorer psychosocial outcomes (Busch et al, 2009; Robison et al, 2009). Benefits of returning to work include improvements in quality of life (Matérne et al, 2018), better perceived general health, reduced pain and depression, and higher perceived participation and autonomy compared to those not returning to work (Westerlind et al, 2020). **[2023]**

Returning to work is often complex and depends on a range of interacting factors and the engagement of different stakeholders (Schwarz et al, 2018). Barriers and facilitators after stroke include personal factors, workplace factors and factors related to rehabilitation services (Brannigan et al, 2017; Schwarz et al, 2018). Given the complexity of returning to work after stroke, many people require co-ordinated action involving trained staff with the required competencies and knowledge of the relevant legislation (Scott & Bondoc, 2018), involving all stakeholders. **[2023]**

Vocational rehabilitation (VR) is summarised as “a co-ordinated plan supported by all those working with the employee to optimise their work capability” (British Society of Rehabilitation Medicine, 2021). VR is a neglected area within statutory health services, and returning to work remains a largely unmet

need (BSRM, 2021). The BSRM (2021) and the National Stroke Service Model for England (2021) outline three levels of VR services, ranging from routine guidance to specialist VR for people with complex problems. VR services need to be aware of recommendations based on the experiences of people who have had a stroke, their colleagues and managers (Hellman et al, 2016; Brannigan et al, 2017; Öst Nilsson et al, 2017; Öst Nilsson et al, 2020). **[2023]**

#### **4.15 Recommendations**

- A People with stroke should be asked about their work at the earliest opportunity, irrespective of whether they plan to return. This will enable staff to have a better understanding of their role before having a stroke, and offer the person an opportunity to discuss their thoughts and feelings. **[2023]**
- B People who need or wish to return to any type of work after stroke should:
  - be provided with information regarding rights, financial support and vocational rehabilitation. This should include information regarding driving, where appropriate (e.g. in the work role or travelling to work);
  - be supported to understand the consequences of their stroke in relation to work;
  - be supported by an appropriate professional with an understanding of the person's work-related needs to discuss with their employer their return to work, at a time that is appropriate, taking account of their job role and the support available. Timing should be mutually agreed between the person with stroke, the employer and the professional delivering vocational rehabilitation. This should include human resources where appropriate;
  - be supported to identify their work requirements with their employer, with input from occupational health, where available;
  - be assessed on relevant work-related skills and competencies to establish their potential for return;
  - participate in discussions and decision making regarding the most suitable time and way to return to work, including the nature and amount of work;
  - be referred to statutory employment support (e.g. Jobcentre Plus, Intreo) or vocational rehabilitation (VR), as appropriate to their needs. VR may be provided by publicly funded organisations (such as the NHS), the independent sector (including services funded through the UK's Department for Work and Pensions such as Access to Work) or the voluntary sector (including support from stroke key workers);
  - signposted if required to seek advice from their employer's human resources department (or equivalent), trade union and/or seek specific legal advice. **[2023]**
- C Services supporting people with stroke to return to work should ensure that:
  - there is a co-ordinator (or co-ordinating team or joint cross-agency working) responsible for liaison and support with planning and negotiating return to work with all those involved (including co-workers and managers, where applicable) and who ensures all involved are aware of their roles, responsibilities, and relevant legislation;
  - employers are provided with information and education regarding the individual needs of the person following stroke such as communication needs or fatigue;
  - workplaces offer flexibility (e.g. workplace accommodation) to enable people with stroke to adapt their return to work, in line with the requirements of the Equality Act (2010) in the UK and Employment Equality Acts (1998-2015) in Ireland. **[2023]**
- D Vocational rehabilitation programmes for people returning to work after stroke should include:



- assessment of potential barriers and facilitators to returning to work, based on the work role and demands from both the employee's and employer's perspectives;
- an action plan for how barriers may be overcome;
- interventions as required by the individual, which may include vocational counselling and coaching, emotional support, adaptation of the working environment, strategies to compensate for functional limitations (e.g. communication, cognition, mobility and arm function), and fatigue management;
- collaboration between the person with stroke, their employer and healthcare professional in planning, facilitating and monitoring their return to work. **[2023]**

E Healthcare professionals who work with people following stroke should have knowledge and skills about supporting them to return to work, appropriate to the nature and level of service they provide. **[2023]**

F Authorised healthcare professionals should provide a statement of fitness to work (e.g. 'fit note') to support people to return to work, including recommended alterations to work patterns, tasks undertaken or environment. **[2023]**

#### **4.15 Sources**

- A Guideline Development Group consensus
- B Ntsiea et al, 2015, Guideline Development Group consensus
- C Öst Nilsson et al, 2017, 2020; Guideline Development Group consensus
- D Guideline Development Group consensus
- E Scott and Bondoc, 2018; Guideline Development Group consensus
- F Guideline Development Group consensus

#### **4.15 Evidence to recommendations**

There is a paucity of evidence to inform recommendations on returning to work after a stroke. In countries where usual care includes a statutory programme of vocational rehabilitation (VR), it may not be possible to conduct RCTs where the control group is denied VR. An RCT by Ntsiea (2015) involving 80 participants (N=40 each in the intervention and control group) reported benefits from a workplace intervention versus usual care in improving return to work rates after stroke (60% versus 20%, odds ratio (OR) 5.2, 95% CI 1.8 to 15.0 at 6 months). The 6-week person-centred intervention included a multiprofessional, multiphase intervention involving collaboration between the person with stroke, healthcare professionals and their employer. Participants were mainly better-educated, in higher paid jobs, and were independent in ADL after their stroke. The intervention was based in each person's workplace. This was a small study, undertaken in South Africa, where policies, employment circumstances and services for people with stroke will differ from those in the UK and Ireland. **[2023]**

Key factors for a successful return to work include having an understanding of the consequences of stroke, clear communication and active participation in planning the process (Öst Nilsson et al, 2017). This study also identified the important role of a co-ordinator, acting as a liaison by providing information and support for planning and negotiating return to work. Continuing communication and support were considered important, as well as flexibility to ensure work can be adapted to the individual (Öst Nilsson et al, 2017). **[2023]**

In addition to the person with stroke, successfully returning to work may also require consideration of their colleagues. Returning to work is likely to be stressful, as relationships need to be re-established and increased responsibility and workload for colleagues need to be managed (Öst Nilsson et al, 2020). This study identified the need for co-ordination to ensure the person with stroke, their co-workers and

managers are aware of roles, responsibilities, and relevant legislation, along with commitment and support from the employer (Öst Nilsson et al, 2020). [2023]

A RCT is underway in the UK (RETAKE, ISRCTN12464275) which will help identify the key ingredients of effective VR and guide the future model of clinical delivery. [2023]

## Motor recovery and physical effects of stroke

### 4.16 Introduction

This section focuses on the physical effects of stroke which are common in the majority of people following stroke, and often lead to activity limitations. This section reviews the evidence associated with the various physical effects of stroke with a particular focus on intensive rehabilitation approaches to promote motor recovery. [2023]

Various therapeutic options may be appropriate for a person during their rehabilitation after a stroke. It is important that interventions are selected in collaboration with the person, considering their goals, preferences and other impairments. Whatever the intervention chosen, it must be delivered at the appropriate intensity and dose to achieve optimal outcomes, and at the right point in the person's recovery. Multidisciplinary planning and collaboration are essential in the delivery of rehabilitation programmes, and all interventions should be regularly monitored and evaluated using appropriate outcome measures to guide ongoing rehabilitation plans. Exercise should be commenced early after stroke (see [Section 3.12 Early mobilisation](#)) and to a level appropriate to the medical status of the individual. [2023]

### 4.17 Motor Impairment

#### Muscle Weakness

Weakness of the limbs and face are amongst the most common impairments after stroke, giving rise to a hemiplegia. Weakness is the strongest factor influencing dexterity and upper limb function, activities of daily living, balance and walking (Jørgensen et al, 1995; Tyson et al, 2006b; Harris & Eng, 2007; Veerbeek et al, 2011; Preston et al, 2021). This is reflected in tools to predict recovery of upper limb function and walking after stroke, in which the degree of weakness is the main predictive factor (Smith et al, 2017; Stinear et al, 2017b; Selles et al, 2021). Weakness should therefore be the main focus of treatment to improve movement and subsequently physical function and activity. [2023]

Weakness is defined as an inability to generate muscle forces. It is caused by loss of facilitatory drive to anterior horn motor neurones from higher centres, primarily the motor cortex via the corticospinal tract. This primary impairment is exacerbated by further weakness and stiffness secondary to inactivity and disuse (Gracies, 2005; Kamper et al, 2006; Gray et al, 2007; Hoffmann et al, 2016). Limited force generation is seen in all types of muscle contraction (isometric, concentric and eccentric), speed of contractions (power), sustained and repeated contractions (endurance) and integration within and between muscle groups (co-ordination; Kristensen et al, 2017). In most cases, the degree of weakness is similar between the upper and lower limbs, and in all muscle groups within a limb. The degree of weakness is mainly determined by stroke severity, location and pre-morbid strength; age, sex and side or type of stroke are not factors (Tyson et al, 2006a). Strengthening interventions increase strength, improve activity, and do not increase spasticity (Ada et al, 2006); however, selection of appropriate exercises for an individual is important. [2023]

#### Cardiorespiratory fitness

Cardiorespiratory or aerobic fitness is defined as the ability to transport and use oxygen (Saunders et al, 2020), which confers some degree of endurance. Many people with stroke have low cardiorespiratory fitness pre-morbidly (Kurl et al, 2003) which is exacerbated by the increased energy costs of moving, and by inactivity after stroke (Ivey et al, 2005; Smith et al, 2012; Tieges et al, 2015; Kramer et al, 2016). Low cardiorespiratory fitness is seen in all stages of recovery and can make it difficult for people with stroke to engage in rehabilitation and maintain basic mobility and daily activities (Kunkel et al, 2015). In turn, this feeds into further inactivity, limits participation and increases the risk of recurrent stroke (Mayo et al, 1999; Billinger et al, 2015) making cardiorespiratory fitness an important target for rehabilitation to both maximise recovery and to reduce the risk of recurrence. **[2023]**

The principal approach to treat both weakness and cardiorespiratory fitness after a stroke is exercise, which is defined as “physical activity that is planned, structured and repetitive to condition any part of the body” (Saunders et al, 2020). There is overlap between exercise and repetitive task practice (where functional tasks or activities are practised intensively) and physical activity in which exercise is often set in a recreational context. These terms are sometimes used interchangeably. There are many different ways of exercising, often classified as:

- cardiorespiratory training - generally walking (often on a treadmill) or cycling (stationary or recumbent) at sufficient intensity to produce a cardiorespiratory training effect;
- resistance or strength training using body weight or equipment to resist muscle contractions with a primary aim of improving muscle strength, power and endurance;
- mixed training – a combination of cardiorespiratory and resistance training e.g. circuit training classes. **[2023]**

Treadmills with and without bodyweight support (including underwater and robot-assisted treadmills) and other equipment (such as arm ergometers, seated steppers and static bicycles) are all ways of delivering aerobic and strength training and have been recommended as training methods. Exercise in any form can be delivered individually or in groups, supervised, semi-supervised or independently in health-related or community venues (Mahmood et al, 2022a; Mahmood et al, 2022b). People with stroke report that they value exercise activity and are willing to exercise intensively, even early after stroke. As well as the physical benefits, exercise helps to build confidence, reduce boredom and fosters autonomy. Many also appreciate the camaraderie and peer support experienced in group exercise, preferably in non-healthcare community settings. However, patients also often lack confidence and the self-efficacy to exercise, needing information and the support of professionals and family to overcome the difficulties caused by the stroke and other health conditions (Luker et al, 2015; Poltawski et al, 2015; Young et al, 2021). Health care professionals also face barriers to implementing exercise after stroke. Many feel they lack the knowledge and skills to prescribe exercise effectively, are concerned about safety and have misconceptions about the capabilities and motivation of people with stroke. Lack of resources in terms of staffing, resources, knowledge and training are also an issue (Gaskins et al, 2021; Moncion et al, 2022). **[2023]**

#### **4.17 Recommendations**

- A People with stroke should be assessed for weakness and cardiovascular fitness using a standardised approach, and have the impairment explained to them and their family/carers. Assessment and outcome measures used should encompass the range of effects of exercise including weakness, cardiovascular fitness and activities. **[2023]**
- B People with weakness after stroke sufficient to limit their activities should be assessed within 24 hours of admission by a therapist with knowledge and skills in neurological rehabilitation. **[2023]**
- C Clinicians should screen for, prescribe and monitor exercise programmes for people with stroke, e.g. using a 6 minute walk test or shuttle test. Programmes should be

individualised to the person's goals and preferences. Screening equipment (such as treadmills, ECG and blood pressure monitors) should be available, and clinicians should liaise with other services that offer exercise-based rehabilitation (e.g. cardiac or pulmonary rehabilitation) with regard to integrating screening and exercise resources.

**[2023]**

- D People with weakness after stroke should be taught task-specific, repetitive, intensive exercises or activities to increase their strength. Exercise and repetitive task practice should be the principal rehabilitation approaches, in preference to other therapy approaches including Bobath. **[2023]**
- E People with stroke should be offered cardiorespiratory training or mixed training once they are medically stable, regardless of age, time since stroke and severity of impairment.
  - Facilities and equipment to support high-intensity (greater than 70% peak heart rate) cardiorespiratory fitness training (such as bodyweight support treadmills and/or static/recumbent cycles) should be available;
  - The dose of training should be at least 30-40 minutes, 3 to 5 times a week for 10-20 weeks;
  - Programmes of mixed training (medium intensity cardiorespiratory [40%-60% of heart rate reserve] and strength training [50-70% of one-repetition maximum]) such as circuit training classes should also be available at least 3 days per week for 20 weeks;
  - Exercise aimed at increasing heart rate should be used for those with more severe weakness, such as using arm cycles or seated exercise groups;
  - The choice of programme should be guided by patients' goals and preferences and delivery of the programme individualised to their level of impairment and goals.

**[2023]**
- F People with respiratory impairment and at risk of pneumonia after stroke should be considered for respiratory muscle training using a threshold resistance trainer or flow-oriented resistance trainer.
  - Training should be carried out for at least 20 minutes per day, 3 days per week for 3 weeks;
  - The relevant clinicians (nurses, speech and language therapists, physiotherapists and support staff) should be trained in how to use the training equipment. **[2023]**
- G People with stroke who are unable to exercise against gravity independently should be considered for adjuncts to exercise (such as neuromuscular or functional electrical stimulation), to support participation in exercise training. **[2023]**
- H People with stroke should be supported with measures to maximise exercise adherence such as:
  - measures to build confidence and self-efficacy (such as the use of social networking apps or physical activity platforms);
  - ensuring patients and family/carers know the benefits of exercise and why they are doing it, including how the exercises given relate to their individual needs;
  - incorporation of exercise into documented goal setting;
  - individualisation of exercise programme to suit their abilities and goals;
  - use of technology (e.g. apps, videos, phone check-ins);
  - ongoing coaching to support written exercise instructions;
  - the involvement of family and carers with exercise. **[2023]**
- I Clinicians should not use risk assessment protocols that limit training for fear of cardiovascular or other adverse events except where screening has identified intensive

exercise is contraindicated for an individual. **[2023]**

#### **4.17 Sources**

- A, B Guideline Development Group consensus
- C MacKay-Lyons et al, 2020
- D Pollock et al, 2014a, c; Veerbeek et al, 2014b; Scrivener et al, 2020; Dorsch et al, 2020, 2023
- E Guideline Development Group consensus
- F Zheng et al, 2020; Zhang et al, 2022; Guideline Development Group consensus
- G MacKay-Lyons et al, 2020; Guideline Development Group consensus
- H Miller et al, 2017; Gunnes et al, 2019; García-Cabo and López-Cancio, 2020; Mahmood et al, 2022; Guideline Development Group consensus
- I Guideline Development Group consensus

#### **4.17 Evidence to recommendations**

Seven high quality systematic reviews including one Cochrane review that assessed the effect of exercise on motor impairments (weakness and/or cardio-respiratory fitness) (Lloyd et al, 2018; Lee & Stone, 2020; Luo et al, 2020; MacKay-Lyons et al, 2020; Saunders et al, 2020; Anjos et al, 2022; Machado et al, 2022). These reviews provided a moderate to high level of evidence that all types of exercise are safe and feasible for all stages of stroke recovery in people with all severities of stroke, even those with severe impairments who are unable to walk (English et al, 2017; Lloyd et al, 2018; Luo et al, 2020; MacKay-Lyons et al, 2020; Pogrebnoy & Dennett, 2020; Saunders et al, 2020; Anjos et al, 2022). A high quality review (albeit with a small number of trials) indicated improvements in cardiorespiratory fitness can be maintained over six months after training (Machado et al, 2022). Exercise did not negatively affect spasticity, muscle tone, quality of movement, pain, falls, fatigue, or cardiac events (Ada et al, 2006; Kuys et al, 2011; Mead et al, 2012; Billinger et al, 2014). However, it should be noted that safety was rarely a focus in the selected trials and safety reporting often lacked detail. One high quality trial of aerobic training in people with subacute stroke that specifically completed a safety assessment as a planned secondary analysis (Rackoll et al, 2022) reported a higher incidence of serious adverse events in the aerobic training group than the control group. However, these were not, or were highly unlikely to be, related to the training. Regression analyses indicated that risk was greater in people with diabetes or atrial fibrillation, unmodified by age or stroke severity. The trial was not powered for this analysis so any interpretation needs to be treated with caution. However, it does highlight that more research is needed to fully understand the safety aspects of aerobic training, particularly in those with stroke-related co-morbidities. **[2023]**

Cardiorespiratory training, especially when involving walking, appears to be the most effective (with a moderate effect size) for cardiorespiratory fitness, and walking and balance. Mixed training has a slightly lesser effect. Resistance training is most effective in improving muscle strength and endurance (Saunders et al, 2020). The type of exercise prescribed depends, therefore, on the patient's treatment goals. However, cardiorespiratory training involving walking has the greatest overall benefit, which can persist into the long term (Saunders et al, 2020). **[2023]**

Although the optimal way to deliver exercise after stroke is still not clear, there is an indication from high quality meta-analyses (albeit of a small number of trials) that treadmill gait training may be more effective than cycle ergometry (Luo et al, 2020), and that high intensity interval training (HIIT, in which periods of maximal intensity exercise are interspersed with low activity or rest) may be more effective than continuous aerobic training in terms of cardiorespiratory fitness, strength and function (Anjos et al, 2022). The optimal dose of exercise is unclear and there have been no dose-response studies of

sufficient quality to inform practice. Nonetheless, several high quality meta-analyses have made recommendations for the minimum dose of exercise needed to be effective:

- **Cardiorespiratory training:** High-intensity exercise (70-85% heart rate reserve /  $\text{VO}_2$  peak) for 30-40 minutes, 3 to 5 times a week for about 12 weeks. High-intensity exercise can also be defined as 'achieving greater than 70% peak heart rate' or 'a score of more than 14/20 on the Borg Rating of Perceived Exertion (RPE) scale' (Luo et al, 2020; Anjos et al, 2022).
- **Mixed training:** Moderate intensity aerobic training (40%-60% of heart rate reserve) plus moderate intensity resistance training (50%-70% of one-repetition maximum) 3 days per week for at least 20 weeks. Longer training sessions promote greater cardiorespiratory fitness; moderate frequency and lower volume exercise (number of repetitions) benefit muscle strength; and moderate frequency and longer duration benefit walking capacity (Lee & Stone, 2020).
- Non-ambulant individuals are able to take part in cardiorespiratory training using bodyweight-supported treadmill training (increasing the treadmill incline as well as speed to achieve the required heart rate), electromechanical gait training or static or recumbent cycle ergometry. A high quality meta-analysis found insufficient evidence to make specific recommendations but the dose of cardiorespiratory training that improved fitness and mobility was similar to that above (Lloyd et al, 2018; Shen et al, 2018; MacKay-Lyons et al, 2020). **[2023]**

A key issue when prescribing exercise is that the effects of exercise are specific to the movements or tasks trained. Two high quality systematic reviews with meta-analysis have also concluded that respiratory muscle training using a threshold resistance trainer or flow-oriented resistance trainer can reduce the risk of post-stroke respiratory complications (i.e. pneumonia RR 0.11-0.51) with a number needed to treat of 15 (Zheng et al, 2020; Zhang et al, 2022). However, the nature or extent of the respiratory impairment and proportion of participants who had dysphagia were unclear. The most effective training protocol was more than 20 minutes per day, three times per week for three weeks (Zhang et al, 2022). **[2023]**

Exercise is only effective if people do it. Although adherence to supervised exercise in a treatment setting is often good, the rates tend to fall when people are not directly supervised, whether outside therapy sessions whilst an inpatient, or when exercising at home. Clinicians need to take measures to support adherence, such as ensuring people and their family/carers know the benefits of exercise and why they are doing it, incorporating exercise into goal setting, individualising the exercise programme to suit patients' abilities and goals, using technology (e.g. apps, videos, phone check-ins), providing ongoing supervision and coaching to support written exercise instructions, and involving family and carers (Miller et al, 2017; Gunnes et al, 2019; García-Cabo & López-Cancio, 2020; Mahmood et al, 2022a). **[2023]**

## 4.18 Arm function

Approximately 70% of people experience loss of arm function after a stroke, and this persists for about 40%. This section includes interventions intended to deliver repetitive and functionally relevant practice to improve arm function. Guideline users should also refer to other relevant sections that cover the following: weakness ([Section 4.17 Motor impairment](#)), sensation ([Section 4.47 Sensation](#)), shoulder subluxation and pain ([Section 4.23.3 Shoulder subluxation and pain](#)), activities of daily living ([Section 4.8 Independence in daily living](#)). **[2023]**

Patterns of arm recovery are varied and are largely dependent on the initial degree of weakness and patency of the corticospinal tract (Stinear et al, 2017a), particularly preservation or return of finger extension and shoulder abduction. This has led to the development of tools to predict arm recovery in



clinical practice: for example the SAFE and PREP2 tools (Nijland et al, 2010; Stinear et al, 2017b) and the Viatherapy app, an app to guide evidence-based rehabilitation (Wolf et al, 2016). Prognostic tools may be useful to help identify who is most likely to benefit from intensive upper limb interventions and who requires a compensatory approach focusing on reduction of secondary complications such as shoulder subluxation, pain and spasticity. [2023]

Whilst research regarding interventions to promote motor recovery has progressed, continued focus is required to ensure these are implemented into practice. Intensity of practice of movements and tasks during therapy must be coupled with efforts to translate movements into everyday activities. Current practice in the UK indicates too few rehabilitation sessions are dedicated to the upper limb and within sessions too few repetitions are achieved (Stockley et al, 2019). A co-ordinated multidisciplinary approach should be taken to maximise upper limb rehabilitation as well as ensuring that people are supported to practise outside of therapist-delivered sessions. [2023]

Management and recovery of the hemiplegic upper limb often takes place over months or years and must be considered in the context of other impairments including sensation, sensory or visual neglect, learnt non-use, spasticity and balance. Whilst promoting motor recovery (particularly early after stroke) is of the utmost importance, enabling the person to be independent in daily life activities, such as eating and drinking, is essential, and compensatory strategies should be used where appropriate. [2023]

### **Repetitive task practice**

Recovery of the upper limb is best achieved through training that involves repetition of functional tasks and targeted exercises that follow motor learning principles. Components of functional tasks may be practised but should then be incorporated into practice of the whole functional task. Training should be supplemented with aids and equipment as necessary to enable safe, intensive and functionally relevant practice. [2023]

### **Electrical stimulation**

Electrical stimulation has been used as an adjunctive treatment for the upper limb for many years. The most common form is therapeutic or cyclical electrical stimulation (also known as neuromuscular electrical stimulation [NMES]) to the wrist and finger extensors, which stimulates the muscles to contract in order to improve weakness and reduce motor impairment. [2023]

### **Vagus nerve stimulation**

Vagus nerve stimulation (VNS) aims to enhance the effects of repetitive task training by stimulating the vagus nerve during the movement(s) being practised. It is therefore limited to use in people with mild-moderate upper limb weakness (typically, a Fugl-Meyer Upper limb Assessment score of 20-50/100). The stimulation is applied either by an implanted device directly attached to the vagus nerve, or indirectly by transcutaneous nerve stimulation over the vagus nerve in the left side of the neck or the sensory area of the nerve on the external part of the ear. The exact mechanism of action is unknown but it is associated with increased neuroplasticity (Hays et al, 2013; Engineer et al, 2019). [2023]

### **Constraint-induced movement therapy**

The original constraint-induced movement therapy (CIMT) protocol incorporates three components of rehabilitation consisting of (1) intensive graded practice of the paretic arm for 6 hours a day for 2 weeks (shaping), (2) constraining the non-paretic arm with a mitt to promote use of the weak arm for 90% of waking hours, (3) a transfer training package to learn to use the paretic arm in a real-world environment completing functional tasks (Wolf et al, 2006; Taub et al, 2013). Original protocols for CIMT were found to be effective in improving arm function for people following a subacute stroke but only when all three components were used, and 'forced use' is not effective alone (Kwakkel et al, 2015). The time resource needed for CIMT has made this approach challenging to adopt in clinical practice. [2023]

In subsequent years various protocols have been developed aiming for 3-4 hours of CIMT, core components of which are consistent with the original intervention. These are now more commonly adopted in clinical practice, delivered by a combination of qualified therapists, rehabilitation assistants and self-practice, supported remotely as appropriate. Using the paretic arm in functional daily tasks remains a key feature of all modified CIMT (mCIMT) programmes and should be aligned to individualised goals. **[2023]**

### **Mental practice**

Mental practice is a training method that involves repetitive cognitive rehearsal of physical movements in the absence of physical, voluntary attempts. From a practical perspective, mental practice constitutes a feasible alternative to other rehabilitation approaches to produce the movement because it does not require physical movement, can be performed without direct supervision, and requires minimal expense and equipment (Page & Peters, 2014). Mental practice may promote neuroplasticity, as neuroimaging studies have shown that similar overlapping brain areas are activated in mental practice and with physical movement (Di Rienzo et al., 2014). **[2023]**

### **Mirror therapy**

Mirror therapy involves performing movements of the non-affected arm, whilst watching its mirror reflection hiding the affected arm. This creates a visual illusion of enhanced movement capability of the affected arm (Yang et al, 2018). The precise mechanisms of mirror therapy are not fully understood, but it is proposed that it promotes motor function of the upper limb via activation of the primary motor cortex or mirror neurones (Garry et al, 2005; Cattaneo & Rizzolatti, 2009). **[2023]**

### **Robotics**

A robot is defined as a reprogrammable, multifunctional manipulator designed to move material, parts, or specialised devices through variable programmed motions to accomplish a task (Chang & Kim, 2013). Robot-mediated treatment uses devices to provide passive, active-assisted or resistive limb movement, and has the potential to offer extended periods of treatment and an opportunity to increase intensity through repetition. Some robots may be able to adapt treatment in response to performance. **[2023]**

## **4.18 Recommendations**

- A People with some upper limb movement at any time after stroke should be offered repetitive task practice as the principal rehabilitation approach, in preference to other therapy approaches including Bobath. Practice should be characterised by a high number of repetitions of movements that are task-specific and functional, both within and outside of therapy sessions (self-directed). Repetitive task practice:
  - may be bilateral or unilateral depending on the task and level of impairment;
  - should be employed regardless of the presence of cognitive impairment such as neglect or inattention;
  - may be enhanced by using trunk restraint and priming techniques. **[2023]**
- B People with stroke who have at least 20 degrees of active wrist extension and 10 degrees of active finger extension in the affected hand should be considered for constraint-induced movement therapy. **[2023]**
- C People with wrist and finger weakness which limits function after stroke should be considered for functional electrical stimulation applied to the wrist and finger extensors, as an adjunct to conventional therapy. Stimulation protocols should be individualised to the person's presentation and tolerance, and the person with stroke, their family/carers and clinicians in all settings should be trained in the safe application and use of electrical stimulation devices. **[2023]**
- D People with stroke without movement in the affected arm or hand (and clinicians, families



- and carers) should be trained in how to care for the limb in order to avoid complications (e.g. loss of joint range, pain). They should be monitored for any change and repetitive task practice should be offered if active movement is detected. **[2023]**
- E People with stroke may be considered for mirror therapy to improve arm function following stroke as an adjunct to usual therapy. **[2023]**
- F People with stroke who are able and motivated to participate in the mental practice of an activity should be offered training and encouraged to use it to improve arm function, as an adjunct to usual therapy. **[2023]**
- G People with arm weakness after stroke, who are able and motivated to follow regimes independently or with the support of a carer, should be considered for self-directed upper limb rehabilitation to increase practice in addition to usual therapy, e.g. patients undergoing constraint-induced movement therapy or functional electrical stimulation. **[2023]**
- H People with mild-moderate arm weakness after stroke may be considered for transcutaneous vagus nerve stimulation in addition to usual therapy. Implanted vagus nerve stimulation should only be used in the context of a clinical trial. **[2023]**
- I People with reduced arm function after a stroke may be considered for robot-assisted movement therapy to improve motor recovery of the arm as an adjunct to usual therapy, preferably in the context of a clinical trial. **[2023]**

#### **4.18 Sources**

- A Veerbeek et al, 2014b; French et al, 2016; Grattan et al, 2016; Wattchow et al, 2018; Chen et al, 2019; Zhang et al, 2021; da Silva et al, 2020
- B Kwakkel et al, 2015; Corbetta et al, 2015; Barzel et al, 2015; Yadav et al, 2016; Liu et al, 2017; Abdullahi, 2018
- C, D Guideline Development Group Consensus
- E Thieme et al, 2018; Yang et al, 2018; Zeng et al, 2018; Zhang et al, 2021
- F Page and Peters, 2014; Di Rienzo et al, 2014; Barclay et al, 2020; Stockley et al, 2021; Poveda-Garcia et al, 2021
- G Da-Silva et al, 2018; Guideline Development Group consensus
- H Dawson et al, 2021; Ahmed et al, 2022; Guideline Development Group consensus
- I Mehrholz et al, 2018; Takebayashi et al, 2020

#### **4.18 Evidence to recommendations**

##### **Repetitive task practice**

There is good quality evidence for interventions involving intensive, repetitive, task-oriented and task-specific training including constraint-induced movement therapy, mental practice, virtual reality and interactive video games (Pollock et al, 2014b). It remains unclear whether practising unilateral functional activities is more beneficial than bilateral practice, but this is likely to depend on a person's level of impairment. The evidence base for virtual reality and interactive video gaming-based interventions for the arm (as an adjunct to usual care to increase overall therapy time) is developing, though studies are often of low quality and further research is needed before recommendations can be made regarding their use. **[2023]**

The ideal dose of repetitive task practice required to be beneficial remains unclear (Lang et al, 2009; French et al, 2016b) but is likely to be substantially higher than is currently being delivered (Schneider et al, 2016; Clark et al, 2021) and in the order of several hundred repetitions per day (McCabe et al, 2015;

Daly et al, 2019; Ward et al, 2019; Hayward et al, 2021). This can lead to both short-term and sustained improvements in arm and hand function in people with both subacute and chronic stroke (French et al, 2016b; Wattchow et al, 2018) even in those with cognitive impairments such as neglect or inattention (Grattan et al, 2016). **[2023]**

Adding trunk restraint to task-oriented arm and hand training can further improve impairments and activity within the first six months after stroke by limiting compensatory movements (Zhang et al, 2022). There is some evidence that priming activities can enhance training effects, with moderate quality evidence for brain stimulation or sensory priming, and low quality evidence for motor priming to enhance improvements in impairments and activity (da Silva et al, 2020). Brain stimulation usually involves transcranial magnetic or direct current stimulation, sensory priming involves electrical or sensory stimulation and motor priming involves aerobic activity or bilateral activities (da Silva et al, 2020) but there is little information on the appropriate dose, timing or type of priming activity. **[2023]**

High quality systematic reviews and meta-analyses provide sufficient evidence to discourage routine use of Bobath therapy in place of repetitive training or practice of functional tasks (Veerbeek et al, 2014b; Wattchow et al, 2018). **[2023]**

### **Electrical stimulation**

Four good quality systematic reviews with meta-analysis have shown that electrical stimulation to the wrist and hand can improve motor impairments and function (Yang et al, 2019; Tang et al, 2021; Kristensen et al, 2022; Loh et al, 2022). Tang et al (2021) included a network meta-analysis which indicated that functional electrical stimulation to the wrist and finger extensors during practice of functional tasks was more effective at improving upper limb function than passive neuromuscular electrical stimulation, especially when used to enable repetitive task practice (Yang et al, 2019). A suggested way to do this is by coupling stimulation of the weak arm with movements of the unaffected arm (referred to as contralaterally controlled functional electrical stimulation; Loh et al, 2022). The optimal dose and stimulation protocol are still unclear so clinical decisions should be made according to an individual person's needs, goals and preferences. **[2023]**

### **Vagus nerve stimulation**

High quality evidence from systematic reviews of six RCTs of vagus nerve stimulation (VNS, n=237, (Xie et al, 2021; Zhao et al, 2021; Ahmed et al, 2022)) including a phase III trial of implanted VNS in 108 people with chronic stroke (Dawson et al, 2021), showed VNS can enhance the effect of repetitive task practice on upper limb impairment, with a moderate effect size. All trials which reported on safety found VNS to be safe. However, many factors remain unclear, such as the optimal dose and stimulation parameters, integration of stimulation with repetitive task practice and identifying those who benefit most. Further research is needed to understand these factors, and the relative merits of implanted or transcutaneous stimulation. Furthermore, the dose of repetitive task training is likely to be important; it is unlikely that VNS would be effective without a high dose of repetitive task practice, which is currently rarely achieved in practice. VNS may be considered, when it can be provided without reducing the amount of practice completed, alongside other priming techniques according to patients' presentation, goals and preferences. **[2023]**

### **Intensive upper limb programmes**

Whilst findings from single-centre studies of specialist intensive upper limb programmes for selected patients appear promising (Daly et al, 2019; Ward et al, 2019), there was insufficient high quality evidence to make general recommendations regarding provision of such programmes. Providing the evidence-based, intensive upper limb treatments contained in the recommendations in this section at a sufficient dose should remain the priority, along with delivering generalisable RCTs of intensive upper limb programmes in chronic stroke. Providers and commissioners/service planners should ensure access for all people with stroke who could benefit from rehabilitation at the intensities recommended,

including measures to ensure therapy can be replicated and maintained over the longer term at home. **[2023]**

### **Constraint-induced movement therapy**

Constraint-induced movement therapy (CIMT) includes an extended daily period of constraint of the non-paretic arm, repetitive task training for the paretic arm (shaping and task practice) and a 'transfer package' to support implementation into everyday life. Evidence suggests the transfer package is of particular importance, ensuring that motor gains translate into functional tasks and improve outcomes. Outcomes generally relate to arm function and effects are mostly confined to the trained activities (Pollock et al, 2014a; Pollock et al, 2014b; Veerbeek et al, 2014b). Challenges in clinical delivery and adherence to original CIMT protocols have resulted in modified CIMT (mCIMT) being adopted, where the time during which the non-paretic arm is constrained is reduced and the training hours spread over a longer period of time. Other mCIMT protocols have explored different methods and locations of delivery, for example home, clinic or remote delivery. Both CIMT and mCIMT improve arm function and activities of daily living in people with mild-moderate weakness (that is at least 20 degrees of active wrist extension and 10 degrees of active finger extension in the affected hand) in people with acute and subacute stroke (Corbetta et al, 2015; Kwakkel et al, 2015; Liu et al, 2016). However, mCIMT protocols vary and the optimal way to modify CIMT is unclear (Barzel et al, 2015; Yadav et al, 2016; Abdullahi, 2018). **[2023]**

Future research should aim to identify the most effective mCIMT protocols to use in clinical practice for people with different degrees of weakness and disability (e.g. the duration and frequency of constraint). Research should also consider the acceptability of CIMT and mCIMT for people with stroke and consider the support required for its use. There is emerging evidence of successful alternative ways to administer CIMT/mCIMT for example through video games or telehealth (Smith & Tomita, 2020; Taub et al, 2021; Gauthier et al, 2022) that merit further investigation. **[2023]**

### **Mental practice**

Mental practice is an adjunct to conventional therapy, which can lead to significant improvement in upper limb function in the acute, subacute and chronic phases after stroke (Barclay et al, 2020). There is some evidence that mental practice may be more effective in the first three months after stroke in people with the most severe arm weakness, but the required dose is unclear and further research is warranted (Barclay et al, 2020; Stockley et al, 2021). A small observational study has indicated that the ability to mentally visualise (i.e. imagine) movements should be assessed before prescribing mental practice (Poveda-Garcia et al, 2021). **[2023]**

### **Mirror therapy**

Systematic reviews and meta-analyses provide moderate evidence that mirror therapy can improve arm function and activities of daily living for people after a stroke (Thieme et al, 2018; Yang et al, 2018; Zeng et al, 2018; Zhang et al, 2021). **[2023]**

Mirror therapy is only effective for improving arm function as an adjunct to therapy or compared to a placebo (Thieme et al, 2018). Mirror therapy is not superior to dose-matched, conventional rehabilitation that involves upper limb action observation, movement or functional training (Lin et al, 2019). More robust research is required, and future research should focus on defining the most effective treatment protocols and the patients for whom it is most beneficial (Morkisch et al, 2019). Systematic reviews also suggest that mirror therapy may be effective in the treatment of pain and neglect, but this was not a focus of the 2023 update. **[2023]**

### **Robotics**

A Cochrane review (Mehrholtz et al, 2018) concluded that electromechanical and robot-assisted arm training resulted in a slight improvement in activities of daily living, muscle strength and arm function.

However, a variety of types of robot were used and the dose of training was under-reported making it unclear how robotics could be routinely adopted in practice. Further uncertainty comes from suggestions from other trials that the effects of robotic therapy on arm function are confined to secondary outcomes in people with subacute stroke when combined with conventional therapy (Takebayashi et al, 2022) or only if enhanced by the addition of functional electrical stimulation (Straudi et al, 2020). A further systematic review suggested robotic therapy maybe slightly superior to therapist-led training (Chen et al, 2020) while other studies indicate that including robotic therapy in a conventional therapy session could achieve similar improvements to conventional therapist-led treatment but with less staffing resource (Aprile et al, 2020; Budhota et al, 2021). Further research is needed to find ways to translate the improvements in upper limb impairment seen with robot-assisted training into meaningful benefits in upper limb function and activities of daily living (Rodgers et al, 2019). In the meantime, teams may consider or continue supplementing face-to-face therapy with robot-assisted arm training and be reassured regarding its safety, and seek opportunities for their patients to participate in research studies. Future research should include non-inferiority or equivalence trials, as it may be that equivalent clinical outcomes can be achieved using less resource. The target population should be people with severe arm weakness and less potential for spontaneous recovery (Wu et al, 2021). An economic evaluation concluded that robot-assisted therapy was not cost-effective, and also recommended further research (Fernandez-Garcia et al, 2021). **[2023]**

## 4.19 Ataxia

Ataxia occurs in around 3% of people with ischaemic strokes, principally in cases involving the cerebellum or its connections (Tohgi et al, 1993). It is characterised by four cardinal signs; gait and limb ataxia, dysarthria and nystagmus (Deluca et al., 2011). It may also occur as a consequence of severe sensory dysfunction (known as sensory ataxia). Balance problems and falls are also common, as is the presence of dysphagia. Examples of standardised measures of motor impairment include the Motricity Index and the Scale for the Assessment and Rating of Ataxia (SARA). Ataxia UK published a guideline in 2016 on management of various types of ataxia (Ataxia UK, 2016); however there is little high quality evidence in stroke populations to support specific interventions. **[2023]**

### 4.19 Recommendations

- A People with posterior circulation stroke should be assessed for ataxia using a standardised approach, and have the impairment explained to them, their family/carers and the multidisciplinary team. **[2023]**
- B People with ataxia after stroke sufficient to limit their activities should be assessed by a therapist with knowledge and skills in neurological rehabilitation. **[2023]**
- C People with ataxia after stroke should be taught task-specific, repetitive, intensive exercises or activities to increase strength and function. **[2023]**
- D People with ataxia after stroke should be considered for compensatory techniques to aid functional independence and safety, such as proximal stabilisation, and provision of equipment (small aids). **[2023]**

### 4.19 Sources

- A, B Guideline Development Group consensus
- C Pollock et al, 2014a, c; Veerbeek et al, 2014c
- D Guideline Development Group consensus

#### 4.19 Evidence to recommendations

The Scale for Assessment and Rating of Ataxia (SARA) is a standardised measures of ataxia which has been validated for stroke-related ataxia (Kim et al, 2011; Choi et al, 2018). **[2023]**

There is little research evidence specific to stroke to guide the management of ataxia. Therefore our recommendations are informed by those for the inherited ataxias and multiple sclerosis (NICE, 2022a) and a systematic review of 19 studies of ataxia included a small proportion of people with stroke (Marquer et al, 2014). These provide low quality evidence that intensive rehabilitation programmes involving balance, walking (including treadmill training) and co-ordination training, and strengthening exercises were effective. No specific recommendations about the type or dose of training could be made. Virtual reality and visual or auditory feedback may be useful adjuncts to exercise and task-specific training. **[2023]**

#### 4.20 Balance

Many people experience difficulty with balance after a stroke. This is primarily because of lower limb weakness, but limited trunk control, altered sensation, difficulties with dual tasking and perception of verticality can also be factors. Whatever its cause, impaired balance reduces confidence and increases the risk of falls ([Section 4.21 Falls and fear of falling](#)). See also [Section 4.22 Walking](#) and [Section 4.48 Vision](#). **[2023]**

##### 4.20 Recommendations

- A People with impaired balance after a stroke should receive a structured multi-factorial assessment including investigation of other causes such as medication, and issues with vision, weakness, dual tasking and the peripheral vestibular system. The assessment should include impacts on daily activities, safety and independence. Onward specialist referral for vestibular rehabilitation should be considered for those people with peripheral vestibular problems. **[2023]**
- B People with impaired balance at any level (sitting, standing, stepping, walking) at any time after stroke should receive repetitive task practice in the form of progressive balance training such as trunk control exercises, treadmill training, circuit and functional training, fitness training, and strengthening exercises. **[2023]**
- C People with impaired balance after stroke should be offered repetitive task practice and balance training as the principal rehabilitation approach, in preference to other therapy approaches including Bobath. **[2023]**
- D People with limitations of dorsiflexion or ankle instability causing balance limitations after stroke should be considered for ankle-foot orthoses and/or functional electrical stimulation. The person with stroke, their family/carers and clinicians in all settings should be trained in the safe use and application of orthoses and electrical stimulation devices. **[2023]**
- E People with limitations of their standing balance or confidence after stroke should be offered walking aids to improve their stability. **[2023]**
- F People with difficulties with sitting balance after stroke should receive an assessment of postural and seating needs. Equipment should be available and provided for patients with identified seating and postural needs regardless of setting. **[2023]**

##### 4.20 Sources

- A Guideline Development Group consensus

- B van Duijnhoven et al, 2016; Tally et al, 2017; Arienti et al, 2019; Hugues et al, 2019; Nindorera et al, 2021
- C Scrivener et al, 2020 C Scrivener et al, 2020
- D Hong et al, 2018; Nascimento et al, 2020; Johnston et al, 2021; Guideline Development Group consensus
- E, F Guideline Development Group consensus

#### **4.20 Evidence to recommendations**

Evidence from Cochrane (Pollock et al, 2014a; French et al, 2016a; English et al, 2017; Mehrholz et al, 2017; Laver et al, 2020; Saunders et al, 2020) and other good quality reviews (Veerbeek et al, 2014b; Tally et al, 2017a; Hugues et al, 2019; Van Criekeing et al, 2019; Nindorera et al, 2021) indicate that the basis of balance rehabilitation after stroke should be repetitive task practice and exercise, supplemented by aids such as ankle foot orthoses and functional electrical stimulation as necessary to enable safe intensive and functionally relevant practice and function in everyday life (Tyson & Kent, 2013; Hong et al, 2018; Johnston et al, 2021). Several methods for delivering repetitive task practice and exercise have been found to improve balance including treadmill training (Mehrholz et al, 2017; Tally et al, 2017b; Nindorera et al, 2021), circuit and functional training classes (English et al, 2017), fitness training (Saunders et al, 2020), practising functional tasks including trunk control (Veerbeek et al, 2014b; Van Criekeing et al, 2019; Moreno-Segura et al, 2022) and exercise (van Duijnhoven et al, 2016). These effects are seen at any time after stroke including the chronic stages (French et al, 2016b; Hugues et al, 2019) and included all aspects of balance (sitting, standing, stepping, standing up and sitting down). However, the optimal type of training for people with stroke at different stages and levels of ability remains unclear, but it is likely to be substantially higher than is currently delivered. For example, Nindorera et al. (2021) found at least 30 minutes of treadmill training, 3 times per week for 8 weeks was needed to have an effect, while Hugues et al. (2019) reported that in trials with a positive effect, patients received on average an additional 300 minutes of treadmill training in 12 sessions over 3 weeks. There was insufficient evidence to reach conclusions about the effect on balance of virtual reality and interactive video gaming (Laver et al, 2017). **[2023]**

A high quality systematic review and meta-analysis has shown that repetitive task practice is more effective than Bobath therapy for the recovery of lower limb activities including balance (Scrivener et al, 2020), and thus Bobath therapy (or other approaches which prioritise normal movement and tone or inhibition of reflex activity rather than maximising practice and patient activity) should not be used in preference to repetitive task training. **[2023]**

Several systematic reviews with meta-analysis (Hong et al, 2018; Johnston et al, 2021; Nascimento et al, 2021) have found strong evidence that functional electrical stimulation of dorsiflexion can improve balance. One meta-analysis (Johnston et al, 2021) found no difference in benefit between an ankle-foot orthosis or functional electrical stimulation, so either could be used depending on the person's needs, goals and preferences. An ankle-foot orthosis is less expensive than functional electrical stimulation but practical considerations such as comfort, ability to apply and remove, and ability to accommodate the device with the person's footwear and clothing need to be considered. **[2023]**

#### **4.21 Falls and fear of falling**

People with stroke are at high risk of falls at all stages in their recovery (Verheyden et al, 2013). Falls are associated with balance and mobility problems, assisted self-care, sedative or psychotropic medications, cognitive impairment, depression, history of falling (Xu et al, 2018) and circumstances involving dual



tasking and the planning and execution of tasks (Baetens et al, 2013). Falls may have serious physical and psychological consequences, including an increased risk of hip fracture (usually on the weaker side), reduced physical activity, and greater morbidity and mortality (Ramnemark et al, 2000; Pouwels et al, 2009). Support for the sensory, physical and psychological difficulties contributing to fear of falling should be available. **[2023]**

#### **4.21 Recommendations**

- A People with stroke should be offered a falls risk assessment and management as part of their stroke rehabilitation, including training for them and their family/carers in how to get up after a fall. Assessment should include physical, sensory, psychological, pharmacological and environmental factors. **[2023]**
- B People with stroke should be offered an assessment of fear of falling as part of their falls risk assessment and receive psychological support if identified. **[2016]**
- C People at high risk of falls after stroke should be offered a standardised assessment of fragility fracture risk as part of their stroke rehabilitation. **[2016]**
- D People with stroke with symptoms of vitamin D deficiency, or those who are considered to be at high risk (e.g. housebound) should be offered calcium and vitamin D supplements. **[2016]**
- E People at high risk of falls after stroke should be advised to participate in physical activity/exercise which incorporates balance and co-ordination at least twice per week. **[2016]**
- F People with stroke and limitations of dorsiflexion or ankle instability causing impaired balance and risk or fear of falling should be considered for referral to orthotics for an ankle-foot orthosis and/or functional electrical stimulation. The person with stroke, their family/carers and clinicians in all settings should be trained in the safe use and application of orthoses and electrical stimulation devices. **[2023]**

#### **4.21 Sources**

- A NICE, 2013b; Guideline Development Group consensus
- B Working Party consensus
- C, D NICE, 2017a; SIGN, 2021; Working Party consensus
- D NICE, 2019b, Working Party consensus
- E Department of Health (UK), 2019; Working Party consensus
- F Hong et al, 2018; Johnston et al, 2021; Guideline Development Group consensus

#### **4.21 Evidence to recommendations**

Several studies have tried to identify people with stroke at risk of falls using composite and single tests, but none of these tools accurately predict falls (Nystrom & Hellstrom, 2013; Breisinger et al, 2014) and nearly all people with stroke can be presumed to be at high falls risk (as high as 73% in the first year after severe stroke (Sackley et al, 2008) and their care planned accordingly (NICE, 2013a). **[2016]**

Despite evidence for the effectiveness of progressive muscle strengthening and balance training to prevent falls among community-dwelling older people, a Cochrane review (Denissen et al, 2019) found insufficient evidence that exercise interventions were effective in people with stroke. Two trials suggested reduced falls with bone protection medication (vitamin D or alendronic acid), but low statistical power means that they cannot be routinely recommended. More research is needed to evaluate interventions to reduce falls, injuries and fear of falling in people with stroke. Future studies

should evaluate multi-factorial interventions including education and adaptations, strength and balance training, bone protection and strategies that target specific stroke-related factors. **[2023]**

A clinical practice guideline has provided strong evidence that functional electrical stimulation to the dorsiflexor muscles or an ankle-foot orthosis can reduce falls and fear of falling (Johnston et al, 2021). An ankle-foot orthosis or functional electrical stimulation were equally effective, so selection should be based on the person's needs, goals and preferences. An ankle-foot orthosis is less expensive but practical considerations such as comfort, ability to apply and remove the orthosis, and the ability to accommodate the device with the person's footwear and clothing need to be considered. **[2023]**

## 4.22 Walking

Approximately half of people with stroke are unable or are limited in their ability to walk. Although most regain some mobility, few regain their previous level. Impaired speed, endurance and energy efficiency often limit activity and participation even in those who are independently mobile. Unsurprisingly, walking is a high priority for many people after a stroke and enables increased independence in functional tasks and participation. This section focuses on treatments and equipment to improve walking, the basis of which should be intensive practice of walking and exercise using aids and equipment as necessary to enable safe practice and mobility during usual activities (such as treadmills, electro-mechanical gait trainers, activity and heart rate monitors). Walking practice at a level that promotes cardiovascular training builds motor skills, strength and cardiovascular fitness which enables greater activity in everyday life. Real-world walking is an important aspect of rehabilitation and is often a goal identified by people with stroke who need to traverse uneven ground, walk dogs or manage inclines. **[2023]**

### 4.22 Recommendations

- A People with limited mobility after stroke should be assessed for, provided with and trained to use appropriate mobility aids, including a wheelchair, to enable safe independent mobility. **[2023]**
- B People with stroke, including those who use wheelchairs or have poor mobility, should be advised to participate in exercise with the aim of improving aerobic fitness and muscle strength unless there are contraindications. **[2023]**
- C People with impaired mobility after stroke should be offered repetitive task practice as the principal rehabilitation approach, in preference to other therapy approaches including Bobath. **[2023]**
- D People who cannot walk independently after stroke should be considered for electromechanical-assisted gait training including body weight support. **[2023]**
- E People with stroke who are able to walk (albeit with the assistance of other people or assistive devices) and who wish to improve their mobility at any stage after stroke should be offered access to equipment to enable intensive walking training such as treadmills or electromechanical gait trainers. To achieve this, training needs to be at 60-85% heart rate reserve (by adjustment of inclination or speed) for at least 40 minutes, three times a week for 10 weeks. **[2023]**
- F People with stroke with limited ankle/foot stability or limited dorsiflexion ('foot drop') that impedes mobility or confidence should be offered an ankle-foot orthosis (using a lightweight, flexible orthosis in the first instance) or functional electrical stimulation to improve walking and balance, including referral to orthotics if required.
  - Any orthosis or electrical stimulation device should be evaluated and individually fitted before long-term use.



- The person with stroke, their family/carers and clinicians in all settings should be trained in the safe application and use of orthoses and electrical stimulation devices.
  - People using an orthosis after stroke should be educated about the risk of pressure damage from their orthosis, especially if sensory loss is present in addition to weakness. Services should provide timely access for orthotic repairs and adaptations. **[2023]**
- G Stroke services should have local protocols and agreements in place to ensure specialist assessment, evaluation and follow-up is available for long-term functional electrical stimulation use. **[2023]**
- H People with stroke who are mobile should be assessed for real-world walking such as road crossing, walking on uneven ground, over distances and inclines. This should include assessment of the impact of dual tasking, neglect, vision and confidence in busy environments. **[2023]**
- I Stroke services should consider building links with voluntary sector and recreational fitness facilities such as gyms or leisure centres or providing equipment in outpatient departments to enable community-dwelling people with stroke to access treadmills and other relevant fitness equipment. **[2023]**
- J Clinicians should not use risk assessment protocols that limit training for fear of cardiovascular or other adverse events, given the good safety record of repetitive gait training however it is delivered. **[2023]**

#### **4.22 Sources**

- A Guideline Development Group consensus
- B Meek et al, 2003; Saunders et al, 2004; Ada et al, 2006; Pang et al, 2006; Brazzelli et al, 2011
- C Scrivener et al, 2020; Veerbeek et al, 2014b
- D Mehrholz et al, 2013, 2020
- E Mehrholz et al, 2017, 2018; French et al, 2016; Nindorera et al, 2021; Nascimento et al, 2020; Luo et al, 2020; Balinski and Madhavan, 2021; Klassen et al, 2020
- F Johnston et al, 2021; Nascimento et al, 2020; Prenton et al, 2016; Tyson et al, 2018; Guideline Development Group consensus
- G-J Guideline Development Group consensus

#### **4.22 Evidence to recommendations**

Evidence from Cochrane (Pollock et al, 2014b; French et al, 2016b; Mehrholz et al, 2017) and other high quality systematic reviews with meta-analyses and network meta-analysis (Veerbeek et al, 2014b; Prenton et al, 2016; Mehrholz et al, 2018; Luo et al, 2020; Scrivener et al, 2020; Johnston et al, 2021; Nascimento et al, 2021; Nindorera et al, 2021; Balinski & Madhavan, 2022) was considered. **[2023]**

At any time after stroke, people benefit from intensive task-specific gait training in the short and long term. For those who are already able to walk (albeit with assistance) interventions that can achieve this effect should be considered, including treadmill training with or without body weight support (Mehrholz et al, 2017), electromechanical gait training using an end-effector device (Mehrholz et al, 2018), strengthening exercises for the leg, over-ground walking with activity and heart rate monitors (Klassen et al, 2020) and circuit classes (English et al, 2017). Regardless of the intervention, treatment should be 'intensive', and involve walking at a pace to generate a cardiovascular training effect i.e. heart rate of 60-85% of heart rate reserve (Luo et al, 2020). Walking speed (and inclination if using a treadmill) should

be adjusted as necessary to achieve the required target heart rate. For more severely impaired individuals, the use of up to 40% body weight support may also be useful to enable the required training protocol to be achieved, but this should be reduced as the person progresses. **[2023]**

The evidence to date indicates that the amount of training is important, as greater amounts of training are associated with greater, more sustained improvements. Programmes which involved at least 30 training sessions within 10 weeks (i.e. three times per week) and at least 40 minutes per session appear necessary to reach a meaningful change in gait speed (of 0.1 m/s) and overall mobility (Mehrholz et al, 2017; Klassen et al, 2020; Luo et al, 2020; Nindorera et al, 2021; Balinski & Madhavan, 2022). It may be possible to achieve these training levels without using equipment if the cardiovascular training level is reached and around 4,000 steps per training session are achieved (Klassen et al, 2020). **[2023]**

It appears that treadmill training is at least as effective as over-ground training (Nascimento et al, 2021) and that training using an end-effector electro-mechanical gait trainer is more effective than treadmill training with or without bodyweight support (Mehrholz et al, 2018). **[2023]**

People who are not able to walk independently at the start of treatment do not appear to benefit from treadmill training (Mehrholz et al, 2017) but electromechanical-assisted gait training (in addition to standard physiotherapy) does enable more people to regain independent mobility, especially in the first three months after stroke (Mehrholz et al, 2020). **[2023]**

Several studies have included adverse events as an outcome and report that repetitive gait training, however delivered, is safe (French et al, 2016a; Mehrholz et al, 2017; Klassen et al, 2020; Luo et al, 2020; Mehrholz et al, 2020). **[2023]**

Intensive walking training can be supplemented by aids and equipment to enable safe walking both during treatment and in real life, including walking sticks/canes and an ankle-foot orthosis to support the hemiplegic foot and ankle. People with stroke sometimes choose to use a walking aid to help them practise walking earlier rather than waiting until they can walk without one (Tyson & Rogerson, 2009). A systematic review and meta-analysis of ankle-foot orthosis for people after stroke (Tyson & Kent, 2013) found improvements in walking activity in short-term studies. An alternative device is functional electrical stimulation, in which the peroneal nerve is stimulated electrically to produce a contraction of the ankle dorsiflexors. A foot switch is used to time the stimulation with the swing phase of gait and thus prevent foot drop. Several systematic reviews have shown strong evidence that functional electrical stimulation and ankle-foot orthoses improve mobility in terms of gait speed and endurance in both the short and long term (Prenton et al, 2016; Johnston et al, 2021; Nascimento et al, 2021) with no difference in efficacy between the devices. Thus the choice about which to use should be based on the person's goals, needs and preferences and other practical considerations, such as cost. **[2023]**

A high quality systematic review and meta-analysis has shown that repetitive task practice is more effective than Bobath therapy for the recovery of walking and other lower limb activities (Scrivener et al, 2020), and Bobath therapy should not be used in preference to repetitive task practice. **[2023]**

A systematic review of nine studies of real world walking showed a small but significant effect, indicating that programmes that included behavioural change interventions appeared to be more effective at improving real world walking habits than exercise alone (Stretton et al, 2017). **[2023]**

## **4.23 Pain**

Pain is a frequent problem after stroke and can be due to many causes including neuropathic pain, musculoskeletal pain including spasticity, and depression. It may also be due to a pre-existing problem

which is not directly related to the stroke. This section includes musculoskeletal pain, neuropathic pain and shoulder pain, as well as shoulder subluxation. Guideline users may need to refer to separate sections on sensation ([Section 4.47 Sensation](#)) and spasticity ([Section 4.24 Spasticity and contractures](#)). Pain management includes non-pharmacological and medical approaches and may require collaboration with a specialist pain management team. [2016]

### 4.23.1 Neuropathic pain (central post-stroke pain)

Stroke is one cause of pain following damage to neural tissues (called neuropathic pain or central post-stroke pain [CPSP]). The incidence of CPSP is uncertain, with estimates varying between 5% and 20% of people with stroke, and it can often be overlooked. There may be some overlap with spasticity which can cause pain, and with sensory loss which can be associated with unpleasant sensory phenomena. It is separate from musculoskeletal pain, which is considered in [Section 4.23.2 Musculoskeletal pain](#). [2016]

#### 4.23.1 Recommendations

- A People with central post-stroke pain should be initially treated with amitriptyline, gabapentin or pregabalin:
  - amitriptyline starting at 10 mg per day, with gradual titration as tolerated, but no higher than 75 mg per day (higher doses could be considered in consultation with a specialist pain service);
  - gabapentin starting at 300 mg twice daily with titration as tolerated to a maximum of 3.6 g per day;
  - pregabalin starting at 150 mg per day (in two divided doses; a lower starting dose may be appropriate for some people), with titration as tolerated but no higher than 600 mg per day in two divided doses. [2016]
- B People with central post-stroke pain who do not achieve satisfactory pain reduction with initial pharmacological treatment at the maximum tolerated dose should be considered for treatment with another medication of or in combination with the original medication:
  - if initial treatment was with amitriptyline switch to or combine with pregabalin;
  - if initial treatment was with gabapentin switch to pregabalin;
  - if initial treatment was with pregabalin switch to or combine with amitriptyline. [2016]
- C People with central post-stroke pain should be regularly reviewed including physical and psychological well-being, adverse effects, the impact on lifestyle, sleep, activities and participation, and the continued need for pharmacological treatment. If there is sufficient improvement, treatment should be continued and gradual reductions in the dose over time should be considered if improvement is sustained. [2016]

#### 4.23.1 Sources

A–C NICE, 2020; Wiffen et al, 2013

#### 4.23.1 Evidence to recommendations

There is very little trial evidence specific to the management of CPSP, and it may well be that CPSP is different from neuropathic pain resulting from other conditions such as peripheral neuropathy or spinal cord pathology. There is no evidence that simple or opioid analgesics have any role in the treatment of neuropathic pain, and many anticonvulsant and antidepressant medicines have a very poor quality evidence base despite their frequent use. The NICE guideline CG173 on neuropathic pain (NICE, 2020) recommends the initial use of amitriptyline, duloxetine (based purely on evidence of effectiveness in

painful diabetic neuropathy), gabapentin or pregabalin for neuropathic pain, switching between them if the response is inadequate. **[2016]**

## 4.23.2 Musculoskeletal pain

Musculoskeletal pain is not uncommon in people with stroke. Prolonged immobility and abnormal posture can cause pain and exacerbate pre-existing musculoskeletal conditions such as osteoarthritis. The most specific musculoskeletal pain problem after stroke, shoulder pain, is considered in Section [4.23.3 Shoulder subluxation and pain](#). Pain management may be non-pharmacological (e.g. physiotherapy) as well as pharmacological. **[2016]**

### 4.23.2 Recommendations

- A People with musculoskeletal pain after stroke should be assessed to ensure that movement, posture and moving and handling techniques are optimised to reduce pain. **[2016]**
- B People who continue to experience musculoskeletal pain should be offered pharmacological treatment with simple analgesic medication. Paracetamol, topical non-steroidal anti-inflammatory drugs (NSAIDs) or transcutaneous electrical nerve stimulation (TENS) should be offered before considering the addition of opioid analgesics. **[2016]**

### 4.23.2 Sources

A, B NICE, 2022c; Working Party consensus

### 4.23.2 Evidence to recommendations

The Working Party did not find any research evidence on musculoskeletal pain specific to stroke. Recommendations are based on NICE guidance for osteoarthritis and the consensus of the Working Party. **[2016]**

## 4.23.3 Shoulder subluxation and pain

Hemiplegic shoulder pain affects 30-65% of people with stroke and is often associated with upper limb weakness, gleno-humeral subluxation and restricted range of shoulder movement (Kumar et al, 2022). Furthermore, shoulder pain and subluxation are associated with reduced function and recovery of the upper limb, interference with rehabilitation, higher rates of depression and poorer quality of life, so they are important targets for rehabilitation (Adey-Wakeling et al, 2016; Paolucci et al, 2016). The precise aetiology of shoulder pain is unknown, but it is often associated with subluxation of the joint and, in the later stages, spasticity. Shoulder subluxation is not always associated with pain and the two may have different causes. Addressing shoulder subluxation is a priority in order to optimise upper limb motor recovery, and manage spasticity and pain. **[2023]**

Slings to support the upper limb should be used with caution, as they are often ineffective at reducing the subluxation and encourage the upper limb to rest in adduction, internal rotation and flexion at the elbow, which can result in muscle shortening. **[2023]**

### 4.23.3 Recommendations

- A People with functional loss in their arm after stroke should have the risk of shoulder pain reduced by:
  - careful positioning of the arm, with the weight of the limb supported, including the use of wheelchair arm rests;

- ensuring that healthcare staff and family/carers handle the affected arm correctly, avoiding mechanical stress and excessive range of movement;
- avoiding the use of overhead arm slings/ shoulder supports and pulleys. **[2023]**
- B People with arm weakness after stroke should be asked regularly about shoulder pain. **[2016]**
- C People who develop shoulder pain after stroke should:
  - be assessed for causes and these should be managed accordingly, including musculoskeletal issues, subluxation and spasticity;
  - have the severity monitored and recorded regularly, using a validated pain assessment tool;
  - have preventative measures put in place;
  - be offered regular simple analgesia. **[2016]**
- D People with shoulder pain after stroke should only be offered intra-articular steroid injections if they also have inflammatory arthritis. **[2016]**
- E People with inferior shoulder subluxation within 6 months of hemiplegic stroke should be considered for neuromuscular electrical stimulation, unless contraindicated. The stimulation protocol should be individualised to the person's presentation and tolerance. The person with stroke, their family/carers and clinicians in all settings should be trained in the safe application and use of electrical stimulation devices. **[2023]**
- F People with persistent shoulder pain after stroke should be considered for other interventions such as orthotic provision, spasticity management, or suprascapular nerve block, including specialist referral if required. **[2023]**

#### 4.23.3 Sources

- A Guideline Development Group consensus
- B, C Working Party consensus
- D Kalita et al, 2006; Lakse et al, 2009; Rah et al, 2012
- E Lee et al, 2017; Guideline Development Group consensus
- F Guideline Development Group consensus

#### 4.23.3 Evidence to recommendations

The literature on hemiplegic shoulder pain and shoulder subluxation in stroke consists of small trials and systematic reviews that evaluate interventions such as electrical stimulation of the long head of biceps (Manigandan et al, 2014), subacromial injections of corticosteroid (Rah et al, 2012) or local injections of botulinum toxin (Singh & Fitzgerald, 2010). Botulinum toxin injections showed some positive benefits in reducing pain and improving shoulder function and range of motion. Low statistical power means that this intervention cannot be confidently recommended and larger high quality RCTs are required. There is little evidence to support shoulder strapping as a way of preventing or treating shoulder subluxation. Strapping may have a preventative role by making it clear to carers that the shoulder is at risk of damage from incorrect handling or positioning. **[2023]**

A high quality systematic review and meta-analysis of 11 trials including 432 participants provided moderate to good evidence that neuromuscular stimulation can reduce shoulder subluxation for people when used in the acute or subacute stages of stroke (i.e. up to 6 months; Lee et al, 2017). The meta-analysis was underpowered to test the effects for people with chronic stroke and the impact on pain and function. Further research is needed to establish the optimal stimulation parameters and dose of stimulation. **[2023]**

## 4.24 Spasticity and contractures

There is considerable debate on the definition, physiological nature and importance of spasticity. Although spasticity is less common than assumed in the past, it represents a considerable burden for those who develop it, affecting up to 40% of people with severe weakness after stroke, and is considered severe and disabling in about 15% of people. It is associated with pain, contracture and other motor impairments (Wissel et al, 2013; Zorowitz et al, 2013; Glaess-Leistner et al, 2021). **[2023]**

Any joint that does not move frequently is at risk of developing shortening of surrounding tissues leading to restricted movement. This is referred to as a contracture, and is not uncommon in limbs affected by spasticity. Contractures can impede activities such as washing or dressing, and may also be uncomfortable or painful and limit the ability to sit in a wheelchair or mobilise. Splinting is the process of applying a prolonged stretch through an external device, most commonly splints or serial casts, historically believed to prevent or treat contractures. Standardised measures for ease of care and resistance to passive stretches include the Arm Activity measure and modified Ashworth Scale respectively. **[2023]**

### 4.24 Recommendations

- A People with motor weakness after stroke should be assessed for spasticity as a cause of pain, as a factor limiting activities or care, and as a risk factor for the development of contractures. **[2016]**
- B People with stroke should be supported to set and monitor specific goals for interventions for spasticity using appropriate clinical measures for ease of care, pain and/or range of movement. **[2016]**
- C People with spasticity after stroke should be monitored to determine the extent of the problem and the effect of simple measures to reduce spasticity e.g. positioning, passive movement, active movement (with monitoring of the range of movement and alteration in function) and/or pain control. **[2016]**
- D People with persistent or progressive focal spasticity after stroke affecting one or two areas for whom a therapeutic goal can be identified (e.g. ease of care, pain) should be offered intramuscular botulinum toxin. This should be within a specialist multidisciplinary team and be accompanied by rehabilitation therapy and/or splinting or casting for up to 12 weeks after the injections. Goal attainment should be assessed 3-4 months after the injections and further treatment planned according to response. **[2016]**
- E People with generalised or diffuse spasticity after stroke should be offered treatment with skeletal muscle relaxants (e.g. baclofen, tizanidine) and monitored for adverse effects, in particular sedation and increased weakness. Combinations of antispasticity medication should only be initiated by healthcare professionals with specific expertise in managing spasticity. **[2016]**
- F People with stroke should only receive intrathecal baclofen, intraneural phenol or similar interventions in the context of a specialist multidisciplinary spasticity service. **[2016]**
- G People with stroke with increased tone that is reducing passive or active movement around a joint should have the range of passive joint movement assessed. They should only be offered splinting or casting following individualised assessment and with monitoring by appropriately skilled staff. **[2016]**
- H People with stroke should not be routinely offered splinting for the arm and hand. **[2016]**
- I People with spasticity in the upper or lower limbs after stroke should not be treated with electrical stimulation to reduce spasticity. **[2023]**
- J People with spasticity in their wrist or fingers who have been treated with botulinum toxin



may be considered for electrical stimulation (cyclical/neuromuscular electrical stimulation) after the injection to maintain range of movement and/or to provide regular stretching as an adjunct to splinting or when splinting is not tolerated. **[2023]**

- K People with stroke at high risk of contracture should be monitored to identify problematic spasticity and provided with interventions to prevent skin damage, or significant difficulties with hygiene, dressing, pain or positioning. **[2023]**

#### 4.24 Sources

- A Working Party consensus
- B Turner-Stokes et al, 2013; Working Party consensus
- C Royal College of Physicians et al, 2018; Working Party consensus
- D Royal College of Physicians et al, 2018; Gracies et al, 2015
- E Montane et al, 2004; Working party consensus
- F Sampson et al, 2002; Royal College of Physicians et al, 2018
- G-H College of Occupational Therapists and Association of Chartered Physiotherapists in Neurology, 2015; Lannin et al, 2007b, Working party consensus
- I Tang et al, 2021; Johnston et al, 2021; Guideline Development Group consensus
- J-K Guideline Development Group consensus

#### 4.24 Evidence to recommendations

The evidence for spasticity management includes a clinical guideline (Royal College of Physicians et al, 2018) and several RCTs of botulinum toxin (McCrory et al, 2009; Shaw et al, 2011; Ward et al, 2014; Gracies et al, 2015). There are systematic reviews (Rosales & Chua, 2008; Elia et al, 2009; Rosales et al, 2012) and a Cochrane review (Katalinic et al, 2011) of splinting and stretching and two systematic reviews with meta-analyses of electrical stimulation (Johnston et al, 2021; Tang et al, 2021). **[2023]**

Botulinum toxin administration improves spasticity, range of movement and ease of care (i.e. passive function) and clinical goal attainment (Turner-Stokes et al, 2013) but not activity-level function (i.e. active function). This may partly reflect limitations in some of the measurement tools used. Improvements in activity for leg spasticity require further evaluation, but one study indicates improvements in goal attainment and ambulatory outcomes (Demetrios et al, 2014). **[2016]**

The evidence base for splinting remains limited and therapists must be circumspect in identifying who and when to splint and when not to splint. Splints should only be assessed, fitted and reviewed by appropriately skilled staff. NICE-accredited national guidance has been published to support best practice (College of Occupational Therapists & Association of Chartered Physiotherapists in Neurology, 2015). **[2016]**

High quality evidence from two meta-analyses showed that electrical stimulation does not affect spasticity after stroke and should not be used alone for the purpose of reducing spasticity (Johnston et al, 2021; Tang et al, 2021). **[2023]**

#### 4.25 Fatigue

Post-stroke fatigue has been described by people with stroke as ‘a fatigue like no other’ (Thomas et al, 2019a). It is characterised by a disproportionate sense of tiredness, a lack of energy, and a need to rest



that is greater than usual, although rest may not be effective in alleviating it (Lanctot et al, 2020). There is no consensus on how to define post-stroke fatigue, but case definitions have been proposed (Lynch et al, 2007). Post-stroke fatigue needs to be differentiated from post-stroke apathy ([see Section 4.40 Apathy](#)). **[2023]**

Post-stroke fatigue can profoundly impact the lives of people with stroke, particularly their return to work, mobility, physical activity, mood, cognitive function, functional ADL (e.g. shopping) and social activities (Worthington et al, 2017). Post-stroke fatigue can also impact on a person's ability to engage in rehabilitation, requiring therapists to adopt strategies to manage it during therapy (Riley, 2017). Post-stroke fatigue often affects the lives of families and carers, as it may limit their social life and result in increased loneliness and isolation (Ablewhite et al, 2022b). As family members or carers are often involved in overseeing the implementation of post-stroke fatigue management strategies, fatigue may add considerably to the burden of care. **[2023]**

Post-stroke fatigue is common and may be the sole residual problem in people who have made an otherwise good recovery (Stroke Association, 2022). Between 35 and 92% of people with stroke are estimated to have post-stroke fatigue (Duncan et al, 2012), with estimates varying by the type of measure, the point at which it is measured during recovery, and the type of stroke (Alghamdi et al, 2021). Post-stroke fatigue may present early or later after stroke, whilst early-onset fatigue persists in a proportion of cases (Wu et al, 2015). Persistent fatigue may continue to impact on functioning and participation several years after stroke (Elf et al, 2016). **[2023]**

The causes of post-stroke fatigue are not fully understood. It needs to be considered in a holistic manner (Thomas et al, 2019a) and a biopsychosocial model has been proposed (Wu et al, 2015). Post-stroke fatigue appears to be multi-factorial (Wu et al, 2015; Aarnes et al, 2020), and may fluctuate over the course of the day and vary in severity. It is commonly associated with pre-stroke fatigue (Wu et al, 2015), demographic (older age, female gender), clinical (stroke site, immune response characteristics, pain, sleep disturbance), physical (disability severity), emotional (depression, anxiety, avoidant or confrontational coping styles), cognitive (impaired information processing), and social factors (lack of social support) (Aarnes et al, 2020). It is plausible that different factors are associated with early compared to late-onset post-stroke fatigue, while psychological factors play a role in both (Wu et al, 2015; Chen & Marsh, 2018). There is overlap between post-stroke fatigue and depression, but post-stroke fatigue should be considered a condition in its own right (Aarnes et al, 2020). Potential triggers include physical or cognitive exertion, emotional experiences and sedentary behaviour, but in a proportion of cases there are no known triggers, rendering it unpredictable (Worthington et al, 2017). **[2023]**

The multifactorial nature of post-stroke fatigue should be captured in tools used to assess it, but a systematic review showed that the most commonly used outcome measures do not address potentially relevant aspects of post-stroke fatigue (Skogestad et al, 2021). Measures for post-stroke fatigue have been reviewed by Mead et al (2007) and Skogestad et al (2021). **[2023]**

People with stroke indicate that their fatigue is often not understood by healthcare professionals (Thomas et al, 2019a), that they are rarely provided with information or advice on how to manage it (Worthington et al, 2017; Thomas et al, 2019a; Drummond et al, 2021) and that recommended approaches may be conflicting (Thomas et al, 2019a). People with post-stroke fatigue indicate that this lack of awareness by healthcare professionals can cause anxiety (Drummond et al, 2021). Healthcare professionals' understanding of post-stroke fatigue varies widely (Thomas et al, 2019b), and in the absence of clear evidence, their management of it largely relies on their own clinical experience (Riley, 2017). **[2023]**

#### 4.25 Recommendations

- A Healthcare professionals should anticipate post-stroke fatigue, and ask people with stroke (or their family/ carers) if they experience fatigue and how it impacts on their life. **[2023]**
- B Healthcare professionals should use a validated measure in their assessment of post-stroke fatigue, with a clear rationale for its selection, and should also consider physical and psychological fatigue, personality style, context demands and coping styles. **[2023]**
- C People with stroke should be assessed and periodically reviewed for post-stroke fatigue, including for factors that might precipitate or exacerbate fatigue (e.g. depression and anxiety, sleep disorders, pain) and these factors should be addressed accordingly. Appropriate time points for review are at discharge from hospital and then at regular intervals, including at 6 months and annually thereafter. **[2023]**
- D People with stroke should be provided with information and education regarding fatigue being a common post-stroke problem, and with reassurance and support as early as possible, including how to prevent and manage it, and signposting to peer support and voluntary sector organisations. Information should be provided in appropriate and accessible formats. **[2023]**
- E People with post-stroke fatigue should be involved in decision making about strategies to prevent and manage it that are tailored to their individual needs, goals and circumstances. **[2023]**
- F People with post-stroke fatigue should be referred to appropriately skilled and experienced clinicians as required, and should be considered for the following approaches, whilst being aware that no single measure will be effective for everyone:
  - building acceptance and adjustment to post-stroke fatigue and recognising the need to manage it;
  - education on post-stroke fatigue for the person with stroke, and their family/ and carers;
  - using a diary to record activities and fatigue;
  - predicting situations that may precipitate or exacerbate fatigue;
  - pacing and prioritising activities;
  - relaxation and meditation;
  - rest;
  - setting small goals and gradually expanding activities;
  - changing diet and/or exercise (applied with caution and tailored to individual needs);
  - seeking peer support and/or professional advice;
  - coping methods including compensatory techniques, equipment and environmental adaptations. **[2023]**
- G Healthcare professionals working with people affected by post-stroke fatigue should be provided with education and training on post-stroke fatigue, including its multi-factorial nature and impact, potential causes and triggers, validated assessment tools and the importance of involving people affected by post-stroke fatigue in designing strategies to prevent and manage it. **[2023]**
- H Healthcare professionals working with people with post-stroke fatigue should consider the impact of fatigue on their day-to-day ability to engage with assessment and rehabilitation, and tailor the scheduling and length of such activities accordingly. **[2023]**
- I Service planners and managers should consider people with stroke whose ability to engage in rehabilitation is affected by post-stroke fatigue, and provide access to alternative solutions to ensure that they are still able to benefit from personalised

rehabilitation input as required. **[2023]**

#### **4.25 Sources**

- A Lancot et al, 2020; Drummond et al, 2022a; Guideline Development Group consensus
- B Drummond et al, 2021; Ablewhite et al, 2022b
- C Hinkle et al, 2017; Lancot et al, 2020; Guideline Development Group consensus
- D Lancot et al, 2020; Drummond et al, 2021; Ablewhite et al, 2022a, 2022b; Guideline Development Group consensus
- E Thomas 2019b; Drummond et al, 2021; Ablewhite et al, 2022a, 2022b; Guideline Development Group consensus
- F Drummond et al, 2021; Ablewhite et al, 2022a, 2022b; Guideline Development Group consensus
- G Thomas et al, 2019b; Drummond et al, 2021; Ablewhite et al, 2022a
- H, I Guideline Development Group consensus

#### **4.25 Evidence to recommendations**

Recommendations are based on one Cochrane systematic review (Legg et al, 2019), three other systematic reviews (Mead et al, 2019; Pacheco et al, 2019; Chen et al, 2022); four randomised controlled trials (Bivard et al, 2017; Dennis et al, 2020; Hankey et al, 2020; Dong et al, 2021) and one follow-up study (Hankey et al, 2021), one survey (Ablewhite et al, 2022a), two qualitative studies (Drummond et al, 2021; Ablewhite et al, 2022b), one scientific statement (Hinkle et al, 2017), and best practice recommendations (Lancot et al, 2020) together with the consensus of the Guideline Development Group. **[2023]**

Two high quality systematic reviews (Legg et al, 2019; Mead et al, 2019) and two large, high quality RCTs including a follow-up study (Dennis et al, 2020; Hankey et al, 2020; Hankey et al, 2021) provide clear evidence that fluoxetine should not be used to prevent post-stroke fatigue as it is not effective, but increases the likelihood of falls, fractures and epileptic seizures. **[2023]**

One high quality but small RCT (Bivard et al, 2017) of modafinil found a significant reduction in post-stroke fatigue without any serious adverse events. However, a large RCT is ongoing and until its findings have been published, modafinil for people with post-stroke fatigue should only be provided in the context of a clinical trial. **[2023]**

A systematic review of acupuncture of acceptable quality (Chen & Marsh, 2018) found a statistically significant reduction in post-stroke fatigue, but only one of the studies included had received ethical approval. All studies were small and at risk of bias, and only one study reported adverse events (which were absent). Until more rigorous evidence has been published, acupuncture for people with post-stroke fatigue should only be provided in the context of a clinical trial. **[2023]**

One small RCT of transcranial direct current stimulation (tDCS) of acceptable quality (Dong et al, 2021) reported a significant reduction in post-stroke fatigue without any serious adverse events, but until more rigorous evidence has been published, tDCS for post-stroke fatigue should only be provided in the context of a clinical trial. **[2023]**

In the absence of clear evidence, healthcare professionals and people affected rely on their own expertise and experience to prevent and manage post-stroke fatigue (Drummond et al, 2021; Ablewhite et al, 2022b). A UK survey of clinical approaches to post-stroke fatigue found variations in the type, amount and duration of support, including access to follow-up, and that a proportion of healthcare

professionals lack confidence in managing post-stroke fatigue (Ablewhite et al, 2022a). This survey also found that assessment of post-stroke fatigue lacks standardisation, both in terms of the tools used and in the timing of assessment (Ablewhite et al, 2022a). **[2023]**

A qualitative study of healthcare professionals in the UK found that fatigue management approaches commonly used include: diaries to record activities and fatigue; pacing and prioritising; education on post-stroke fatigue for the person with stroke, their family, friends and carers; coping methods including compensatory techniques, equipment and environmental adaptations; and exercise applied with caution and tailored to individual needs (Drummond et al, 2021). A qualitative study of people with stroke and their carers indicated that raising the topic of post-stroke fatigue and receiving support from professionals and peers can be helpful (Ablewhite et al, 2022b). The following measures were used to self-manage fatigue: learning to accept post-stroke fatigue and recognise the need to manage it, predicting situations that may precipitate fatigue, pacing, using a diary, relaxation or meditation, rest, setting small goals and gradually expanding activities, optimising diet and exercise, seeking peer support and professional advice, and educating family and friends about their fatigue and its management (Ablewhite et al, 2022b). However, the findings also showed that no single approach was effective for everyone, and any measure should be tailored to the individual and their personal circumstances (Ablewhite et al, 2022b). **[2023]**

## 4.26 Swallowing

Dysphagia (swallowing difficulty associated with foods, fluids and saliva) is common after acute stroke with an incidence between 40 and 78%. There is an association between dysphagia and poor outcomes including a higher risk of longer hospital stay, chest infection, disability and death (Martino et al, 2005). Evidence from national audit shows that delays in the screening and assessment of dysphagia are associated with an increased risk of stroke-associated pneumonia (Bray et al, 2017). Prompt detection of dysphagia in patients with acute stroke is therefore essential. In patients with dysphagia on initial screening, a specialist swallowing assessment is indicated that includes consideration of function and cognition and a broader range of food and fluids of varying texture. **[2016]**

The majority of people with dysphagia after stroke will recover, in part due to bilateral cortical representation of neurological pathways (Hamdy et al, 1998). A proportion will have persistent abnormal swallow and continued aspiration at 6 months (Mann et al, 1999) and a small proportion, particularly those with brainstem lesions, will have chronic and severe swallowing difficulty. People with persistent swallowing problems may avoid eating in social settings and thus lose the physical and social pleasures connected with food and drink. **[2016]**

This section should be read in conjunction with the sections on hydration and nutrition ([Section 4.9 Hydration and nutrition](#)), mental capacity ([Section 4.35 Mental capacity](#)) and end-of-life (palliative) care ([Section 2.15 End-of-life \(palliative\) care](#)). In particular, these recommendations are not intended as burdensome restrictions on oral food and fluid intake for people with stroke receiving holistic palliative care. The decision-making process to support people to eat and drink with acknowledged risks should be person-centred and involve the person and/or family/carers, and other members of the multidisciplinary team, and include a swallowing assessment and steps to minimise risk (Royal College of Physicians, 2021). **[2023]**

### 4.26 Recommendations

- A Patients with acute stroke should have their swallowing screened, using a validated screening tool, by a trained healthcare professional within four hours of arrival at hospital and before being given any oral food, fluid or medication. **[2023]**
- B Until a safe swallowing method is established, patients with swallowing difficulty after

acute stroke should:

- be immediately considered for alternative fluids;
  - have a comprehensive specialist assessment of their swallowing completed by a specialist in dysphagia management within 24 hours of admission;
  - be considered for nasogastric tube feeding within 24 hours;
  - be referred to a dietitian for specialist nutritional assessment, advice and ongoing monitoring;
  - receive adequate hydration, nutrition and medication by alternative means;
  - be referred to a pharmacist to review medication formulation. **[2023]**
- C Patients with swallowing difficulty in the acute phase of stroke should only be given food, fluids and medications in a form that minimizes the risk of aspiration. **[2023]**
- D People with stroke who require modified food or fluid consistency should have these provided in line with internationally agreed descriptors e.g. International Dysphagia Diet Standardisation Initiative (IDDSI). **[2023]**
- E Patients with stroke with suspected aspiration or who require tube feeding or dietary modification should be considered for instrumental assessment (videofluoroscopy or fibre-optic endoscopic evaluation of swallowing [FEES]). **[2023]**
- F Patients with stroke who require instrumental assessment of swallowing (videofluoroscopy or fibre-optic endoscopic evaluation of swallowing [FEES]) should only receive this:
- in conjunction with a specialist in dysphagia management;
  - in order to investigate the nature and causes of swallowing difficulties;
  - to facilitate shared decision making and direct an active treatment/rehabilitation programme for swallowing difficulties. **[2023]**
- G Patients with swallowing difficulty after stroke should be considered for compensatory measures and adaptations to oral intake aimed at reducing the risks of aspiration and choking, improving swallowing efficiency and optimising nutrition and hydration. This should be based on a thorough assessment of dysphagia and may include:
- texture modification of food and fluids;
  - sensory modification, such as altering the volume, taste and temperature of foods or carbonation of fluids;
  - compensatory measures such as postural changes (e.g. chin tuck) or swallowing manoeuvres (e.g. supraglottic swallow). **[2023]**
- H People with swallowing difficulty after stroke should be considered for swallowing rehabilitation by a specialist in dysphagia management. This should be based on a thorough assessment of dysphagia, such as by a speech and language therapist, to decide on the most appropriate behavioural intervention, and may include a variety of muscle strengthening and/or skill training exercises. **[2023]**
- I People with dysphagia after stroke may be considered for neuromuscular electrical stimulation as an adjunct to behavioural rehabilitation where the device is available and it can be delivered by a trained healthcare professional. **[2023]**
- J Patients with tracheostomy and severe dysphagia after stroke may be considered for pharyngeal electrical stimulation to aid decannulation where the device is available and it can be delivered by a trained healthcare professional. **[2023]**
- K People with difficulties feeding themselves after stroke should be assessed and provided with the appropriate equipment and assistance (including physical help and verbal encouragement) to promote independent and safe feeding. **[2023]**

- L People with swallowing difficulty after stroke should be provided with written guidance for all staff and carers to follow when feeding them or providing fluids. **[2023]**
- M People with stroke should be considered for gastrostomy feeding if they:
  - need, but are unable to tolerate, nasogastric tube feeding, even after a trial with a nasal bridle if appropriate and other measures such as taping the tube or increased supervision;
  - are unable to swallow adequate food and fluids orally by four weeks from the onset of stroke and gastrostomy feeding is considered to be required long-term;
  - reach the point where shared decision making by the person with stroke, their family/carers, and the multidisciplinary team has agreed that artificial nutrition is appropriate due to the high long-term risk of malnutrition. **[2023]**
- N For people with dysphagia after stroke the option to eat and drink orally despite acknowledged risks should be considered. This decision-making process should be person-centred and taken together with the person with stroke, their family/carers and the multidisciplinary team. It should include a swallowing assessment and steps to minimise risk. **[2023]**
- O People with stroke who are discharged from specialist treatment with continuing problems with swallowing food or fluids safely should be trained, or have family/carers trained, in the management of their swallowing and be regularly reassessed. **[2023]**
- P People with stroke receiving end-of-life (palliative) care should not have burdensome restrictions on oral food or fluids if those restrictions would exacerbate suffering. In particular, following assessment this may involve a decision, taken together with the person with stroke, their family/carers and the multidisciplinary team, to allow oral food or fluids despite risks including aspiration and choking. **[2023]**

#### **4.26 Sources**

- A Kertscher et al, 2014; Martino et al, 2014; Bray et al, 2017
- B Geeganage et al, 2012; NICE, 2017c, 2022e
- C Guideline Development Group consensus
- D Cichero et al, 2017
- E Wilson and Howe, 2012; Bax et al, 2014; Kertscher et al, 2014
- F Martino et al, 2005; Carnaby et al, 2006; Royal College of Speech and Language Therapists, 2007, 2008; Terre and Mearin, 2012
- G Bath et al, 2018; Dziewas et al, 2021
- H Bath et al, 2018; Dziewas et al, 2021; Zhang et al, 2022
- I Bath et al, 2018; Dziewas et al, 2021; Wang et al, 2021a; Li et al, 2021; Zhao et al, 2022; Hsiao et al, 2022; He et al, 2022
- J Dziewas et al, 2018
- K, L Guideline Development Group consensus
- M Dennis et al, 2005; Geeganage et al, 2012; NICE, 2017c
- N Royal College of Physicians, 2021; Royal College of Speech and Language Therapists, 2021; Guideline Development Group consensus
- O Heckert et al, 2009; Drury et al, 2014; NICE, 2017c, Guideline Development Group consensus



P Royal College of Physicians, 2021; Royal College of Speech and Language Therapists, 2021;  
Guideline Development Group consensus

#### **4.26 Evidence to recommendations**

There is good evidence that a multi-item dysphagia screening protocol that includes at least a water intake test of 10 teaspoons and a lingual motor test is more accurate than screening protocols with only a single item (Martino et al, 2014). Additionally a systematic review (Kertscher et al, 2014) and cost-effectiveness analysis (Wilson & Howe, 2012) suggest that the investigation of dysphagia with instrumental assessments (providing direct imaging for evaluation of swallowing physiology) helps to predict outcomes and improve treatment planning (Bax et al, 2014). **[2016]**

A number of treatments for dysphagia after stroke have been studied, including swallowing exercises, acupuncture, medicines, neuromuscular electrical stimulation (NMES), pharyngeal electrical stimulation (PES), thermal stimulation, transcranial direct current (tDCS), transcranial magnetic stimulation (TMS) and expiratory muscle strength training (EMST). The aim of treatment in these studies is to improve swallowing and to reduce the risk of the person developing aspiration pneumonia. A Cochrane review of swallowing therapy, which included acupuncture, behavioural interventions, medication, NMES, PES, physical stimulation, tDCS, and TMS concluded that as a whole, swallowing therapy did not change outcomes of death or dependency/disability, case fatality or penetration aspiration score, but may have reduced length of hospital stay, dysphagia, chest infections, and improved swallowing ability (Bath et al, 2018). However, the results were based on studies of variable quality and did not distinguish between specific interventions. The review concluded that additional high quality trials in the field are required to investigate the effectiveness of individual swallowing therapies. **[2023]**

Two systematic reviews investigating non-invasive neurostimulation therapies reported some positive effects on swallowing function and quality of life for NMES, tDCS, TMS (Li et al, 2021; Wang et al, 2021a) but not PES (Wang, 2021). Similar findings were also reported in recent European Stroke Organisation and European Society for Swallowing Disorders guidelines, although there is a lack of evidence of improvements in other outcomes such as mortality, pneumonia, length of stay or feeding tube removal (Dziewas et al, 2018). **[2023]**

More high quality research is required on NMES treatment regimens, including a comparison with a sham intervention (Wang et al, 2021a). Similarly, treating dysphagia with tDCS, repetitive transcranial magnetic stimulation (rTMS) or PES appeared to be safe, but the interventions require further investigation in larger, high quality trials (Bath et al, 2018; Dziewas et al, 2021; Li et al, 2021; Wang et al, 2021a; He et al, 2022; Hsiao et al, 2022; Zhao et al, 2022). Currently tDCS and rTMS are only carried out as part of a clinical trial. **[2023]**

Two systematic reviews have suggested that respiratory muscle training may reduce the occurrence of respiratory complications and reduce laryngeal penetration in patients with dysphagia after stroke (Zheng et al, 2020; Zhang et al, 2022). However, the time since stroke and the proportion of participants who had dysphagia were unclear, and the authors recommended that further research was needed (Zhang et al, 2022). **[2023]**

PES to aid decannulation in patients with a tracheostomy and dysphagia after stroke was shown to be effective in a single blind RCT (Dziewas et al, 2018). In this trial, PES significantly increased the number of patients who were ready to be decannulated compared to sham stimulation. **[2023]**

In the presence of dysphagia, eating and drinking with acknowledged risks should be considered. This is recognised as a complex and personalised decision. Whilst there is a need for more research on this topic, recent multiprofessional guidance describes the characteristics of shared decision making. These

include that decisions should be person-centred and involve the person and/or family/carers and other members of the multidisciplinary team, and include a swallowing assessment and steps to minimise risk, principally of aspiration and choking (Royal College of Physicians, 2021). [2023]

## Psychological effects of stroke

### 4.27 Introduction

Neuropsychological sequelae are common following stroke and include a range of cognitive and mood disorders, as well as difficulties with adjustment, body image and confidence. Cognitive difficulties (changes in thinking skills as a direct effect of brain injury) are different from changes in mood or emotion which could be a direct effect of brain injury, but also as psychosocial consequences of adjusting to stroke. People with stroke report that psychological problems are often under-recognised, with high levels of unmet need. Psychological effects of stroke can have a significant and long-lasting impact on people with stroke and their carers and are associated with poorer rehabilitation outcomes. It is important that any pre-stroke psychological conditions are understood and considered in the assessment and treatment of any further psychological consequences of stroke. [2023]

National policymakers have identified the importance of improvements in psychological care after stroke in the NHS England National Stroke Service Model (2021) and Integrated Community Stroke Service Model (2022). Clinical psychologists/neuropsychologists are an essential member of the multidisciplinary stroke team along the pathway of care and have an important role in supporting the delivery of psychological care by the broader team. [2023]

These sections on cognition covers the range of cognitive problems that can occur after stroke with recommendations to help the person with stroke to reduce the impact of these problems on social participation. General issues are covered ([Section 4.28 Psychological effects of stroke – general](#)) followed by recommendations for specific cognitive domains ([Sections 4.29-4.34](#)) and mental capacity ([Section 4.35 Mental capacity](#)) and should be read together with recommendations for the organisation of psychological care ([Section 2.11 Psychological care – organisation and delivery](#)). [2023]

### 4.28 Psychological effects of stroke – general

Awareness, identification and management of both cognitive and mood impairment can be viewed through the lens of the stepped care (Gillham & Clark, 2011) and matched care models more commonly associated with mood disorders (see [Section 2.11 Psychological care – organisation and delivery](#)). Knowledge and skills required by the multidisciplinary team must be maintained across all levels of the model, with all members being able to support those with mild impairment (level 1), those with specialist skills and competencies such as occupational therapists working with those with moderate impairment affecting activities of daily living or engagement in rehabilitation (level 2), and access to clinical psychology/neuropsychology for those with severe or persistent impairment or where psychological issues are significantly impacting on safety or decision making (level 3). Adequate provision of clinical psychology/neuropsychology is required along the pathway to assist in training and supporting the stroke team as well as providing specialist clinical management for those requiring it, particularly those with level 3 needs. [2023]

Mood disorders are associated with poor outcomes after stroke and increased mortality (House, et al, 2001). Some patient groups have higher prevalence, such as those with aphasia being twice as likely to develop depression after stroke, than those without aphasia. Assessment of mood requires use of validated tools for people with stroke, being mindful of cognitive and communication difficulties.

Gillham & Clark (2011) suggest a screening pathway which includes those with aphasia. It is important that pre-existing mental health conditions are well understood by the team, including management and previously used strategies. **[2023]**

There are some shared features across domains which can make it challenging to identify where to start with screening and assessment. For example, someone may present as 'flat' and not initiating activities for a variety of reasons, including mood disorder, apathy, fatigue, or cognitive lack of initiation (due to memory, or executive dysfunction). These features can present similarly and can co-exist. Working with clinical psychology/neuropsychology colleagues assists the multidisciplinary team to understand the contribution and impact of these various factors in interpreting findings and informs treatment planning. **[2023]**

Cognitive impairment is associated with poor outcomes after stroke, such as increased length of hospital stay and reduced independence. Cognitive deficits are probably present in the early period after stroke for the majority of people, even those without limb weakness. Each cognitive domain (e.g. perception, attention, memory, executive functioning) should not be considered in isolation because most everyday activities draw on a range of abilities. Assessment and treatment need to take this overlap into account, particularly where changes to communication skills or mood exist. People should not be excluded from rehabilitation by an existing diagnosis of dementia. **[2023]**

#### **4.28 Recommendations**

- A Healthcare professionals should select screening tools and assessments for psychological problems appropriate to the needs of the person with stroke, with a clear rationale regarding which tools are to be used in which circumstances. These tools and assessments should:
  - be validated for use in people with stroke;
  - include freely available training in their use for staff;
  - cover the full range of potential impairments including attention, visual perception, memory, and executive functioning;
  - be applied consistently along local stroke pathways;
  - be completed with a speech and language therapist if the person with stroke has language difficulties;
  - be conducted in the patient's first language, using an interpreter if required;
  - be conducted in a quiet environment where distractions are minimised, at a time of day appropriate for the individual (particularly those with fatigue). **[2023]**
- B All members of the stroke multidisciplinary team should be trained and engaged in supporting those with psychological problems following stroke. The team should have the stroke-specific knowledge and skills to support people with cognitive impairment after stroke in daily activities and reduce the impact on participation, including making any necessary adjustments to the rehabilitation approach. **[2023]**
- C Stroke-skilled clinical psychology/neuropsychology should be available to multidisciplinary team members involved in the assessment and formulation of psychological problems people may have after stroke to provide training, clinical supervision, advice and support. **[2023]**
- D Stroke-skilled clinical psychology/neuropsychology should be available for people with stroke who have complex or atypical psychological presentations, or specific issues affecting risk or safety. **[2023]**
- E Following any screening or cognitive assessment, people with cognitive impairment after stroke and their family/carers should receive appropriate supporting information and

education regarding the findings, implications, and recommended approach to their cognitive problems. **[2023]**

- F People with cognitive impairment after stroke should be considered for moderate-intensity cardiorespiratory training programmes to improve cognitive function according to the person's needs, goals and preferences, as part of an overall treatment approach that also includes neuropsychological assessment and intervention. Cognitive impairment should not be considered a barrier to engaging with repetitive task training. **[2023]**

#### **4.28 Sources**

A-E Guideline Development Group consensus

F Lin et al, 2022; Guideline Development Group consensus

#### **4.28 Evidence to recommendations**

Cognitive research usually focuses on a specific impairment meaning there is little high quality evidence regarding general cognitive rehabilitation. Two RCTs were identified. Schmidt et al (2013) evaluated a self-awareness intervention based on a meal preparation activity, comparing three groups: video with verbal feedback, verbal feedback alone and no feedback. Video with verbal feedback was superior to the other methods but the type of brain injury was unspecified and the relevance to stroke is unclear. Alvarez-Sabin et al (2013) evaluated citicoline and cautiously concluded that citicoline showed promise in a composite score derived from multiple cognitive tests, but larger trials with functional outcomes are needed. A high quality systematic review and meta-analysis indicated that physical exercise can significantly improve overall cognition, executive function and working memory in people with chronic cerebrovascular disease, particularly if there was a cognitive impairment at the start of the intervention. Moderate-intensity aerobic training was the most effective form of delivery (Lin et al, 2022). **[2023]**

### **4.29 Cognitive screening**

Cognitive screening uses a brief multidomain test to identify cognitive problems after stroke. Screening makes a distinction between those with and without likely problems, and identifies a group who may need more detailed or bespoke assessment. Initial screening (in the first few days after stroke) is expected to offer value in care planning and is applicable for most patients with exceptions where conscious level is reduced, delirium or severe cognitive impairment would confound the interpretation. Decision-making about if/when to proceed with cognitive screening should be based on clinical judgement and an understanding of the purpose of screening. Where cognitive screening is judged to be impractical or inappropriate, consideration must nevertheless be given to the potential influence of cognitive impairment on immediate support and care needs of the patient e.g. awareness of risk, initiating taking drinks, making meal choices, managing visitors. **[2023]**

Cognitive screening is not diagnostic, and the screening test result is only a part of the initial multidisciplinary assessment process. The MDT approach and treatment plan should be informed by a holistic understanding of the patient's and (if relevant) family's perception of current cognitive status, ongoing clinical interpretation of patient's presentation, cultural factors and their screening performance. **[2023]**

Common uses of cognitive screening will include: to establish the presence or absence of a deficit; to provide preliminary information regarding strengths and weaknesses; to give an indication of immediate support needs and long-term care and rehabilitation planning considerations (along with wider clinical information available to the MDT); to optimise the design of individual rehabilitation programmes; to consider assessment needs regarding mental capacity; and to plan further detailed and specific assessments. Screening alone should not be used to inform any rehabilitation outcomes (especially long

term). It is widely accepted that screening tools have limitations, such as a 'ceiling effect', therefore there will be some people with stroke who do experience cognitive impairments but perform well during screening. It is therefore important that screening performance is considered along with patient-reported difficulties and functional performance. Cognitive assessment should be considered for any person reporting or demonstrating a change in cognition, irrespective of their screening score. **[2023]**

The timing of cognitive screening is influenced by several variables, including the ability of the patient to engage in the process and the intended purpose of screening. Impaired performance on a screening test is common in the first days following stroke and the natural history is usually a degree of spontaneous improvement over time. It is important that screening results are considered in the context of pre-morbid ability, function and age, rather than solely on cut-off scores. The key consideration in timing must be the identification of cognitive factors required for planning necessary support and rehabilitation. Direct cognitive assessment may not be feasible or useful early after stroke, but screening for delirium and pre-stroke cognitive issues can begin immediately (SIGN, 2019; NICE, 2023b). **[2023]**

Re-screening is not routinely required at each transition along the pathway, but should be undertaken when clinically indicated. Re-screening is part of the ongoing pathway of care and is indicated when knowledge of cognitive function is not sufficient (due to the passage of time or change of patient status over time); or when the conclusions from previous cognitive screening or assessment cannot be accessed. **[2023]**

Screening should only be administered and interpreted by staff trained in the use of the selected tool, and who are familiar with its limitations. Advice from colleagues with appropriate expertise should be sought to aid test interpretation where needed. **[2023]**

#### **4.29 Recommendations**

- A Healthcare professionals screening people for cognitive problems after stroke should establish a baseline of their cognitive abilities prior to the stroke by taking a collateral history from family/carers and clinical records. **[2023]**
- B People with stroke should be routinely screened for delirium. Multidisciplinary teams should be aware of delirium throughout the person's inpatient stay, and an unexpected change in cognition should prompt a further assessment for delirium. **[2023]**
- C People with stroke should be screened for cognitive problems as soon as it is medically appropriate and they are able to participate in a brief interaction, usually within the initial days after onset of stroke. **[2023]**
- D Registered healthcare professionals who undertake cognitive screening of people with stroke should have the necessary knowledge and skills to appropriately select a screening tool for the identified purpose; to appropriately administer cognitive screening tools; and to interpret the findings taking account of the person's pre-stroke cognition, perception of cognition, functional abilities and other relevant factors such as mood. **[2023]**
- E People with cognitive impairment after stroke, identified by screening, should have further assessment, including functional assessment and cognitive or neuropsychological assessment where indicated, to inform treatment planning, patient and family education and discharge planning. **[2023]**

#### **4.29 Sources**

- A-E Guideline Development Group consensus

### 4.30 Cognitive assessment

In this context assessment means undertaking a detailed or focused investigation and evaluation, that may be both diagnostic and prognostic. This can be achieved by combining assessment of functional performance, standardised cognitive assessments and the person's perception of their cognitive skills and difficulties. Assessment is required to determine the nature and extent of the impairment, to detect more subtle cognitive changes and to provide a detailed cognitive profile. However, assessment is an ongoing process that should continue along the stroke pathway, with assessments undertaken as required to inform a rehabilitation approach relevant to the person's needs at that time. **[2023]**

Assessment requires a trained assessor such as an occupational therapist, clinical psychologist, or clinical neuropsychologist. The assessor requires the knowledge and skills to undertake and interpret the assessment, and to evaluate the clinical presentation in the context of other variables such as educational attainment and the clinical context. Access to or supervision by a clinical psychologist/clinical neuropsychologist is required for members of the multidisciplinary team administering neuropsychological assessments. Standardised assessments can be multi-domain but are more likely to be limited to a specific aspect of cognition under investigation. **[2023]**

#### 4.30 Recommendations

- A People with cognitive problems after stroke should receive an in-depth cognitive assessment, including functional performance, using standardised and validated tools to determine the nature of their cognitive difficulties and to detect uncommon or subtle changes for which screening tests may lack sensitivity. **[2023]**
- B Community stroke teams (including clinical psychology/neuropsychology) should be available to accept referrals for further cognitive assessment, identification of rehabilitation goals and assessment and management of risk, including when it is inappropriate for this to be conducted in the acute hospital setting. This should include contributing to mental capacity or safeguarding decisions and the assessment and management of people returning to cognitively demanding roles such as work or driving. **[2023]**
- C Standardised cognitive assessments should be carried out by a specialised assessors (e.g. occupational therapists with relevant knowledge and skills, or stroke clinical psychologists/neuropsychologists) with appropriate training and awareness of the properties and limitations of the various tests. **[2023]**
- D People with stroke returning to cognitively demanding roles such as managing instrumental activities of daily living (e.g. finances, driving or work) should have detailed cognitive assessments performed by an appropriately skilled assessor. **[2023]**
- E People with stroke who are unable to tolerate or adequately engage in standardised cognitive assessment should be assessed using appropriate functional tasks within a structured approach. **[2023]**

#### 4.30 Sources

- A-E Guideline Development Group consensus

### 4.31 Apraxia

Apraxia is the difficulty performing purposeful actions due to disturbance of the conceptual ability to organise actions to achieve a goal. People with apraxia often have problems carrying out everyday activities such as dressing or making a hot drink despite adequate strength and sensation. They may



also have difficulties in selecting the right object at the right time or in using everyday objects correctly. Apraxia can be detected using standardised tools (e.g. Test of Upper Limb Apraxia [TULIA]) and is usually associated with damage to the left cerebral hemisphere. **[2016]**

#### **4.31 Recommendations**

- A People with difficulty executing tasks after stroke despite adequate limb movement should be assessed for the presence of apraxia using standardised measures. **[2016]**
- B People with apraxia after stroke should:
  - have their profile of impaired and preserved abilities determined using a standardised approach;
  - have the impairment and the impact on function explained to them, their family/carers, and the multidisciplinary team;
  - be offered therapy and trained in compensatory techniques specific to the deficits identified, ideally in the context of a clinical trial. **[2016]**

#### **4.31 Sources**

- A Working Party consensus
- B West et al, 2008; Vanbellingen et al, 2010, 2011

#### **4.31 Evidence to recommendations**

One Cochrane review found insufficient evidence for the effectiveness of strategy training, transfer of training or gesture training (West et al, 2008). Case series research suggests that the types of observed action errors are important clues for the type of retraining needed (Sunderland et al, 2006). Future research needs to provide detailed descriptions of the interventions and measure the impact on everyday function. **[2016]**

### **4.32 Attention and concentration**

Attention is a prerequisite for almost all cognitive functions and everyday activities. Disturbed alertness is common after stroke especially in the first few days and weeks, and more so in non-dominant hemisphere stroke. Attention impairments may persist in the longer term and may be specific (e.g. focusing, dividing or sustaining attention) or more generalised, affecting alertness and speed of processing and be evident in poor engagement or general slowness. Attention problems may lead to fatigue, low mood and difficulty with independent living. **[2016]**

#### **4.32 Recommendations**

- A People who appear easily distracted or unable to concentrate after stroke should have their attentional abilities assessed using standardised measures. **[2016]**
- B People with impaired attention after stroke should have cognitive demands reduced by:
  - having shorter treatment sessions;
  - taking planned rests;
  - reducing background distractions;
  - avoiding activities when tired. **[2016]**
- C People with impaired attention after stroke should:
  - have the impairment explained to them, their family/carers and the multidisciplinary team;
  - be offered an attentional intervention (e.g. time pressure management, attention process training, environmental manipulation), ideally in the context of a clinical trial;

- be given as many opportunities to practise their activities as reasonable under supervision. **[2016]**

#### **4.32 Sources**

- A–B Working Party consensus
- C Loetscher and Lincoln, 2013; Working Party consensus

#### **4.32 Evidence to recommendations**

One Cochrane review of six small studies (Loetscher & Lincoln, 2013) found limited evidence that cognitive rehabilitation interventions (attention process training, time pressure management and/or computer-based training packages) improved some aspects of attention in the short term, but insufficient evidence for any persisting effects. **[2016]**

### **4.33 Memory**

Subjective problems with memory are very common after stroke, and memory deficits are often revealed on formal testing with standardised measures (e.g. the Rivermead Behavioural Memory Test [RBMT]). Memory deficits can lead to longer hospital stay, poorer outcomes, risks to personal safety, and cause distress to people with stroke and their family. Memory loss is a characteristic feature of dementia, which affects about 20% of people after stroke, but this section is not directly concerned with the impairments associated with diffuse cerebrovascular disease. It should also be noted that subjective memory problems can result from attentional or executive difficulties. **[2016]**

#### **4.33 Recommendations**

- A People with stroke who report memory problems and those considered to have problems with learning and remembering should have their memory assessed using standardised measures. **[2016]**
- B People with memory impairment after stroke causing difficulties with rehabilitation should:
  - have the impairment explained to them, their family/carers and the multidisciplinary team;
  - be assessed for treatable or contributing factors (e.g. delirium, hypothyroidism);
  - have their profile of impaired and preserved memory abilities determined, including the impact of other cognitive deficits e.g. attention;
  - have nursing and therapy sessions altered to capitalise on preserved abilities;
  - be trained in approaches that help them to encode, store and retrieve new information e.g. spaced retrieval (increasing time intervals between review of information) or deep encoding of material (emphasising semantic features);
  - be trained in compensatory techniques to reduce their prospective memory problems (e.g. use of electronic reminders or written checklists);
  - receive therapy in an environment as similar as possible to their usual environment.**[2016]**

#### **4.33 Sources**

- A Working Party consensus
- B Fish et al, 2008; Das Nair and Lincoln, 2012; Working Party consensus

#### 4.33 Evidence to recommendations

Previous editions of this guideline identified one Cochrane review of two small trials (Das Nair & Lincoln, 2007), one RCT of mostly younger people with subarachnoid haemorrhage suggesting temporary benefits from electronic paging reminder systems, and two inconclusive studies of the impact of active music listening (Fish et al, 2008; Winkens et al, 2009; Sarkamo et al, 2010). For this guideline the Working Party included one small RCT of sufficient quality (Das Nair & Lincoln, 2012). The ReMiND trial compared two memory rehabilitation strategies (compensation and restitution) against a control condition ('self-help'). People with stroke were in the minority in this mixed neurological sample. The compensation and restitution groups used more internal memory strategies than the control group but there was no difference in outcomes. Further research is needed to establish the clinical effectiveness (at the level of activities or participation) and acceptability of memory rehabilitation approaches, recruiting larger, more representative, groups of people with stroke. **[2016]**

### 4.34 Executive function

Executive function refers to the ability to plan and execute a series of tasks, inhibit inappropriate automatic impulses, regulate emotional responses, foresee the consequences of actions and make judgements about risk. The 'dysexecutive syndrome' encompasses various impairments, including difficulties with problem solving, planning, organising, initiating, inhibiting and monitoring behaviour. It also includes impairments in cognitive flexibility, which is the ability to change cognitive or behavioural strategies to adapt to novel or evolving task demands. These can be detected using standardised tools (e.g. the Behavioural Assessment of the Dysexecutive Syndrome [BADS]). Executive functions rely heavily upon attention ([Section 4.32 Attention and concentration](#)) and are associated with deficits in everyday function and independence. **[2016]**

#### 4.34 Recommendations

- A People with stroke who appear to have adequate skills to perform complex activities but fail to initiate, organise or inhibit behaviour should be assessed for the dysexecutive syndrome using standardised measures. **[2016]**
- B People with an impairment of executive function and activity limitation after stroke should be trained in compensatory techniques, including internal strategies (e.g. self-awareness and goal setting), structured feedback on performance of functional tasks and external strategies (e.g. use of electronic reminders or written checklists). **[2016]**
- C People with an executive disorder after stroke should have the impairment and the impact on function explained to them, their family/carers, and the multidisciplinary team. **[2016]**

#### 4.34 Sources

- A Working Party consensus
- B Chung et al, 2013; Working Party consensus
- C Working Party consensus

#### 4.34 Evidence to recommendations

For this guideline, the Working Party evaluated a Cochrane review (Chung et al, 2013), another systematic review (Poulin et al, 2012) and two RCTs (Levine et al, 2011; Schmidt et al, 2013). The Cochrane review identified 19 trials (and selected 13 for meta-analysis) but concluded that there was insufficient high quality evidence to guide practice. Further high quality research is needed. **[2016]**

### 4.35 Mental capacity

Assessment of mental capacity and subsequent actions are an important feature of stroke care because of the prevalence of cognitive and communication impairments after stroke. The law is clear that these are not reasons to assume that a person lacks capacity. **[2023]**

Mental capacity is assessed by whether a person has an impairment of mind or brain that affects their ability to understand, retain and weigh up information relating to a particular decision and to express their opinions, desires and feelings about the decision. A capacity assessment is decision-specific and often requires the skills of the multidisciplinary team to enable the person with stroke to demonstrate their ability to make a decision for themselves. Every opportunity should be taken to support the individual to demonstrate capacity, which may involve preparatory sessions introducing resources, orientation to the decision, and establishing the most reliable means of communication. The capacity interview should be undertaken by someone with the appropriate skills, relationship with the person, and knowledge of the relevant information, including, for example, speech and language therapists for those with aphasia or complex feeding decisions. The interview should be augmented according to the person's individual needs, such as time of day, environment, means of communication and the length of interview. Information gathered at the capacity interview should be presented alongside information gathered regarding functional abilities, previously expressed wishes and consistently held preferences. **[2023]**

Where a person with stroke lacks capacity regarding a specific decision, decision making should be made in line with the best interest process, considering foremost the decision the individual would have made had they had capacity and the least restrictive option available. The use of best interest balance charts may help in ensuring all aspects of the decision are included, such as medical, social, ethical, and safety issues. **[2023]**

#### 4.35 Recommendations

- A When making decisions with and on behalf of people with stroke, healthcare professionals should adhere to the principles defined in the relevant legislation (England and Wales: Mental Capacity Act 2005; Scotland: Adults with Incapacity (Scotland) Act 2000; Northern Ireland: Mental Capacity Act (Northern Ireland) 2016; Ireland: Assisted Decision-Making (Capacity) Act 2015), especially with regard to determining mental capacity and making decisions in the best interests of a person who lacks mental capacity. **[2016]**
- B The specialist multidisciplinary team should be involved in making decisions about mental capacity, and should provide information and advice to the person with stroke (when appropriate) and their family/carers. **[2016]**

#### 4.35 Sources

- A <http://www.legislation.gov.uk/ukpga/2005/9/contents;>  
<http://www.legislation.gov.uk/asp/2000/4/contents;>  
<https://www.legislation.gov.uk/nia/2016/18/contents/enacted;>  
<https://www.gov.ie/en/publication/5830f-assisted-decision-making-capacity-act-2015/>
- B Working party consensus

#### 4.35 Evidence to recommendations

This section covers the ability of people with stroke to make decisions about their health, with reference to the specific and legally-defined framework described in the relevant legislation (England and Wales: Mental Capacity Act 2005; Scotland: Adults with Incapacity (Scotland) Act 2000; Northern Ireland:

Mental Capacity Act (Northern Ireland) 2016; Ireland: Assisted Decision-Making (Capacity) Act 2015). For instance, the Mental Capacity Act 2005 lays out statutory principles underpinning practice including that ‘a person must be assumed to have capacity unless it is established that they lack capacity’. The Act states that ‘a person is not to be treated as unable to make a decision unless all practicable steps to help them to do so have been taken without success’ and ‘the fact that a person is able to retain the information relevant to a decision for a short period only does not prevent them from being regarded as able to make the decision’. This is of particular relevance to people with communication (e.g. [Section 4.43 Aphasia](#)) and cognitive impairments ([Sections 4.28-4.30](#)) after stroke. The Act obliges those taking a decision on behalf of an adult who lacks mental capacity to decide in their best interests and ‘must consider so far as is reasonably ascertainable...the person’s past and present wishes and feelings and, in particular, any relevant written statement made by them when they had capacity’. **[2016]**

## 4.36 Perception

Perception involves the processing and interpretation of incoming sensations, which is essential to everyday activities. Perceptual functions include awareness, recognition, discrimination and orientation. Disorders of perception are common after stroke and may affect any sensory modality. However, visual perception has been the most widely studied, particularly visual agnosia (impaired object recognition). Perceptual disorders can be detected using standardised assessment tools (e.g. the Visual Object and Space Perception battery [VOSP]). It is important to distinguish between deficits affecting the whole perceptual field (covered in this section) and unilateral neglect ([Section 4.37 Sensation](#)) or damage to the visual pathway or eye movements ([Section 4.48 Vision](#)). **[2016]**

### 4.36 Recommendations

- A People who appear to have perceptual difficulties after stroke should have a perceptual assessment using standardised measures. **[2016]**
- B People with agnosia after stroke should:
  - have the impairment explained to them, their family/carers and the multidisciplinary team;
  - have their environment assessed and adapted to reduce potential risks and promote independence;
  - be offered a perceptual intervention, such as functional training, sensory stimulation, strategy training and/or task repetition, ideally in the context of a clinical trial. **[2016]**

### 4.36 Sources

- A Working Party consensus
- B Bowen et al, 2011; Working Party consensus

### 4.36 Evidence to recommendations

A Cochrane review (Bowen et al, 2011) examined the evidence for the four main intervention approaches that are used, often in combination, in clinical practice: functional training, sensory stimulation, strategy training and task repetition. There is uncertainty over the merits of any one approach over any other. **[2016]**

## 4.37 Neglect

Neglect refers to a neuropsychological condition common after stroke whereby a person has reduced and impaired ability to process spatial information. This has consequences for further

neuropsychological processing including reasoning, memory encoding and retrieval, as well as the frequently observed impaired interaction with the environment whereby people overlook or appear to be unaware of items or their contextual field. **[2023]**

Problems with spatial awareness (also referred to as visuospatial inattention) refer to a reduced awareness of some part/s of the person's body or their environment. Visual neglect can be allocentric (relating to interpreting environmental stimuli) or egocentric (relating to the person's own point of view). It is more common in people with non-dominant hemisphere stroke (typically causing left-sided neglect) and those with hemianopia. Behavioural symptoms include bumping into objects on the affected side or only reading one side of pages in newspapers or books. Patients are usually unaware of the impairment, and therefore the treatment approach differs from that used in hemianopia where patients are more readily able to compensate. **[2023]**

Neglect can be detected using standardised assessments (e.g. the Catherine Bergago Scale) and should be reviewed across personal, reaching and locomotor space. Neglect can be severe, with a person demonstrating features of the neglect syndrome (such as being unable to turn their head beyond the midline), or very subtle, affecting people moving through locomotor space, which may only be evident during a more cognitively demanding task. It is particularly important to ensure those who are using electric wheelchairs, crossing roads or returning to driving (see [Section 4.14 Driving](#)) or work (see [Section 4.15 Return to work](#)) are fully assessed. Neglect is linked with the attentional systems of the brain, thus occurs in people with difficulties maintaining and dividing attention, and impacts on activities of daily living, motor recovery (through learnt non-use) and safety. **[2023]**

Sensory neglect is also a feature post stroke, with people lacking awareness of the sense of touch, proprioception or movement in a limb, despite sensation being present. In those with severe neglect, both sensory and visual neglect are often present. **[2023]**

#### **4.37 Recommendations**

- A People with stroke affecting the non-dominant cerebral hemisphere should be considered at risk of impaired awareness on the contralateral side and should be assessed for this using standardised measures. **[2016]**
- B When assessing problems with spatial awareness in people with stroke, clinicians should use a standardised test battery in preference to a single subtest, and the effect on functional tasks such as dressing and mobility should be included. **[2016]**
- C People with impaired awareness to one side after stroke should:
  - have the impairment explained to them, their family/carers and the multidisciplinary team;
  - be trained in compensatory strategies to reduce the impact on their activities;
  - be given cues to draw attention to the affected side during therapy and nursing activities;
  - be monitored to ensure that they do not eat too little through missing food on one side of the plate;
  - be offered interventions aimed at reducing the functional impact of the reduced awareness (e.g. visual scanning training, limb activation, sensory stimulation, eye patching, prism wearing, prism adaptation training, mirror therapy, galvanic vestibular stimulation, transcranial magnetic stimulation), ideally in the context of a clinical trial. **[2016]**



#### 4.37 Sources

- A Working Party consensus
- B Jehkonen et al, 2006
- C Bowen et al, 2013; Working Party consensus

#### 4.37 Evidence to recommendations

Current evidence consists of a Cochrane review of 23 RCTs (Bowen et al, 2013) and three further recent RCTs which investigated mirror therapy (Pandian et al, 2014), galvanic vestibular stimulation (Wilkinson et al, 2014) and sensory cueing (Fong et al, 2013). Transcranial magnetic stimulation (TMS) was outside the scope of the review. There is insufficient high quality evidence to recommend any specific interventions to increase independence. However, there is some very limited evidence that cognitive rehabilitation may have an immediate beneficial effect on tests of neglect (Bowen et al, 2013). The trials of mirror therapy, galvanic vestibular stimulation, sensory cueing and TMS showed promise, but these require evaluation in larger trials with higher quality research design and reporting. **[2016]**

### 4.38 Mood and well-being

The following sections cover a range of emotional problems that can occur after a stroke, with recommendations to help the person with stroke to achieve improved well-being and quality of life. The recommendations should be implemented in the context of a psychological needs assessment and care planning and in relation to the organisation of psychological care [Section 2.11 Psychological care – organisation and delivery](#). See also the section on self-management ([Section 4.4 Self-management](#)). **[2023]**

### 4.39 Anxiety, depression and psychological distress

Mood disturbance is very common after stroke. It may present as low mood, depression or anxiety, or with increased levels of emotional agitation, instability or emotionalism, limiting functional recovery and often associated with risk assessment needs and increased mortality (Morris et al, 1993; House et al, 2001). Many people with stroke are troubled by psychological distress that does not meet diagnostic criteria for depression and anxiety but which nevertheless disrupts and impedes their lives and relationships. A stroke is a significant life event and in this context some emotional distress is normal and part of adjustment to a substantial change in circumstances. Healthcare professionals working with people with stroke should be aware that mood disturbance after stroke can arise because of psychosocial factors (e.g. disability, loss, trauma), or as a result of neurochemical changes in the brain, or both. **[2023]**

Depression affects about one third of people with stroke and frequently persists long-term (Hackett et al, 2009; Ayerbe et al, 2014). Anxiety is also common, affecting around one-quarter of people with stroke, and, like depression, may only become evident after several months (Knapp et al, 2020). Depression and anxiety are closely linked and may be part of a single emotional response to stroke, commonly alongside additional psychological effects such as hopelessness, frustration or anger. **[2023]**

In a UK survey, three-quarters of people with stroke reported experiencing at least one mental health problem after a stroke, with 44% of people reporting experiencing anxiety or depression, 42% experiencing mood swings, 47% experiencing reduced self-confidence and 16% reporting suicidal thoughts (Stroke Association, 2020). A survey of long-term needs found that nearly three-quarters of people with emotional difficulties felt their needs had not been fully met (McKevitt et al, 2011). **[2023]**

Psychological disturbances also commonly follow on from neuropsychological consequences of stroke, whether such underlying effects are recognised or hidden. This highlights the need for sufficient and adequate assessment to correctly identify what may underpin and explain emotional changes after stroke and thereby guide appropriate rehabilitation approaches. Additionally, mood disturbance or other mental health issues may frequently exist for people prior to a stroke, which will affect their post-stroke experience (Taylor-Rowan et al, 2019), and need to be considered and understood for their clinical management and rehabilitation planning. **[2023]**

As far as is possible, approaches and assessment measures should be adapted for use with people with mild aphasia, and several have been designed specifically for people with more severe aphasia (e.g. the Stroke Aphasic Depression Questionnaire [SADQ], the Depression Intensity Scale Circles [DISCs] or the Behavioural Outcomes of Anxiety [BOA] scale). **[2016]**

#### **4.39 Recommendations**

- A Healthcare professionals should be aware of the psychological needs of people with stroke and their family/carers, and routinely provide education, advice, and emotional support for them. Multidisciplinary teams should embed measures that promote physical and mental well-being within the wider rehabilitation package, and collaborate with other statutory and voluntary services to deliver them, such as:
  - increased social interaction;
  - meaningful activities to support rebuilding of self-confidence and self-esteem;
  - increased exercise;
  - mind-body interventions such as relaxation, mindfulness, Tai Chi and yoga;
  - other psychosocial interventions such as psychological education groups. **[2023]**
- B People with stroke should be routinely screened for anxiety and depression using standardised tools, the results of which should be used alongside other sources of information to inform clinical formulation of treatment and support needs. **[2023]**
- C People with stroke with one mood disorder (e.g. depression) should be assessed for others (e.g. anxiety). **[2023]**
- D When assessing, diagnosing or treating people with mood disorders after stroke, clinicians should take account of other relevant factors such as prior psychological history, type of stroke and other features such as cognitive or language deficits and fatigue. **[2023]**
- E People with mood disorders after stroke who are assessed to have suicidal ideas or intent, or who have a previous history of suicidal ideas or intent, should be referred for assessment and risk management by a psychiatric team and have a risk management plan put in place immediately. **[2023]**
- F People with depression or anxiety after stroke, and those assessed to be at risk, should be considered by the multidisciplinary team for non-pharmacological approaches, education and a reasonable period of watchful waiting where appropriate. **[2023]**
- G People with stroke should be offered one-to-one motivational interviewing or problem-solving therapy, adapted as necessary for people with aphasia or cognitive impairment, as part of a multidisciplinary rehabilitation approach to prevent depression. **[2023]**
- H People with stroke at significant risk of anxiety or depression should be offered psychological therapies (motivational interviewing, cognitive behavioural therapy, problem-solving therapy or acceptance and commitment therapy) provided they have sufficient cognitive and language skills to engage with the therapy. **[2023]**
- I People with stroke should not be routinely offered SSRIs for the prevention of depression, but SSRIs may be considered when other preventative approaches are not appropriate

- (e.g. in people with severe cognitive or language impairment) or when the risk of depression is high (e.g. in people with a previous history of depression). The balance of risk and benefit from SSRIs should take account of the potential for increased adverse effects (seizures and hip fracture). **[2023]**
- J** People with depression after stroke should be offered psychological interventions (motivational interviewing, cognitive behavioural therapy or problem-solving therapy) adapted as necessary for use with people with aphasia or cognitive impairment and/or an SSRI. **[2023]**
- K** People with depression after stroke may be considered for non-invasive brain stimulation in the context of a clinical trial. **[2023]**
- L** People with aphasia and low mood after stroke should be considered for individual behavioural therapy. **[2023]**
- M** People with anxiety after stroke may be considered for medication therapy, after discussion between clinician and the person about adverse events and alternative treatment approaches including psychological interventions. **[2023]**
- N** People with depression or anxiety after stroke who are treated with antidepressant medication should be monitored for effectiveness and adverse effects within the first 6 weeks. If there has been a benefit people should be treated for at least four months beyond initial recovery. If the person's mood has not improved after 6 weeks, medication adherence should be checked before considering a dose increase, a change to another antidepressant or an alternative non-pharmacological treatment. **[2023]**
- O** People with persistent moderate to severe emotional disturbance after stroke who have not responded to high-intensity psychological intervention or pharmacological treatment should receive collaborative care, which should include long-term follow-up and involve liaison between the GP, stroke team and secondary care mental health services with supervision from a senior mental health professional. **[2023]**
- P** Where people with depression or anxiety after stroke are being treated within primary care mental health services (such as Improving Access to Psychological Therapies [IAPT]) or secondary care mental health services, advice, consultation and training should be available from the stroke service. Guidance for the management of people with significant language and cognitive impairment should be agreed between services and joint working offered where appropriate. **[2023]**
- Q** People with severe, persistent, or atypical symptoms of emotional disturbance after stroke, and those with complex presentations where emotional disturbance, cognitive and language deficits co-exist, should receive specialist assessment and treatment from a clinical psychologist/neuropsychologist to facilitate formulation and treatment planning within the multidisciplinary team. **[2023]**
- R** Healthcare professionals who undertake mood assessment of people with stroke should have the knowledge and skills to select a screening tool appropriate for the purpose; to administer assessment tools appropriately; and to interpret the findings taking into account the person's pre-stroke psychological history, perception of mood, and other relevant contextual factors such as medical state, fatigue, and sleep. **[2023]**
- S** Stroke-skilled clinical psychology/neuropsychology should be available to multidisciplinary team members involved in the assessment and formulation of psychological problems after stroke, to help facilitate an understanding of these problems for people with stroke, to facilitate appropriate treatment approaches, and to provide training, clinical supervision, advice and support. **[2023]**

#### **4.39 Sources**

|     |   |
|-----|---|
| A-F | Guideline Development Group consensus                         |
| G   | Allida et al, 2020a   |
| H   | Guideline Development Group consensus                         |
| I-K | Allida et al, 2020a, b; Guideline Development Group consensus |
| L   | Thomas et al, 2013  |
| M   | Knapp et al, 2017; Guideline Development Group consensus      |
| N   | NICE, 2022d   |
| O-S | Guideline Development Group consensus                         |

#### **4.39 Evidence to recommendations**

The evidence reviewed for the current edition of the guideline was largely based on three Cochrane systematic reviews: treating anxiety (Campbell Burton et al, 2011), and preventing and treating depression (Allida et al, 2020a & b). For anxiety, the Cochrane review of three studies indicated that psychological interventions and medication treatments appear useful (Campbell Burton et al, 2011) but the studies were of low quality. SSRIs reduce anxiety but no single SSRI is superior to any other (Mead et al, 2012). The Guideline Development Group considered a small RCT of a self-help relaxation recording which showed promise (Golding et al, 2015) but a larger sample would be needed to confirm recommendations. More research is needed into psychological interventions for anxiety after stroke. **[2023]**

A Cochrane review of 19 RCTs with 1,771 patients found that there was low quality evidence that selective serotonin reuptake inhibitors (SSRIs) can prevent depression in some people at risk of depression after stroke but there remains uncertainty over the balance of benefits and risk of adverse events (Hackett et al, 2009; Tsai et al, 2011; Allida et al, 2020a). Another systematic review and meta-analysis (Kalbounieh et al, 2022) found SSRIs had a significant effect in preventing and treating depression but with an increased risk of seizures. Similarly, low quality evidence showed that psychological interventions, such as motivational interviewing or problem-solving therapy, may help prevent depression (NICE, 2022b). **[2023]**

There have been three large scale RCTs of the SSRI fluoxetine in the first days following stroke (Dennis et al, 2020; Lundström et al, 2020; Almeida et al, 2021), one of which is cited in the Cochrane review of SSRIs for stroke recovery (Legg et al, 2019) and in two meta-analyses of fluoxetine for stroke recovery (Mead et al, 2019; Elsnhory et al, 2022). The trials were designed to assess functional recovery but collected information on the incidence of depression. Two of the studies suggested that medication therapy could reduce depression but at the cost of more serious adverse events, principally seizures and hip fracture. **[2023]**

A Cochrane review (Allida et al, 2020b) of 49 trials and over 3,000 patients synthesised low quality (high risk of bias) evidence that non-invasive brain stimulation and psychological interventions may be of benefit in the treatment of depression, in addition to pharmacological treatment with SSRIs. Of interest, psychological interventions were evaluated as a stand-alone treatment and were found to be as effective as combined therapy (SSRI and psychological therapy). For people with aphasia after stroke, individual behavioural therapy from an assistant psychologist was found to be more effective than usual care at improving mood (Thomas et al, 2013). **[2023]**

Acceptance and commitment therapy following stroke is a promising new area (Majumdar & Morris, 2019; Niu et al, 2022) that has received interest from clinicians and where further research is required. Further work is also needed to explore the adaptations required to cognitive behavioural therapy for

use in people with stroke. All psychological therapies should be underpinned by a neuropsychological understanding of the effects of stroke and should only be practised by members of the team with adequate training and clinical supervision. **[2023]**

## 4.40 Apathy

Apathy is described as a reduction in goal-directed activity in behavioural, cognitive or social dimensions of a person's life in comparison to their previous level of functioning (Robert et al, 2018). It can be characterised by both subjective motivational changes and reduced observable behaviour, and by decreased emotional responsiveness. Apathy occurs in about one third of people with stroke and has a negative impact on functional outcomes, and is under-recognised and poorly understood (Tay et al, 2021). In clinical practice, recognition of apathy is in its infancy. Increased understanding and training is required by stroke healthcare professionals to identify apathy alongside other cognitive or mood-related changes. Training should be provided by those with appropriate knowledge and skills such as clinical psychologists/neuropsychologists. **[2023]**

### 4.40 Recommendations

- A For people with stroke who show diminished motivation, reduced goal-directed behaviour or decreased emotional responsiveness that is persistent and affects engagement with rehabilitation or functional recovery, apathy should be considered alongside other cognitive and mood disorders. **[2023]**
- B People with apathy after stroke should have a review of rehabilitation goals to ensure they reflect the person's values, preferences and priorities. The person's confidence to complete rehabilitation activities and plans should also be considered as an additional need requiring support. **[2023]**
- C People with apathy after stroke should be managed by a multidisciplinary approach in line with the stepped care and matched care models of psychological care. Assessment and treatment from a clinical psychologist/neuropsychologist should be available, particularly when the presentation is complex, persistent or is resistant to approaches trialled by the multidisciplinary team, to support assessment, clinical formulation and rehabilitation planning. **[2023]**
- D People with apathy after stroke should have the impairment and the impact on function explained to them, their family/carers, and the multidisciplinary team. **[2023]**
- E Members of the stroke multidisciplinary team should receive training in psychological care including apathy, at levels appropriate to the stepped care and matched care models. **[2023]**

### 4.40 Sources

- A-E Guideline Development Group consensus

### 4.40 Evidence to recommendations

Systematic reviews and meta-analyses have reported apathy in people after stroke is associated with high levels of disability, depression and cognitive impairment (Caeiro et al, 2013; van Dalen et al, 2013). Recognition of apathy after stroke is important for informing rehabilitation approaches and outcomes, but there is a lack of high quality evidence to guide recommendations on assessment and management. Recent studies have included an underpowered RCT (n=13) of the pharmacological treatment nefiracetam (Brockman et al, 2016), a pilot trial (n=13) of repetitive transcranial magnetic stimulation (Sasaki et al, 2017) and a RCT (n=30) of strategy training (Skidmore et al, 2015). Earlier trials have

examined antidepressants, modafinil and cholinesterase inhibitors, but no agent has shown a convincing treatment effect. [2023]

## 4.41 Emotionalism

Emotionalism is an increase in emotional behaviour (crying or, less commonly, laughing) following minimal provoking stimuli. Around 20% of people with stroke are affected in the first six months and although frequency decreases by 12 months, more than 10% remain affected (Hackett et al, 2010). Emotionalism can be distressing for people with stroke and their families and can interfere with rehabilitation. [2016]

### 4.41 Recommendations

- A People with stroke who persistently cry or laugh in unexpected situations or are upset by their fluctuating emotional state should be assessed by a specialist member of the multidisciplinary team trained in the assessment of emotionalism. [2016]
- B People diagnosed with emotionalism after stroke should be appropriately distracted from the provoking stimulus when they show increased emotional behaviour. [2016]
- C People with severe or persistent emotionalism after stroke should be given antidepressant medication, monitoring effectiveness by the frequency of crying. They should be monitored for adverse effects and treated for at least four months beyond initial recovery. If the person's emotionalism has not improved after 2-4 weeks, medication adherence should be checked before considering a dose increase or a change to another antidepressant. [2016]

### 4.41 Sources

- A, B Working Party consensus
- C Hackett et al, 2010

### 4.41 Evidence to recommendations

Recommendations have not changed since the 2012 edition of the guideline when they were based on one Cochrane review (Hackett et al, 2010) and the consensus of the Working Party, as there have been no subsequent high quality research studies. There is no evidence regarding the choice of antidepressant or length of treatment, and well designed longer-term studies are needed. [2016]

## Communication and language

### 4.42 Introduction

This section covers the range of speech and language problems that can occur after stroke with recommendations to help the person with stroke to communicate and increase social participation. Swallowing impairment (dysphagia) is covered in [Section 4.26 Swallowing](#). [2023]

### 4.43 Aphasia

Aphasia refers to an impairment of language function affecting all aspects of communication including speaking, understanding, reading (separately called alexia) and writing (agraphia). Aphasia affects about a third of people with stroke, and can have a significant impact on the lives of individuals and their family/carers. Aphasia has wide-ranging effects on mood, self-image, well-being, relationships,



employment, leisure and social opportunities. Problems with communication can also occur following damage to the non-dominant hemisphere. **[2023]**

Delivery of speech and language interventions can be described under two main approaches: interventions delivered by trained professionals (e.g. speech and language therapists), which are currently the majority and address many aspects of language use, and digital therapies delivered on computers, mobile devices or as apps, which tend to target a specific aspect of language function e.g. the ability to retrieve and produce specific spoken words. Some studies have investigated a blend of the two approaches and use mainstream and specialist software to augment therapist-delivered speech and language therapy. In order to evaluate complex interventions such as speech and language therapy a broad range of studies are required (Skivington et al, 2021). **[2023]**

#### **4.43 Recommendations**

- A People should be assessed early after stroke for communication difficulties by a speech and language therapist to diagnose the problem, devise and implement a treatment programme and explain the nature and implications to the person, their family/carers and the multidisciplinary team. **[2023]**
- B People with aphasia after stroke should be given the opportunity to improve their language and communication abilities as frequently and for as long as they continue to make meaningful gains, under supervision from a speech and language therapist. **[2023]**
- C People with aphasia after stroke should be offered access to appropriate practice-based digital therapies. Adherence to and engagement with these digital therapies will likely be improved if supported by a carer or healthcare professional. Telerehabilitation programmes should:
  - be personalised to the individual’s goals and preferences;
  - be used when it is considered to be a beneficial option to promote recovery and should not be used as an alternative to in-person rehabilitation;
  - be monitored and adapted by the therapist according to progress towards goals;
  - be supplemented with face-to-face reviews and include the facility for contact with the therapist as required. **[2023]**
- D People with communication difficulties after stroke should:
  - be assessed and offered access to a range of communication aids, prescribed according to the person’s needs, goals, and preferences;
  - be assessed for their ability to use assistive technology and have programmes and equipment adjusted accordingly;
  - be trained and supported in the use of the appropriate technology. **[2023]**
- E People with communication difficulties after stroke should be offered access to social and participatory activities such as conversation partners, peer support groups, and return to work programmes as appropriate. **[2023]**
- F People with aphasia after stroke whose first language is not English should be assessed and provided with information about aphasia and offered therapy and communication practice in their preferred language. Referral to appropriate services such as interpreters should be made promptly to facilitate early assessment and treatment. **[2023]**
- G Intensive speech and language therapy such as comprehensive aphasia programmes may be considered from 3 months after stroke for those who can tolerate high-intensity therapy. **[2023]**
- H People with aphasia after stroke should be monitored and assessed for depression and other mood disorders using validated tools. Accessible information should be provided

and psychological interventions tailored to the person's needs. **[2023]**

- I The carers and family of a person with communication difficulties after stroke, and health and social care staff, should receive information and training from a speech and language therapist to improve their communication skills and enable them to optimise engagement in the person's rehabilitation, and promote autonomy and social participation. **[2023]**
- J People with persistent communication difficulties after stroke, that limit their social activities, should be offered information about local or national groups for people with aphasia and referred as appropriate. **[2023]**

#### **4.43 Sources**

- A, B Brady et al, 2016; RELEASE Collaborators, 2021, 2022a, 2022b; Guideline Development Group consensus
- C Lavoie et al, 2017; Palmer et al, 2019; Harrison et al, 2021; Braley et al, 2021; Guideline Development Group consensus
- D-F Guideline Development Group consensus
- G Hoover et al, 2017; Leff et al, 2021
- H Guideline Development Group consensus
- I Kagan et al, 2001; Simmons-Mackie et al, 2016
- J Guideline Development Group consensus

#### **4.43 Evidence to recommendations**

A high quality meta-analysis carried out by the RELEASE Collaborators (2022b) re-examined data from 25 published trials involving 959 people with aphasia across 10 different languages. This meta-analysis demonstrated a clear dose effect (total hours of therapy); that is, people with aphasia who received more hours of therapy (more than 20 to 50 hours) made large and clinically meaningful gains in language abilities and function, compared with those who received fewer hours. No functional communication gains were observed for people with aphasia receiving less than 5 hours of therapy nor comprehension gains for those receiving less than 20 hours. There was a weaker effect of frequency (number of days per week that therapy was delivered) with 3-5 days being best. The data on intensity (hours of therapy per week) were less clear (Dignam et al, 2015; RELEASE Collaborators, 2022a). **[2023]**

The majority of evidence derives from people with aphasia in the chronic phase (more than 6 months after stroke but often much longer than this). There is no evidence to support a set time limit after stroke when therapy should be stopped. People with aphasia should be offered therapy for as long as they continue to make meaningful gains in their language and communication abilities (RELEASE Collaborators, 2021). **[2023]**

The greatest overall gains in language outcomes for people with aphasia after stroke are seen when therapy starts in the acute/subacute stage, within 1 month of stroke (RELEASE Collaborators, 2021). There is less evidence regarding the intensity and dose for people with aphasia when treatment starts within one month of stroke. A high quality RCT of people with acute stroke showed no difference between 10 hours (control group) and 23 hours (active group) of speech and language therapy delivered over a month (Godecke et al, 2021). **[2023]**

For people with aphasia in the chronic phase (more than 3 months after stroke) the greatest gains were associated with moderate-intensity/high-dose therapy (3-4 hours/week; more than 50 hours of treatment in total; (RELEASE Collaborators, 2022b)). One way of delivering higher doses of therapy is through comprehensive aphasia programmes, with positive results seen in one non-randomised trial

(Hoover et al, 2017) and one observational study (Leff et al, 2021). However, not all people with aphasia can manage the high-intensity treatment mandated by these programmes. These studies suffer from selection bias and their results cannot be generalised to all people with aphasia, and more high quality research is needed. **[2023]**

There has been a lot of interest in digital therapies for people with aphasia, with several RCTs demonstrating large gains in naming in particular (Palmer et al, 2019; Braley et al, 2021). It should be noted that the majority of digital therapies are not designed to replicate the interventions delivered by a speech and language therapist - rather, they automate the repetitive and often impairment-based aspects of therapy. As such, their effects are often only seen on the aspects of language, or items, that the person with aphasia practices. There is good evidence that both clinician and self-administered digital therapies can be effective (Lavoie et al, 2017), but those with more support from carers or therapists tend to engage more and make larger language gains (Harrison et al, 2020). **[2023]**

#### **4.43 Implications**

Stroke services should consider all the ways that the dose of speech and language therapy can be increased to the levels recommended here, as they are considerably higher than currently delivered. Holistic aspects of rehabilitation such as peer support, social and singing groups may have communication benefits as they provide opportunity for social communication practice. Groups or programmes (such as return to work) should be facilitated and adapted to ensure accessibility for those with aphasia. Aphasia-specific participation activities, such as with communication partners from the statutory or voluntary sectors, should be available, together with equipment and training for supervised telerehabilitation. **[2023]**

### **4.44 Dysarthria**

Dysarthria is a neurological motor speech impairment that is characterised by slow, weak, imprecise and/or uncoordinated movements of the speech musculature and may involve respiration, phonation, resonance, and/or oral articulation. Impaired muscular control affects speech intelligibility, which is usually described as slurred or blurred. Dysarthria is common in the early stages of stroke, and is often associated with dysphagia (see [Section 4.26 Swallowing](#)). **[2016]**

#### **4.44 Recommendations**

- A People with unclear or unintelligible speech after stroke should be assessed by a speech and language therapist to diagnose the problem and to explain the nature and implications to the person, their family/carers and the multidisciplinary team. **[2016]**
- B People with dysarthria after stroke which limits communication should:
  - be trained in techniques to improve the clarity of their speech;
  - be assessed for compensatory and augmentative communication techniques (e.g. letter board, communication aids) if speech remains unintelligible. **[2016]**
- C The communication partners (e.g. family/carers, staff) of a person with severe dysarthria after stroke should be trained in how to assist the person in their communication. **[2016]**

#### **4.44 Sources**

- A Working Party consensus
- B King and Gallegos-Santillan, 1999; Mackenzie and Lowit, 2007; Palmer and Enderby, 2007
- C King and Gallegos-Santillan, 1999

#### **4.44 Evidence to recommendations**

There are only two small RCTs on this topic, neither of which provides definitive evidence regarding treatment. Bowen et al (2012) included a planned subgroup of 66 people with dysarthria and Mackenzie et al (2014) was a feasibility study of 39 people. In the former, there was no significant difference between speech and language therapy and an attention control in the first few months after stroke, but a nested, qualitative study found that early, regular and frequent contact from a therapist or trained visitor was positively rated by people with stroke and their family/carers (Young et al, 2013). Mackenzie et al (2014) involved people with chronic dysarthria, and there was no difference in outcomes between individuals who received only speech practice and those who received speech practice and oro-motor exercises, although both groups improved over time. Participants were compliant with both interventions and many completed daily independent practice and reported an increase in confidence with treatment. There is little evidence to support the interventions in common use but there is some evidence of qualitative benefits (Palmer & Enderby, 2007). **[2016]**

#### **4.45 Apraxia of speech**

A few people with stroke have specific and relatively isolated impairment of the ability to plan and execute the multiple skilled oral motor tasks that underlie successful talking – this is apraxia of speech. It is usually associated with damage to the non-dominant hemisphere, and requires careful separation from aphasia and dysarthria. Interventions such as syllable level therapy and metrical pacing have been studied and the use of computers to increase intensity of practice has been suggested. **[2016]**

#### **4.45 Recommendations**

- A People with marked difficulty articulating words after stroke should be assessed for apraxia of speech and treated to maximise articulation of key words to improve speech intelligibility. **[2016]**
- B People with severe communication difficulties but good cognitive and language function after stroke should be assessed and provided with alternative or augmentative communication techniques or aids to supplement or compensate for limited speech. **[2016]**

#### **4.45 Sources**

- A Stolk-Hornsveld et al, 2006; Connell et al, 2008; Working Party consensus
- B Working Party consensus

#### **4.45 Evidence to recommendations**

Studies in apraxia of speech are often small a Cochrane review (West et al, 2005) found no trials. There has been one subsequent crossover trial (Varley et al, 2016) which compared self-administered computerised communication therapy with a sham computerised treatment for people with chronic speech apraxia. Improvements in spoken word production (naming and repetition) were greater for the intervention group after the six week treatment but limited to trained single words. **[2016]**

## **Sensory effects of stroke**

#### **4.46 Introduction**

A stroke can result in changes to any of the senses, including touch, vision, hearing, taste and smell. Little trial evidence exists regarding taste and smell, but evidence for changes to hearing after stroke is reported (Bamiou, 2015). Changes to vision or touch senses after stroke often lead to concerns

regarding safety; visual impairment can significantly limit independence; and most sensory changes impact on aspects of social engagement. Hypersensitivity is also described across the senses, and may contribute to processing or attentional limitations. [2023]

## 4.47 Sensation

Sensory loss after stroke is a recognised impairment. Reported prevalence rates vary, with some estimating that up to 80% of people have loss or alteration in various somatic sensations – touch, position sense, temperature, pain, etc. (Doyle et al, 2010). The severity of sensory loss is associated with the extent of motor loss, and so the independent importance of sensory loss is difficult to quantify but one example of a standardised assessment tool is the Nottingham Sensory Assessment. Sensory retraining can be passive using electrical stimulation, or active involving repeated exposure to varying stimuli such as texture, temperature, joint position sense or shape. [2016]

### 4.47 Recommendations

- A People with stroke should be screened for altered sensation and if present, assessed for sensory impairments using standardised measures. [2016]
- B People with sensory loss after stroke should be trained in how to avoid injury to the affected body parts. [2016]

### 4.47 Sources

- A Stolk-Hornsveld et al, 2006; Connell et al, 2008; Working Party consensus
- B Working Party consensus

### 4.47 Evidence to recommendations

There is no good evidence to support any particular passive or active intervention for sensory impairment after stroke. Studies evaluating mirror therapy (Thieme et al, 2012) and electrical stimulation (Veerbeek et al, 2014b) show promising results but further research is needed into specific interventions as part of goal-directed rehabilitation (Pollock et al, 2014b). [2016]

## 4.48 Vision

Visual problems after stroke are common. In a multicentre prospective cohort study, 58% of people with stroke were found to have visual problems and about half of them, regardless of the visual impairment type, were visually asymptomatic (Rowe, 2017; Rowe et al, 2020). Visual problems include altered acuity, field loss such as hemianopia and disruption of eye movements causing diplopia, nystagmus, blurred vision and loss of depth perception (NICE, 2013b; Hepworth et al, 2015). Ocular stroke can cause visual loss due to central or branch retinal artery occlusion, but central visual loss can be due to coexistent ocular conditions. Perceptual disorders such as visual agnosia ([Section 4.36 Perception](#)) and neglect ([Section 4.37 Neglect](#)) should be distinguished from visual impairments. Visual disturbance has a significant impact on confidence, safety and independence and should therefore remain a focus for all members of the multidisciplinary team to support with identification, adjustment and adaptation. People with visual changes following stroke who were previously driving should be advised of the requirements and restrictions (see [Section 4.14 Driving](#)). [2023]

### 4.48 Recommendations

- A People with stroke should be screened for visual changes by a professional with appropriate knowledge and skills, using a standardised approach. [2023]
- B People with stroke should be:
  - assessed for visual acuity whilst wearing their usual glasses or contact lenses to check

- their ability to read newspaper text and see distant objects clearly;
  - examined for the presence of visual field deficit (e.g. hemianopia) and eye movement disorders (e.g. strabismus and motility deficit);
  - assessed using adapted visual tests for those with communication impairment. **[2023]**
- C** People with altered vision, visual field defects or eye movement disorders after stroke should receive information, support and advice from an orthoptist and/or an ophthalmologist. **[2023]**
- D** People reporting visual disturbance following stroke should be assessed by an occupational therapist to assess its impact on their ability to carry out functional tasks independently, their confidence and safety. **[2023]**
- E** People with visual loss due to retinal artery occlusion should be jointly managed by an ophthalmologist and a stroke physician. **[2023]**
- F** Multidisciplinary treatment programmes should be developed with an orthoptist and should include restorative and compensatory approaches to maximise safety and independence, in accordance with the person's presentation, goals and preferences. For people with visual field loss due to stroke, compensation training such as visual scanning or visual search training should be considered. **[2023]**
- G** People with visual deficits following stroke should be advised about driving restrictions and receive accessible written information regarding the process of assessment and decision making. **[2023]**

#### **4.48 Sources**

- A-D Working Party consensus
- E-G Hanna and Rowe, 2017; Howard and Rowe, 2018; Liu et al, 2019; Pollock et al, 2019; Guideline Development Group consensus

#### **4.48 Evidence to recommendations**

All patients with stroke should be screened for visual impairment early after their stroke. Given that visual impairment is frequently asymptomatic, screening should be carried out by those with the appropriate knowledge and skills, such as an occupational therapist, or with specialist skills in visual assessment, such as an orthoptist or optometrist. These specialists can carry out further assessment and targeted treatment specific to the type of visual impairment (Rowe, 2017). One study found that it is feasible to undertake a visual screen for most patients within the first 3 days after stroke and a full visual assessment within 4 days (Rowe et al, 2019). Therefore, a visual screen could be completed in the same 72-hour time frame as other therapy assessments, given that visual problems can impact on delivery of other rehabilitation interventions. **[2023]**

An agreed visual care pathway is required to ensure appropriate access to a range of specialists, including orthoptists, ophthalmologists, optometrists and low vision rehabilitation workers. Recommendations for orthoptist staffing levels in hyperacute and acute stroke units are set out in a British and Irish Orthoptists Society consensus document (British and Irish Orthoptic Society, 2021) which advises orthoptic staffing for hyperacute units as 0.4 WTE/10 beds, and for acute units as 0.2 WTE/10 beds. Specialists are required for identification of post-stroke visual impairment, diagnosis of eye movement disorders and the assessment of functional and driving implications (also see [Section 4.14 Driving](#)). **[2023]**

With regard to visual impairment of central vision and eye movement deficits, management may include interventions such as compensatory (e.g. head scanning training to adjust for poor eye movements),



substitutive (e.g. magnifiers to increase print size) and restitutive (e.g. botulinum toxin/eye muscle surgery to correct strabismus) approaches, which require referral to specialist eye services. **[2023]**

For people with visual field loss after stroke, interventions are proposed to work by either compensating for the visual field defect by changing their behaviour or activity, substituting for the defect by using devices such as prisms to shift the field of view from the affected side, or restoring the visual field through repetitive stimulation of the affected field of vision. Compensatory training includes both visual scanning training, which involves repetitive symmetrical movements to each (right/left) side and visual search training, which involves repeatedly looking for (searching) for objects on each side. A Cochrane review found that there is limited, low quality evidence that compensatory training, and in particular visual scanning and search training, may be more beneficial than placebo, sham or control at improving quality of life, but not other outcomes (Hanna & Rowe, 2017; Howard & Rowe, 2018; Liu et al, 2019; Pollock et al, 2019). There is insufficient evidence to reach any generalised conclusions about the effect of substitutive interventions (prisms) or restitutive interventions as compared to placebo, control, or no treatment. There is low-quality evidence that prisms may cause minor adverse events (Pollock et al, 2019). All these areas warrant further research. **[2023]**

# Glossary

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|                            |   |
|----------------------------|---|
| Activities of daily living | Refers to activities that people normally undertake (e.g. bathing, dressing, feeding themselves).   |
| Acupuncture                | A complementary medicine that involves inserting thin needles into the skin.  |
| Acute stroke service       | Consists of: a) a comprehensive stroke centre (CSC) providing hyperacute, acute and inpatient rehabilitation including thrombectomy (thrombectomy centre) and neurosurgery; or b) an acute stroke centre (ASC) providing hyperacute, acute and inpatient rehabilitation. All components of a specialist acute stroke service should be based in a hospital that can investigate and manage people with acute stroke and their medical and neurological complications. |
| Aerobic exercise           | Low- to moderate-intensity exercise that can be sustained for long periods of time (e.g. cycling, swimming or walking).   |
| Agnosia                    | The inability for a patient to recognise or make proper sense of sensory information.   |
| Alteplase                  | A drug used for thrombolysis.   |
| Aneurysm                   | A bulge in the wall of a blood vessel that is filled with blood. This can burst and cause a haemorrhage.  |
| Angiography                | A technique that uses X-ray technology to image blood vessels.  |
| Anticoagulants             | A group of drugs used to reduce the risk of clots by thinning the blood.  |
| Antiphospholipid syndrome  | Sometimes called 'sticky blood syndrome' because blood clots form too quickly; this is due to antibodies against the body's phospholipid part of every cell in the body.  |
| Antiplatelets              | A group of drugs used to prevent the formation of clots by stopping platelets in the blood sticking together.   |
| Antithrombotics            | The generic name for all drugs that prevent the formation of blood clots. This includes antiplatelets and anticoagulants.   |
| Aphasia                    | Communication difficulties after a stroke which can affect a person's speech, processing, reading and writing.  |
| Arterial dissection        | This is caused as a result of a small tear forming in the lining of the arterial wall.  |
| Atherosclerosis            | Fatty deposits that harden on the inner wall of the arteries (atheroma) and roughen its surface; this makes the artery susceptible to blockage either by narrowing or by formation of a blood clot.   |
| Atrial fibrillation        | A heart condition that causes an irregular heartbeat, often faster than the normal heart rate.  |
| Audit (clinical)           | A method of evaluating the performance of a clinical service against a set of standards/criteria.   |
| Bobath therapy             | Treatment which aims to use facilitative handling which prioritises normal movement and muscle tone or inhibition of reflex activity rather than maximising practice and patient activity. Also known as neurophysiological or neurodevelopmental treatment.  |
| Body mass index (BMI)      | An index of body weight corrected for height.   |
| Botulinum toxin            | A toxin which when injected can relax muscles to reduce spasticity.   |

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| Cardiovascular disease                                      | Disease of the heart and/or blood vessels.  |
| Care pathway  | A tool used by healthcare professionals to define the sequence and timings of a set of tasks or interventions that should be performed for a patient who enters a healthcare setting (e.g. a hospital) with a specific problem.   |
| Carotid angioplasty   | A surgical procedure that widens the internal diameter of the carotid artery, after it has been narrowed by atherosclerosis.  |
| Carotid arteries  | Main blood vessels in the neck, which supply oxygenated blood to the brain.   |
| Carotid endarterectomy (CEA)                                | A surgical procedure used to clear the inside of the carotid artery of atheroma.  |
| Carotid stenosis  | The narrowing of the carotid arteries in the neck.  |
| Carotid stenting  | Insertion of a tube into the carotid artery in order to prop the artery open and reduce narrowing.  |
| Caval filter  | A device that is inserted into the veins to prevent a blood clot entering the lungs.  |
| Cerebral venous thrombosis                                  | A blood clot that forms within a vein inside the brain.   |
| Clinician   | A registered healthcare professional such as a doctor, nurse or therapist.  |
| Cochrane review   | A systematic review of research in health care and health policy that is published in the Cochrane Database of Systematic Reviews.  |
| Commissioner (health services)                              | Person or organisation in some parts of the UK National Health Service (NHS) that decides how to allocate the health budget for a service.  |
| Community stroke team, community stroke rehabilitation team | A stroke specialist multidisciplinary team that provides stroke rehabilitation for patients in their own home or other community setting (including care homes and nursing homes). This may be following hospital discharge, after a patient has been discharged from an early supported discharge team or at any point post stroke where rehabilitation needs are identified. The intensity and duration of this service should be determined by patient need. |
| Compensatory strategies                                     | Learning an alternative way of completing a task.   |
| Computed tomography (CT)                                    | An X-ray technique used to examine the brain.   |
| Confidence interval (CI)                                    | When analysing a research study, this is the range ('interval') of possible results that statisticians are 95% confident the actual result lies between.  |
| Constraint-induced movement therapy                         | Therapy that involves preventing the use of the unaffected side of the body thus forcing the use of the affected side.  |
| Cost-effectiveness  | The extent to which the benefits of a treatment outweigh the costs.   |
| Decompressive hemicraniectomy                               | A surgical procedure for the treatment of raised pressure inside the brain from fluid, blood or swelling. A piece of skull is removed to allow the brain to swell.  |
| Deep vein thrombosis (DVT)                                  | A blood clot that develops in the large veins, usually in the legs.   |
| Diabetes, diabetes mellitus                                 | A metabolic disease in which a person has high blood sugar.   |
| Diagnostic accuracy   | The degree to which a diagnostic (or screening) tool or procedure is able to distinguish between cases and non-cases. See also 'sensitivity' or 'specificity'.  |

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| Doppler ultrasound                      | An imaging technique that measures blood flow and velocity through blood vessels.   |
| Dysarthria                              | Difficulty producing clear speech, caused by muscle weakness.   |
| Dyspepsia                               | Indigestion.  |
| Dysphagia                               | Difficulty in swallowing.   |
| Early supported discharge               | An intervention delivered by a co-ordinated, stroke specialist, multidisciplinary team that facilitates the earlier transfer of care from hospital into the community and provides responsive (within 24 hours) and intensive stroke rehabilitation in the patient's place of residence (usually over a time-limited period). |
| Endarterectomy                          | The surgical removal of plaque from a blocked artery to restore blood flow.   |
| Face Arms Speech Time (FAST) test       | A test used to screen for the possibility of a stroke or a TIA.   |
| Fatigue                                 | Physical or mental exhaustion that does not get better through normal periods of rest.  |
| Foot-drop                               | A condition in which the foot hangs limply whilst walking.  |
| Gastrointestinal bleeding               | Bleeding anywhere between the throat and the rectum.  |
| Gastrostomy                             | A surgical opening into the stomach to enable feeding.  |
| Gastrostomy feeding (also tube feeding) | Provision of nutrition and fluids via a tube directly into the gastrointestinal tract.  |
| Goal attainment                         | Rehabilitation goals for particular tasks are set by the patient and therapists together.   |
| Haemorrhage                             | Bleeding caused by blood escaping into the tissues.   |
| Haemorrhagic stroke                     | A stroke that happens when a blood vessel bursts, leading to bleeding in the brain (also called a 'brain haemorrhage').   |
| Healthcare professional                 | A professional involved in stroke care, such as a doctor, nurse, therapist, or care staff.  |
| HEART UK                                | A cholesterol charity.  |
| Hemianopia                              | Blindness or some loss of vision in one part of the visual field.   |
| Homeostasis                             | Regulation of internal environment (e.g. body temperature regulated at 37°C).   |
| Hydrocephalus                           | A build up of fluid within the skull.   |
| Hyperacute stroke unit/centre/service   | A stroke unit, centre or service that treats patients in the first 72 hours of symptom onset.   |
| Hyperlipidaemia                         | Raised levels of lipids (cholesterol, triglycerides or both) in the blood serum.  |
| Hypertension                            | Raised blood pressure.  |
| Hypertensive encephalopathy             | Brain damage caused by raised blood pressure.   |
| Hypoglycaemia                           | Blood sugar levels lower than the normal range.   |
| Hypoxia                                 | Blood oxygen levels outside the normal range, e.g. below 95% saturation.  |
| Incontinence                            | Inability to control passing of urine and/or faeces.  |
| Infarct                                 | An area of cell death due to a deprived blood supply.   |

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| Integrated community stroke service                                      | An integrated service that provides early supported discharge and community stroke rehabilitation.  |
| International Classification of Functioning, Disability and Health (ICF) | A classification of health used as a framework by the World Health Organization (WHO) to measure health and disability.   |
| Ischaemic stroke   | A stroke that happens when a blood clot blocks an artery that is carrying blood to the brain.   |
| Lumbar puncture  | A diagnostic or therapeutic procedure that involves collection of fluid from the base of the spine.   |
| Magnetic resonance imaging (MRI)   | A non-invasive imaging technique that allows for detailed examination of the brain.   |
| Malnutrition Universal Screening Tool (MUST)                             | A screening tool consisting of five steps to help identify which adults are malnourished or at risk of malnourishment.  |
| Meta-analysis  | A statistical technique for combining the results of a number of studies that address the same question and report on the same outcomes to produce a summary result.  |
| Mouth care   | Also referred to as oral health care. Refers to the promotion and maintenance of a clean oral cavity including the teeth, gums, cheeks, tongue and palate. A clean mouth requires the removal of traces of food and debris and dental plaque.   |
| MRI with diffusion-weighted imaging                                      | This type of scan shows areas of recent ischaemic brain damage.   |
| Musculoskeletal pain   | Pain of the muscles and/or joints.  |
| National Institute for Health and Care Excellence (NICE)                 | A special health authority set up within the NHS to develop appropriate and consistent advice on healthcare technologies, and to commission evidence-based guidelines. Its remit extends in most cases to England, Wales and Northern Ireland.  |
| National Institute of Health Stroke Scale (NIHSS)                        | A score to assess the severity of a stroke.   |
| Neuropathic pain   | Pain caused by damage to nerves.  |
| Orthosis   | An appliance used to support or align an area of the body to facilitate movement, or prevent or correct damage.   |
| Palliative care  | Care that relieves rather than treats symptoms.   |
| Pneumonia  | An inflammatory condition of the lungs usually caused by infection.   |
| Pulmonary embolism   | A blood clot in the lungs.  |
| Quality of life  | Refers to the level of comfort, enjoyment, and ability to pursue daily activities.  |
| Quality standard   | A standard set (e.g. by NICE) that is used to define whether the quality of care is of a high standard.   |
| Randomised controlled trial (RCT) (often 'randomised trial')             | A trial in which people are randomly assigned to two (or more) groups: one (the experimental group) receiving the treatment that is being tested, and the other (the comparison or control group) receiving an alternative treatment, a placebo (dummy treatment) or no treatment. The two groups are followed up to compare differences in outcomes to see how effective the experimental treatment was. Such trial designs help minimise experimental bias. |

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| Recognition of stroke in the emergency room (ROSIER) | A tool used to establish the diagnosis of stroke or TIA.   |
| Rehabilitation                                       | A set of treatments and activities to promote recovery and reduce disability. Rehabilitation treatments are provided by therapists and therapy assistants.   |
| Saturated fat  | A type of fat that is commonly found in meat and dairy products as opposed to fats found in plants and fish, which may be unsaturated.   |
| Self-efficacy  | A person's belief in their own competency.   |
| Self-management                                      | Actions and confidence of individuals to manage the medical and emotional aspects of their condition in order to maintain or create new life roles.  |
| Sensitivity  | The ability of a test to detect a problem.   |
| Service planners                                     | Those responsible for planning and sanctioning health services in Ireland.   |
| Side effect  | An adverse event that occurs because of a therapeutic intervention.  |
| SIGN   | Scottish Intercollegiate Guidelines Network, an organisation set up to develop evidence-based guidelines. It is part of Healthcare Improvement Scotland and its remit covers Scotland.   |
| Spasticity   | Increased stiffness of the muscles that occurs in the paralysed limbs after stroke.  |
| Specialist   | A healthcare professional with the necessary knowledge and skills in managing people with stroke and conditions that mimic stroke, usually by having a relevant further qualification and keeping up to date through continuing professional development. This does not require the healthcare professional exclusively to manage people with stroke, but does require them to have specific knowledge and practical experience of stroke.   |
| Specialist team                                      | A group of specialists who work together regularly managing people with stroke and conditions that mimic stroke, and who between them have the knowledge and skills to assess and resolve the majority of problems. At a minimum, any specialist unit, team or service must be able to deliver all the relevant recommendations made in this guideline. This does not require the team exclusively to manage people with stroke, but the team should have specific knowledge and practical experience of stroke. |
| Specificity  | The ability of a test to detect the right problem.   |
| Splint   | A custom or ready-made external device to support a joint or limb in a certain position.   |
| Stenosis   | Abnormal narrowing of a blood vessel.  |
| Stenting   | A metal mesh tube is placed in an artery or blood vessel to increase blood flow to an area blocked by stenosis.  |
| Stroke   | A clinical syndrome, of presumed vascular origin, typified by rapidly developing signs of focal or global disturbance of cerebral functions lasting more than 24 hours or leading to death.  |
| Subarachnoid haemorrhage (SAH)                       | A haemorrhage from a cerebral blood vessel, aneurysm or vascular malformation into the subarachnoid space (the space surrounding the brain where blood vessels lie between the arachnoid and pia mater).   |
| Subluxation  | An incomplete or partial dislocation of a joint.   |
| Systematic review                                    | A way of combining the findings from a variety of different research studies to better analyse whether the studies have provided a convincing answer to a research question.   |



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| Telemedicine                            | The use of telecommunication and information technologies in order to provide clinical healthcare at a distance.   |
| Tenecteplase                            | A drug used for thrombolysis.  |
| Therapist                               | In the context of the guideline this includes the allied health professionals (UK) and health and social care professionals (Ireland) involved in stroke care. The main ones are dietitians, occupational therapists, orthoptists, orthotists, physiotherapists, and speech and language therapists. |
| Thrombectomy                            | The excision of a blood clot from a blood vessel.  |
| Thrombectomy centre                     | A centre providing thrombectomies without providing acute stroke care.   |
| Thrombolysis                            | The use of drugs to break up a blood clot. An example of a thrombolysis drug is alteplase, also sometimes called tPA.  |
| Thrombosis                              | A formation of a blood clot.   |
| Transient ischaemic attack (TIA)        | An acute loss of focal cerebral or ocular function with symptoms lasting less than 24 hours and which is thought to be due to inadequate cerebral or ocular blood supply as a result of low blood flow, thrombosis or embolism associated with diseases of the blood vessels, heart, or blood.       |
| Tube feeding (also gastrostomy feeding) | Provision of nutrition and fluids via a tube directly into the gastrointestinal tract.   |
| Venography                              | An X-ray test that provides an image of the leg veins after a contrast dye is injected into a vein in the patient's foot.  |
| Videofluoroscopy                        | A test for assessing the integrity of the oral and pharyngeal stages of the swallowing process. It involves videotaping X-ray images as the patient swallows a bolus of barium.  |
| Vocational rehabilitation               | A co-ordinated plan to optimise a person's ability to participate in paid or voluntary work.   |
| Work                                    | Different forms of occupation, including paid employment, vocational training, sheltered, therapeutic or voluntary work, and adult education.  |
| Xanthochromia                           | The yellowish appearance of cerebrospinal fluid that occurs after bleeding into the fluid, usually after subarachnoid haemorrhage.   |

# Abbreviations and acronyms

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| ABCD2     | Age, blood pressure, clinical features, duration of TIA, and presence of diabetes                                     |
| ADL       | Activities of daily living  |
| AF        | Atrial fibrillation   |
| APS       | Antiphospholipid syndrome   |
| ASC       | Acute stroke centre   |
| ASPECTS   | Alberta Stroke Program Early Computed Tomography Score  |
| ASA       | Atrial septal aneurysm  |
| BADS      | Behavioural Assessment of the Dysexecutive Syndrome   |
| BMI       | Body mass index   |
| BOA       | Behavioural Outcomes of Anxiety   |
| BP        | Blood pressure  |
| BPPV      | Benign paroxysmal positional vertigo  |
| CAA       | Cerebral amyloid angiopathy   |
| CADASIL   | Cerebral autosomal dominant arteriopathy with subcortical infarcts and leucoencephalopathy                            |
| CI        | Confidence interval   |
| CIMT      | Constraint-induced movement therapy   |
| COC       | Combined oral contraceptive   |
| COVID-19  | Coronavirus disease   |
| CPAP      | Continuous positive airways pressure  |
| CPSP      | Central post-stroke pain  |
| CSC       | Comprehensive stroke centre   |
| CT        | Computed tomography   |
| CTA       | Computed tomography angiography   |
| CVT       | Cerebral venous thrombosis  |
| DISCs     | Depression Intensity Scale Circles  |
| DOAC      | Direct oral anticoagulant   |
| DVA       | Driver and Vehicle Agency (Northern Ireland)  |
| DVLA      | Driver and Vehicle Licencing Agency (England, Scotland, Wales)  |
| DVT       | Deep vein thrombosis  |
| DWI       | Diffusion-weighted imaging  |
| EADL      | Extended activities of daily living   |
| ECG       | Electrocardiogram   |
| ELISA     | Enzyme-linked immunosorbent assay   |
| EMA       | European Medicines Agency   |
| FAST test | Face Arm Speech Time test   |
| FEES      | Fibre-optic endoscopic evaluation of swallowing   |
| FLAIR     | Fluid attenuated inversion recovery   |
| GDG       | Guideline Development Group   |
| GP        | General practitioner  |
| HAS-BLED  | Hypertension, Abnormal score renal and liver function, Stroke, Bleeding, Labile INRs, Elderly, Drugs or alcohol score |
| HDL       | High density lipoprotein  |
| HIIT      | High intensity interval training  |
| HR        | Hazard ratio  |
| HRT       | Hormone replacement therapy   |

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| HSE        | Health Service Executive (Ireland)   |
| IAPT       | Improving Access to Psychological Therapies                                    |
| ICF        | International Classification of Functioning, Disability and Health             |
| ICH        | Intracerebral haemorrhage  |
| ILR        | Implantable loop recorder  |
| INR        | International normalised ratio (for blood clotting time)                       |
| IQR        | Interquartile range  |
| LDL        | Low density lipoprotein  |
| MCA        | Middle cerebral artery   |
| mCIMT      | Modified constraint-induced movement therapy                                   |
| MDT        | Multidisciplinary team   |
| MHRA       | Medicines and Healthcare Products Regulatory Agency                            |
| MI         | Myocardial infarction  |
| MICON      | Microbleeds International Collaborative Network                                |
| MR         | Magnetic resonance   |
| MRA        | Magnetic resonance angiography   |
| MRI        | Magnetic resonance imaging   |
| mRS        | Modified Rankin Scale score  |
| MSU        | Mobile stroke unit   |
| MUST       | Malnutrition Universal Screening Tool  |
| NASCET     | North American Symptomatic Carotid Endarterectomy Trial                        |
| NDLS       | National Driver Licence Service (Ireland)                                      |
| NHS        | National Health Service (UK)   |
| NICE       | National Institute for Health and Care Excellence                              |
| NIHSS      | National Institutes of Health Stroke Scale                                     |
| NIMAST     | Northern Ireland Multidisciplinary Association of Stroke Teams                 |
| NMES       | Neuromuscular electrical stimulation   |
| NNT        | Number needed to treat   |
| NOAC       | Non-vitamin K anticoagulant  |
| NSAID      | Non-steroidal anti-inflammatory drug   |
| OR         | Odds ratio   |
| OSA        | Obstructive sleep apnoea   |
| PADL       | Personal activities of daily living  |
| PAF        | Paroxysmal atrial fibrillation   |
| PC-ASPECTS | Posterior circulation – Alberta Stroke Program Early Computed Tomography Score |
| PCC        | Prothrombin complex concentrate  |
| PE         | Pulmonary embolism   |
| PES        | Pharyngeal electrical stimulation  |
| PFO        | Patent foramen ovale   |
| POC        | Progestin only contraceptive   |
| RBMT       | Rivermead Behavioural Memory Test  |
| RCP        | Royal College of Physicians of London  |
| RCT        | Randomised controlled trial  |
| ROSIER     | Recognition of Stroke in the Emergency Room                                    |
| RR         | Relative risk  |
| SAH        | Sub arachnoid haemorrhage  |
| SARA       | Scale for the Assessment and Rating of Ataxia                                  |
| SBP        | Systolic blood pressure  |
| SIGN       | Scottish Intercollegiate Guidelines Network                                    |
| SLT        | Speech and language therapy  |
| SMC        | Scottish Medicines Consortium  |

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| SRU   | Stroke rehabilitation unit                  |
| SSNAP | Sentinel Stroke National Audit Programme    |
| SSRI  | Selective serotonin reuptake inhibitor      |
| SWI   | Susceptibility-weighted imaging             |
| tDCS  | Transcranial direct current stimulation     |
| TENS  | Transcutaneous electrical nerve stimulation |
| TIA   | Transient ischaemic attack                  |
| TMS   | Transcranial magnetic stimulation           |
| TOE   | Transoesophageal echocardiogram             |
| TTE   | Transthoracic echocardiogram                |
| TULIA | Test of Upper Limb Apraxia                  |
| VA    | Vertebral artery                            |
| VKA   | Vitamin K antagonist                        |
| VNS   | Vagus nerve stimulation                     |
| VOSP  | Visual Object and Space Perception battery  |
| VR    | Vocational rehabilitation                   |
| VTE   | Venous thromboembolism                      |
| WHO   | World Health Organization                   |
| WTE   | Whole time equivalent                       |

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