

Best Practice Guidance for the Development of **Exercise after Stroke Services** in Community Settings

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Chest
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Stroke
Scotland



different Strokes

Content

Project group	3
Foreword	4
1. Executive Summary of the Best Practice Recommendations	5
2. Introduction	6
2.1 The need for a guideline	6
2.2 The remit of this guideline	6
2.3 Vision	7
2.4 Background	7
2.5 Guideline development	8
2.6 Scope	9
2.7 Target service providers	10
2.8 Target service users	11
3. The Best Practice Recommendations	12
3.1 Governance	12
3.1.1 Management/ working group	12
3.1.2 Involvement of the regional stroke Managed Clinical Network	14
3.1.3 Partnership agreement	14
3.1.4 Exercise after Stroke service co-ordinator	14
3.1.5 Location	15
3.2 Referral systems and the role of the health professional	15
3.2.1 Routes into the Exercise after Stroke service	16
3.2.1.1 Immediately following discharge from physiotherapy	16
3.2.1.2 Stroke survivors living in the community	17
3.2.2 Process of referral to an Exercise after Stroke service and the role of the health professional	17
3.2.2.1 Pre-exercise assessment	19
3.2.2.2 Screening for absolute contraindications for exercise	19
3.2.2.3 Multidimensional pre-exercise assessment	20
3.2.2.4 Local Exercise after Stroke service inclusion criteria	22
3.2.3 Risk assessment and management	23
3.2.3.1 Risk of cardiac events	23
3.2.3.2 Risk of falls and fractures	25
3.2.3.3 Other exercise related risks	26
3.2.4 Barriers and motivators to exercise after stroke	27
3.2.5 Transfer of care	28
3.2.5.1 Role of the Exercise after Stroke service co-ordinator	28
3.2.5.2 Role of the referring health care professional	28
3.2.5.3 Transfer of responsibility	30
3.2.5.4 Transfer of information	30
3.3 Exercise after Stroke service organisation	33
3.3.1 Service co-ordinator/ liaison staff	33
3.3.2 Group exercise format	33
3.3.3 Ratio of instructors to stroke survivors	34
3.3.4 On-going service provision	34
3.3.5 Exercise after Stroke and the patient pathway	35
3.3.6 Promoting life-long participation in exercise	35
3.3.7 Signposting back to GP	36
3.4 Instructor training and qualification	36
3.4.1 Skills Active endorsed training for exercise instructors	37
3.4.2 The ARNI Trust	39

3.5	The role of the exercise professional	39
3.5.1	Pre-exercise assessment	39
3.5.2	Individualised exercise programme	40
3.5.3	Physical activity plan	40
3.5.4	Personal exercise record	41
3.5.5	Social support	42
3.5.6	Change in medical status during the exercise programme	42
3.6	Content of the Exercise after Stroke programme	42
3.6.1	Warm up	43
3.6.2	Training section	44
3.6.2.1	Aerobic/cardiac component	44
3.6.2.2	Functional aerobic activities	44
3.6.2.3	Strengthening activities	45
3.6.2.4	Balance activities	46
3.6.3	Cool down	46
3.6.4	Programming variables	49
3.6.4.1	Duration	49
3.6.4.2	Intensity	49
3.6.4.3	Frequency	49
3.7	Record keeping and outcome evaluation	50
3.7.1	Data protection	50
3.7.2	Minimum data set	50
3.7.3	Outcome evaluation	51
3.7.4	Adverse events	52
3.7.5	Feedback to referrers	52
4.	Other Good Practice Recommendations	53
4.1	Personal pre-session contact	53
4.2	Accompanying stroke survivors to their first session	53
4.3	In-service stroke awareness training	53
4.4	Orthotics assessment	54
4.5	Assistants	54
5.	Temporary measures in the absence of community Exercise after Stroke services	55
6.	Conclusion	56
	Declaration of interest	56
	Acknowledgements	57
	Reference group	57
	References	59
	Appendix I: checklist of criteria for Exercise after Stroke Services	64

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Foreword



I am delighted to launch this clinical guideline on Exercise after Stroke, which has been endorsed by the National Advisory Committee on Stroke. Stroke is still the major cause of disability in the community. There is mounting evidence that exercise training improves functional recovery and quality of life for stroke survivors. This guideline is the culmination of a Scottish Government funded project, which scoped the provision of exercise services after stroke, interviewed service providers, and scrutinised relevant UK clinical guidelines in stroke and exercise referral. Guideline development has been overseen by a multidisciplinary Reference Group of health and exercise professionals, the key stroke charities, patients and carers.

The guideline provides service providers with practical advice on how to set up community Exercise after Stroke services. It is applicable to the development of service throughout the UK. I would urge you to use this guideline to start to drive forward the development of Exercise after Stroke services. I have no doubt that the development of such services will have a major impact on the quality of life of stroke survivors.

Professor Martin Dennis

Chair, National Advisory Committee on Stroke, Scottish Government, and Founding

President of British Association of Stroke Physicians

1. Executive Summary of the Best Practice Recommendations

The following recommendations are designed to be applied across all UK Exercise after Stroke services (Box 1). Each aspect of this service will be described in more detail in subsequent parts of this document. [Appendix I](#) includes a checklist for service providers, commissioners and stroke survivors.

Box 1 Summary of best practice recommendations for Exercise after Stroke services

SECTION	ASPECT OF SERVICE	RECOMMENDATION
3.1	Governance	Exercise after stroke services should be overseen by a multidisciplinary working group
3.2	Referral systems and the role of the health professional	Referral into an exercise after stroke service should be undertaken by a health care professional within a robust, standardised, quality assured model, where stroke survivors are assessed for absolute contraindications to exercise. Treadmill exercise testing is not considered necessary in most cases.
3.3	Exercise after Stroke service organisation	The aim is to deliver a high-quality service that is safe, stroke-specific, evidence-based, person-centred, and enjoyable, with a view to encouraging a more active lifestyle where possible
3.4	Instructor training and qualification	Exercise professionals wishing to work with stroke survivors should undertake the Level 4 Register of Exercise Professionals accredited, endorsed national qualification
3.5	The role of the exercise professional	Exercise after stroke services need to be specifically <i>adapted</i> to the needs of stroke survivors, and <i>tailored</i> to suit the needs and reduce the risks for the individual with stroke
3.6	Content of the exercise after stroke programme	The exercise programme should include evidence-based cardiovascular walking training with the following parameters: <ul style="list-style-type: none"> • Frequency: 3x per week • Duration: 1 hour per session • Intensity: moderate where possible
3.7	Record keeping and outcome evaluation	Detailed records of attendance, adverse events and outcomes should be kept, according to guidance on confidentiality and data protection
4	Other good practice recommendations	<ul style="list-style-type: none"> • pre-exercise session contact • accompany stroke survivors to their first session • in-service stroke awareness training • orthotics assessment • involving assistants

2. Introduction

2.1 The need for a guideline

Stroke is the most common cause of complex disability (Adamson et al. 2004). There are over one million people in the UK who have had a stroke (Institute of Public Health, 2008) and it is estimated that around half of this population has a permanent stroke-related disability (World Health Organisation, 2004). It is well established that stroke survivors have low levels of physical fitness (Ivey et al. 2005) and muscle strength and, since many do not have the physical fitness necessary to perform common activities of daily living (Ivey et al. 2005), this impacts on their independence and community participation (Mayo et al. 1999).

There is good evidence that exercise can be effective in improving physical fitness and function after stroke (Saunders et al. 2009) and the importance of exercise after stroke is recognised in national clinical guidelines for stroke. In response to these guidelines and the needs of stroke survivors, new community-based Exercise after Stroke (EAS) services are emerging across the UK and around the world. However, there is little information about the content, structure or governance of these services, and to what extent they are evidence-based. Furthermore, until now, there was little guidance on how to improve existing or develop new community-based exercise after stroke services.

2.2 The remit of this guideline

In 2009, the Scottish Government's National Advisory Committee for Stroke commissioned the Exercise after Stroke project group to develop best practice guidelines for Exercise after Stroke services. The aim of the project was to facilitate the development of standardised, high quality services across Scotland and the UK, with the view to enhance the long term physical fitness, health and well-being of stroke survivors.

The remit of this project was to:

- Scope the provision of Exercise after Stroke services in Scotland
- Develop best practice guidelines for Exercise after Stroke services, based on current research evidence, clinical and exercise science, relevant guidelines and existing practice, which would be relevant to Scotland and the rest of the UK
- Disseminate this information via our website www.exercisefterstroke.org.uk

2.3 Vision

The aim of these best practice guidelines is to enhance current delivery and guide further development of Exercise after Stroke services, in Scotland and the rest of the UK, that are safe, evidence-based, effective and person-centred and that enable stroke survivors to improve their health and physical fitness in the long term.

2.4 Background

There is a growing body of evidence that exercise training, particularly cardiorespiratory training, improves physical function, fitness and quality of life after stroke (Saunders et al. 2009; Carin-Levy et al. 2009; Stuart et al. 2009). The role of exercise in stroke care is recognised in the Royal College of Physicians' National Clinical Guidelines for Stroke (2008) which, in the section on rehabilitation, recommends:

'After stroke, all patients should participate in aerobic training unless there are contraindications unrelated to stroke' (6.4.1.)

This guideline refers to aerobic training *during* rehabilitation. It is acknowledged in other guidance that the provision of supported exercise needs to extend beyond the course of usual health care. The Scottish Intercollegiate Guideline Network (SIGN) Guideline Number 108 (2008) states that:

'life long participation in programmes of Exercise after Stroke should be encouraged' (p 49).

The development of services to support long-term participation in exercise after stroke is promoted in the Scottish Government's Better Heart Disease and Stroke Care Action Plan (2009). It recommends:

'NHS Boards, through their stroke Managed Clinical Networks (MCNs), should continue to work with leisure industry representatives to make best use of [the Exercise and Fitness Training after Stroke] training course to improve access to exercise and fitness training for people with stroke in their area.' (5.40)

The Department of Health's National Stroke Strategy (2007) also states that:

'Rehabilitation – support to regain well-being – requires rehabilitation specialists and continuing support from a wide range of community-based services, such as exercise classes....'

SIGN Guideline 118 Management of patients with stroke: Rehabilitation, prevention and management of complications and discharge planning, was published after we had scoped the provision of exercise after stroke services in Scotland (Best et al. 2010). Section 5.6.4 of that guideline includes our best practice recommendations. Thus, it is clear that the policy drivers for the development of Exercise after Stroke are in place. These guidelines aim to provide structure for the implementation process.

2.5 Guideline development

The guidelines were developed in collaboration with a national, multidisciplinary group of experts in Exercise after Stroke.

The guideline recommendations are based on: evidence from the Cochrane review of physical fitness training for stroke patients (Saunders et al. 2009); their own randomised controlled trial (Mead et al. 2007); in-depth analysis of the content and

organisation of existing exercise services for ambulatory stroke survivors in Scotland; plus relevant stroke and exercise guidelines and National Occupational Standards for exercise professionals. Members of the project group have also drawn upon their direct experience of developing Exercise after Stroke services in Scotland and in training exercise professionals to deliver these services.

The evidence base for Exercise after Stroke is growing rapidly but in aspects such as the optimum frequency and intensity of exercise, evidence is sparse at present (Saunders et al. 2009). Realistically, the research evidence base is unlikely ever to be sufficiently comprehensive to support decisions about all aspects of service delivery and organisation. Therefore, some recommendations are based on expert consensus guided by the clinical reasoning and experience of the guideline development project group and our multidisciplinary [Reference Group](#). The guideline project group also build upon knowledge of service models that have been demonstrated in practice to be feasible and acceptable to stroke survivors and upon the templates of other exercise pathways for long-term conditions e.g. falls prevention and cardiac rehabilitation.

As more research evidence becomes available, these guidelines will require to be reviewed.

2.6 Scope

These guidelines concern the development of the community-based services, which are positioned at the final stage of the rehabilitation process, i.e. the transition to self-management. They are services run by physiotherapists, stroke nurses and/or therapy assistants in outpatient settings, or by specialist exercise professionals in community venues such as leisure centres, health clubs, health centres or community halls.

Exercise and fitness related terms are often employed inconsistently; therefore for clarification the following definitions will be used in this document (see [Box 2](#)).

Box 2 Terms related to fitness

(adapted from Caspersen et al. 1985, and U.S. Department of Health and Human Services 2008)

Physical activity is 'any bodily movement produced by skeletal muscles that requires energy expenditure above that used at rest'.

Physical fitness is a set of attributes that people have or achieve that relates to the ability to perform physical activity.

Physical fitness can be subdivided into health related and skill related physical fitness.

- Health related physical fitness includes cardiorespiratory fitness, muscular endurance, muscular strength, body composition, and flexibility.
- Skill related fitness includes agility, balance, coordination, speed, power and reaction time.

Exercise is physical activity that is planned, structured, repetitive, and purposive in the sense that improvement or maintenance of one or more components of physical fitness is an objective.

2.7 Target service providers

These guidelines are aimed at organisations and professionals currently delivering Exercise after Stroke services or planning to do so in the future. In particular, they are aimed at organisations encouraged to develop or commission Exercise after Stroke services in the Scottish Government's Better Heart Disease and Stroke Care Action Plan and the Department of Health's National Stroke Strategy (p.38, para 15) i.e. local authority leisure services or leisure trusts and stroke Managed Clinical Networks (MCNs) or Stroke Care Networks. Organisations and individuals who currently run Exercise after Stroke services, or may do in the future, include Community Health Partnerships, stroke charities, private health and fitness clubs and public sector leisure centres and community centres.

This document is also aimed at the multi-sector, multidisciplinary range of professionals involved in the organisation and delivery of exercise on referral. The referrers to Exercise after Stroke services include: general practitioners, physiotherapists, occupational therapists, stroke nurses, and practice nurses. It is also intended to be read by people who will design, deliver, adapt, tailor and progress the exercise sessions such as exercise professionals, physiotherapists and therapy and nursing assistants.

2.8 Target service users

These services will primarily be aimed at promoting physical activity in *ambulatory* stroke survivors. This is because most research to date has been conducted with ambulatory stroke survivors and we have evidence that exercise interventions will be beneficial for this group. There are large numbers of ambulatory stroke survivors in the community who have the capacity to be more active and improve their physical fitness, given appropriate support.

However, it is likely that services will need to evolve to provide Exercise after Stroke for non-ambulatory stroke survivors as the evidence base becomes stronger. For example, there is evidence of the benefit of seated exercise on both physical and mental health in the frail elderly (e.g. McMurdo and Rennie 1992), but whether this would generalise to non-ambulatory stroke survivors will need to be evaluated in clinical trials. If current Exercise after Stroke services wish to include non-ambulatory stroke survivors, there is accredited training and a qualification in seated/chair based exercise for health, exercise and social care professionals that should be undertaken when delivering chair-based exercises. Adaptations for stroke patients are outlined on this Later Life Training course.

3. The Best Practice Recommendations

This section will describe each of the best practice recommendations listed in [Executive Summary](#) in more detail. They are based on our comprehensive examination of all existing models of Exercise after Stroke service delivery in Scotland and mapped as closely as possible to research evidence, including meta-analyses of randomised controlled trials. After each recommendation, an indication of the rationale behind it is given.

3.1 Governance

Each local Exercise after Stroke service should be overseen, or supported by, a multidisciplinary working group consisting of local stakeholder organisations, stroke survivors and Stroke Managed Clinical Network/ Care Network representatives.

The structural /planning issues to be covered in this section include the:

- Management/ Working group ([3.1.1](#))
- Involvement of the regional Stroke Managed Clinical Network ([3.1.2](#))
- Partnership agreement ([3.1.3](#))
- Exercise after Stroke Service Co-ordinator ([3.1.4](#)) and
- Location ([3.1.5](#))

3.1.1 Management/ working group

Close multidisciplinary, multi-sector, multi-agency working is essential for the development of effective services. A local Working Group consisting of representatives from all relevant local organisations and professional groups should be convened to oversee development of Exercise after Stroke services. The Working Group will provide overall direction to service development and will oversee pathways into and out of the service. [Figure 1](#) below shows the possible membership of the Management/ Working group. The Working Group should

include all local stakeholders in stroke service provision including: doctors, physiotherapists, specialist stroke and practice nurses, occupational therapists, speech and language therapists, orthotists, podiatrists, exercise professionals, health, leisure and voluntary sector service managers, social services, transport providers, stroke survivors and carers.

Rationale – this is based on the experience of existing Exercise after Stroke services. It also follows the national models of development by which the Cardiac and Pulmonary Rehabilitation and Falls Prevention services were established.

The work of the Scottish Government’s Joint Improvement Team (2010) and the philosophy of Shifting the Balance of Care (2008) towards preventative community services support the move towards collaborative working between health and social care organisations to provide joint services for long-term conditions.

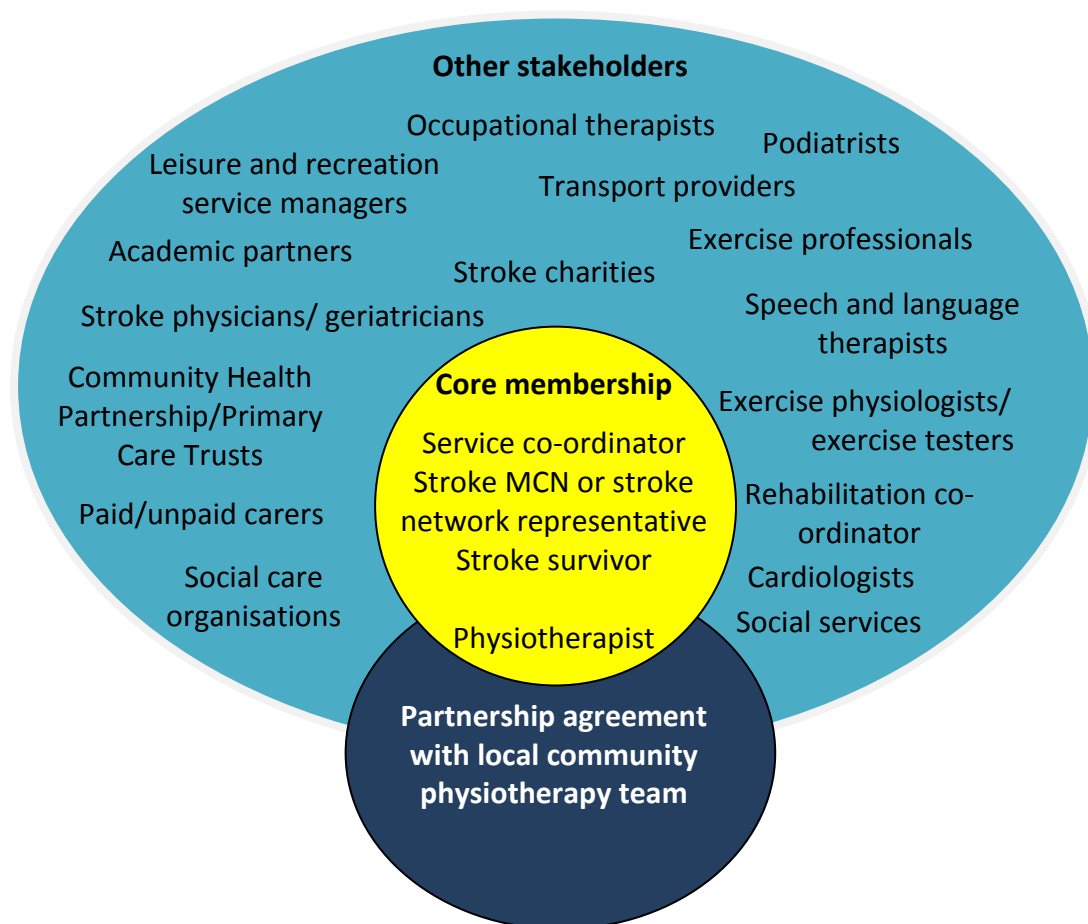


Fig. 1: diagram showing membership of the Management / Working group of an Exercise after Stroke service

3.1.2 Involvement of the regional Stroke Managed Clinical Network

The Stroke Managed Clinical Networks in Scotland or the Stroke Care Networks in England should be part of the Management/ Working Group and be involved in planning new Exercise after Stroke services to ensure that the service is integrated and coordinated with the rest of the patient pathway.

Rationale - this is based on the experience of existing services.

3.1.3 Partnership agreement

Close links between Exercise after Stroke services, physiotherapy teams and other health professionals are crucially important. At the inception of a new Exercise after Stroke service, a partnership agreement should be developed between all parties. Included within the partnership agreement should be a quality assurance framework, agreed standards and related performance indicators, and description of roles and responsibilities for all partners. This agreement will include on-going physiotherapy advice and input to the service in terms of workforce development and staff training. This would include provision of specific advice from physiotherapists about how to manage co-morbid medical conditions and how to tailor exercises for individuals. This is in addition to the Working Group who provides overall direction to the development and oversees pathways into and out of the service.

Rationale - this recommendation is based on the experience of existing services and highlights the importance of the close working relationships they have developed with local physiotherapy teams.

3.1.4 Exercise after Stroke service co-ordinator

Service planning, systems development and liaison, and the publicising and promotion of services to potential referrers and stroke survivors require dedicated time, expertise and experience. Resources should be allocated for a dedicated service co-ordinator to perform these tasks. This does not need to be a full-time post but can be included with other responsibilities. However, it does require a clearly

designated individual to be the main point of contact and act as the lynch pin and 'champion' for the service.

In cases where it is not possible to create a new post, an individual needs to be identified from existing resources to co-ordinate service development. For example, in a number of services identified in Scotland, a senior exercise professional with a job title such as 'Physical Activity Development Officer' or 'Community Health Development Officer' takes on the role of Exercise after Stroke coordinator within a wider remit.

Rationale – The identification of service co-ordinators appears to work well for existing Exercise after Stroke services. The establishment of these posts in cardiac rehabilitation and falls prevention services has proved beneficial to service development (e.g. Dinan et al. 2005, Martin et al. 2000, Elley et al. 2008).

3.1.5 Location

When planning a new Exercise after Stroke service, transport and accessibility are central considerations. Lack of transport is likely to constitute a significant barrier to exercise participation. Services should be provided in accessible venues that meet health and safety regulations and have good public transport links.

Rationale – existing service providers reported to us that transport was a barrier to participation for many stroke survivors. In the research literature, lack of transport to venues is cited as a barrier to exercise participation (Rimmer et al. 2008).

3.2 Referral systems and the role of the health professional

To ensure that exercise professionals receive appropriate information regarding the medical and functional status of stroke survivors who wish to exercise, a robust referral system must be in place that aligns with Department of Health's (2001) National Quality Assurance Framework for Exercise Referral Systems. Stroke survivors who wish to exercise must first be assessed by a health professional to

determine whether they have any absolute contraindications to exercise. For more detail on this process, see Screening for absolute contraindications to exercise (section [3.2.2.2](#)).

3.2.1 Routes into an Exercise after Stroke Service

Stroke survivors can access Exercise after Stroke via two possible routes. These are directly after discharge from secondary / tertiary health care ([3.2.1.1](#)) or via primary care ([3.2.1.2](#)).

3.2.1.1 Immediately following discharge from in- or outpatient physiotherapy

This will be the route for people who have recently had a stroke and have undergone a period of rehabilitation. The Royal College of Physicians (2008) in their National Clinical Guideline for Stroke recommend that aerobic exercise is incorporated into usual rehabilitation for stroke. Where this happens and aerobic exercise is included as part of rehabilitation, the physiotherapist will have information on individual stroke survivors' response to exercise and the duration and intensity of the aerobic training that can be tolerated. This information is important for the exercise professional who will be delivering exercise in the community setting. For this reason, the ideal referral route into an Exercise after Stroke service is from a physiotherapist who has worked with the stroke survivor on this aspect of their physical fitness.

Rationale – The Royal College of Physician's National Clinical Guideline for Stroke (2008), recovery phase from impairments and limited activities: rehabilitation section recommendation 6.4.1 states:

'After stroke all patients should participate in aerobic training unless there are contraindications unrelated to stroke'.

3.2.1.2 Stroke survivors living in the community

The other main route into Exercise after Stroke services is for stroke survivors already discharged from secondary health care services. All health professionals

who come into contact with stroke survivors should address the issue of exercise along with other lifestyle factors linked to secondary stroke prevention. Health professionals who have contact with stroke survivors should address personal, social and environmental barriers to exercise. Referral to an Exercise after Stroke service should be made wherever possible.

Stroke survivors who had a stroke some time ago or did not receive inpatient treatment can access Exercise after Stroke services through their General Practitioner or other appropriate health professional. This could be the practice nurse (delegated by GP), community physiotherapist, stroke specialist nurse or occupational therapist.

Rationale – The Royal College of Physicians’ National Clinical Guidelines for stroke in the section on secondary prevention (5.3.1) recommends:

‘All patients should be advised to take regular exercise as far as they are able:

- **The aim should be to achieve moderate physical activity (sufficient to become slightly breathless) for 20–30 minutes each day.**
- **Exercise programmes should be considered and tailored to the individual following appropriate assessment....’**

3.2.2 Process of referral to an Exercise after Stroke service and the role of the health professional

The diagram below shows the process of referral to an Exercise after Stroke service ([Fig. 2](#)). More information is given about each stage in the following sections.

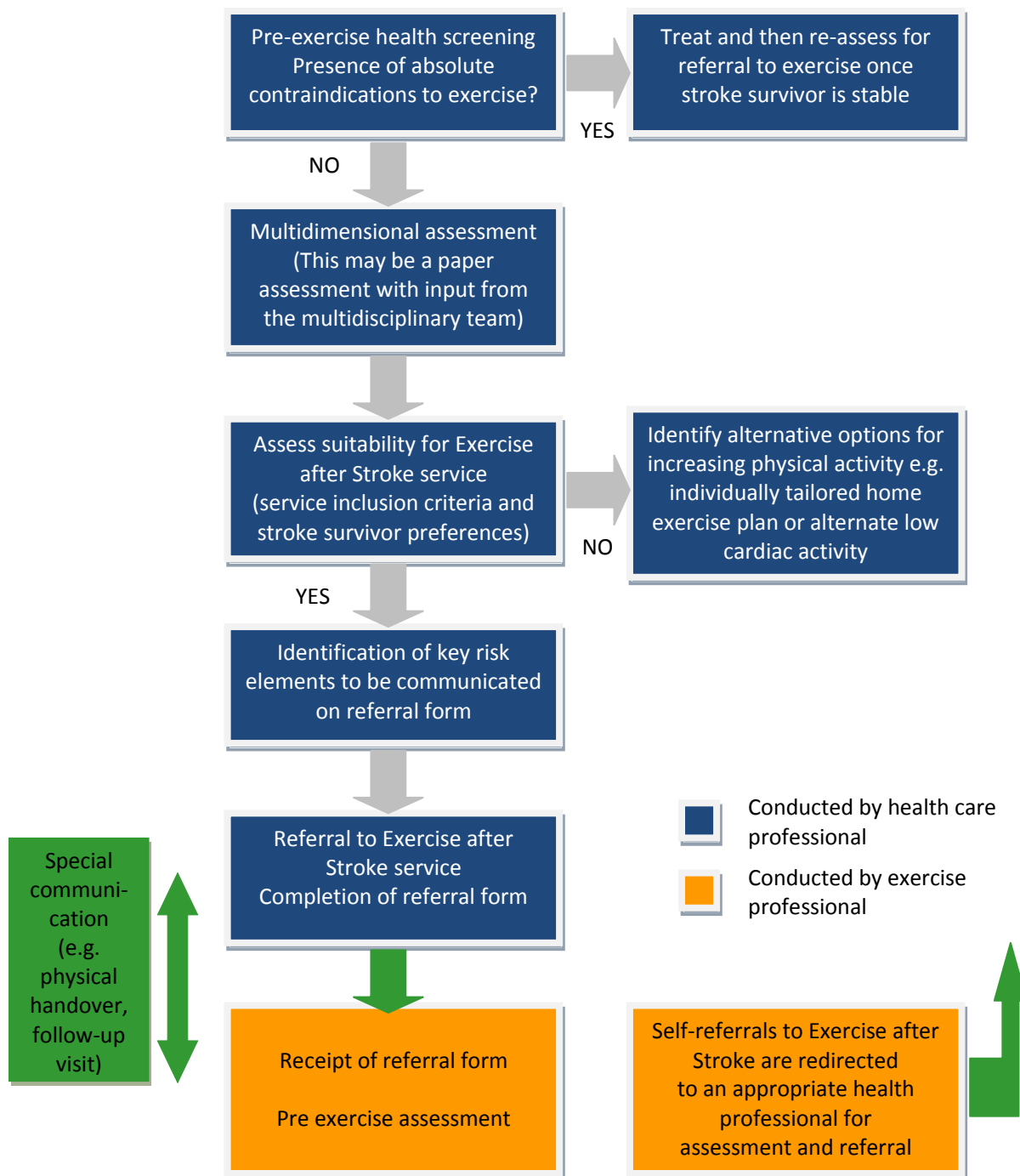


Fig. 2 Process of referral to an Exercise after Stroke Service

3.2.2.1 Pre-exercise assessments

Pre-exercise assessment by a health professional prior to referral to an Exercise after Stroke service has four elements:

1. Screening for absolute contraindications for exercise ([3.2.2.2](#)) – to identify people who should not be exercising due to unstable medical conditions
2. Multidimensional assessment ([3.2.2.3](#)) to give the exercise professional a global picture of the individual stroke survivor’s medical and functional status,
3. Local Exercise after Stroke inclusion criteria ([3.2.2.4](#)) to ensure a match between the stroke survivor and the Exercise after Stroke session and
4. Risk assessment and management ([3.2.3](#)) to highlight areas of the multidimensional assessment that require specific tailoring of the exercise intervention in order to ensure the maximum possible benefit from exercise.

The four elements are described in detail below as separate processes for sake of clarity but in practice there is a great deal of overlap between these elements, and they will usually all be completed within a single assessment session.

More information on these processes is given below.

3.2.2.2 Screening for absolute contraindications for exercise

The health professional will determine whether there are any absolute contraindications to exercise ([Box 3](#)). The main absolute contraindications to exercise are due to unstable heart disease.

Box 3 Absolute contra-indications

American College of Sports Medicine 2010: Absolute Contra-Indications to Exercise Testing; Dinan 2001; Mead et al. 2007)

- Recent electrocardiogram changes suggesting recent myocardial infarction
- severe stenotic or regurgitant valvular heart disease
- Uncontrolled arrhythmia, hypertension and/or diabetes
- Unstable angina
- Third degree heart block or acute progressive heart failure.
- Acute aortic dissection
- Acute myocarditis or pericarditis
- Acute pulmonary embolus or pulmonary infarction
- Deep venous thrombosis
- Extreme obesity, with weight exceeding the recommendations or the equipment capacity (usually >159kg [350 lb.])
- Suspected or known dissecting aneurysm
- Acute infections.
- Uncontrolled visual or vestibular disturbances
- Recent injurious fall without medical assessment

3.2.2.3 Multidimensional pre-exercise assessment

The long-term effects of stroke are varied and wide-ranging so the exercise professional will need an overview of the stroke survivor's residual impairments in order to tailor the exercise programme to the individual. Once absolute contraindications to exercise have been excluded, the health professional should proceed to the multidimensional assessment of the stroke survivor, which should cover all domains shown in [Box 4](#). This information must be communicated to the exercise professional in appropriate terminology, with support where needed. Each service will need to design its own form according to local requirements – a list of the required referral information is shown in [Box 9](#). Most of this information would be available from the stroke survivor's medical records. This type of assessment is labelled "multidimensional" as one health professional may not be able to complete all relevant sections. If this is the case, input from other members of the multidisciplinary team or primary care team should be sought where necessary.

Box 4 Multidimensional pre-exercise assessment.

This information should be transferred to the exercise professional, once absolute contraindications to exercise have been ruled out, and the stroke survivor has given written informed consent to be referred. For an example of the content of a referral form see [box 9](#).

- **General medical and stroke medical history**
- **Information on any co-morbidity** that might contraindicate or restrict exercise e.g. ischaemic heart disease, heart failure, respiratory disease, poor circulation, uncontrolled epilepsy, joint replacements etc.
- **Medications and how these may restrict exercise ability**
- **Pain status:** stroke-related (central or shoulder), musculoskeletal or other
- **Joint active and passive range of motion** (particularly with relation to the risks associated with subluxation or poor control in shoulder movement – a common source of post stroke pain)
- **Problems with muscle tone**
- **Motor control:** coordination of joint stability, strength and power, protective reactions, movement involving single and multiple body segments, and functional activities.
- **Balance** both in static and dynamic situations and recovery responses.
- **Gait** (walking ability), addressing both neurological and biomechanical aspects of gait. Ideally, this should include different variations of gait (i.e. slow, fast, backward and side-stepping, turning, managing obstacles and stair climbing) in different environments (i.e. rough and smooth ground, flat ground and slopes, different lighting and noise conditions).
- **Visuospatial problems**, difficulties with body schema awareness
- **Functional abilities** history and direct observations of functional tasks related to activities of daily living (ADLs),
- **Compensatory overuse of less affected side**
- **Activity history** including current physical activity status, interests, preferences, means and readiness to exercise. This indicates that the stroke survivor has agreed with the referring party that they are ready to exercise, are motivated enough to attempt a programme, and able to attend the intended exercise programme times.
- **Communication:** the stroke survivor's ability to understand and follow instructions and to communicate with the exercise instructor. This is particularly important when the individual has aphasia (dysphasia): a language disorder which has a variable effect on both understanding and expression of both speech and writing. Dysarthria is a motor speech disorder which can variably limit the intelligibility of speech and some stroke survivors may prefer to use alternative means to communicate during sessions.
- **Cognition:** the presence of memory impairment, executive dysfunction, impaired insight or dementia, may require adapted communication strategies to allow the individual to participate or require the involvement of a communication assistant.

Rationale –Skills Active National Occupational Standards for exercise professionals working with people with stroke (Unit D516 Design, agree and adapt a physical activity programme with adults after stroke) and the syllabus of the Exercise and Fitness Training after Stroke instructor training course (Mead et al. 2010).

3.2.2.4 Local Exercise after Stroke service Inclusion Criteria

The health care professional will assess the stroke survivor's suitability for an Exercise after Stroke service in relation to the local service's inclusion criteria. The Exercise after Stroke service co-ordinator is responsible for ensuring that all the health professionals involved have clear information on the service inclusion criteria. Below is an example of Exercise after Stroke service inclusion criteria ([Box 5](#)). The emphasis of this part of the process is on inclusion. The inclusion criteria are not a repetition of the absolute contraindications to exercise. Instead, the inclusion criteria describe appropriate stroke survivors for referral into a particular service. This is based on the stroke survivor's clinical and functional characteristics, the type of exercise that will be provided and the level of expertise of the instructors.

Box 5 Example Exercise after Stroke inclusion criteria

- Able to sit in any seat independently (time unlimited)
- Able to mobilise more than 5m with or without a walking aid, independently or supervised
- In cases where the stroke survivor has aphasia, communication strategies in place to allow participation
- No unstable angina/ acute heart failure
- No ongoing cardiac arrhythmia
- Resting Heart Rate maximum of 100 bpm
- Blood pressure maximum 180 mmHg systolic, 100 mmHg diastolic
- Tinetti score minimum 12 / 28

Rationale — Existing practice.

3.2.3 Risk Assessment and Management

Risk assessment and management concerns the risk of an adverse reaction during or immediately following exercise. The current available evidence suggests that the benefits of exercise outweigh the risks for the general population and for stroke survivors. For this reason, risk assessment should not be construed in a negative sense, raising fears about the participation of stroke survivors in exercise with the outcome of excluding individuals from Exercise after Stroke services. The process should however, focus on the more positive aspects with the aim of enabling stroke survivors to safely participate in exercise.

The risk assessment by the health care professional is there to assist the exercise professional to appropriately adapt and tailor the exercise (type, intensity, duration, limb angle etc) and to put in-place safety procedures and/or equipment to manage the identified risks. The risk assessment is part of a four stage process (see [3.2.2](#))

NB The health screening for absolute contraindications has already identified people who should not be exercising ([3.2.2.2](#)).

The service inclusion criteria are there to ensure the crucial match between included stroke survivors and the current service ([3.2.2.4](#)).

The final part of the pre-exercise assessment concerns the management of relative risks for exercise. The health professional should use the multidimensional pre-exercise assessment ([3.2.2.3](#)) as a basis for highlighting the presence of individual risk factors to the exercise professional.

The most significant risks to stroke survivors from participating in exercise are from cardiac events, falls, and fractures.

3.2.3.1 Risk of cardiac events

There is considerable co-morbidity between stroke and cardiac disease. It is estimated that around 75% of stroke survivors have co-morbid heart disease (Roth et al. 1993) and that between 20 and 40% of stroke survivors will test positive for

silent cardiac ischaemia (Adams et al. 2003; Ivey et al. 2005). In people with known coronary heart disease the primary cause of death after exercise is ventricular fibrillation. Nevertheless the overall risk from exercise is low, even in people with coronary disease, as in cardiac rehabilitation programmes (where exercise is tailored to minimise risk) cardiac arrests occur at a rate of 1 in 12 000 to 15 000 in people with cardiac disease (Zipes et al. 1998).

The American Heart Association (AHA) recommends that graded exercise testing with electrocardiac monitoring is a pre-requisite to referral for exercise (Gordon et al. 2004) because up to 75% of stroke clients will have underlying coronary artery disease which may be 'silent'. However, exercise testing itself may carry risks (e.g. many stroke survivors will not have sufficient balance or strength to undergo conventional treadmill testing), and other testing protocols (e.g. arm cycle ergometry) may not be practical. The AHA suggests that if an exercise test cannot be performed for practical reasons, lighter intensity exercise should be prescribed. However, The Scottish Intercollegiate Guidelines Network (2002) guidelines for ischaemic heart disease suggest that for most clients, clinical risk stratification based on history, examination and resting ECG combined with a functional capacity test such as a shuttle walking test or a six minute walking test will be sufficient. Exercise testing and echocardiography is recommended only for high risk clients.

The recommendation is that treadmill exercise testing is not necessary prior to referral to exercise after stroke services, and that a functional test such as the 6 minute walk, in combination with detailed referral information, is usually sufficient.

Rationale: SIGN guidelines for ischaemic heart disease (2002) and consensus opinion of Exercise after Stroke Reference group.

Once the contraindications to exercise have been ruled out for a stroke survivor, then assessment of level of cardiac risk should be a clinical decision. Factors to be considered (based on American College of Sports Medicine's (2010) relative contraindications to exercise testing and Scottish Intercollegiate Guidelines Network guideline 57, 2002) would include those listed in [Box 6](#).

Box 6 Cardiac risk factors to be evaluated

- History of myocardial infarction complicated by heart failure, cardiogenic shock and/or complex ventricular arrhythmias,
- Tachyarrhythmias or bradyarrhythmias
- High degree atrio-ventricular block
- Angina or breathlessness occurring at a low level of exercise
- Cardiomyopathy
- Moderate stenotic valvular heart disease
- Complex ventricular ectopy
- Left main coronary artery stenosis

Where any of these signs and symptoms or other indications of cardiac disease are present then this should be communicated clearly to the exercise professional in the referral documentation.

3.2.3.2 Risk of falls and fractures

The other key risk for stroke survivors undertaking exercise is from falls and fractures. In their review of circuit class therapy to improve mobility after stroke, English et al. (2010) found in two studies reporting adverse events (i.e. falls) during therapy that there were more falls in the intervention group than the control group. The authors attributed this to the fact that balance is systematically challenged during these circuits compared to the control condition. None of the falls was serious but the risk of falls from participation in exercise should be carefully evaluated and session design measures (e.g. adaptations to pace, transitions between exercises and direction changes etc) introduced to minimise this risk for stroke survivors. The health professional should assess whether there is a risk of falls or fractures and it should be remembered that this is usually in the context of a group of stroke survivors. This is a clinical decision based on factors such as a history of falls, evidence of impaired balance, osteoporosis, or prescription of psychoactive medication. The Falls Management Exercise (FaME) trial (Skelton et al. 2005) demonstrated that an exercise intervention for older people at risk of falling could be delivered safely and effectively (with no falls during the intervention). Thus, exercise

can be delivered safely for these groups but the exercise professional needs to be aware of the stroke survivors' risk for falls in order to tailor the intervention effectively.

3.2.3.3 Other exercise related risks

Other systemic factors (based on the American College of Sports Medicine 2010 relative contraindications to exercise testing) that may lead to identified risks are shown in [Box 7](#).

Box 7 Systemic risk factors to be considered

- Electrolyte imbalance
- Systolic blood pressure >180 mm Hg
- Diastolic blood pressure >100 mm Hg
- Mental or physical impairment leading to inability to exercise safely and adequately
- Uncontrolled metabolic disease (diabetes, thyrotoxicosis, or myxedema)
- Chronic infectious disease (mononucleosis, hepatitis, AIDS, urinary tract infections).
- Hydration constipation
- Medication toxicity

The risk assessment highlights areas of the multidimensional assessment that require particular attention and proactive adjustment of the exercise programme to ensure it is safe for the stroke survivor.

Following the risk assessment, health professionals should engage stroke survivors in a discussion of the relative risks of exercise versus inactivity and the benefits of exercise so that stroke survivors can make an informed decision on whether to be referred to an Exercise after Stroke service. At this time, written informed consent should be sought and obtained for a referral.

Rationale – American College of Sports Medicine's guidelines on exercise testing and prescription (2010) suggest discussion of the risks and benefits of exercise for all exercise prescription (not specifically for stroke).

This section completes the four elements of the pre-exercise assessments conducted by the health professional

3.2.4 Barriers and motivators to Exercise after Stroke

Referring health professionals should explore barriers and motivators to exercise participation for each individual. Where stroke survivors are reluctant to engage in group-exercise, other options for increasing activity levels should be explored. Health professionals should consider the presence of depression as this may be a barrier to taking up a new physical activity programme. Ideally, most ambulatory stroke survivors will be referred to an Exercise after Stroke programme.

An indication of the individual's barriers and motivators to exercise should be included in the referral documentation, as this information is invaluable for the exercise professional receiving and using the referral as the basis for an individually tailored programme.

Rationale - we know that the majority of community-dwelling stroke survivors are inactive (Rand et al. 2009; Moore et al. 2010). It is necessary to explore individual physical, psychosocial and environmental barriers to exercise in order to overcome this (as suggested by Gordon et al. 2004 in the American Heart Association recommendations on physical activity and exercise for stroke survivors and in Damush et al. 2007; Mead 2009). The optimum methods for promoting physical activity after stroke are not known. However, we do know that repeated advice to be more active is probably not sufficient to change behaviour after stroke (Boysen et al. 2009). Therefore, examination of an individual's physical, psychosocial and environmental barriers is recommended.

3.2.5 Transfer of care

The following processes will ensure the safe transfer of care from the health professional to the exercise professional and the Exercise after Stroke service and includes.

- Coordination by the Exercise after Stroke service co-ordinator ([3.2.5.1](#))
- Referral from a health care professional ([3.2.5.2](#))

- Transfer of responsibility ([3.2.5.3](#))
- Transfer of information ([3.2.5.4](#))

3.2.5.1 Role of the Exercise after Stroke service co-ordinator

A designated professional should be the key contact for the Exercise after Stroke service. Ideally, this will be a dedicated stroke service co-ordinator (see also sections [3.1.4](#) and [3.3.1](#)). Their role is to organise and review the referral for exercise and to ensure that the referral processes meet the relevant standards and indicators (see [3.2.2](#)). This model of service co-ordination has been successfully employed in Cardiac Rehabilitation and Falls Prevention services.

Rationale – the service co-ordinator is accountable for ensuring the referral process meets the standards set out in the Department of Health’s National Quality Assurance Framework for Exercise Referral Systems (Department of Health 2001).

3.2.5.2 Role of the health care professional

Stroke survivors entering an Exercise after Stroke service must be referred by their general practitioner or hospital consultant or other pre-agreed health care professional e.g. physiotherapist, practice nurse, occupational therapist, stroke nurse specialist or stroke liaison nurse.

Rationale – Department of Health’s National Quality Assurance Framework for Exercise Referral Systems (Department of Health 2001).

The responsibilities are shown in [Box 8](#) and include undertaking the [pre-exercise assessments](#) already described.

Box 8 Key responsibilities of the referring health professional

- To assess the stroke survivor for [absolute contraindications](#) for exercise
- To complete a [multidimensional assessment](#) which will include: identifying **pathologies** which are present, and ensuring that they (and their medications) are accurately and clearly communicated to the exercise professional

To highlight any way these may influence the **safety or comfort of everyday physical activity** e.g. susceptibility to angina or postural hypotension
- To identify the most **appropriate form of exercise** for individual (for most stroke survivors this will be an EAS service) – based on current relevant evidence and clinical reasoning, local Exercise after Stroke [service inclusion criteria](#) and personal preferences of the stroke survivor
- To identify any [key risk elements for exercise](#) that emerge from the multidimensional assessment e.g. risk of falls, cardiac events, prescribed medications that will affect response to exercise- that require particular tailoring of the exercise session
- To educate the stroke survivor in the **early recognition of symptoms** which might indicate that a part or the whole of the exercise programme was, in some way, unsuitable to them at that time. For example, people with osteoarthritic knees should be taught to recognise and respect an increase in pain, stiffness or swelling; stroke survivors who experience a severe increase in their habitual level of resting muscle tone etc, should be instructed to consult the exercise professional about the problem and only continue to exercise if the exercise can be appropriately tailored to resolve the problem/adverse effect.
- To communicate that any [problem with exercise](#) e.g. worsening pain in arthritic knee, should be discussed with the exercise instructor and the GP and/or referrer.

Rationale- experience of project team, Department of Health's (2001) National Quality Assurance Framework for Exercise Referral Systems, and Dinan (2001).

3.2.5.3 Transfer of responsibility

Once it has been agreed by the GP or physiotherapist that the stroke survivor is appropriate to be referred for exercise (i.e. pre-exercise health screen and multi dimensional assessment including risk assessment completed) and that the proposed exercise instructor and exercises and programme are suitable, the responsibility for the design and delivery of the exercise programme and the monitoring of the individual's response to the exercise passes to the exercise professional (Department of Health, 2001). (NB The long-term monitoring of the stroke survivor's health and well being in relation to the exercise programme remains with the general practitioner or referring health professional, or both, as appropriate).

This transfer of responsibility to the fitness sector includes the owner/manager of the fitness facility where the session takes place. The responsibilities of the fitness centre operator (i.e. manager) are to:

- Ensure that there are adequate systems in place to support the process of patient referral (secure records/confidentiality etc.) and importantly to
- Ensure the instructors are properly [qualified](#) (according to the Skills Active National Occupational Standards). The instructor should be sufficiently experienced to design, deliver and progress exercise for this patient group and to meet the conditions of their insurance cover.

All exercise professionals working with stroke survivors should be Register of Exercise Professionals registered or have evidence of working towards this registration as this is the recommended best practice indicator in the specialist field of exercise referral.

3.2.5.4 Transfer of information

Written, informed consent should be sought from the stroke survivor before referral and transfer of information.

Exercise after Stroke services should have procedures and supporting documents to ensure an adequate transfer of relevant medical information to the exercise professional from the referrer.

An example of the domains included in the referral form developed in NHS Greater Glasgow and Clyde for those already screened and who have no absolute contra-indications for exercise, is shown in [Box 9](#).

Actual referral forms need to be designed according to local needs.

Box 9: Exercise Referral Information

1. **Name**
2. **Address**
3. **Date of birth**
4. **Telephone number**
5. **GP Details**
 - Name
 - Address
 - Tel number
 - Fax number
 - Next of kin and contact details
6. **Health Problems**
 - Cardiac History – inc. left ventricular function deficits and any associated heart failure
 - Others e.g.
 - Respiratory History
 - Multiple sclerosis
 - Osteoarthritis
 - Rheumatoid Arthritis
 - Falls history
 - Fracture history
 - Back Pain
 - Joint Replacement
 - Osteoporosis
 - Diabetes
 - Epilepsy

Stroke History

 - Time since stroke / date of stroke
 - Functional levels post-stroke
 - Chronic fatigue
 - Hearing impairment
 - Visual impairment
 - Cognitive / perceptual impairment
 - Use of aids (e.g. walking aids)
7. **Medication**
8. Has attended **NHS Rehabilitation** Service?
 - Name and location of service
 - Dates
 - How many classes attended
 - Relevant tests completed and results
 - Blood pressure
 - Agreed training heart rate
9. **Personal exercise considerations and limitations**
 - Tone / spasticity
 - Contractures
 - Poor balance/strength
 - Splinting
 - Difficulty moving on/ off equipment
 - Ability to self monitor/ pace self
 - Readiness to exercise
 - General physical activity levels (current and pre-stroke).
 - Access to Transport

3.3 Exercise after Stroke service organisation

3.3.1 Service co-ordinator/ liaison staff

An important role of the service co-ordinator is to raise awareness of the service among referrers to ensure that stroke survivors are referred to the service. The role of the Exercise after Stroke service co-coordinators is to publicise the service to referrers. It is important to ensure referrers are aware of the service inclusion criteria and the content of the service through provision of clear written materials and through personal visits/presentations to potential referrers e.g. at weekly practice/management meetings. Emphasising the evidence base, the qualifications of the exercise staff, the close, ongoing links with the local physiotherapy teams, the quality assurance and evaluation mechanisms, appears to be effective. Many health professionals welcome the opportunity to visit an ongoing exercise session. Likewise, exercise professionals should aim to revisit rehabilitation sites to remind them of the complexities of presentation of stroke and the demands of the rehabilitation process after stroke.

Rationale - In the research literature, stroke survivors report 'not knowing where to exercise' as being a barrier to exercise participation (Rimmer et al. 2008). Physiotherapists report they are uncertain whether the exercise professionals delivering Exercise after Stroke sessions have sufficient training, knowledge and competence to work with these stroke survivors (Wiles et al. 2008).

3.3.2 Group exercise format

Where possible and appropriate, Exercise after Stroke Services should be delivered in a group format rather than individual gym sessions. Individual sessions and home exercise booklets can help to supplement the group sessions (see section [3.5.3](#) on Physical activity planning).

Rationale - There is evidence that group circuit training is effective in improving functional outcomes after stroke (Wevers et al. 2009). Stroke survivors report benefits from the social aspect of the group (Carin-Levy et al. 2009; Reed et al.

2010). Additionally, group exercise is likely to be more cost effective as indicated by the study by English et al. (2007), though more specific evidence will be available on completion of the on-going trial by van de Port et al. (2009)

3.3.3 Ratio of instructors to stroke survivors

Exercise groups should have a maximum of 1:8 instructors to stroke survivors ratio initially, although this will depend to some extent on case mix and the length of time stroke survivors have been exercising regularly. The ratio in each cohort should be jointly decided by the Exercise after Stroke co-ordinator and/or the health and exercise staff. The appropriate ratios are shown in the table below.

Table 1: Recommendations for staff to stroke survivor ratio for exercise after stroke services.

A “reserve” is an additional member of staff who may be required, depending on the group’s level of functioning and experience with the exercise programme.

Stroke survivors	1-8	9-16	16+
Staff	1 (+1 reserve)	2 (+1 reserve)	Not recommended

Rationale – Current recommendations in the Later Life Training Exercise and Fitness Training after stroke instructor course.

3.3.4 On-going service provision

Exercise after Stroke services should be on-going, not time-limited, as long term physical activity behaviour change is required. It should be recognised from the outset that a significant proportion of stroke survivors would not be able to move on to mainstream exercise provision.

Rationale - for on-going exercise - There is evidence for low retention of cardiovascular training effects after training finishes (Mead, et al. 2007). The Scottish Government’s physical activity strategy (2003) recommends that adults in later life ‘should be supported and encouraged to stay active in the community for as long as they choose’ (p. 55).

Rationale for specialist provision - National Quality Assurance Framework for Exercise Referral Systems (Department of Health 2001).

3.3.5 Exercise after Stroke and the patient pathway

Ideally, an Exercise after Stroke service will be an integrated part of a comprehensive patient pathway that begins with in- or outpatient treatment for stroke and covers the full range of physical activity options available in the local community. Stroke survivors will be assessed at entry to the physical activity pathway and reassessed at agreed intervals by the exercise professional to ensure that they are progressing appropriately.

Rationale – current good practice – e.g. there are multipathology services that have mapped out the patient pathway through their services so that stroke survivors can enter at a level appropriate to them and move through the system: from tiered intake classes (3 levels of sessions that are graded according to level of mobility and cardiovascular fitness required) and, as appropriate, onto long-term maintenance classes.

3.3.6 Promoting life long participation in exercise

Although life long participation in exercise is recommended in clinical guidelines, (e.g. SIGN 108 Management of patients with stroke or TIA: Assessment, investigation, immediate management and secondary prevention) there is little research evidence on how this can be achieved in practice. Several elements have been identified as contributing to enhanced motivation, enjoyment and long-term adherence and reducing attrition (drop out) in other community-based exercise for stroke survivor services. These include ensuring that, wherever possible:

- The community sessions are at the same (or very similar) time;
- The sessions are in the same venue (or nearby);
- The instructor remains the same as in the intake sessions (or is introduced to the stroke survivors and/or is involved in the teaching of the intake phase).
- In-service training is given for all the professionals and support staff involved (including the reception staff). This could include free on-line training (www.strokecompetencies.org)
- Transport should be provided for stroke survivors where possible, delivered by dedicated, well-briefed patient transport personnel.

Peer mentor interventions and peer mentor training also appears to be effective in increasing adherence to exercise sessions in both older and patient populations (Stewart et al. 2001). More research is needed into the effectiveness of peer mentoring interventions in increasing retention to Exercise after Stroke programmes.

3.3.7 Signposting back to GP

Exercise instructors must be able to recognise the signs/symptoms requiring signposting of stroke survivors back to their GP or other appropriate health professional, should the person's performance deteriorate beyond reasonable expectations or should new and/or exercise-contraindicated signs/ symptoms occur (section [3.2.2.2](#)).

Rationale: National Quality Assurance Framework for Exercise Referral Systems, (Department of Health, 2001), Dinan (2001) and the professional experience of the project group.

3.4 Instructor training and qualification

Exercise professionals who work with stroke survivors must have appropriate training in order to be competent in the design, adaptation, tailoring, progression,

communication and evaluation of the exercise programme to individuals and groups. This should be a nationally recognised and accredited qualification.

Skills Active is the Sector Skills Council for Active Leisure, Learning and Well-Being. Exercise professional qualifications should map fully to the Skills Active National Occupational Standard Unit D516 (Design, agree and adapt a physical activity programme with adults after stroke). The qualification must be endorsed by Skills Active and recognised by the Register of Exercise Professionals (REPs) at Level 4 (Specialist Instructor) as providing the Stroke Specialist Exercise Instructor Category of Registration (<http://www.exerciseregister.org/>). It is essential to note that this is required for the validation of the instructor's insurance.

Other competency based-training is available (e.g. see section [3.4.2](#)) but is not endorsed by Skills Active nor recognised by REPs and does not lead to a REPs recognised national qualification. However, competency based training may have a valuable role to play in providing Continuing Professional Development for professionals who have attained the Specialist Exercise and Fitness Training after Stroke qualification.

Existing Exercise after Stroke services should work towards all their instructors having a specialist instructor qualification within a realistic time-frame. As there is now a dedicated Level 4 Specialist Exercise and Fitness Training after Stroke qualification and instructor category on the REPs framework, this is essential to validate instructors' insurance. Existing services should be planning ahead to complete this standard within the next 2-3 financial years.

Rationale – National Quality Assurance Framework for Exercise Referral Systems, (Department of Health, 2001).

3.4.1 Skills Active endorsed training for exercise instructors.

The Exercise and Fitness Training after Stroke course, administered by LaterLife Training, is currently the only Skills Active endorsed, REPs recognised and university

validated Level 4 Specialist Instructor qualification in the UK (Fig. 3). It is also the only course that is aligned with the Curriculum Framework of the Chartered Society of Physiotherapy. This course, designed by the University of Edinburgh and Queen Margaret University, has been validated at Scottish Higher Education Level 2 (Scottish Credit and Qualifications Framework Level 8). The course is supported by all the key non-governmental organisations in this field: Chest Heart & Stroke Scotland, Northern Ireland Chest Heart & Stroke, Different Strokes and The Stroke Association.



Fig. 3 The Exercise and Fitness Training after Stroke specialist instructor course. From top left: teaching workshop; tutor demonstration on gym equipment; simulation of perceptual and motor impairments; student-led teaching workshop; problem solving exercise; seminar. Photos: John Dennis and Frederike van Wijck.

3.4.2 The Action for Rehabilitation from Neurological Injury (ARNI) Trust

The ARNI Trust (<http://www.arni.uk.com/>) delivers the ARNI 'Functional Training After Stroke' course which aims to give instructors experience of how to work with stroke survivors on the performance of functional tasks. The ARNI course is distinct in its content and outcomes from the Level 4 Specialist Exercise and Fitness Training after Stroke course, developed by Queen Margaret University and University of Edinburgh and administered by Later Life Training, but could be seen as complementary. The ARNI course is eclectic in its approach and employs novel and experiential strategies. Therefore, previous training and experience in this specialist field is regarded as essential to be able to apply the ARNI approaches safely and effectively (e.g. BSc (Hons) Physiotherapy or Level 4 Exercise and Fitness Training after Stroke specialist instructor qualification). An important asset is that ARNI has been developed by a stroke survivor and has been well received by other stroke survivors. The ARNI approaches are currently being evaluated by Brunel University. ARNI and Later Life Training are working together to refine the ARNI course as Continuing Professional Development for Level 4 specialist instructors and physiotherapists.

3.5 The role of the exercise professional

The following sections describe the role of the exercise professional in the Exercise after stroke service, which comprises the pre-exercise assessment, designing individualised exercise programmes based around personal goals, maintaining personal exercise records, fostering social support, and referring back to the health care professional as required.

3.5.1 Pre-exercise assessment

Before joining the first exercise session, each stroke survivor will have a half-hour appointment with the exercise professional for: pre-exercise assessment, information exchange and, where appropriate, some exercise induction. Extra time should be allowed when scheduling this pre-exercise session for people who are new to the

service, to accommodate practicalities such as getting through sport centre reception, finding a locker etc.

Rationale – current practice and the National Quality Assurance Framework for Exercise Referral Schemes (Department of Health, 2001) states that all stroke survivors should have a pre exercise assessment including the use of suitable measures to assess personal progress.

3.5.2 Individualised exercise programme

Each stroke survivor will be given an individualised exercise programme (adapted for stroke survivors in general and tailored to the individual in particular) designed by the specialist exercise instructor.

Rationale – Skills Active National Occupational Standards D516 and current practice

The individualised exercise programme will be formulated with reference to the referral information, the instructor's assessment of the stroke survivor and the stroke survivor's personal goals for exercise.

Rationale – current practice and the American College of Sports Medicine's Exercise Management for Persons with Chronic Diseases and Disabilities (Durstine et al. 2009) describes the benefits of pre-exercise assessment and goal planning in clinical populations. This is also discussed in Buckley (2008).

3.5.3 Physical activity plan

Most Exercise after Stroke services currently offer exercise sessions only once a week. Increasing physical activity on more than one day of the week should be an aim of the service. The preferred method and that used in the research setting, would be that Exercise after Stroke services provide exercise sessions three times a week, however as this is rarely feasible for either the service provider or the stroke survivor, other ways of increasing weekly activity levels should be explored including

walking groups and home exercise programmes. Therefore, the exercise programme might be part of an individualised personal activity plan that includes appropriate physical activity choices outside the Exercise after Stroke session.

Rationale - All randomised controlled trials of cardiovascular and mixed training for stroke survivors included in the updated Cochrane review of physical fitness training for stroke survivors (Saunders et al. 2009) are delivered at a frequency of 3 times per week or more. This may not be feasible in community settings but increasing physical activity on more than one day of the week should be an aim of the service.

3.5.4 Personal exercise record

Stroke survivors should be given a copy of their individualised exercise programme for use during the exercise class, particularly the circuit section. The exercise programme should indicate how many repetitions the stroke survivor should aim for at each station of the circuit or of each unison exercise. These should be in pictorial as well as written form. Their current level of physical effort should be monitored (and self-monitored where possible) using, for example, the BORG Rate of Perceived Exertion Scale (Borg 1982).

Rationale- for a personal exercise programme–current practice

It is recommended that on the reverse side of this individualised circuit diagram and unison exercise programme there should be a place to encourage stroke survivors to record their progress (number of repetitions, time spent training strength or resistance in unison exercises) and service specific [outcome measures](#) where appropriate.

Rationale – current practice. Personal plans are likely to facilitate memory, while improved outcomes may enhance self-efficacy and motivation.

3.5.5 Social support

Prior to the exercise session, the exercise professional should be scheduled to be present in the exercise area for 15-20 minutes to assist entry to the premises where necessary. Also, importantly, the exercise professional should ensure contact with each individual prior to the session and facilitate opportunities for socialisation between stroke survivors. After each session, social interaction between stroke survivors should be facilitated – e.g. time and a comfortable space to have tea or coffee and a chat.

Rationale - stroke survivors report benefits from the social aspect of the group (Carin-Levy, et al. 2009; Reed et al. 2010).

3.5.6 Change in stroke survivor's medical status during the exercise programme

Any change in the stroke survivor's medical status (See [Box 7](#) i.e. aggravation or worsening of an existing condition or the identification of new symptoms/signs etc) should instigate a discussion with, and referral back to, the referring health care professional for further assessment before continuing with their exercise programme.

Rationale- Department of Health (2001) National Quality Assurance Framework for Exercise Referral Systems.

3.6 Content of the Exercise after Stroke programme

The exercise programme should be evidence based. It should contain a significant proportion of cardiorespiratory walking training, as this type of training has the strongest evidence of improving functional outcomes for stroke survivors (Saunders et al. 2009; Wevers et al. 2009).

The cardiovascular endurance training should also include marching, sidestepping, alternate knee lifting and other rhythmical, large muscle group aerobic activities that utilise a stable base and dynamic balance. In addition, the session should contain balance, co-ordination, functional strength and flexibility training not only to improve

the performance of everyday activities, range of movement and posture, but also to reduce falls (and falls related fracture) risk.

The exercise session will last around one hour and will be divided into:

- Warm up ([3.6.1](#)),
- Training section ([3.6.2](#)) and
- Cool down ([3.6.3](#)).

Recommendations for programming variables ([3.6.4](#)) such as duration, intensity and frequency are also given. These recommendations on session content are mainly based on the intervention used in the **Stroke: A Randomised Trial of Exercise or Relaxation (STARTER)** trial (Mead et al. 2007) which was found to be feasible and effective in improving the physical fitness of stroke survivors.

3.6.1 Warm up

Sessions should start with a stroke-specific **adapted warm up** to enhance circulation, mobility and to become familiar with basic movement patterns that will be utilised in the training session (15 to 20 minutes). This can be reduced to 15 minutes, as stroke survivors get fitter. Chair-based options should be provided for new stroke survivors and for certain exercises for certain stroke survivors and should be demonstrated at the beginning of each exercise.

Rationale – American College of Sports Medicine’s guidelines for exercise testing and prescription (2010) p153 ‘components of an exercise training session’ and the syllabus of the Exercise after Stroke specialist instructor course.(Mead et al. 2010) Primary studies such as Houmard et al. (1991) demonstrate the benefit of a warm up section before aerobic training for the general population.

3.6.2 Training section

3.6.2.1 Aerobic/ cardiac component

Current evidence suggests that the aerobic/cardiac component should be wholly or partly based on a circuit format. The circuit should eventually include around ten stations; a maximum of five or six is recommended initially. The station exercises should comprise cautiously progressed, rhythmical, large muscle group (arms and legs) aerobic training activities adapted for stroke survivors (e.g. supported/ unsupported walking, stepping, cycling). These should be interspersed with local muscular endurance training activities, e.g. trunk rotation/ lifting and lowering with a medium sized balance ball. Many of the activities in these options inherently involve functional coordination and balance work, which should be undertaken within each session. An example of how to combine these elements and the circuit and unison components is shown below in [Table 2](#) (circuit based on the Level 4 specialist Exercise and Fitness Training after Stroke course (Mead et al. 2010)).

Rationale - the circuit model allows a wide range of different cardiovascular exercise activities without the necessity for specialist equipment (other than the cycle ergometer). This is desirable because it allows transfer of most of the other exercises to other environments, i.e. stroke survivors can be encouraged to practise at home. A circuit also allows cardiovascular endurance exercises to be alternated with local muscular endurance exercises while facilitating one to one coaching and supervision within this dynamic exercise component.

3.6.2.2 Functional aerobic activities

The circuit should include functionally related activities. In particular, there should be an emphasis on walking training.

Rationale – evidence for improvement in function is task specific (van Peppen et al. (2004); French et al. (2009). For example, cycling does not improve walking ability or balance; only practising walking improves walking outcomes. Training should focus on the most useful functions for activities of daily living. In addition to walking, sit to

stand, step training and stair climbing is recommended (Mead et al 2007, and the Level 4 specialist Exercise and Fitness Training after Stroke course (Mead et al. 2010)).

NB This aerobic endurance training section should end with an aerobic cool down phase where the rhythmical activities are tapered down (i.e. arm and leg movements gradually reduced in size and, therefore, intensity) to lower heart rate safely and effectively.

3.6.2.3 Strengthening activities

The training section should continue with strengthening activities that involve **functional movement** (e.g. sit to stand) including dynamic balance and co-ordination exercises. It is recommended that these types of exercise are done in a unison format (versus circuit) to ensure that the instructor can closely monitor the stroke survivors' exercise technique and effort and can further tailor the exercise to the individual.

Rationale - There is evidence that both muscle strength and muscle power are reduced after stroke (e.g. Carin-Levy et al. 2006). There is also evidence that strength training improves muscle strength after stroke (Mead et al. 2007; Ada et al. 2006; Eng 2004). The American College of Sports Medicine's Exercise Management for Persons with Chronic Disease and Disabilities (Durstine et al. 2009) recommend strength training 2 days per week, as does the American Heart Association recommendation for physical activity and exercise after stroke (Gordon et al. 2004).

There should be 4-6 adapted strength exercises using a combination of body weight (e.g. sit to stand performed slowly to increase resistance) and appropriate equipment (e.g. resistance bands and weighted bars) as resistance. As before, **life-specific, functional** activities should be included wherever possible (e.g. lifting and lowering a weighted bar from a chair simulates lifting a tray of food from a kitchen unit to a lower table).

Rationale – professional experience of project group, Exercise and Fitness Training after Stroke syllabus (Mead et al. 2010) and Mead et al. (2007).

3.6.2.4 Balance activities

Dedicated balance exercises such as steadily paced lateral stepping are also recommended to reduce falls risk and improve locomotion and transition skills.

Rationale – professional experience of project group. Palmer-McLean and Harbst (2009) recommend co-ordination and balance activities. In the FaME trial, balance exercises reduced the risk of falls in older people (Skelton et al. 2005).

3.6.3 Cool down

Sessions should end with an adapted cool down (i.e. different from the aerobic cool down) that includes some rhythmical activities to lower heart rate and to prepare the body for some flexibility exercises to improve range of movement, posture and to help prevent long-term injury. This is considered good general injury prevention practice for all age groups participating in exercise.

Rationale – this protocol was used in the STARTER trial (Mead et al. 2007) and was found to be effective. In addition, this is current good practice for general and patient populations (American College of Sports Medicine 2009, Buckley 2008). A relevant example is its application in the Later Life Training Postural Stability Instructor course for older adults including those with minor stroke.

Table 2. Sample Exercise after Stroke session content (Mead et al. 2007)

Component	Main purpose	Method
<p>Warm-up</p> <ol style="list-style-type: none"> 1. Posture check 2. Circulation booster: march 3. Shoulder rolls mobiliser 4. Circulation booster: march 5. Side bend mobiliser 6. Circulation booster- march 7. Trunk twists mobiliser 8. Circulation booster: march 9. Ankle mobiliser 10. Circulation booster- 11. Stretches (normal range of movement and posture check; gentle) 	<p>To increase circulation, gently stretch soft tissue and prepare for exercise</p> <p>Optimise posture and effectiveness of exercises</p> <p>↑circulation</p> <p>Mobilise the shoulder girdle</p> <p>↑circulation</p> <p>Mobilise the trunk</p> <p>↑circulation</p> <p>Mobilise the trunk</p> <p>↑circulation</p> <p>Mobilise the ankle joint</p> <p>↑circulation</p> <p>Gently and safely elongate soft tissue in pain-free range</p>	<p>Unison format: seated</p> <p>Check symmetry and upright posture</p> <p>Marching on the spot, legs only, small movements</p> <p>Roll shoulders with emphasis on retraction</p> <p>Marching on the spot, legs only, larger movements</p> <p>Flex spine laterally</p> <p>Marching on the spot, legs only, larger movements</p> <p>Rotate spine</p> <p>Marching on the spot, legs and (small) arm movements</p> <p>With unaffected then affected leg: touch heel then toe</p> <p>Progress through side steps and involve arms in march</p> <p>Gently extend through pain-free range of movement while maintaining optimum posture</p>
<p>Main Training workout:</p> <p>A. Cardiovascular/ Aerobic Training¹</p> <ol style="list-style-type: none"> 1. Bike 2. Ball raise 3. Shuttle walk 4. Wall press 5. Step up 6. Knee to hand <ul style="list-style-type: none"> • Squat or Sit to Stand: Optional 	<p>To improve general cardiovascular function, strength, balance and coordination and posture; in particular:</p> <p>↑ lower limb strength, coordination, sitting balance</p> <p>↑ upper limb strength, trunk control, standing balance</p> <p>↑ gait speed and dynamic balance</p> <p>↑ upper limb and upper body strength, trunk control</p> <p>↑ lower limb strength, coordination, dynamic balance</p> <p>↑ lower limb strength, trunk control, dynamic balance</p> <p>↑ lower limb strength, trunk control, coordination, dynamic balance</p>	<p>Circuit format</p> <p>Exercise bike</p> <p>Standing (against wall if required): lift ball with two hands</p> <p>Walk 10 m between chairs, along wall if required</p> <p>Press-ups in standing, facing wall</p> <p>Step-ups alongside wall</p> <p>Standing (against wall if required): opposite knee to hand</p> <p>Squat (behind chair), or Sit to stand (rhythmical)</p>

¹ This comprises rhythmical, large muscle group activity

<p>Main Training workout: Functional Strength/ Resistance Training</p> <ol style="list-style-type: none"> 1. Upper back strengthener 2. Sit to stand leg strengthener 3. Back of arm strengthener 4. Pole lift from chair 	<p>To improve general strength, trunk control and coordination; in particular:</p> <p>↑ back extensor, shoulder retractor, ext. rotator strength ↑ lower limb extensor strength ↑ shoulder external rotator, elbow extensor. strength ↑ lower limb and trunk extensor strength</p>	<p>Unison format</p> <p>Seated: retract both shoulder blades while externally rotating shoulders, using resistance band Slower pace than in A Seated: extend elbow, externally rotating shoulder if possible, using resistance band Standing and facing chair; lift pole from seat, bring towards body, and return</p>
<p>Cool down</p> <ol style="list-style-type: none"> 1. Circulation lower/ re-warm 2. Flexibility stretches: <ol style="list-style-type: none"> a. Calf muscles b. Chest muscles c. Back of thigh muscles d. Side of trunk muscles 	<p>To lower heart rate, prepare for flexibility exercises</p> <p>↑ soft tissue extensibility of calf muscles ↑ soft tissue extensibility of pectorals ↑ soft tissue extensibility of hamstrings ↑ soft tissue extensibility of lateral trunk muscles</p>	<p>Unison format</p> <p>Seated</p> <p>Standard postures in standing, with seated options where required.</p>

3.6.4 Programming variables

3.6.4.1 Duration

The overall duration of the session will be one hour. The total duration of the aerobic/cardiac exercise training should increase from 15 minutes (week one) to 40 minutes by week 12.

Rationale – this protocol was used in the STARTER trial (Mead et al. 2007) and was found to be effective. In addition, the progressive increase in duration in the training component is current practice, for example in the Postural Stability Instructor course for older adults where the aerobic/cardiac and balance training components increased in duration as well as intensity.

3.6.4.2 Intensity

The **intensity** of exercise should aim to be moderate as opposed to low. This effort level is required for all components but will be adjusted for each individual according to health status on a session-by-session basis.

Rationale – there is little evidence in this area but the study by Rimmer et al. (2009) indicates that greater benefits accrue in stroke survivors from shorter periods of moderate intensity exercise than longer periods of low intensity exercise.

3.6.4.3 Frequency

The **frequency** of the session should be three times per week wherever possible.

Rationale -- All Cochrane reviewed (Saunders et al. 2009) randomised controlled trials of physical fitness training for stroke survivors delivered the exercise

intervention at a minimum frequency of three sessions per week (where this is not possible, a physical activity plan should be devised (see section [3.5.3](#)).

3.7 Record keeping and outcome evaluation

Exercise after Stroke services should collect a minimum data set of: stroke survivors' Community Health Index number, referral information, attendance records and maintain records of all adverse events experienced by stroke survivors (see [3.7.3](#)). This section includes:

- Data protection ([3.7.1](#))
- Minimum data set ([3.7.2](#))
- Outcome evaluation ([3.7.3](#))
- Adverse events ([3.7.4](#))
- Feedback to referrers ([3.7.5](#))

3.7.1 Data protection

All data on stroke survivors must be held securely at the exercise venue and be processed in accordance with data protection legislation.

Rationale – Data Protection Act 1998, National Quality Assurance Framework for Exercise Referral Systems (Department of Health, 2001) and the professional experience of project group

3.7.2 Minimum data set

Most community-based Exercise after Stroke services do not currently routinely collect outcome data on physical health or functional outcomes due to resource constraints and because they want to 'normalise' and 'demedicalise' exercise. However, collecting a minimum set of key data would allow a more robust case

for the continued funding of these specialist stroke services to be developed. The following are recommended to be recorded in an electronic database of stroke survivor information:

- patient Community Health Index (CHI) number (for services in Scotland)
- contact details,
- referral information,
- number of sessions attended,
- at least one outcome measure (see [3.7.3](#))

The CHI number would allow anonymous data linkage to other health datasets to assess long-term morbidity and mortality outcomes in stroke survivors – next section).

Rationale – professional experience of project group

3.7.3 Outcome evaluation

Outcome evaluation can be useful for a number of different purposes; including:

- informing stroke survivors of any effects of the exercise programme,
- enabling exercise professionals to evaluate effects, tailor programmes to individual stroke survivors and – with their consent – provide meaningful feedback to referrers,
- enabling exercise services to demonstrate the effectiveness and impact on stroke survivors' health and well-being to service commissioners.

Services could also consider developing academic partnerships for evaluation purposes. Outcome measures may include:

- 6 min walk test or 10 m walk test
- 'timed up and go'
- Stroke Impact Scale
- Personal goal attainment

An overview of other outcomes used to evaluate the effects of exercise and fitness training after stroke can be found in the Cochrane systematic review by Saunders et al. (2009).

Times at which to evaluate outcomes would be at eight weeks and then every six months. Where data are to be used for research purposes, appropriate research governance is required and this would usually include written informed consent from stroke survivors prior data collection.

Rationale –Professional experience of project group

3.7.4 Adverse events

Information on adverse events should be in records specific to the Exercise after Stroke sessions – not just in the venue’s incident and accident book. Records of adverse events should be reviewed by the Exercise after Stroke Working group and developed as part of an education package for training of staff and stroke survivors. All medical adverse events should be reported back to the GP and or referrer as soon as possible after the event.

Rationale – professional experience of project group

3.7.5 Feedback to referrers

If services choose to perform baseline and follow-up measures of fitness or function, such follow up data should be shared (in a concise, standardised format and with the stroke survivor’s written informed consent) with the referring health professional as a means of giving feedback and keeping in regular contact regarding the stroke survivor’s progress.

Rationale – professional experience of project group

4. Other Good Practice recommendations

The following recommendations comprise additional good practice points, which services may wish to consider.

4.1 Personal pre-session contact

To improve uptake by potential stroke survivors, personal contact by the Exercise after Stroke co-ordinator/ instructor with stroke survivors before they join the class is important in allaying any anxieties and other barriers and in answering practical questions. Clear communication with stroke survivors is important with a detailed protocol for contacting stroke survivors prior to them entering the course. Stroke survivors should receive written information and a phone call prior to attendance.

Referrers should make a one off follow-up telephone call or visit to stroke survivors to ensure referral process has been followed through, i.e. stroke survivor is attending on regular basis or has not developed any anxieties/ complications with regard to exercise classes.

Rationale – current practice

4.2 Accompanying stroke survivors to their first session

Uptake of services may also be facilitated if stroke survivors are accompanied to their first session. This is potentially a volunteer/peer mentor role to collect and accompany stroke survivors to their first one or two sessions

Rationale – current practice

4.3 In-service stroke awareness training

Provide stroke awareness training for frontline staff in the venues where the Exercise after Stroke classes will take place. It is recommended that the staff running the scheme undertake any face-to-face training required. An excellent source of free online training is available at www.strokecorecompetencies.org.

Rationale – current practice

4.4 Orthotics assessment

Stroke survivors are signposted back to the local orthotic department for orthotic review if their orthosis is interfering with exercises or causing discomfort during exercise or providing insufficient control of foot and ankle alignment.

Rationale – current practice

4.5 Assistants

Services should consider inviting trainee exercise instructors and/or student physiotherapists to volunteer to assist at the sessions. It is important to ensure that they have some training in the exercises and in how to assist. This is good experience for them and also increases the support available to class stroke survivors. Note: These assistants do not affect the recommended ratio of stroke survivors to qualified instructors: they are supernumerary.

Rationale – current practice

5. Temporary measures in the absence of community Exercise after Stroke services

In the event of there being no existing community Exercise after Stroke services, physiotherapists should liaise with the lead stroke consultant and community leisure services through the generic exercise referral coordinator (or similar posts in leisure service services, Primary Care Trusts or Community Health Partnerships as appropriate) to initiate service development. In the interim, Stroke Managed Clinical Networks should identify funding for the Level 4 Exercise and Fitness Training after Stroke course, to enable existing Level 4 Cardiac Rehabilitation and Falls Prevention instructors, Level 3 Exercise Referral instructors and/ or physiotherapists to gain the competencies required to deliver exercise and fitness training to stroke survivors (see [3.4](#)).

Whilst these best practice Exercise after Stroke services are being put in place, stroke networks may wish to make use of existing cardiac rehabilitation, falls and generic exercise referral schemes, applying appropriate pre-exercise health screening and assessment (see [3.2.2](#)) and providing support for the professionals involved.

However, it is important to emphasise that these are temporary measures and that the stroke networks, and other exercise providers, address the issues of specialist instructor competency and valid insurance by working towards ensuring the Skills Active Exercise after Stroke National Occupational Standards and Level 4 Specialist Qualifications and Training are met (see [3.4](#)).

Rationale -- professional experience of the project group, National Quality Assurance Framework (Department of Health, 2001) Skills Active National Occupational Standards D516 and the Register for Exercise Professionals.

6. Conclusion

There is an urgent need for more Exercise after Stroke services that are stroke-specific, person-centred, evidence-based and standardised in terms of quality-assurance. Building on the well-established national quality assurance frameworks for cardiac rehabilitation and falls prevention, this guidance document sets the UK standard for community-based Exercise after Stroke services.

These best practice guidelines are based on the current available research evidence, the experience of service providers and the opinions of experts in the field of Exercise after Stroke. It is envisaged that the recommendations will be applied across all Exercise after Stroke services in the UK.

As more research evidence becomes available, the guidelines will need to be reviewed to ensure that stroke survivors continue to gain optimum benefit from high quality Exercise after Stroke services.

Declaration of interest

Members of the project team developed the Exercise and Fitness after Stroke Level 4 Physical Activity and Health Specialist Instructor Training course referred to in the guidelines. Dr Dinan-Young is a director of Later Life Training, which is the organisation administrating the provision of the Exercise and Fitness Training after Stroke course. Other members of the project team regularly contribute to the delivery and on-going development of the course and are paid for their time.

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Appendix 1

Criteria checklist for stroke survivors, commissioners and service providers for Exercise after Stroke services (EAS).

[The page number indicates where more information can be found in the main text.]

CRITERION	CHECK
<p><u>Governance (p. 12)</u></p> <ul style="list-style-type: none"> • The EAS is overseen by a multidisciplinary working group that represents all stakeholders, including the regional stroke Managed Clinical Network/ Stroke Care Network <input type="checkbox"/> • There is a partnership agreement in place between the EAS and health professionals, which encompasses: <ul style="list-style-type: none"> ○ A quality assurance framework detailing agreed standards, performance indicators, and roles and responsibilities of those involved <input type="checkbox"/> ○ Arrangements for ongoing physiotherapy input <input type="checkbox"/> • There is a dedicated EAS coordinator in place who: <ul style="list-style-type: none"> ○ Acts as the main contact for the service <input type="checkbox"/> ○ Plans, develops and raises awareness of the service <input type="checkbox"/> ○ Liaises with all stakeholders <input type="checkbox"/> ○ Is accountable for ensuring that the referral process meets the standards of the DoH (2001) National Quality Assurance Framework for Exercise Referral Systems <input type="checkbox"/> • In terms of venue, the service: <ul style="list-style-type: none"> ○ ideally provides transport or has good public transport links <input type="checkbox"/> ○ complies with all relevant health and safety standards <input type="checkbox"/> ○ offers facilities that are accessible for disabled people <input type="checkbox"/> 	
<p><u>Referral systems and the role of the health professional (p. 15)</u></p> <ul style="list-style-type: none"> • Unless there are contra-indications, stroke survivors should be encouraged to participate in EAS; either following discharge from in- or outpatient physiotherapy after stroke, or when reviewed in the community. A discussion about risks/ benefits and barriers/ motivators re. exercise may be helpful to enhance motivation for exercise. <input type="checkbox"/> • If a stroke survivor does not wish to be referred to an EAS, health professionals should explore alternative forms of physical activity. <input type="checkbox"/> • A robust referral process should be in place that aligns with the DoH (2001) National Quality Assurance Framework for Exercise Referral Systems; stroke survivors <u>must be referred by an appropriate health professional</u> <input type="checkbox"/> • The role of the health professional in referring stroke survivors to EAS is to: <ul style="list-style-type: none"> ○ Screen stroke survivors for absolute contraindications to exercise. When these have been excluded, the health professional should then proceed to: <input type="checkbox"/> ○ Undertake a multidimensional assessment of the stroke survivor's medical and functional status <input type="checkbox"/> ○ Identify the most appropriate form(s) of exercise, depending on the stroke survivor's medical and functional status, their personal preference for physical activity, current relevant evidence, clinical <input type="checkbox"/> 	

