



DELIVERABLE NO. 3.5 – COMPARATIVE ANALYSIS OF RESOURCES AVAILABLE FOR THE FOLLOW UP AND REHABILITATION OF STROKE PATIENTS

WP3 Analysis and benchmarking of stroke healthcare pathways

Due date:	29/02/2020
Actual submission date:	14/03/2021
Responsible partner:	Open Evidence
Version:	Version no. 4
Status:	Final
Dissemination level:	PU

Deliverable description:

This deliverable maps the resources and structure of stroke rehabilitation in each region. It has been developed with the information from the regional plans and in-depth interviews with the representatives of each region health system.

Revision history

Version	Date	Comments	Partner
1	30/07/2020		OE
2	10/10/2020		OE
3	12/01/2021		OE
4	14/03/2021		OE

Authors

Name	Partner
Núria Febrer	OE
Clara Faulí	OE
Inès Lecland	OE
Florian Weber	OE
Alexandra Theben	OE
Francisco Lupiáñez-Villanueva	OE

Contributors

Name	Partner
Miquel Gallofré	Fictus
Maria Rosa Vivanco	AQuAS
Enrique Bernal	IACS
Carmen Jimenez	IDISBA
Elsa Azevedo	ARS Norte
María Herrera	Navarrabiomed

Experts

Ismael Said
Manuel Correia
Elena Cancio
Carmen Buen
Bárbara Moreira
Santiago Martínez
Esther Duarte
Conxita Closa
Carlos Aragues

TABLE OF CONTENTS

1.	Introduction.....	7
2.	Methodology	9
2.1.	Review of academic literature	9
2.2.	Selection of indicators	10
2.3.	In-depth interviews.....	13
3.	Stroke rehabilitation: scoping the field	15
4.	Pathways in stroke rehabilitation.....	18
4.1.	Aragon	18
4.2.	Catalonia	24
4.3.	Balearic Islands	27
4.4.	Navarra	27
4.5.	ARS Norte.....	28
4.6.	Occitanie	30
5.	Resources for stroke survivors	32
5.1.	Aragon	32
5.2.	Catalonia	34
5.3.	Balearic Islands	35
5.4.	Navarra	36
5.5.	ARS Norte.....	36
5.6.	Occitanie	36
6.	Follow-up of stroke survivors	38
6.1.	Aragon	38
6.2.	Catalonia	38
6.3.	Balearic Islands	39
6.4.	Navarra	39
6.5.	ARS Norte.....	39
6.6.	Occitanie	39
7.	Secondary prevention	41

7.1.	Aragon	41
7.2.	Catalonia	41
7.3.	Balearic Islands	42
7.4.	Navarra	42
7.5.	Occitanie	42
8.	Reginal comparison	43
9.	Bibliography.....	45
10.	Annexes.....	47
10.1.	Articles screened to select the indicators.....	47
10.2.	Selection of indicators: Round 1	49
10.3.	Selection of indicators: Round 2	58
10.4.	Selection of indicators: Round 3	72
10.5.	Final selection of indicators for the evaluation of rehabilitation pathways and resources: round 4	74
10.6.	Final selection of indicators for the evaluation of secondary prevention pathways and resources: round 4	76

LIST OF FIGURES

Figure 1 Indicators selection process	10
Figure 2 Stroke rehabilitation pathways	11
Figure 3 Aragon: Evaluation and rehabilitation initiation	20
Figure 4 Aragon: Pathway to the most appropriate rehabilitation service after stroke	22
Figure 5 Aragon: Patient care after hospital discharge	23
Figure 6 Catalonia: Derivation modalities algorithm after an acute stroke	26
Figure 7 ARS Norte: Derivation modalities algorithm after an acute stroke	29
Figure 8 ARS Norte: Re-evaluation of patients at hospital or outpatient clinic	30
Figure 9 Aragon: Re-evaluation of patients at hospital or outpatient clinic	41

LIST OF TABLES

Table 1 Key words related to stroke rehabilitation	9
Table 2 Exclusion criteria (score).....	13
Table 3 List of interviews conducted.....	14
Table 4 Aragon: Phases and subprocesses in the Aragon Stroke Plan	18
Table 5 Aragon Requirements for rehabilitation in stroke acute and subacute phases	19
Table 6 Catalonia: Referral protocol in acute stroke and disability	25
Table 7 Aragon: Basic human resources in stroke units.....	34
Table 8 Comparison of rehabilitation and secondary prevention across ICTUSnet regions	43

EXECUTIVE SUMMARY

The objective of the present deliverable is to map the resources and structure of rehabilitation care in each region covered by the ICTUSnet project (Spain, France and Portugal). This is a descriptive study carried out using the information available in the different stroke plans, and also through data obtained using qualitative social research techniques (in-depth interviews and stakeholder consultations). It identifies the unmet needs in the follow-up and rehabilitation after stroke as well as secondary prevention, both within and across regions. It contains the conceptual framework to assess the rehabilitation resources available in each region, as well as detailed common points and discrepancies between territories.

1. Introduction

The increasing number of strokes in Europe represents a challenge for those trying to meet long term needs of stroke survivors, impacting on health and social care providers and their funders, as well as on families and other informal care givers (Stevens, 2017). There are many factors that can affect the recovery process after stroke, such as the type of brain lesion, the severity of the stroke, the age of the patient, previous health and functional abilities, social environment and personal motivation (Richards, 2015). Thus, there is an ongoing need to find the most optimal existing rehabilitation services and therapeutic interventions.

The ICTUSnet project aims to improve the quality of stroke healthcare, including stroke care strategies. The present deliverable belongs to WP3 “analysis and benchmarking of stroke healthcare pathways”, which aims to perform an analysis and comparison of the different regional stroke care models through all the stroke care stages, including the rehabilitation phase. The project involves stroke regional plans of six regions of Spain (Aragon, Balearic Islands, Catalonia and Navarra), France (Occitanie) and Portugal (ARS Norte). The objective of this deliverable is to map the resources and structure of rehabilitation care in each region covered by the ICTUSnet project.

The methodology used for this study is based on qualitative research methods. First, a scoping review exercise of academic literature and other relevant documents was performed. This resulted in a set of 47 indicators divided in four dimensions, namely; pathways, follow-up, resources and secondary prevention. The stroke regional plans were subsequently screened and analysed, focusing on the above-mentioned stroke rehabilitation dimensions, as well as their sub-dimensions. Then, a series of in-depth interviews were conducted with the main stakeholders involved in rehabilitation planification and deployment in each region, with the aim of covering the gaps or providing clarification on certain dimensions.

Among the different stroke regional plans that have been analysed, the Aragon Plan of Stroke Care (in Spanish, *Plan de atención al ictus en Aragón*) stands out for its accuracy in the explanation of the different trajectories in the rehabilitation phase. The document was updated on November 2018 and provides the strategic lines and objectives in all the stages of stroke care, including the rehabilitation process which already begins in the acute phase. The Aragon Plan of Stroke Care includes specific information for each phase of the stroke care, including activities, key players, criteria, services and resources.

In the Balearic Islands region, there exists the Stroke Strategy of the Balearic Islands (in Spanish, *Estrategia de ictus de las Illes Balears*), a document first published on May 2017. The strategy is built on a series of strategic areas of interest for which specific objectives and strategic action lines are defined. Rehabilitation is one of these main strategic areas

of interest, which begins in the acute phase of stroke and is understood as a continuous process linked to the rehabilitation after hospital admission.

The region of Catalonia counts with the Master Plan for the diseases of the circulatory system (in Spanish, *Plan Director de Enfermedades del Aparato Circulatorio*), which includes a Stroke Programme, and also with the updated version of the protocol for diagnosis and treatment of cerebral vascular diseases (in Catalan, *Diagnòstic i tractament de les malalties vasculars cerebrals*). The documents include specific sections for rehabilitation and secondary prevention, as well as a general overview on the objectives, governance and strategy for the circulatory system diseases.

As for the Navarra region, stroke rehabilitation is included in the Integrated care strategy for chronic and multi-pathological patients (in Spanish, *Estrategia de atención integrada a pacientes crónicos y pluripatológicos*), developed on 2013. The main rehabilitation highlights of this strategy are to improve the quality of life of chronic and multi-pathological patients and to promote their autonomy. The document focuses on rehabilitation from a high-level perspective, meaning that the information provided avails for several diseases and is not specifically focused on stroke.

In the North of Portugal, stroke rehabilitation is included in the the stroke physical medicine and rehabilitation policy document (in Portuguese, *Acidente Vascular Cerebral: Prescrição de Medicina Física e de Reabilitação*). A set of policies and criteria for stroke rehabilitation are explained with detail, giving very specific information on the rehabilitation processes for the involved professionals. This policy document was issued in April of 2012 by the Department of Health Quality.

Finally, in the French region of Occitanie, most of the information has been obtained from the Occitan regional health plan (in French, *PRS Occitanie: Projet Régional de Santé*), which was issued in July 2018 by the Regional Health Agency of Occitanie. This document is not only specific to stroke, and also includes other diseases. Nevertheless, the section on vital emergencies includes two priorities related to stroke rehabilitation.

Overall, the six regions that have been analysed on this report count with some kind of guidance or protocol for stroke rehabilitation. However, there are significant differences in the level of detail among the different regions.

2. Methodology

2.1. Review of academic literature

A scoping review of academic literature and other relevant documents related to stroke rehabilitation¹ was performed. This had the goal of collecting **indicators** used in the evaluation of stroke rehabilitation and follow-up, including:

- Indicators to measure the state of stroke patients when they leave acute care, and indicators to measure recovery
- Indicators related to resources used by health organisations to treat stroke patients in the rehabilitation phase

Based on this objective, and on a first screening of relevant articles (ESO & SAFE, 2018; Richards, Malouin, & Nadeau, 2015; Stevens, Emmett, Wang, McKeivitt, & Wolfe, 2017), some key words were identified (see Table 1).

Table 1 Key words related to stroke rehabilitation

Dimension	Words
Disease	Stroke
Phase	Rehabilitation, Long-term, discharge, follow-up, post-stroke, "after stroke", recovery, post-hospital, survivor, reintegration
Rehabilitation Services	therapy, treatment, programme, services, care, support, training, pathway, plan, intervention, strategy, guidelines, review, protocol, "early supported discharge", "secondary prevention"
Sequelae	Sequelae, limitations, restrictions, disability, handicap, disorders, deficits, impairment, function, independence, ADLs/Activities of Daily Living/daily activities, Disability Adjusted Life Years lost/DALYs lost/ DALY, morbidity, consequences, problems
Resources	"health professionals", personnel/staff, beds, equipment, budget, resources
Evaluation	Indicators, evaluation, impact, effect, assessment
Economic impact	Costs, burden, economic, financial, productivity, earnings, income, work
Societal impact	Socio-economic impact, societal/social, emotional problems, depression, anxiety, relationships, quality of life, leisure, community, caregivers/carers, informal care/unpaid care

Source: authors' elaboration

¹ Rehabilitation is the third phase of the care pathway, after prevention and the acute phase.

These words were combined in order to form the search strings that were used to find the relevant documents. The search for academic articles was conducted in PubMed, Scopus and Google Scholar. Moreover, additional documents were obtained through Google search. Moreover, some of the articles provided new sources that were also relevant and were included in the selection.

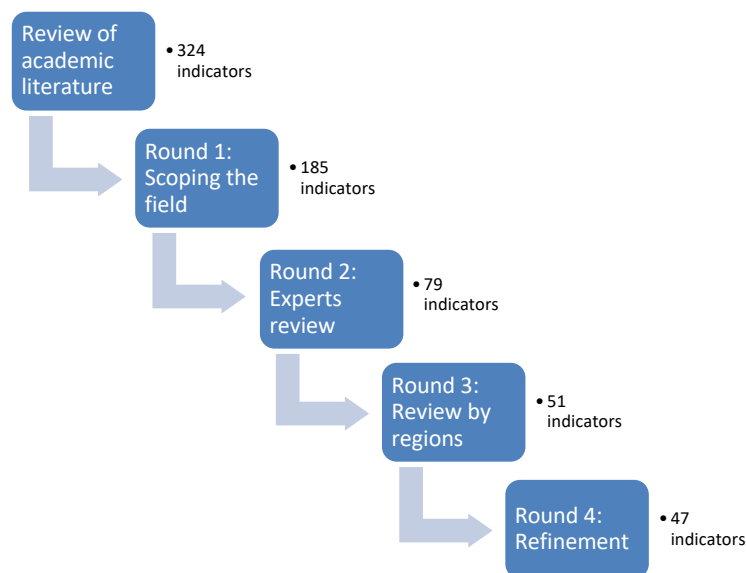
Due to the elevate number of studies on stroke rehabilitation, we mainly focused on multi-country studies, documents on ICTUSNET countries (France, Portugal, Spain) and regions (Occitanie, ARS Norte, Aragon, Navarra, Balearic Islands, Catalonia), and systematic reviews, literature reviews and meta-analysis. Moreover, some key words were translated to the languages of ICTUSNET regions (French, Portuguese, Spanish, Catalan), which provided additional articles.

The first selection contained 305 documents. The most relevant articles were identified by reading the titles and the abstract. A total of 79 articles were screened.

2.2. Selection of indicators

A set of 324 indicators were obtained from the screened articles (available in Annex 10.1). The selection process for the indicators counted with a series of rounds which involved the participation of relevant stakeholders and experts on the field. After reviewing the indicators and applying the exclusion criteria, 47 indicators remained for the evaluation of stroke rehabilitation and secondary prevention pathways and resources. Figure 1 summarises the different stages involved in this selection.

Figure 1 Indicators selection process



Source: author's elaboration

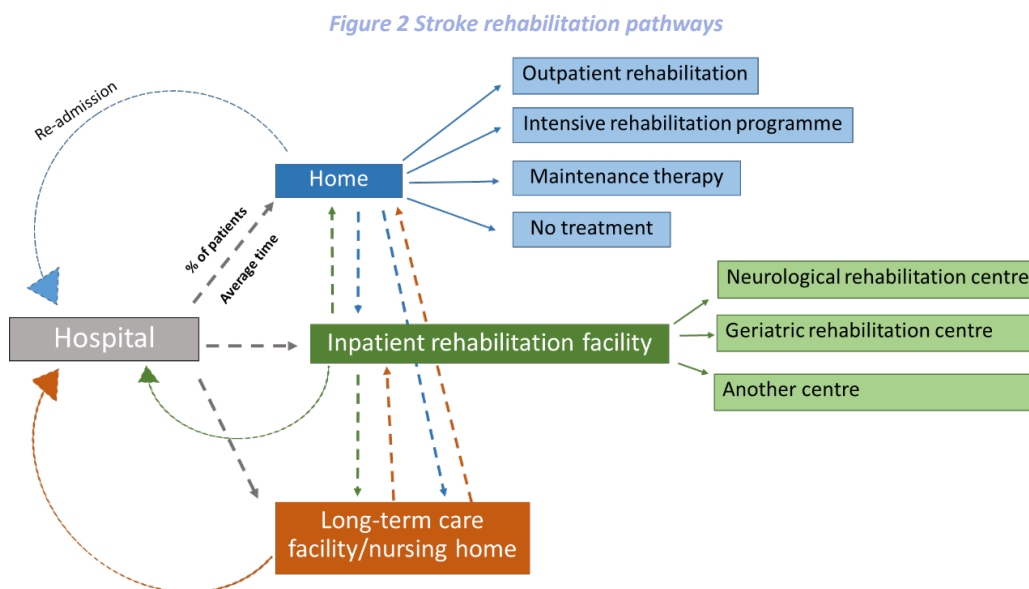
The indicators were selected only if they fulfilled the RACER criteria²:

- **Relevance:** Indicators must be linked to the project’s analytical objectives.
- **Accepted** by the staff and other relevant stakeholders.
- **Credible** for non-experts. Indicators must be clearly defined to avoid unambiguity and must be easily comprehensible.
- **Easy to monitor.** The burden of data collection should be minimised, for example by exploring what data is already collected.
- **Robust** against manipulation. The possibility that any of the actors involved in the data generation and collection processes alters the indicators must be minimised. They must also be up to date.

Selection: round 1

During the first screening 185 indicators were deemed relevant because they focused on measuring the state of stroke patients after acute care. These indicators, which are displayed in Annex 10.2, were organised in four dimensions, namely; pathway, follow-up, resources and secondary prevention.

The dimension ‘**pathway**’ includes indicators that describe the different trajectories available (a mix of resources and processes) for stroke patients. An example including the main pathways is depicted in Figure 2.



Source: Authors elaboration based on Richards et al (2015)

² COMMISSION STAFF WORKING DOCUMENT. Better Regulation Guidelines. Strasbourg, 19.5.2015. SWD (2015) 111 final; European Commission. Tool on monitoring arrangements and indicators.

The dimension '**resources**' includes the rehabilitation services and therapies offered (related to the patient's physical and mental wellbeing, as well as to support for caregivers) and also the level of use and cost of these services and the associated personnel.

The dimension '**follow-up**' refers to whether the status and level of recovery of stroke survivors is assessed when they leave acute care and at different points of time, and to the sequelae that are assessed. These comprise the health condition, indicators related to patients' and informal caregivers' quality of life and mental wellbeing, and to economic consequences (e.g. derived from the impossibility to return to work). It includes a mix of processes and outcomes.

'**Secondary prevention**' has the aim to prevent a second stroke. This dimension includes how secondary prevention is managed, whether patients are assessed for risk factors and for adherence to the secondary prevention treatment, and the interventions that are implemented in this domain (e.g. educational interventions, interventions to modify lifestyle, interventions to address clinical variables).

Selection: round 2

The second-round focused on the criteria "accepted by the staff and other relevant stakeholders". The list of 154 indicators related to rehabilitation (e.g. those in the first three dimensions) was shared with experts with long experience in rehab and home care in stroke in Catalonia who collaborate with the Catalan Stroke Program. Secondary prevention indicators were not revised for this selection since it was out of their scope of expertise. Each of them selected 50 indicators. We kept the indicators that were selected by at least one of them (a total of 79). These are also displayed in the Annex 10.3.

Selection: round 3

This list was then shared with five regions (Aragon, Balears, Navarra, ARS Norte and Occitanie) participating in the ICTUSnet project who were asked to select 40 indicators out of a list of 110 indicators (79 indicators from the previous round plus 31 indicators from 'secondary prevention' dimension). The indicators' form contained two questions; Q1) Do you have this information; and Q2) Is this indicator relevant for the study? The ICTUSnet regions are relevant stakeholders, therefore it was ensured that the indicators were not only accepted by them, but also agreed on the feasibility of the data collection (contributing to the 'easy to monitor' criteria). Results from this exercise are available in Annex 10.3.

Once the data from the regions were collected, the most relevant indicators were identified by scoring them systematically. First, results per indicator were summed, obtaining two totals (one for Q1 and one for Q2). Indicators that scored 0 in either Q1 or Q2 were automatically excluded. After, we summed the results of Q1 and Q2 to obtain the indicator score for each indicator. Then we set the exclusion criteria by calculating the average score per dimension and rounding up the results, as seen on Table 2:

Table 2 Exclusion criteria (score)

Dimension	Average	Exclusion criteria
1. Pathway	4,8	<5
2. Follow up	2,7	<3
3. Resources	3,6	<4
4. Secondary prevention	3,7	<4

Source: authors' elaboration

Averages were calculated per dimension in order not to discriminate the lowest scored dimensions. Next, two independent researchers assessed the list of indicators searching for similarities among them, and merged those which would obtain equal data. The number of indicators after applying the abovementioned exclusion criteria resulted in a list of 51 indicators, which can be found in Annex 10.4.

Selection: round 4

A team of clinicians from Navarra and Balears reviewed the remaining 51 indicators (including both rehabilitation and secondary prevention) and adjusted them in order for them to be as useful as possible for the successful evaluation of stroke rehabilitation and secondary prevention pathways and resources. When conducting this refinement exercise, it was noticed that even though all the indicators were highly relevant, only a few of them could be collected with the standard data bases available at hospital. It was thus highlighted the need for hospitals and regions to include the rehabilitation and secondary prevention phases into the databases even when patients are referred to centres outside a hospital, since it is crucial for the evaluation of pathways and resources. Therefore, the research team divided the by type; (1) indicators, which are retrievable through standard databases and (2) sub-indicators, which are only retrievable when rehabilitation and secondary prevention phases are included into the databases.

The result of this exercise is available on Annexes 10.5 and 10.6, comprising a set of 18 indicators and 16 sub-indicators for the evaluation of stroke rehabilitation pathways and resources and a set of 2 indicators and 11 sub-indicators for the evaluation of stroke secondary prevention pathways and resources.

2.3. In-depth interviews

In-depth interviews with stroke rehabilitation experts were conducted in a first phase in order to obtain a general overview of the stroke rehabilitation in the ICTUSnet regions. Table 3 displays the interviews conducted.

Table 3 List of interviews conducted

Region	Type of stakeholder	Date	Conducted by
Aragon	Doctor with expertise in rehabilitation + managerial role + member of the strategic committee	27 th March 2019	Fundació Ictus
Balearic Islands	Doctor with expertise in rehabilitation + member of the strategic committee	21 st March 2019	Fundació Ictus & Open Evidence
Catalonia	Doctor with expertise in rehabilitation + Integrated care director	31 st October 2019	Open Evidence
Navarra	Director of neurorehabilitation at Complejo Hospitalario de Navarra	23 rd October 2019	Open Evidence
ARS Norte	Doctor with expertise in rehabilitation + managerial role	21 st March 2019	Fundació Ictus & Open Evidence

Source: authors' elaboration

The following sections contain a summary of the results obtained from the review of academic literature and the analysis of the regional plan for stroke rehabilitation in each ICTUSnet region, based on the input obtained from the analysis of regional plans and similar documents, the indicators and the in-depth interviews.

3. Stroke rehabilitation: scoping the field

When discussing on **stroke rehabilitation** pathways, it is important to take into account the difference between stroke recovery and stroke rehabilitation. According to Belagaje (2017), stroke rehabilitation has been commonly understood as any aspect of stroke care that aims to reduce disability and promote participation in activities of daily living. Thus, this process involves treatments and trainings, which are provided to stroke survivors to help them return to their normal lives (Belagaje, 2017). On another front, **stroke recovery** could be defined as an improvement across a variety of outcomes, which begins with biological and neurologic changes that show an improvement on performance and activity of the patient, based on behavioural measures (Belagaje, 2017). Richards (2015) elaborates on the stroke rehabilitation process, explaining that it involves three major principles of recovery, namely; adaptation, restitution and neuroplasticity. According to the author, based on these principles, multiple different approaches exist to enhance rehabilitation, both pharmacologic and non-pharmacologic.

According to Gache (2014), patient access to well organised and multidisciplinary care in stroke units has been shown to improve the service quality and ultimately to reduce stroke morbidity/mortality rates. Certainly, in the sub-acute phase, many studies and meta-analyses have indisputably demonstrated the effectiveness of specific, multidisciplinary rehabilitation (Schnitzler, 2014). Functional prognosis, morbidity and mortality, quality of life, and home-discharge possibility have all been shown to improve when patients are cared for within a specialized centre (Schnitzler, 2014).

Thus, **stroke care pathways** have been set up in European countries over the past years with a framework that embraces multidisciplinary care, care coordination and overall cooperation, and includes several components, namely; first contact with providers, notification of emergency medical services (EMS) and their response to ensure speedy access to stroke units, acute and sub-acute stroke care, access to rehabilitation and chronic care centres, and provision of home care for dependent patients (Gache, 2014). Based on the Quebec Stroke Rehabilitation Strategy, Richards (2015) explains five different **rehabilitation trajectories**, namely;

- Very mild strokes: Return home with or without a recommendation for further outpatient rehabilitation.
- Mild or moderate stroke: Require intensive rehabilitation and fulfill the criteria for an early supported discharge (ESD) rehabilitation program at home. The ESD program (an intensive rehabilitation program offered by an interprofessional team 5 days per week) can be expected to last 6–8 weeks, and is often followed by outpatient rehabilitation of variable duration and intensity.

- More severe strokes or those who do not fulfill the criteria for an ESD program but require intensive rehabilitation: Directed to an inpatient rehabilitation facility. Inpatient rehabilitation can vary from a few weeks to up to 16 or more weeks for very severely affected patients and may be followed by outpatient rehabilitation for variable periods.
- Very severe strokes that the interprofessional stroke team does not consider to be candidate for intensive rehabilitation: Referred to a long-term care facility where maintenance rehabilitation services may or may not be available, although such services are recommended. Should this patient, however, reveal a later developing potential for more intensive rehabilitation, provision should be made for a transfer to inpatient rehabilitation.
- Patients and families or caregivers who refuse intensive rehabilitation care and prefer to return home with maintenance therapy offered by home care services.

On his work, Richards (2015) explains that the **duration of rehabilitation** offered in the different trajectories is related to different variables such as stroke severity, patient goals, and availability of rehabilitation personnel. In relation to this, several authors discuss on the impact of EDS on the stroke rehabilitation, since it is used to accelerate discharge from hospital with the provision of moving early both rehabilitation and support to the community setting. Now several RCTs have proven that ESD reduces the length of the in-patient stay and the overall cost of care while lowering the risk of death or institutionalisation and promoting participation in Instrumental activities of daily living (IADL) (Rousseaux, 2009). However, studies on the topic are heterogeneous and more research needs to be done to achieve conclusions.

As for the timelines, Belagaje (2017) argues that most stroke deficits hit the highest rate of recovery during the first 3 to 6 months after stroke. After 6 months have passed, recovery tends to reach a plateau phase where there is no significant improvement, although in some cases improvement can continue several years after stroke. Certainly, several authors identify the **reintegration into the community** as one of the main challenges for stroke rehabilitation (Richards, 2013). Rehabilitation services are poorly developed to assist stroke survivors and patients describe feelings of abandonment given the lack of information about community services, lifestyle changes related to secondary prevention, rehabilitation follow-up or support for caregivers. Thus, there is a need to develop a long-term case management type of service to assist stroke survivors in accessing services and to ensure regular evaluations with rehabilitation services to promote the maintenance of gains, and also to develop community services for this same purpose.

According to Teasell (2018), specialized stroke rehabilitation units are associated with better outcomes, compared with mixed rehabilitation wards, general medicine, and mobile stroke teams. In Europe, the ESO (2018) set a series of targets for 2030 in regards of **services provided in stroke rehabilitation**, including, among others, access to early rehabilitation within the stroke unit for at least 90% of the stroke survivors and provision of early supported discharge for at least 20% of stroke survivors. In addition to that, to overcome the challenge of reintegrating stroke patients into the community, the ESO (2018) also adds that national plans should address survivors' and their families' long-term unmet needs and that they should set out the support that will be provided to stroke survivors regardless of their place of residence and socio-economic

status. In this regard, Stevens (2017) states that stroke survivors across Europe are waiting too long to have their immediate rehabilitation needs assessed and therapies started. In general, the rehabilitation they get is not intense enough, is too short, and often fails to address on-going issues, such as depression. At the same time, very few people get follow up reviews (Stevens, 2017).

On another front, the ESO (2018) defends that European countries should ensure sufficient **resources for rehabilitation** and improve the capacity of stroke units to ensure all patients have equitable access to rehabilitation. In particular, the ESO (2018) states that stroke survivors should have access to a multidisciplinary team, personalised rehabilitation plans and a regular review of their rehabilitation needs, stressing the relevance of counting with skilled and specialist rehabilitation staff, which are lacking in many countries.

The literature identifies the availability of **rehabilitation personnel** as another challenge for stroke rehabilitation. Different authors and institutions have different considerations on which are the key personnel that should be involved in the stroke rehabilitation process. Belagaje (2017) explains that stroke rehabilitation doesn't only involve neurologists, but also a variety of healthcare professionals, such as physical therapists, occupational therapists or speech and language pathologists. Thus, successful rehabilitation involves understanding the natural history of stroke recovery and a multidisciplinary approach with judicious use of resources to identify and treat common post stroke sequelae (Belagaje, 2017). To this, Kuçukdeveci (2018) adds that not all patients will need the same professionals, since some stroke survivors may need the help of other health professionals that should be included in the team, such as dietitians, orthotists, sports and recreational therapists, rehabilitation engineers, as well as other physicians such as orthopaedic surgeons, neurosurgeons or psychiatrists, among others.

From the review of literature, it seems clear that there is room for improvement in the field of stroke rehabilitation pathways. This is not something that applies only to Europe but also at a global level, as the World Stroke Organisation also has rehabilitation as one of the main areas of concern, where recommendations have been established for the continuous improvement of rehabilitation to reduce the impact of stroke on patients. On the following section, a detailed analysis of the different identified dimensions concerning stroke rehabilitation and secondary prevention has been performed in the six regions involved in the ICTUSnet project.


4. Pathways in stroke rehabilitation

4.1. Aragon

The Stroke care process included in the Aragon Stroke Plan counts with 4 phases and 10 subprocesses that cover the different patient's needs (see Table 4) of which 6 are related to the rehabilitation process.

Table 4 Aragon: Phases and subprocesses in the Aragon Stroke Plan

Phase	Subprocess
0. Interventions previous to stroke	0. Primary prevention
1. Hyperacute phase	1. Emergency care (out of hospital)
	2. Urgent hospital care
	3. Reperfusion treatment (neurointervention)
2. Acute phase	4. Care in stroke units/areas
	5. Assessment and initiation of rehabilitation
3. Subacute phase	6. Attention in hospital units
	7. Rehabilitation in the subacute phase and convalescence
4. Chronic phase	8. Secondary prevention
	9. Rehabilitation in sequelae phase
	10. Socio-health care and support for dependency


REHABILITATION ACTIONS

Source: Adapted from Aragon Plan of Stroke Care (2018)

The acute phase includes all the actions that occur in the first 48 hours after the stroke, including subprocess 5 which consists on assessment and initiation of the rehabilitation process. At this stage patients are evaluated to decide whether they need rehabilitation or not. In parallel, first measures for secondary prevention are undertaken and guidelines for patients and relatives are provided in order for them to adapt to the new situation at the earliest convenience. The rehabilitation process can begin either at a therapeutic room or in their hospital rooms. It starts during the first 24-48 hours and it lasts until the patient is clinically stable.

There are five objectives for the rehabilitation process during the acute phase, which are defined at the Aragon Plan of Stroke Care. These are namely; to reduce the probability of disability, to establish an early diagnose, to define the needs for patients who become disabled and to plan their care, to inform caregivers on treatments for permanently disabled patients and to assess patients on their new lifestyle and how to readapt to their socio-familiar environment. Main requirements that need to be fulfilled during the rehabilitation treatment both in the acute and the subacute phase are identified and described on Table 5:

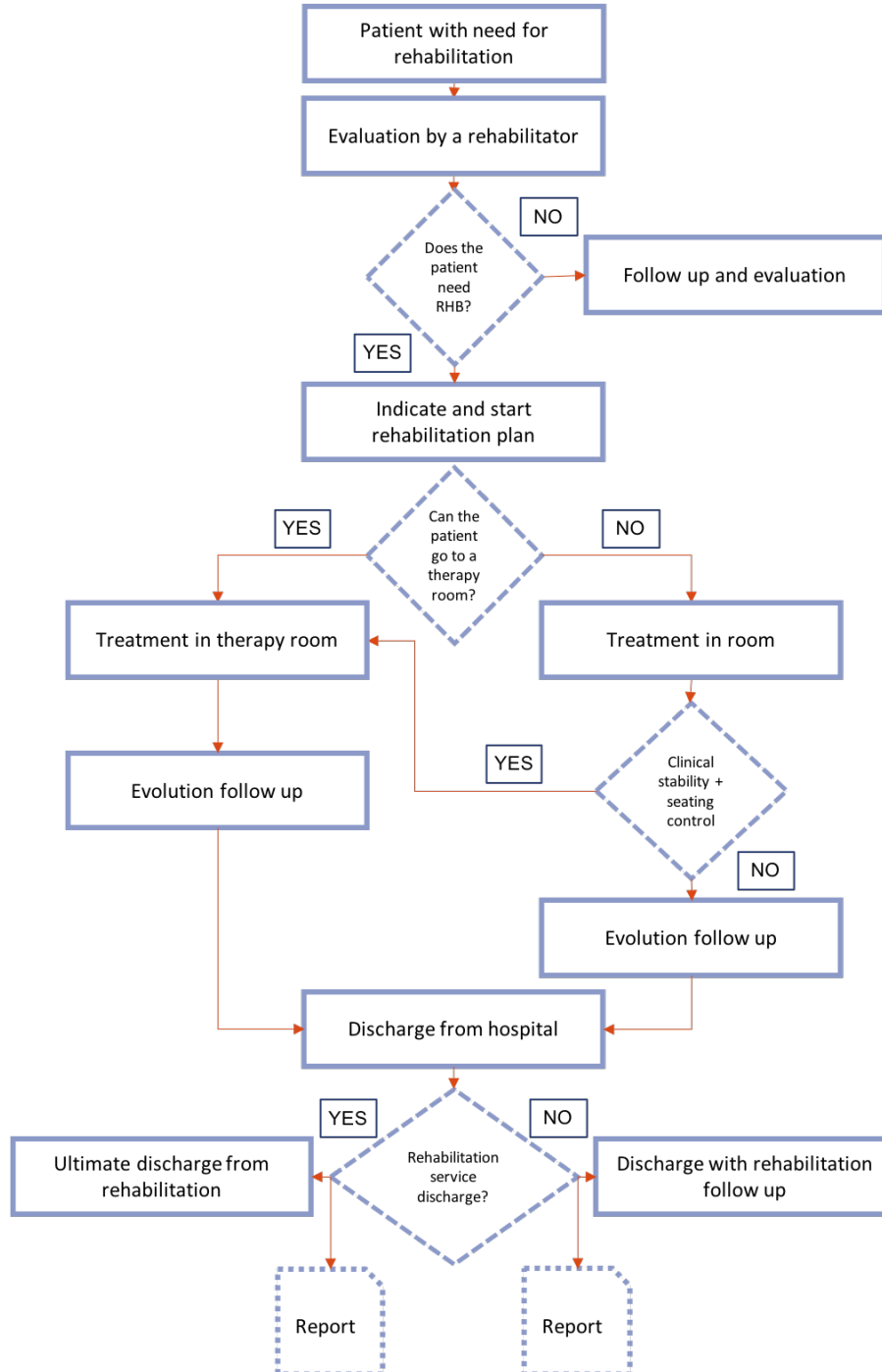
Table 5 Aragon Requirements for rehabilitation in stroke acute and subacute phases

Continuity	To ensure continuity of care during the whole treatment, especially during the transition from hospitals to outpatient clinics and vice versa, to avoid potential interruptions of the rehabilitation programmes.
Intensity	To apply high intensity rehabilitation treatments, which have to be as intense as the patient can tolerate and assume (at least 30 minutes of physiotherapy and 30 minutes of occupational therapy, if necessary additional 30 minutes of speech therapy as well).
Duration	To ensure the rehabilitation process only finalises when there are no further functional objectives to achieve, or when the patient wants to end with it.
Periodic evaluation	To use scales to identify problems, establish objectives and pinpoint the successful interventions. It is recommended to evaluate mobility, language and functional aspects. As in quality of life, it is recommended to use the Barthel index.
Training for family and caregivers	To provide training resources to patients and their families to make it easier for them to take part in the rehabilitation process.

Source: Adapted from Aragon Plan of Stroke Care (2018)

This subprocess involves the collaboration of a group of professionals that consists of physiotherapists, nurses, occupational therapists, social workers, speech therapists, rehabilitation doctors and psychologists. Nine activities fall under subprocess 5, including a first evaluation of patients by a multidisciplinary team. After the assessment and during the first 48 hours, patients receive rehabilitation treatment including physiotherapy, occupational therapy and speech therapy. Meanwhile, doctors specialised in rehabilitation establish a therapeutic plan which identifies the objectives tailored to each patient and they assess patient's disability. Once the therapeutic plan is ready, the team provide information and advice on the different care stages to patients and their families. While patients are at the hospital, they receive prevention care in order to avoid complications. At the time of hospital discharge, doctors develop an electronic medical report, also handed to patients, which includes information on the process that has been followed for rehabilitation, treatment measures, continuity actions, follow up, etc. At this stage doctors assess patient's needs and plan the continuity of caring methods, such as adapting patient's houses as per their disabilities, intensity of home treatment, medical/nursing support, etc. On Figure 3 the pathway for the assessment and start of stroke rehabilitation actions is summarised.

Figure 3 Aragon: Evaluation and rehabilitation initiation



Source: Adapted from Aragon Plan of Stroke Care (2018)

The **subacute phase** involves all the actions oriented towards patient stabilisation, etiologic diagnosis, secondary prevention, socio-sanitary planification and rehabilitation. Subacute phase goes from first 48/72 hours until hospital discharge, and it is formed by two subprocesses, namely; subprocess 6 “attention on hospital units” and subprocess 7 “Rehabilitation in the subacute phase and convalescence”.

Subprocess 6 “attention on hospital units” begins with the arrival of patients to hospital units from specialised stroke units. The pathway implies the elaboration four reports that aim at making care continuity easier for patients and also for the different professional teams involved in the rehabilitation process. These are:

- **Medical report:** This report is produced in electronic format and it is adapted for the specific stroke patients’ template. It gathers information on previous medical history, vascular risk facts, etiologic and topographic diagnosis, previous functional situation, discharge information, therapeutic recommendations and follow up plan.
- **Rehabilitation report:** This report includes a description of the rehabilitation process for each patient, including therapeutic procedures, clinical and functional situation, treatment and recommendations for after hospital discharge.
- **Nursing care report:** This report includes an assessment of the necessities of each patient (following Virginia Henderson model) at the moment of hospital discharge. It also includes a risk assessment to suffer an ulcer, a description of the care processes that the patient has been through during the process, evolution and recommendations.
- **Social report:** This report provides information on patient’s familiar and social environment with the aim of providing patients with the right sanitary and social resources.

The actions undertaken under this subprocess are mainly focused on obtaining a diagnosis to prepare a treatment, to assess the rehabilitation plan taking into account the socio-sanitary situation of the patient, and to provide follow up support and information to patients and caregivers.

Subprocess 7 “Rehabilitation in the subacute phase and convalescence” involves the assessment and treatment of patients through rehabilitation techniques with the aim of recovering from functional disorders and integrating patients into their normal lives. Rehabilitation in subacute phase starts right after the acute phase and finishes upon hospital discharge, clinical stability, establishment of care continuity or absence of objectives. This subprocess develops in different areas depending on the clinical and social situation of each patient. At this stage, patients are directed to hospitals, outpatient clinics or mid/long term centres:

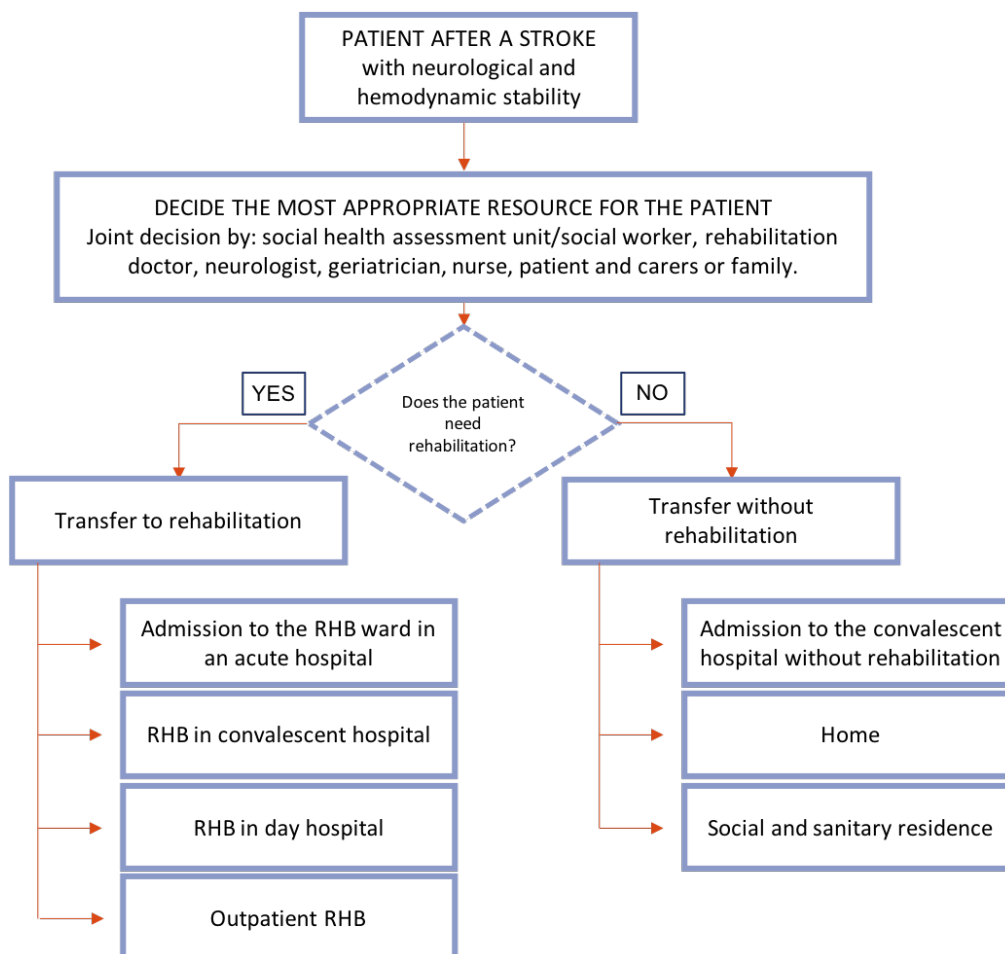
- **Hospital rehabilitation:** This type of rehabilitation is for patients whose disability limits their return home, that count with a cognitive and physical level that allow their participation in the intensive rehabilitation programme.
- **Outpatient clinic rehabilitation:** This type of rehabilitation is for patients whose disability is low-moderate in 2 or more functional areas, that count with sufficient socio-familiar support and are able to commute to the rehabilitation service.

- Mid/long term centre rehabilitation: This type of rehabilitation is for patients whose disability is moderate-severe, and whose physical or cognitive situation limits their participation in high intensity therapy and without enough socio-familiar support.

Once patient’s destination is decided by the rehabilitation doctors, a series of therapies and assessments are performed in order to provide the best type of treatment. At this stage patients and their families are informed of the rehabilitation treatment that they are going to follow as they start it. An evaluation of patient’s disability and a timeline for recovery is performed before patients are discharged from their respective hospitals/clinics/centres. A clinical report including a description of the process, therapeutic processes, clinical situation, recommendations on sanitary procedures and diet needs is provided.

There are cases in which patients are not directed to rehabilitation treatments, these situations are given when patients had severe disabilities before having the stroke, they have been heavily affected at a cognitive/conscious level after the stroke, or the stroke episode coincides with a terminal phase of a different disease.

Figure 4 Aragon: Pathway to the most appropriate rehabilitation service after stroke

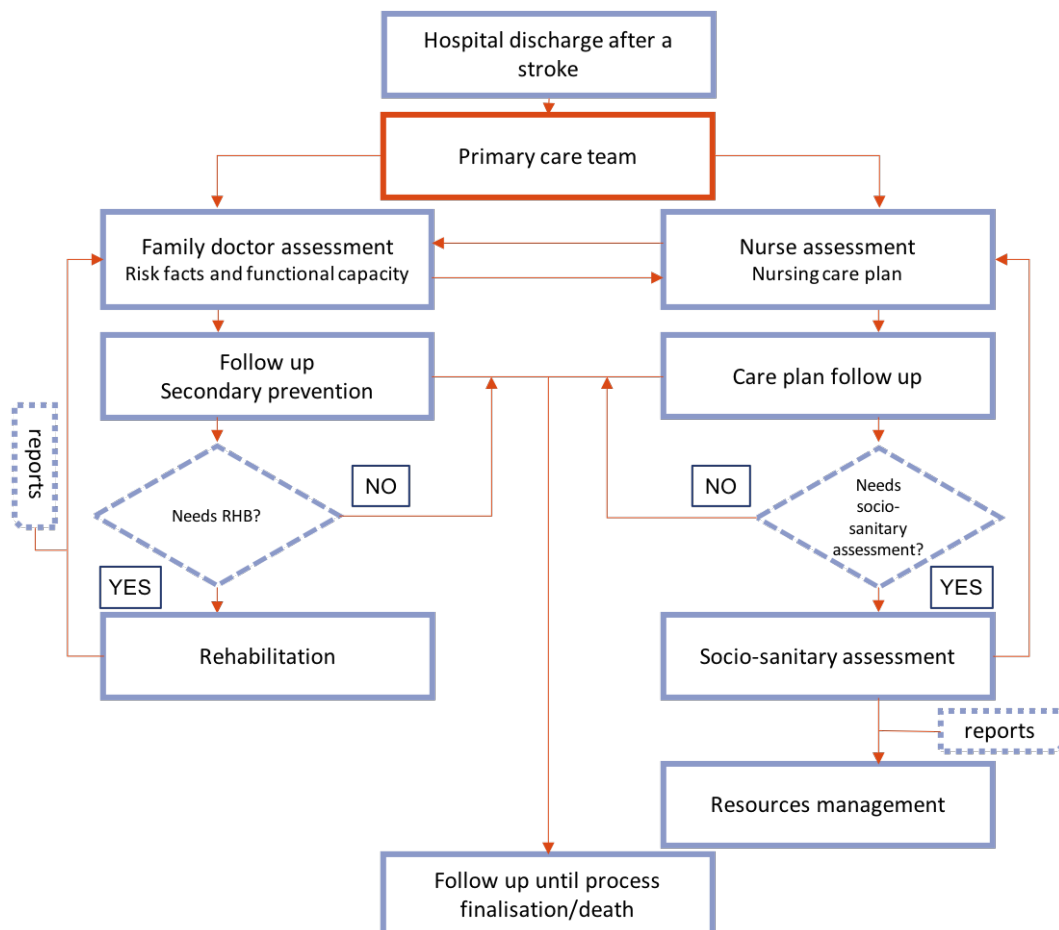


Source: Adapted from Aragon Plan of Stroke Care (2018)

The chronic phase includes all the actions that are oriented towards reintegration into family and social life, monitoring the treatment, controlling the risk factors, providing health education for patients and caregivers and rehabilitation of the sequelae phase. In general, the monitoring and control of patients and their vascular risk factors after discharge will be carried out by the primary care team and, in some cases, the neurologist. The chronic phase involves three subprocesses, namely; secondary prevention, rehabilitation in sequelae phase and socio-sanitary care and support for dependency.

Subprocess 8 “secondary prevention” aims to provide individualised assessment, follow up and control of risk factors in patients who have suffered a first episode of stroke in order to avoid recurrences. This subprocess starts with patients that already have had a stroke and it ends when patients either have another stroke or die. The activities that fall under this subphase are related promoting a healthy lifestyle and intervening in the daily non-healthy practices, such as alcohol and cigarettes consumption, lack of exercise, poor diets, etc. At this stage several personalized plans are also developed according to each patient’s case.

Figure 5 Aragon: Patient care after hospital discharge



Source: Adapted from Aragon Plan of Stroke Care (2018)

As for subprocess 9 “rehabilitation in sequelae phase” refers to the rehabilitation treatment that patients receive once their clinically stable with the aim of adapting the patient to the remaining functional situation. The main objectives at this stage is to assess and treat any kind of complication that may arise (such as central pain, shoulder pain, falls, osteoporosis, etc.) and to find ways of tackling functional disfunctions. This phase starts at the end of the subacute phase and it lasts until patient dies. The procedure followed includes assessment, identification of sequelae and treatment.

Lastly, subprocess 10 socio-sanitary care and dependency support which consists on the recruitment and follow-up of dependent patients (Barthel minor ≤ 90) and/or with mobility problem after suffering an episode of stroke. This phase starts at the end of the subacute phase and it lasts until patient dies. The activities that fall under this subphase are mainly managed by the primary care team, which consist on assessment of each patient’s socio-familiar context, assessment of patient’s mobility, caregiver’s assessment, application to any social care that the patient may need and alternative resources available.

4.2. Catalonia

Catalonia counts with a Master Plan for the diseases of the circulatory system which aims to approach these types of diseases, from promotion and prevention to rehabilitation, and to reduce the impact of these on population’s health. Within this Plan, the Stroke Programme counts with specific objectives for stroke care in Catalonia, which aim to further develop rehabilitation and reinsertion actions for patients with stroke. The main objectives described in the Stroke Programme are to analyse the demand for rehabilitation generated by stroke disease and its different levels of care, and territorial integration of rehabilitation care. The two main activities described in the Stroke Programme are a) the design and implementation of integrated rehabilitation models (following the stroke guide recommendations) and b) the coordination with the sociosanitary Stroke Programme.

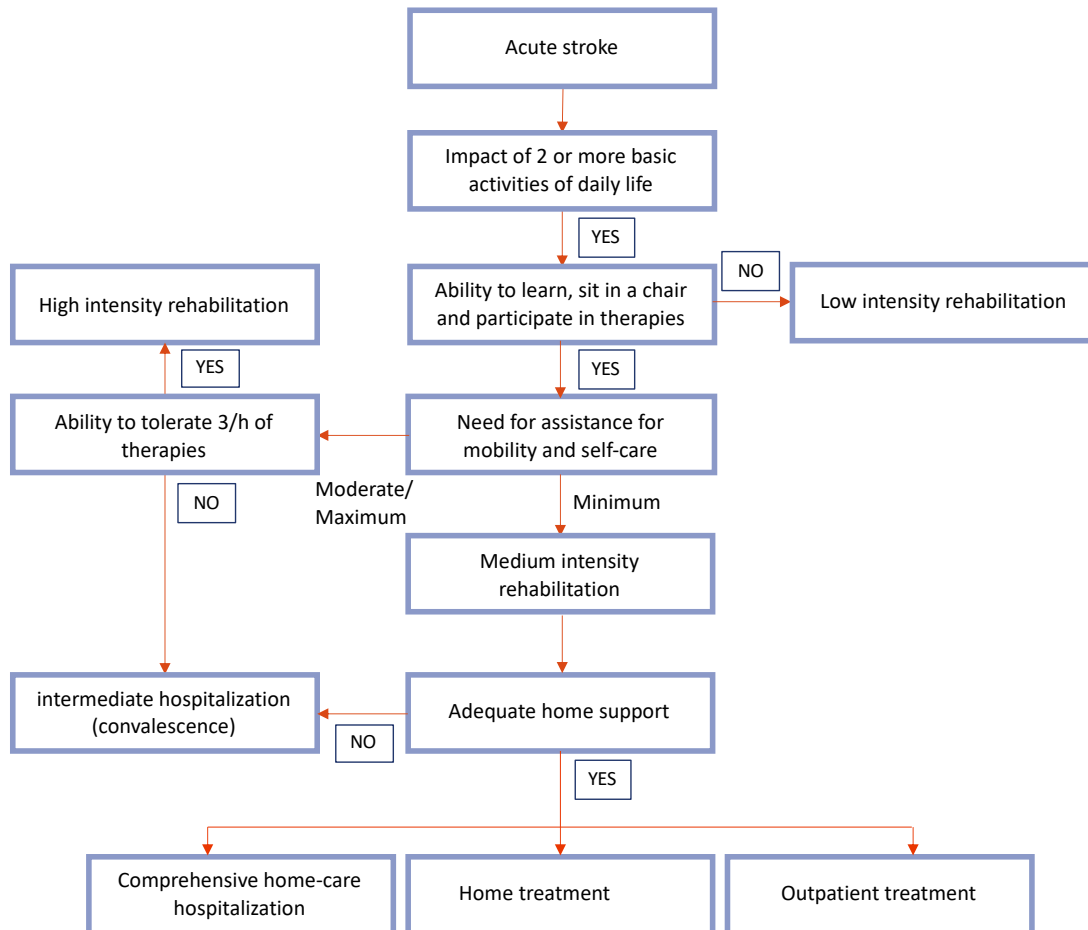
On another front, the Stroke Protocol (updated on 2018) count with a full section referring to stroke rehabilitation and secondary prevention, including different guidelines to be followed by stroke professionals that will be treating the stroke patients. The rehabilitation starts during the acute phase, where patients will be assessed and directed according to the established criteria. The rehabilitation actions and pathways are mainly focused on defining the type of stroke patient (see Table 6³) and the derivation algorithm (see Figure 6).

³ Source: Adapted from the Catalan Master Plan for the diseases of the circulatory system (2018).

Table 6 Catalonia: Referral protocol in acute stroke and disability

Acute stroke and disability protocol									
ACUTE STROKE PATHWAYS	HIGH INTENSITY RHB (multi-disciplinary, 3 h/day)			MEDIUM INTENSITY RHB (multi-disciplinary, 1 h/day)			LOW INTENSITY (maintenance programmes of patients with functional objectives)		
TYPE OF RHB	SPECIAL PROGRAMMES (Hospital)	Intensive programmes		Intermediate hospitalisation	Comprehensive home-care hospitalisation programme	Home care	Outpatient care	Long stay/residence	Home care
		Hospital	Outpatient care						
Selection criteria									
1. Age	≤ 60 years	Indifferent If ≥ 75 it needs caregiver and previous ranking 0-1		Indifferent			Indifferent		
2. Need for hospitalisation	Yes	No		Yes	Home-care hospitalisation	No		Yes	No
3. Previous functional status	Previous ranking ≤ 2 Capacity to live independently		Previous ranking ≤ 3 Moderate/low inability			Indifferent previous ranking			
4. Clinical situation	Initially can include patients with severe cognition deficit: confused answer.	Sufficient medical stability to participate in intensive therapy. Low-moderate comorbidity.		Need for healthcare or continued supervision.	Clinical stability or minimal controllable home requirement (nutrition, wounds, depression, etc.) Multidisciplinary participation (equivalent to home hospitalization).	Clinical stability Sufficient capacity and willingness to participate.		Need for healthcare or continued supervision.	Medical stability.
5. NIHSS	NIHSS ≥ 14	NIHSS (6-13)		Indifferent			Indifferent		
6. Social situation	Indifferent	Caregiver		Indifferent	Presence of effective caregiver	Presence of caregiver		Not enough socio-family support	Caregiver presence

Figure 6 Catalonia: Derivation modalities algorithm after an acute stroke



Source: Adapted from the Catalan Master Plan for the diseases of the circulatory system 2018

Once patients have left the acute stroke units, those in need of hospitalization must be treated in intensive rehabilitation units, where they will receive a minimum of 3 daily hours of physiotherapy, occupational therapy and speech therapy. On another hand, patients with high recovery expectations and short hospitalization or possibilities of returning home, will join intensive rehabilitation programmes to achieve better functional results. In case of patients who already had a disability or show low tolerance to rehabilitation therapies, the protocol recommends they need to follow multidisciplinary programmes of medium intensity (1 hour per day). When the functional and medical status of the patient allows to, they should be discharged home at the earliest convenience. Depending on each patient, recovery programmes will be done either at home or at the outpatient's clinic.

The Stroke Protocol in Catalonia count with several basic principles for the rehabilitation processes, namely; the early start of rehabilitation from the acute phase, the adequate intensity, the continuity of the process throughout the different phases of attention, the active participation of patients and caregivers and the availability of the appropriate technology for the evaluation and treatment of disability.

4.3. Balearic Islands

The Balearic Islands Stroke Strategy 2017-2021 has as main objective to reduce the impact of stroke in the Balearic Islands region and to guarantee prompt stroke identification, treatment and follow up. It aims to follow standards that allow to improve the quality of life of patients and their family. The model explained on the Stroke Plan includes strategic lines towards the improvement of the rehabilitation process, which needs to be comprehensive, to start early, to be continuous and provided at the appropriate level of care for each patient who requires it:

- Effective coordination of all health care devices to achieve continuity of attention.
- Effective coordination with social area devices, integrated within the scope of the Ministry of Health.
- Effective coordination with the network of associations to get better care for affected people and their families.

The Stroke Strategy for the Balearic Islands counts with 7 areas of strategic interest, for which 12 specific objectives have been identified. All in all, it involves 56 lines of strategic actions composed by 187 concrete actions. In order to obtain a rather similar process of rehabilitation among the region, the strategy envisages the creation of general healthcare documents (protocols, programmes and clinical guidelines) that include both assessment and work guidelines in the neurological areas that are typically affected by strokes.

This strategy provides an overview of the trajectory that patients follow after stroke, which should be structured for early or acute phase care, for subacute care and for chronic phase care. After hospital discharge, patients can either return to their home with follow-up by their Primary Care team —if their health condition allows it—, or enter another medium or long stay hospital centre to continue with their rehabilitation and receive the appropriate care.

The objectives described in the Stroke Strategy Plan consider rehabilitation in the acute phase of stroke as a continuous process linked to the rehabilitation after hospital admission. The levels of care should include: acute care hospital, inpatient neurorehabilitation, outpatient rehabilitation in hospital, rehabilitation at home, outpatient rehabilitation in primary care, medium and long-stay rehabilitation hospital, total or partial long-stay residential care homes. Before hospital discharge the rehabilitator should evaluate the indication of rehabilitation to determine the equipment or adaptations that can increase patient's safety and functional independence. This information should be included in the registration report.

4.4. Navarra

We could not find information on this topic in the Integrated care strategy for chronic and multi-pathological patients of Navarra. Through the interviews it has been pointed out that specific documents detailing the pathways in stroke rehabilitation do exist, but they are not officially distributed across the hospital and outpatient centers across the region.

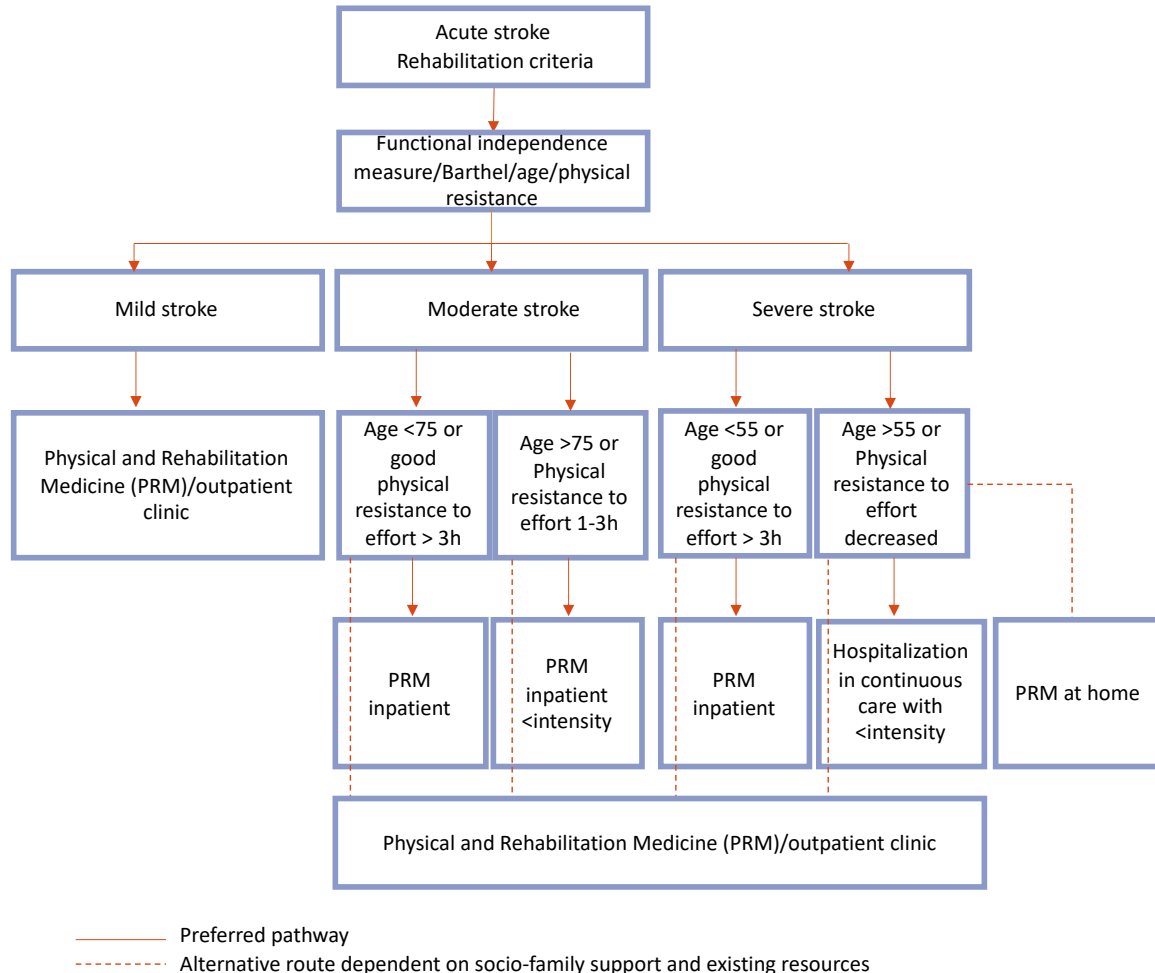
4.5. ARS Norte

In the North of Portugal, the implementation of the stroke rehabilitation plan is monitored and evaluated through two indicators, namely; a) percentage of patients with stroke diagnosis and b) rehabilitation medicine average cost.

The rehabilitation plan covers the rehabilitation actions from the acute phase and counts with 12 criteria to be considered during the rehabilitation process. In clinical situations of hospitalisation for stroke and prescription of physical medicine and rehabilitation, the initial clinical and functional evaluation must be carried as early as possible during the first 24-48 hours, following the recommendations from the Canadian Best Practice Recommendations for Stroke Care. The individual rehabilitation therapy plan is developed taking into account four criteria, namely the clinic evaluation, the functional evaluation and its gravity, the Barthel index or functional independence measure scale scores and the short-term goals.

In mild strokes, patients are preferably referred to outpatient hospitals or rehabilitation centres. Patients under 75 years old with moderate stroke and patients under 55 years old with severe stroke are directed to specialized hospital admission, where they receive a therapeutic plan of intensive rehabilitation. Once they have received the initial rehabilitation phase, they may continue their rehabilitation in an outpatient hospital or rehabilitation centre. On another front, patients over 75 years old with moderate stroke and patients over 55 years old with severe stroke are hospitalized in medium-term integrated or continuous rehabilitation stroke care units, with a less intensive rehabilitation programme. If these patients have a favourable functional and clinical outcome, have acquired the physical capacity to comply with an intensive therapeutic regimen (>3 h) or need more specific or differentiated interventions, they are referred for specialized hospitalization. Figure 7 shows the clinical scheme for the described process.

Figure 7 ARS Norte: Derivation modalities algorithm after an acute stroke

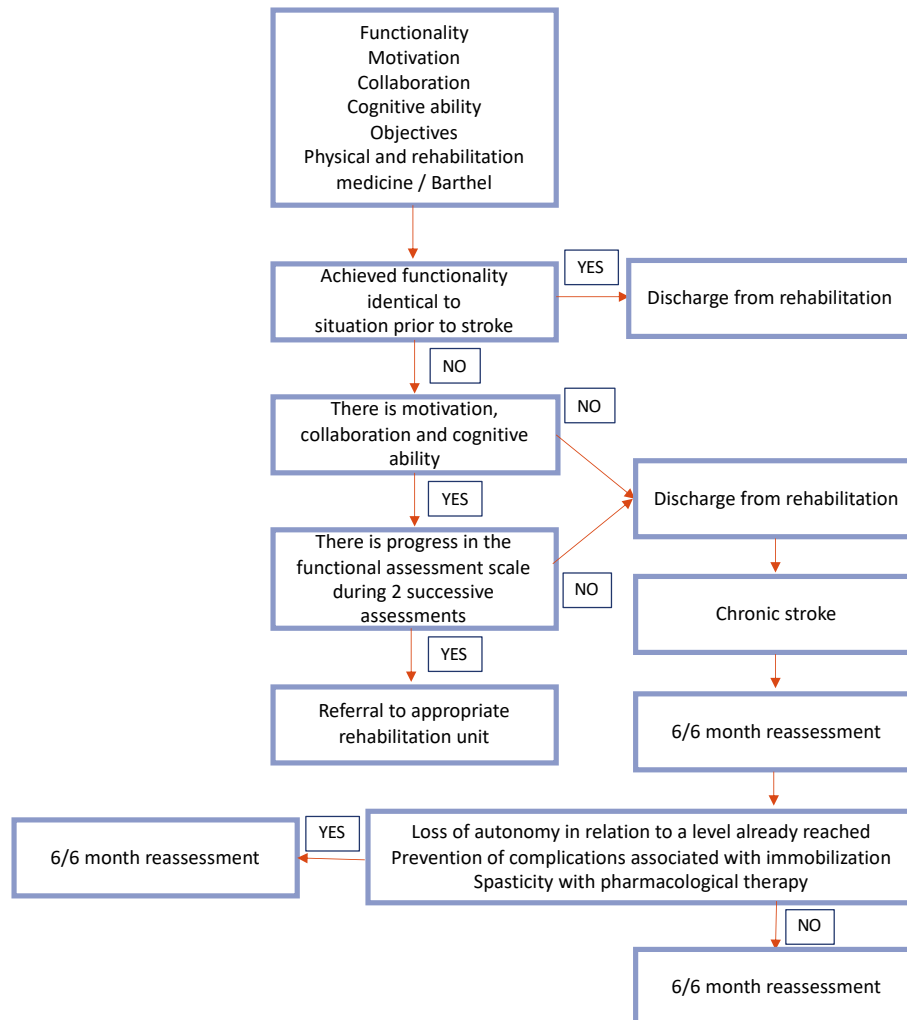


Source: Adapted from the Stroke Physical Medicine and Rehabilitation Policy Document (2012)

The stroke trajectory in the North of Portugal also evaluates social and family factors that may affect the rehabilitation process of the patient, such as absence of family support, housing characteristics (e.g. architectural barriers) and environment. The rehabilitation plan counts with a set of criteria for patients that need specialized hospital admission or follow up at rehabilitation centres. Those patients who are unable to participate actively in the rehabilitation process are referred home or to a residence in coordination with the caregiver and receive a home therapeutic rehabilitation plan to support and prevent complications.

In specialised hospital admission, the absence of progression in the functional evaluation scale is a criterion for transferring the patient to a lower level of care. In the outpatient clinic and in the physical medicine and rehabilitation treatment, the absence of progression is a criterion for discharge (see Figure 8). The chronic sequelae phase of stroke begins when the situation of the patient is stable, with no progression seen on the evaluation scales.

Figure 8 ARS Norte: Re-evaluation of patients at hospital or outpatient clinic



Source: Adapted from the Stroke Physical Medicine and Rehabilitation Policy Document (2012)

4.6. Occitanie

One of the objectives of the Occitan regional health plan in the domain of follow-up and rehabilitation activities (in general, not specific to stroke), is to streamline the connections within the different rehabilitation centres and between them and the health and medico-social structures. In order to aid on this, there is an application that offers personalised guidance to patients: VIATRAJECTOIRE. Another objective is to remove the bottlenecks in these activities by supporting the shift towards outpatient care, promoting the emergence of innovative solutions, analysing the pertinence of inpatient stays, facilitating return home, etc. The last objective is to promote mobile teams specialised in rehabilitation and physical medicine that provide homecare, as an alternative to inpatient care in rehabilitation centres.

In Occitanie, rehabilitation starts in the neurovascular unit (UNV) when the state of the patient allows for it. Afterwards, rehabilitation continues in the specialised rehabilitation centres, in

outpatient care, or at home. One of priorities of the regional plan is to prepare the discharge of people having sequelae after the stroke. In order to achieve this, it indicates that access to rehabilitation centres and to specialised treatments (e.g. spasticity treatment, aphasia treatment) should be facilitated. It also recommends the development of mobile rehabilitation teams (as an alternative to continuing hospitalisation) and of specialised home care (in order to facilitate that patients return home). Some of the expected results linked to this priority are: to streamline the management of care for stroke survivors, to accelerate and coordinate patients' return home; coordination between representatives from the hospital and from the municipality, including also medical and paramedical professionals.

The plan recognises that one of the pending improvements in the management of stroke care is to foster coordination among professionals, especially between neurologists and those responsible for follow-up care with the aim to organise patients' rehabilitation at an early stage to reduce severe sequelae. The national circular on healthcare facilities, indicates that each stroke survivor needs a personalised care plan, covering also the post-stroke phase. This phase mainly involves the SSR. SSR must have links with the centres in charge of the acute phase in order to organise care and prevent sequelae. In order to achieve this, it is necessary that specialists in rehabilitation and physical medicine intervene already in the UNV; the cooperation of a multidisciplinary team including physiotherapists, speech therapists, occupational therapists, and psychologists; and to develop therapeutic education since the acute phase.

This report stresses that the orientation of the patient for the post-stroke phase should take place as early as possible and it recommends following the criteria established for some specific organisations. These criteria include severity of deficiencies linked to the stroke, comorbidities, patient's personal environment, patient's material environment, etc.

The health strategic plan for Languedoc-Roussillon , published in 2011, included the treatment of stroke survivors as one of the focus in the domain of chronic diseases. One of the operational objectives was to organise stroke follow-up, covering the treatment in rehabilitation centres (SSR) and taking care of patients' disabilities., through re-education protocols, home help, and strategies to prevent of stroke recurrence. The health strategic plan 2012-2017 for Midi-Pyrénées, establishes the trajectory of stroke victims. In the post-stroke phase, the plan indicates that it is necessary to coordinate better the relationship between the hospital and the municipality and to ensure a follow-up consultation 3 months after stroke. When patients return home, the plan indicates that they will receive re-education therapy to prevent a second stroke, and to allow them to live better with stroke sequelae.

5. Resources for stroke survivors

5.1. Aragon

In 7 of the 8 health sectors, special beds have been established for the care of patients during the acute phase of stroke. Therefore, Aragon counts with one stroke unit in the Miguel Servet Hospital and a total of 6 additional “stroke areas” in the rest of the hospitals, which result in a decrease in complications during admission and improvement in survival. These units have monitoring of patients and specialized nursing staff who work with agreed and evaluated multidisciplinary care protocols. They are located in the areas of neurology or in the internal medicine, if there is no neurology area in that hospital. These beds are attended by a multidisciplinary professional team, with special interest and dedication to strokes, organized into Stroke Process Teams (one in each Sector). As for the resources, the Aragon plan counts with an exhaustive list of material resources available in the stroke areas.

Therapies

According to the Aragon Stroke regional plan, the beginning of the rehabilitation should start as early as possible, as long as the patient's clinical situation allows it. The evaluation made by the rehabilitation doctor will be made on demand during the first 24-48 hours, through the specific stroke request developed in the electronic history of the patient. All the patients have access to daily rehabilitation of: 30 minutes of physiotherapy, 30 minutes of logopedic treatment and 30 minutes of occupational therapy.

The type of treatment and the areas of intervention vary depending on the type of the dysfunctions of the patient. The different specific areas of intervention in rehabilitation treatment are:

- **Communication disorders:** All patients with aphasia should be evaluated by a specialist in speech pathology (speech therapist), who should inform the family and the staff who treat them of the appropriate communication techniques and how to facilitate communication. As for dysarthria, it must be evaluated and treated, evaluating the need for alternative and augmentative communication systems.
- **Neuropsychological disorders:** Cognitive deficits and behavioral disorders constitute an important part of disability in strokes and interfere with the patient's involvement in rehabilitation, socialization, in the daily life activities, in the quality of life of the patient and its family. In the evaluation of these patients, the alterations of the different cognitive areas must be taken into account: consciousness, attention, perception, language, praxis, gnosis, memory, reasoning, frontal functions, emotional and behavioral disorders. Depression must also be taken into account, which can affect 20-30% of stroke patients and has a negative impact on the progress of rehabilitation.
- **Motor function disorders:** The techniques used can be classified into three modalities: compensation techniques, facilitators and motor learning. Studies have not shown superiority of some techniques over others. They must be applied by expert stroke physiotherapists. Gait re-education will be considered in patients with impaired ambulation.

- Limitation in activities of daily living: These patients should be treated with a multidisciplinary team that includes occupational therapy, which constitutes an essential pillar for the patient's adaptation to its usual environment after the stroke.
- Spasticity: In general, it is recommended to initially treat spasticity with physical therapies and then consider options for oral medication and botulinum toxin infiltrations. Spasticity treatment is indicated when it causes significant symptoms or interferes with rehabilitation.

Quality of Life services

The Aragon Stroke Plan includes under the subprocess 10 “Socio-health care and support for dependency” a study on the social situation of the patient, including the support of a social worker that assesses the capacities of the patients to go back to their previous jobs.

During the rehabilitation process, all patients hospitalised in Aragon centres receive a social report which provides information to facilitate access to adequate health and social resources.

The Aragon Stroke Plan stands out for mentioning and supporting patient associations through the guidelines. The document appoints patient associations and their key role, not only in the dissemination of the disease and the needs of its members, but also in the integration and socialization of patients and in the knowledge and management of their disease. In that sense, Aragon supports their work and encourages their work to be of quality and reach as many people as possible. To this end, a list of patient associations in the regions is included.

Services for caregivers

One of the main requirements explained in the Aragon Regional Plan is that any rehabilitation treatment must include training for family and caregivers, to facilitate the active participation of family members and patients in the rehabilitation process (explanatory brochures on postural treatment, transfers, etc.).

Social services and patient associations can help to maintain the level of social and leisure activities of the caregivers through the advice on all social resources available and the actions aimed at the reintegration and participation of people with stroke. Community activities should be evaluated as an option to help patients and caregivers in this regard.

Personnel

In July 2015, the Aragon Stroke Care Programme (PAIA) defined the minimum contents to guarantee the quality of the training plan and the skills requirements for the nursing staff in the Stroke Units. Patients in Stroke Units have continuous non-invasive monitorization and a nursing ratio of 1/4-6 (nurse ratio/patient). Stroke Units in Aragon count with the following human resources:

Table 7 Aragon: Basic human resources in stroke units

Human resources	
Neurologist	In proportion to the number of beds
Nursing formed and trained in cerebral vascular pathology	1 nurse/4-6 patients. The number of nurses is distributed according to the number of beds in the area
Helper	Care and mobilization of patients
Orderly	With training in postural changes

Source: Adapted from Aragon Plan of Stroke Care (2018)

One of the Aragon regional stroke plan main pillars for the successful stroke recovery is to foster training among all the personnel involved in the stroke care processes. This goal is explained under the Strategic Pathway #4 “training”, included in the Aragon stroke care programme. The specific objectives of this pillar are a) to include best practices related to stroke care, identification and patients transfer in the continuing education programmes; and b) to favour the access of health personnel (doctors, nurses, occupational therapists, physiotherapists) to content and skills that improve their practices and relationships with stroke patients.

5.2. Catalonia

Three hospitals in Catalonia have monographic beds for stroke patients and there is an extensive network of convalescent or social health centers with different modalities of care for chronic patients. Home Care and Ambulatory rehabilitation are covered with public provision in a extense network covering all the country in coordination with hospitals, sociosanitary centers amb primary care.

Therapies

Although the duration of the RHB program will depend on the severity of the stroke, usually the treatment lasts a few months as long as functional targets are identified. The Stroke Protocol pay special attention to specific areas of intervention for the rehabilitation treatment, namely to; aphasia and dysarthria, neuropsychological alterations, alteration of the motor function, limitation of activities of daily life and complications (falls, painful shoulder and spasticity). For each of these areas of interventions, the Stroke Protocol provides a series of evidence-based information on the best therapies available. The selection of therapies must be considered individually.

Quality of Life services

The activity of occupational therapy in the person who has suffered a stroke aims at promoting the conservation or acquisition of the highest autonomy or independence in their environment. The occupational therapist promotes the restoration of the function and participation in self-care, domestic, work and social activities. Basic daily life activities (feeding, clothing, hygiene, bathroom, etc.) and instrumental daily life activities (housework, telephone use, computer, timbres, etc.) are included. The selection of therapies must be considered individually.

Services for caregivers

The Stroke Protocol involves caregivers since the very beginning of the stroke rehabilitation

treatment. Therefore, in Catalonia caregivers receive information and formation on ergonomics and sanitary education for stroke patients care before discharge from hospital.

Personnel

The Stroke Protocol in Catalonia mentions the rehabilitation team, which assist patients with stroke sequelae, and is built on a RHB expert doctor who coordinates a multidisciplinary group of professionals (physiotherapists, nurses, occupational therapists, neuropsychologists, social workers and speech therapists) who work together to achieve the objectives previously highlighted.

The Catalan Master Plan includes the regulation of working groups, which are constituted by external experts in the different fields. At the head of each working group there is a responsible person who must be a member of the Permanent Commission, with the functions of directing and coordinating the group. There are four working groups for the cerebral vascular disease, including one for stroke rehabilitation and reincorporation to the community.

The Stroke Program in collaboration with the Catalan Stroke Foundation (Fundacio Ictus) also includes a project for training stroke professionals, patients and caregivers. The Plan gives special importance to the training of professionals involved in stroke care and the exchange of experiences among them, as well as the education of the patient and the caregiver to deal with the disease during the admission phase and after discharge.

5.3. Balearic Islands

The Balearic Islands has two half-stay hospital centres dedicated to stroke in the subacute phase, the General Hospital, which has a programme specifically defined for stroke care, and the San Juan de Dios Hospital, which counts with neuro-rehabilitation for acquired brain damage, including cerebrovascular disease.

Quality of Life services

The Strategic Plan in the Balearic Islands counts with a specific objective aimed at increasing the percentage of stroke patients who fully reintegrate in their personal and social life. Among other actions, the Plan encourages rehabilitation teams to have a specific stroke programme who focus on the lives of stroke patients and to provide social and health services and services for people who, after a stroke, present sequelae consisting of severe mobility, sensory or cognitive deficits which cover therapeutic actions or resources such as day centres, night centres or part-time residences.

All the resources and services available aimed at improving the quality of life of stroke patients will be duly explained in a document available at the stroke units. The Plan also promotes the use of global scales of function as well as outcome measures, which include instrumental activities of daily life and advanced mobility and adapt them to the cultural and gender environment of the person.

The Balearic Islands Stroke Plan has as an objective to promote employment of people with disabilities caused by stroke. The Plan envisages to support the organisations in the development and aid for companies that maintain employees or generate employment for people with sequelae after a stroke.

Services for caregivers

The Balearic Islands Stroke Plan defines an objective to evaluate the needs of social support before and after the hospital admission for both the patients and caregivers. The strategy aims at developing training workshops for stroke caregivers that include the necessary measures for managing sequelae and prevention of complications.

Personnel

One of the main pillars of the Balearic Islands Stroke Strategy is to enhance the training of professionals in the public health system to adequately address the needs of stroke patients and to promote a comprehensive and integrated approach to the disease.

5.4. Navarra

Quality of Life services

To improve functional capacity and quality of life of patients and caregivers is one of the main objectives described in the Navarra strategy for chronic diseases. This is intended to be achieved by undertaking a series of specific objectives like reducing the emotional impact produced by the patient's condition or preventing the impact on caregivers. However, the strategy has been designed taking into account several chronic diseases, not providing concrete or specific actions for stroke patients.

Services for caregivers

The Integrated care strategy for chronic and multi-pathological patients of Navarra defines actions towards caregiver's wellness, such as caregiver needs assessment, provision of information and advice, training, telephone consultation / preferential e-mail, management of additional family support, personal and emotional support, self-help groups, promotion of volunteering and residential respite services.

5.5. ARS Norte

In the Northern Regional Health Administration the regional plan is developed in a public rehabilitation centre and in 3 acute hospitals with rehabilitation beds, as well as multiple community centres. In addition, ARS Norte also established a convention with a private hospital, where intensive rehabilitation care is delivered in a similar way to a rehabilitation centre.

5.6. Occitanie

The regional plan indicates that the number of beds and places for follow-up and rehabilitation activities is satisfactory, but it doesn't specify the situation regarding beds for stroke rehabilitation. In 2015, the ratio was 2.1 beds and places per 1000 habitants in Occitanie, compared to 1.8 in metropolitan France. Nonetheless, the plan underlines that there are territorial differences.

Therapies

One of the expected results and impacts of the Occitan regional health plan is to promote patients' access to targeted therapies. A project included in the plan is to promote a cooperation protocol for spasticity diagnosis and evaluation. The cooperation protocol for spasticity diagnosis and

evaluation should involve specialists in rehabilitation, neurologists, neurosurgeons and liberal physiotherapists. It intends to delegate to the latter the spasticity diagnosis and the evaluation of the implemented treatments. It also implies a change in the treatment of patients suffering from spasticity from a centralised organisation to a territorial network of rehabilitation centres specialised in diseases that affect the central nervous system. It may be the case that this organisation requires the use of telemedicine. The expected results in the next 5 years are to validate and implement the protocol in Occitanie region, the adherence of health professionals to this protocol, reduction of waiting times to start the treatment of spasticity with botulinum toxin, and increasing the number of patients following this treatment.

Quality of Life services

In France, stroke survivors can receive economic help.

Personnel

One of priorities of the Occitan regional health plan is to support health professionals in charge of stroke, from the pre-hospitalisation phase until reinsertion. It targets several professionals, including specialists in rehabilitation, geriatricians, speech-language pathologists, occupational therapists, physiotherapists, nurses, psychologists and social assistants. Two of objectives are related to the post-stroke phase: “to raise awareness among health professionals about care in adapted rehabilitation facilities, either outpatient care or inpatient care in rehabilitation centres (in French Soins de suite et de réadaptation-SSR)” and “to support and promote educational therapy projects”.

6. Follow-up of stroke survivors

6.1. Aragon

Assessment

One of the main requirements explained in the Aragon Regional Plan is that any rehabilitation treatment in acute or subacute phase must have continuous evaluation. The use of objective scales allows to identify problems, to establish objectives and determine the effectiveness of the interventions made. The Plan recommends to evaluate aspects of mobility, language and cognitive functioning.

Sequelae

The services related to patient sequelae follow-up are carried out fundamentally by the Primary Care Services (during subprocess 7, explained on section 2.1). The main objectives are to evaluate and treat any complication that patients may have, and to assist patients on the recovery of their functional losses. To standardise the follow-up of patients with chronic stroke sequelae and ensure access to evidence-based rehabilitation interventions, it is recommended to use the Post-Stroke Checklist (PSC). The complications that will most often require assessment by the rehabilitation services are: central pain, spasticity, painful shoulder, falls, osteoporosis, sexual dysfunction, dysphagia and neuropsychological or cognitive dysfunction.

For the evaluation of daily life activities, the plan recommends to use the Barthel Index as it has been shown to be valid, reliable and of simple application. Alternative scales are recommended such as Measure of Functional Independence which measures daily life activities, cognition and functional communication.

6.2. Catalonia

Assessment

In Catalonia, patients are assessed once they are in a stable condition, however, the Stroke Protocol do not recommend for the patients to receive rehabilitation treatment during the first 24 hours after the stroke. As mentioned previously, the Catalan Stroke Protocol mention that one of the basic principles of stroke rehabilitation is to count with the appropriate technology for the evaluation and treatment of disability.

Since 2005, Catalonia counts with a strategy to audit the stroke care strategies including the rehabilitation processes. For each of the editions of the Stroke Clinical Audits (four up to the date), a group of experts defined the quality indicators based on scientific evidence and clinical relevance. A key aspect on the stroke audits is the feedback collection and the active dissemination of the results through all the hospitals of the region. As a consequence, the use of evidence-based best practices has improved clinical practices, and hospitals have increased their rates on the established quality indicators.

Sequelae

In Catalonia, the rehabilitation of the patient with stroke has the fundamental objective of treating the disability in order to achieve the maximum possible functional capacity, facilitating autonomy and reintegration into the family, social and working environment, reducing the risk of

institutionalisation and secondary mortality.

During hospitalisation, Catalonia counts with systematic programmes of information, education and support to patients and caregivers as it reduces the necessity of institutionalisation and it improves their quality of life. A Guideline for Stroke patients is distribute for every patient&relatives after the hospital admission. Caregivers must receive information and formation on ergonomics and sanitary education for stroke patients care before discharge from hospital. Prior to hospital discharge, the need for personal and environmental support products must be evaluated to enable the activity and safety of patients at community level.

6.3. Balearic Islands

Assessment

The Balearic Islands Stroke Strategy Plan aims to evaluate the services provided by using the indicators of the National Health System Strategy together with the indicators described along the plan.

6.4. Navarra

Assessment

The Integrated care strategy for chronic and multi-pathological patients of Navarra includes a short set of indicators to evaluate the results that refer to all pathologies within the scope, so there are no specific indicators for stroke patients or caregivers. The indicators focus on the overall improvement of health results, technical quality, functional capacity and quality of life, patients' satisfaction, autonomy and capacity of patients and sustainability of the healthcare system.

6.5. ARS Norte

Assessment

All patients with a therapeutic rehabilitation plan after a stroke are re-evaluated by specialised hospital services during the following 6 and 12 months.

Sequelae

When assessing the post-stroke deficits and evaluating the functional status of the stroke patients, the physicians in the North of Portugal use at least one of the standardized functional assessment scales, namely Barthel Index and functional independence measure (FIM) scale. ARSN is building a national registry to monitor rehabilitation from an early stage, which will allow the monitoring of the follow up after three months using the Modified Ranking Scale (mRS).

6.6. Occitanie

Assessment

One of the expected results and impacts of the Occitan regional health plan is to implement, evaluate and follow-up consultations post-stroke involving different professionals. The plan contains one project related to this: to develop consultations post-stroke involving different professionals. This consultation post-stroke should take place within the 6 months after the stroke (or maximum within the first year). It targets all patients and has the objectives to revert past

complications, prevent or reduce the loss of autonomy, disabilities and social exclusion. There are 3 types of consultations. First, the simple multi-professional consultation consists in a hospital consultation with a neurologist, a specialist in rehabilitation, or a geriatrician plus a paramedical professional. Second, the complex multi-professional consultation consists in a hospital consultation with a medical professional and at least two paramedical professionals or other non-medical professionals. The third is the consultation with a liberal professional (a neurologist, a specialist in rehabilitation, or a geriatrician). The deployment and funding are taking place in Occitanie centres.

The national circular on healthcare facilities stresses the need to assure the health maintenance and surveillance of patients once they have returned home, to define programmes to support social and professional reintegration, to have a follow-up medical consultation between 2 to 6 months after the stroke (depending on the state and needs of the patients the consultation would be with a neurologist, geriatrician, or specialist in physical medicine and rehabilitation), and to collaborate with the social services.

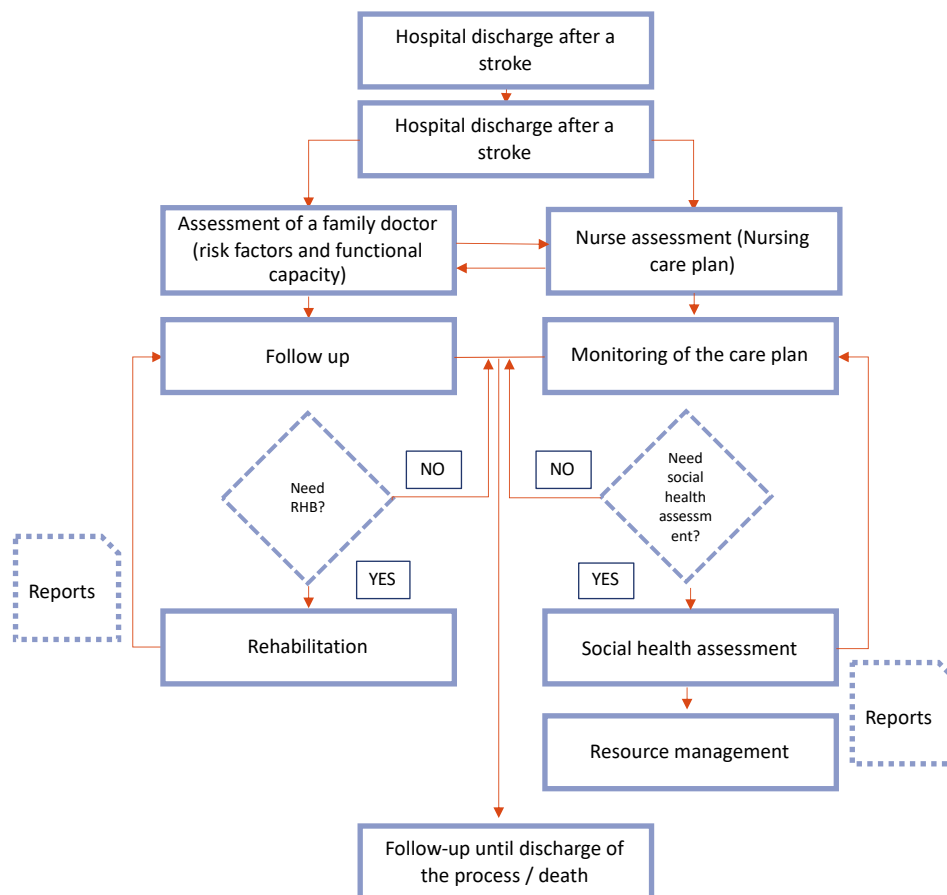
The ministry of health has regulated on the regional organisation of the multi-professional consultations post-stroke and stroke follow-up. It insisted on the importance of formalising stroke follow-up and having multi-professional consultations. In this line, it asks ARS (the regional health agencies) to support health centres that are in charge of conducting multi-professional consultations for stroke follow-up. This has the goal of promoting cooperation among stakeholders and help acquiring the required skills. The ministry provides a list of items that should be considered during this consultation.

7. Secondary prevention

7.1. Aragon

In Aragón, secondary prevention actions start at the acute phase, and they continue during the subacute phase until the chronic phase, where they become a subprocess (subprocess 8 secondary prevention – see Table 4). One of the objectives of the Aragon stroke plan is to reduce the incidence of stroke by controlling risk factors, promoting lifestyle habits and maintaining a preventive medical treatment appropriate. Secondary prevention is addressed to those patients who have already had a stroke. The trajectory for secondary prevention followed in Aragon has been summarised on Figure 9.

Figure 9 Aragon: Re-evaluation of patients at hospital or outpatient clinic



Source: Adapted from Aragon Plan of Stroke Care (2018)

7.2. Catalonia

The Catalan Stroke Guidelines take into account secondary prevention when it comes to providing advice to professionals that need to treat patients at different stages (starting from acute phase and during rehabilitation). Guidelines for several cases are provided in order to prevent readmission or complications of stroke patients.

7.3. Balearic Islands

One of the specific objectives of the Stroke Strategy in the Balearic Islands is to reduce the recurrence of strokes in the region. To do so, the Stroke Strategy defines a series of strategic lines to be followed, such as to monitoring of vascular risk factors in those people who have already suffered a stroke or to ensure the continued care as a tool to reduce mortality. To follow such strategic lines, the plan foresees a series of actions related so secondary prevention, including dissemination of topic-related content with professionals, patients and caregivers, organisation of workshops to create awareness among stroke survivors, and promoting selfcare.

7.4. Navarra

We could not find information on this topic in the Integrated care strategy for chronic and multi-pathological patients of Navarra. Through the interviews it has been pointed out that specific documents detailing the strategy for secondary prevention does exist, but it is not embedded to the analysed and official strategy. Instead, it is available on the website of the health authorities in the region.

7.5. Occitanie

Some of the expected results and impacts of the Occitan regional health plan are to implement therapeutic education programmes targeting patients; avoid recurrent stroke and readmissions to hospital due to complications; and to reduce disabilities and promote return to work. The plan underlines that the therapeutic education of patients' needs improvement.

The French national circular on healthcare facilities emphasizes the importance of therapeutic education, which includes the treatment of the disabilities post-stroke and secondary prevention. This secondary prevention has the aim to avoid another stroke by controlling the neuro-cardio-vascular risks, especially the arterial hypertension. Having a multi-professional follow-up consultation has the goal to ensure a better secondary prevention.

8. Regional comparison

The methodological approach followed for the present deliverable has shown that despite all regions count with some sort of document where stroke rehabilitation is mentioned, there are significant differences in the level of detail provided for each region. For example, Aragon, the Balearic Islands and Portugal count with specific guidelines, protocols or strategies for stroke condition, while in Catalonia, Navarra and France, stroke condition is embedded in a higher level report, which do not only focus on stroke but also on other chronic and multi-pathological conditions, diseases of the circulatory system or cardiovascular diseases. Thus, the information concerning the protocols and guidelines is reported in different manners, making difficult the exhaustive comparison of the different dimensions concerning stroke rehabilitation. However, the present study has been able to identify the main areas for improvement and best practices among regions. In fact, through the qualitative methods used, the present study provides a common framework for stroke rehabilitation and secondary prevention evaluation through indicators, which can be used to overcome the abovementioned challenge in future research.

The exhaustive analysis on the stroke plans and protocols for all the ICTUSnet regions has enabled the comparison of the different dimensions related to stroke rehabilitation and secondary prevention, which is summarized on Table 8. Cells have been colored in green if the stroke plan of the region provides detailed information on a certain dimension, in yellow if it mentions the dimension but does not give specific guidelines or protocols, and in red if it does not mention the dimension at all.

Table 8 Comparison of rehabilitation and secondary prevention across ICTUSnet regions

	Aragon	Catalonia	Balearic islands	Navarra	ARS Norte	Occitanie
1. Rehabilitation pathways	Green	Green	Yellow	Red	Green	Yellow
2. Resources for stroke survivors						
2.1 Therapies	Green	Green	Red	Red	Red	Green
2.2 Quality of life services	Green	Green	Green	Green	Red	Green
2.3 Services for caregivers	Green	Green	Green	Green	Red	Red
2.4 Personnel	Green	Green	Green	Red	Red	Green
3. Follow-up of stroke survivors						
3.1 Assessment	Yellow	Green	Green	Green	Yellow	Green
3.2 Sequelae	Green	Green	Red	Red	Green	Red
4. Secondary prevention	Green	Yellow	Yellow	Yellow	Yellow	Red

Source: Author's elaboration

From the comparison it is clear that there is an information gap when it comes to rehabilitation pathways, follow up of stroke survivors, resources available for stroke survivors and secondary prevention. Aragon region is the only one that counts with a detailed stroke plan covering all the dimensions that have been identified as relevant through an exhaustive revision of scientific literature conducted on the present study. Catalonia also counts with a detailed plan for stroke rehabilitation. Balearic Islands, Navarra, ARS Norte and Occitanie count with information on

rehabilitation, but they miss key pieces on their stroke plans.

It is relevant to mention that in some cases where regional stroke plans and strategies did not cover certain rehabilitation dimensions, interviewees explained that sometimes those dimensions were covered through hospital-level documents, which are not official and therefore were not analysed. That means that even if stroke guidelines do not cover some of the specific areas studied within the scope of this study, that does not mean that they actually do not exist in hospitals. This limitation highlights the need of counting with exhaustive stroke rehabilitation guidelines at a regional level. The fact guidelines may be retained at hospital-level in unofficial documents hinders research and comparison across regions.

In line with this, the information collected on the present study highlights the need for regions to improve the stroke secondary prevention guidelines, where in general regions lack information regarding the pathways. It is also important to note the need to strengthen guidelines to follow-up stroke sequelae and resources for therapies. Clearer protocols on rehabilitation pathways would improve the follow-up of those patients who suffered a stroke, enabling the identification of best practices based on evidence through data analysis.

The present study has identified several indicators to evaluate stroke guidelines at a regional level. The successful evaluation of stroke rehabilitation and secondary prevention would allow for the improvement of the protocols that are in place at the moment, and the exhaustive comparison across hospitals and regions. However, the main barrier identified is that stroke rehabilitation is not easy to monitor, since in general patient records do not include the whole rehabilitation process, and therefore there is no follow up. In the present study we found out that in most cases it is not possible to follow up on a patient after hospital discharge. Taking into account stroke sequelae varies significantly across patients and the high number of therapies and personnel involved in the rehabilitation process, it is key to count with registries that contain the full pathway of each patient during rehabilitation, understanding rehabilitation as a whole process that encompasses the entire chain of care from acute stroke care through to life after stroke.

These results go in line with ESO and SAFE stroke plan for Europe for 2018-2030. Since ESO & SAFE (2018) already pinpoint that both secondary prevention and rehabilitation need stroke registries that cover both care pathways for stroke patients. In particular, one of the targets for 2030 aims at including secondary prevention in all national stroke plans with follow through into primary/community care. Given that after having a stroke patients may acquire several disabilities, rehabilitation has a key role to return stroke patients to their lives. Thus, it is critical that all European countries ensure sufficient resources for rehabilitation, and also ensure an equitable access to rehabilitation services.

9. Bibliography

- ARS Occitanie. (2018). *Projet Régional de Santé. Pour la santé de 6 millions de personnes en Occitanie. #2. Schéma régional de santé.*
- Belagaje, S. R. (2017). *Stroke Rehabilitation. Continuum (Minneapolis, Minn)*, 23(1), 238–253. <https://doi.org/10.1177/136140969000400403>
- Departamento da Qualidade na Saúde. (2011). *Norma da direção-geral da saúde. Accidente Vascular Cerebral: Prescrição de Medicina Física e de Reabilitação.*
- Direcció General de Planificació i Avaluació. (2007). *Plan director de Enfermedades del Aparato Circulatorio. Primera edición: Barcelona.*
- Dirección General de Planificación, Evaluación y Farmacia. (2017). *Estrategia de ictus de las Illes Balears 2017-2021.*
- ESO, & SAFE. (2018). *Stroke Action Plan for Europe 2018-2030. Summary of recommendations.*
- Gache, K., Leleu, H., Nitenberg, G., Woimant, F., Ferrua, M., & Minvielle, E. (2014). *Main barriers to effective implementation of stroke care pathways in France: A qualitative study. BMC Health Services Research*, 14. <https://doi.org/10.1186/1472-6963-14-95>
- Gobierno de Aragón. (2018). *Plan de atención al Ictus en Aragón.*
- Gobierno de Navarra. (2013). *Estrategia Navarrade atención integrada a pacientes crónicos y pluripatológicos (versión resumida).*
- Instituto de Salud Publica y Laboral de Navarra. (2017). *Memoria 2017.*
- Kuçukdeveci, A., Stibrant Sunnerhagen, K., Golyk, V., Delarque, A., Ivanova, G., Zampolini, M., ... Christodoulou, N. (2018). *Evidence-based position paper on Physical and Rehabilitation Medicine (PRM) professional practice for persons with stroke. The European PRM position (UEMS PRM Section). European Journal of Physical and Rehabilitation Medicine.* <https://doi.org/10.23736/S1973-9087.18.05374-1>
- Ministère des affaires sociales de la santé et des droits des femmes. *Instruction n° DGOS/R4/2015/262 du 3 août 2015 relative à l'organisation régionale des consultations d'évaluation pluri professionnelle post Accident Vasculaire Cérébral (AVC) et du suivi des AVC (2015).*
- Ministère du travail de l'emploi et de la santé. *Circulaire DGOS/R4/R3/PF3 no 2012-106 du 6 mars 2012 relative à l'organisation des filières régionales de prise en charge des patients victimes d'accident vasculaire cérébral (AVC) (2012). BO Santé – Protection sociale.*
- Richards, C. L., Malouin, F., & Nadeau, S. (2015). *Stroke rehabilitation: Clinical picture, assessment, and therapeutic challenge. Progress in Brain Research (1st ed., Vol. 218). Elsevier B.V.* <https://doi.org/10.1016/bs.pbr.2015.01.003>
- Rousseaux, M., Daveluy, W., & Kozlowski, O. (2009). *Value and efficacy of early supported discharge from stroke units. Annals of Physical and Rehabilitation Medicine*, 52, 224–233. <https://doi.org/10.1016/j.rehab.2009.01.002>

Schnitzler, A., Woimant, F., Nicolau, J., Tuppin, P., & De Peretti, C. (2014). Effect of rehabilitation setting on dependence following stroke: An analysis of the french inpatient database. *Neurorehabilitation and Neural Repair*, 28(1), 36–44. <https://doi.org/10.1177/1545968313497828>

Serviço Nacional de Saúde. (2017). *Via Verde do Acidente Vascular Cerebral no Adulto*.

Societat catalana de Neurologia. (2019). *Protocol de diagnostic i tractament de malalties vasculars cerebrals. Guies medicas de la societat catalana de neurologia*.

Stevens, E., Emmett, E., Wang, Y., McKeivitt, C., & Wolfe, C. DA. (2017). *The burden of stroke in Europe. Report*. London: Stroke Alliance for Europe (SAFE). <https://doi.org/10.15713/ins.mmj.3>

Teasell, R., Cotoi, A., Chow, J., Wiener, J., Iliescu, A., Hussein, N., ... Salter, K. (2018). *Evidence-based review of stroke Rehabilitation (18th Edition)*.

Teasell, R., Foley, N., Hussein, N., Wiener, J., & Speechley, M. (2018). *The Elements of Stroke Rehabilitation*. In EBRSR [Evidence-Based Review of Stroke Rehabilitation].

10. Annexes

10.1. Articles screened to select the indicators

Authors	Title
Abilleira et al. (2012)	The Second Stroke Audit of Catalonia shows improvements in many, but not all quality indicators.
Belagaje (2017)	Stroke Rehabilitation
Com-Ruelle & Nestrigue (2018)	Parcours de soins des personnes hospitalisées pour un accident vasculaire cérébral
Creutzfeldt, Holloway & Walker (2012)	Symptomatic and palliative care for stroke survivors
de Peretti et al. (2010)	Hospitalisations en soins de suite et de réadaptation en France après un accident vasculaire cérébral survenu en 2007
de Peretti et al. (2012)	Acute and post-acute hospitalizations for stroke in France: recent improvements (2007-2009)
De Wit et al. (2017)	Long-term impact of stroke on patients' health-related quality of life.
Dobkin & Dorsch (2013)	New evidence for therapies in stroke rehabilitation
Doucet et al. (2012)	Returning to work after a stroke: A retrospective study at the Physical and Rehabilitation Medicine Center "La Tour de Gassies"
ESO, & SAFE. (2018)	Stroke Action Plan for Europe 2018-2030. Summary of recommendations.
ESO, 2008	European Stroke Organisation Guidelines for Management of Ischaemic Stroke and Transient Ischaemic Attack
Fattore et al. (2012)	The social and economic burden of stroke survivors in Italy: a prospective, incidence-based, multi-centre cost of illness study.
Feigin et al. 2014.	Global and regional burden of stroke during 1990–2010: findings from the Global Burden of Disease Study 2010. Lancet 383, 245–255
Gabet et al. (2017)	Évolution De L'Admission En Soins De Suite Et De Réadaptation Des Patients Hospitalisés Pour Accident Vasculaire Cérébral En France, 2010-2014
Gache et al. (2014)	Main barriers to effective implementation of stroke care pathways in France: a qualitative study
Godwin et al. (2013)	Long-Term Health-Related Quality of Life of Stroke Survivors and Their Spousal Caregivers
Grubbe et al. (2012)	Evidence-based quality indicators for stroke rehabilitation
Haut Autorité de Santé (2017)	Indicateurs pour l'amélioration de la qualité et de la sécurité des soins. Qualité de la prise en charge initiale de l'accident vasculaire cérébral (AVC). Fiches descriptives des indicateurs retenus pour la campagne 2017.
Haut Autorité de Santé (HAS) (2017b)	Résultats des indicateurs pour l'amélioration de la qualité et de la sécurité des soins. Prise en charge initiale de l'accident vasculaire cérébral. Campagne 2017 – Données 2016
Haute Autorité de santé (HAS) (2012)	Accident vasculaire cérébral: méthodes de rééducation de la fonction motrice chez l'adulte. 2012
Heslin et al. (2016)	A systematic review of the economic evidence for interventions for family carers of stroke patients.
Knecht, Hesse & Oster (2011)	Rehabilitation after stroke
Kucukdevici et al. (2018)	Evidence-based position paper on physical and rehabilitation medicine professional practice for persons with stroke
Langhorne et al. (2018)	Very early versus delayed mobilisation after stroke
Langhorne, Bernhardt & Kwakkel (2011)	Stroke rehabilitation.
Lindsay et al. (2014)	World Stroke Organization global stroke services guidelines and action plan
Lou et al. (2017)	Stroke patients' and informal carers' experiences with life after stroke: an overview of qualitative systematic reviews.
Mackenzie & Greenwood (2012)	Positive experiences of caregiving in stroke: a systematic review.
Marque (2015)	What's new in post-stroke rehabilitation?
Marta, J., & Aragüés, C. (n.d.).	Encuesta: Atención rehabilitadora al ictus. Grupo Nordictus. Neurología y Rehabilitación del Hospital U. M. Servet.
Mas & Inzitari (2015)	A critical review of Early Supported Discharge for stroke patients: from evidence to implementation into practice
Matchar et al. (2015)	International Comparison of Poststroke Resource Use: A Longitudinal Analysis in Europe
Meyer, M.J., et. Al. (2016)	A synthesis of peer-reviewed literature on team-coordinated and delivered early supported discharge after stroke
NICE (2013)	Stroke rehabilitation in adults Clinical guideline
Olson et al. (2011)	Transition of care for acute stroke and myocardial infarction patients: from hospitalization to rehabilitation, recovery, and secondary prevention
Persson et al. (2015)	Spouses of Stroke Survivors Report Reduced Health-Related Quality of Life Even in Long-Term Follow-Up: Results From Sahlgrenska Academy Study on Ischemic Stroke
Persson et al. (2017)	Long-term cost of spouses' informal support for dependent midlife stroke survivors
Philp et al (2013)	Development of a Poststroke Checklist to Standardize Follow-up Care for Stroke Survivors
Pollock, et al (2014)	Physical rehabilitation approaches for the recovery of function and mobility following stroke
Public Health Agency of Canada (PHAC) (2011)	Tracking Heart Disease and Stroke in Canada—Stroke Highlights 2011.
Puhr & Thompson (2015)	The Use of Transitional Care Models in Patients With Stroke.
Purvis et al. (2009)	Systematic review of process indicators: including early rehabilitation interventions used to measure quality of acute stroke care.
République Française (2010)	Plan d'actions national « accidents vasculaires cérébraux 2010-2014 »
Richards et al. (2015)	Stroke rehabilitation: Clinical picture, assessment, and therapeutic challenge

Authors	Title
Rousseaux, Daveluy & Kozlowski (2009)	Value and efficacy of early supported discharge from stroke units
Royal College of Physicians (2015)	Sentinel Stroke National Audit Programme (SSNAP) Post-acute organisational audit: Public Report Phase 2 2015
Saka, McGuire & Wolfe (2009)	Cost of stroke in the United Kingdom
Schmidt et al. (2015)	Acute Ischemic Stroke (AIS) patient management in French stroke units and impact estimation of thrombolysis on care pathways and associated costs.
Schnitzler (2017)	Handicap dans les suites d'un accident vasculaire cérébral : étude de prévalence et impact des filières de soins
Schnitzler et al. (2014a)	Effect of Rehabilitation Setting on Dependence Following Stroke: An Analysis of the French Inpatient Database
Schnitzler et al. (2014b)	Prevalence of self-reported stroke and disability in the French adult population: a transversal study
Schnitzler et al. (2018)	Home rehabilitation in France. The model of stroke
Schultz et al. (2017)	Return to work predictors of stroke survivors and their spousal caregivers.
Siemonsma et al. (2014)	Determinants influencing the implementation of home-based stroke rehabilitation: a systematic review
Stevens et al. (2017a)	The burden of stroke in Europe. Appendix
Stevens et al. (2017b)	The burden of stroke in Europe. The Challenge for Policy Makers.
Stevens et al. (2017c)	The burden of stroke in Europe. Report.
Tchero et al. (2018)	Telerehabilitation for Stroke Survivors: Systematic Review and Meta-Analysis
Teasell & Hussein (2018)	Evidence-Based Review of Stroke Rehabilitation (EBRSR). Chapter 3. Background Concepts in Stroke Rehabilitation
Teasell et al. (2018a)	Evidence-Based Review of Stroke Rehabilitation (EBRSR), 18th ed. SREBR, London, Ontario, Canada. Executive summary
Teasell et al. (2018b)	Evidence-Based Review of Stroke Rehabilitation (EBRSR). Chapter 5. The Efficacy of Stroke Rehabilitation
Teasell et al. (2018c)	Evidence-Based Review of Stroke Rehabilitation (EBRSR). Chapter 6. The Elements of Stroke Rehabilitation
Tellier & Rochette (2009)	Falling through the cracks: a literature review to understand the reality of mild stroke survivors.
Terrill, Schwartz & Belagaje (2018)	Best Practices for the Interdisciplinary Rehabilitation Team: A Review of Mental Health Issues in Mild Stroke Survivors
Tessier (2012)	L'organisation et la prestation de services de réadaptation pour les personnes ayant subi un accident vasculaire cérébral (AVC) et leurs proches
Tuppin et al. (2016)	Care pathways and healthcare use of stroke survivors six months after admission to an acute-care hospital in France in 2012.
Woodman et al. (2014)	Social participation post stroke: a meta-ethnographic review of the experiences and views of community-dwelling stroke survivors.
Wren et al. (2014)	Towards Earlier Discharge, Better Outcomes, Lower Cost: Stroke Rehabilitation in Ireland
Yelnik et al. (2011)	Physical and rehabilitation medicine (PRM) care pathways: "Stroke patients"
Zorowitz (2010)	Stroke rehabilitation quality indicators: raising the bar in the inpatient rehabilitation facility.

#	Dimension	Indicator description	Type
1	Pathway	Whether the hospital provides on-site in-patient rehabilitation services for stroke patients prior to discharge	Output
2	Pathway	% of stroke survivors who return home and do not follow outpatient rehabilitation	Output
3	Pathway	% of stroke survivors who return home and follow outpatient rehabilitation (e.g. Day Hospital, visits with a therapist)	Output
4	Pathway	% of stroke survivors who return home and follow an intensive rehabilitation program at home	Output
5	Pathway	% of stroke survivors who return home and follow maintenance therapy offered by home care services	Output
6	Pathway	% of stroke survivors who follow a rehabilitation program at an inpatient rehabilitation facility (e.g. SSR institution in France)	Output
7	Pathway	% of stroke survivors who are referred to a long-term care facility (e.g. USLD in France)/nursing home	Output
8	Pathway	% of stroke survivors transferred to inpatient rehabilitation facility specialised in neurological issues	Output
9	Pathway	% of stroke survivors transferred to inpatient rehabilitation facility specialised in geriatrics	Output
10	Pathway	Time between discharge or referral and when the service started to treat the patient	Output
11	Pathway	Early discharge from acute care (to inpatient rehabilitation unit or to community) is supported for medically stable patients with mild or moderate impairment	Output
12	Pathway	Number of patients with early admission to rehabilitation (approx. first 30 days)	Output
13	Pathway	Number of patients with very early admission to rehabilitation (approx. first hours)	Output
14	Pathway	Whether stroke patients can transfer among the trajectories	Output
15	Pathway	Whether stroke patients can be re-referred back to a service (after the patient has been discharged by the same service for the same condition at the same location)	Output
16	Pathway	Duration of the rehabilitation treatment/services (in number of appointments, or in weeks/months)	Output
17	Pathway	% of patients who have access to ongoing rehabilitation therapy beyond 3–6 months	Output
18	Pathway	Whether the regional stroke plan covers the rehabilitation phase	Input
19	Pathway	Whether the national stroke plan covers the rehabilitation phase	Input
20	Pathway	Whether a coordinated plan for rehabilitation is established between the different health professionals who treat the patient	Input
21	Pathway	Whether there are set discharge criteria (and if yes, mention which ones)	Input

22	Pathway	Whether there are set criteria to determine the patient pathway (and if yes, mention which ones) (e.g. Disability level, age, physical/occupational/speech/psychology therapy services available)	Input
23	Pathway	Whether the hospital refers discharged stroke patients for off-site in-patient rehabilitation services (to nursing homes, geriatric hospitals, rehabilitation hospitals, psychiatric hospitals, non-acute hospitals)	Input
24	Pathway	Whether the hospital refers discharged stroke patients to other institutions for outpatient rehabilitation	Input
25	Pathway	Whether the hospital refers discharged stroke patients to community rehabilitation services	Input
26	Follow-up	Whether patients' situation is assessed at the point of discharge/Whether the organisation or the region performs an initial stroke rehabilitation assessment	Output
27	Follow-up	Whether a rehabilitation assessment is performed in the first 24h/Whether the patient situation is assessed by a specialist in rehabilitation the first day after admission	Output
28	Follow-up	Whether a rehabilitation assessment is performed in the first 48h	Output
29	Follow-up	Patients are assessed for rehabilitation needs within the first three days after admission and provided with rehabilitation by multidisciplinary staff on the basis of need	Output
30	Follow-up	% of rehabilitation assessments that are performed later than 48h	Output
31	Follow-up	Patients are offered a review after the stroke for assessment of medical and rehabilitation needs: 'n. of patients with follow-up / total n. of patients treated'	Outcome/impact
32	Follow-up	Whether patients are assessed 3 months after starting rehabilitation therapy	Outcome/impact
33	Follow-up	Whether patients' situation is assessed when the rehabilitation phase finishes	Outcome/impact
34	Follow-up	Whether 6-month reviews are performed	Outcome/impact
35	Follow-up	Amount (degree) of recovery (at different points of time, % of recovery after rehabilitation) for stroke survivors (average)	Outcome/impact
36	Follow-up	Average number of weeks to 80% Best Recovery as measured by the Barthel Index (BI) or the Scandinavian Stroke Scale (SSS) (Speed of recovery)	Outcome/impact
37	Follow-up	Average number of weeks to 95% Best Recovery as measured by the Barthel Index (BI) or the Scandinavian Stroke Scale (SSS) (Speed of recovery)	Outcome/impact
38	Follow-up	3-month re-hospitalisation rate	Outcome/impact
39	Follow-up	% of stroke patients who are returned to the community after their stroke and then within six-months or one-year require admission to a long-term care facility	Outcome/impact
40	Follow-up	% of deaths during rehabilitation	Outcome/impact
41	Follow-up	International Classification of Functioning, Disability and Health (ICF). Values for stroke survivors (when leaving acute care; after a specific period: 1 month, 6 months, 1 year, 5 years, etc.)	Outcome/impact
42	Follow-up	Stroke severity computed using the National Institutes of Health Stroke Scale (NIHSS)	Outcome/impact
43	Follow-up	Stroke severity computed using the Canadian Neurological Stroke Scale (CNSS)	Outcome/impact

44	Follow-up	Stroke severity computed on the basis of functional independence measure (FIM) scores	Outcome/impact
45	Follow-up	Stroke severity computed on the basis of the AlphaFIM (an abbreviated 6-item version of the 18-item FIM instrument)	Outcome/impact
46	Follow-up	Système de mesure d'autonomie fonctionnelle (SMAF) as a measure of functional independence	Outcome/impact
47	Follow-up	Fugl-Meyer Assessment Scale (FMAS)	Outcome/impact
48	Follow-up	Barthel Index (BI)	Outcome/impact
49	Follow-up	SAFE score (shoulder abduction finger extension, range 0–10) to predict the potential for upper limb recovery in individual patients	Outcome/impact
50	Follow-up	Modified Rankin Scale (mRS)	Outcome/impact
51	Follow-up	Berg scale	Outcome/impact
52	Follow-up	Motor Index Score (MIS)	Outcome/impact
53	Follow-up	Trunk control test	Outcome/impact
54	Follow-up	ADL scale to assess patients' autonomy or disabilities	Outcome/impact
55	Follow-up	IADL (Instrumental. Activities of Daily Living)	Outcome/impact
56	Follow-up	SOFMER scale to assess patients' autonomy or disabilities	Outcome/impact
57	Follow-up	AGGIR scale to assess patients' autonomy or disabilities	Outcome/impact
58	Follow-up	Glasgow Coma Score (CGS)	Outcome/impact
59	Follow-up	Charlson score of co-morbidities	Outcome/impact
60	Follow-up	Orpington Prognostic Scale (OPS)	Outcome/impact
61	Follow-up	Scandinavian Stroke Scale (SSS)	Outcome/impact
62	Follow-up	Score of physical dependency (dressing, displacement and locomotion, eating, incontinence)	Outcome/impact
63	Follow-up	Gait speed	Outcome/impact
64	Follow-up	% of patients who suffer loss of arm function	Outcome/impact
65	Follow-up	% of patients who suffer spasticity	Outcome/impact
66	Follow-up	% of patients with motor impairment	Outcome/impact

67	Follow-up	% of patients with speech and language impairments/ communication problems	Outcome/impact
68	Follow-up	% of patients with swallowing impairments	Outcome/impact
69	Follow-up	% of patients with vision impairments	Outcome/impact
70	Follow-up	% of patients with cognitive impairments	Outcome/impact
71	Follow-up	% of patients with post-stroke fatigue	Outcome/impact
72	Follow-up	% of patients who were employed before the stroke that do not return to work	Outcome/impact
73	Follow-up	Average time to work re-entry	Outcome/impact
74	Follow-up	Income loss from stroke- related morbidity (e.g. annual number of certified days off work from stroke * mean daily earnings)	Outcome/impact
75	Follow-up	Direct income payments that stroke survivors receive related to stroke morbidity	Outcome/impact
76	Follow-up	% of patients who return to work but in different conditions (e.g. a permanent change of job or employer, reduction of working hours, the survivor is officially accredited as a handicapped worker)	Outcome/impact
77	Follow-up	DALYs	Outcome/impact
78	Follow-up	Quality-Adjusted Life Year (QALY)	Outcome/impact
79	Follow-up	Health-related quality of Life	Outcome/impact
80	Follow-up	Patients' Mental Health-related quality of Life	Outcome/impact
81	Follow-up	Frenchay activities index (FAI)	Outcome/impact
82	Follow-up	Satisfaction With Life Scale (SWLS) (for patients)	Outcome/impact
83	Follow-up	% of patients who suffer depression	Outcome/impact
84	Follow-up	Level of social participation of stroke patients	Outcome/impact
85	Follow-up	Score of psychic dependency (behaviour and social relations, communication)	Outcome/impact
86	Follow-up	% of caregivers who have emotional problems after one year of caring for a stroke victim	Outcome/impact
87	Follow-up	% of informal caregivers (relatives) who are experiencing an important burden	Outcome/impact
88	Follow-up	% of informal caregivers who return to work (or % who need to leave their job/reduce their working hours)	Outcome/impact
89	Follow-up	Satisfaction With Life Scale (SWLS) (for caregivers)	Outcome/impact

90	Follow-up	Daily Caregiving Diary (DCD)	Outcome/impact
91	Follow-up	Carers' Assessment of Satisfactions Index (CASI)	Outcome/impact
92	Follow-up	Carers 'Assessment of Managing Index (CAMI)	Outcome/impact
93	Follow-up	% of caregivers who suffer depression	Outcome/impact
94	Follow-up	caregivers' Health-related quality of Life	Outcome/impact
95	Follow-up	caregivers' Mental Health-related quality of Life	Outcome/impact
96	Resources	Number of stroke rehabilitation units in the region	Input
97	Resources	Number of rehabilitation beds available (e.g. rehabilitation beds per million population)	Input
98	Resources	% of patients who follow a task-specific therapeutic approach	Output
99	Resources	% of patients who follow high-intensity therapy	Output
100	Resources	% of patients who follow repetitive-task training	Output
101	Resources	Whether the patient follows an exercising programme/ aerobic exercise training/ fitness training	Output
102	Resources	% of patients who follow occupational therapy	Output
103	Resources	Whether patients follow adaptive support programs (e.g. Teaching of compensatory and adaptive techniques)	Output
104	Resources	% of patients who follow device-based and adjunctive therapies (e.g. robotic arms, body- weight support treadmills)	Output
105	Resources	% of patients who follow a constraint-induced movement therapy (CIMT)	Output
106	Resources	% of patients who follow a functional electrostimulation	Output
107	Resources	Whether the organisation/the region provides stroke rehabilitation to improve cognition	Output
108	Resources	Whether the organisation/the region provides stroke rehabilitation of swallowing and dysphagia	Output
109	Resources	Whether the organisation/the region provides stroke rehabilitation to improve communication and aphasia	Output
110	Resources	% of patients who use telemedicine service/ tele-rehabilitation	Output
111	Resources	% of patients who use virtual reality in their treatment	Output
112	Resources	% of patients who follow a pharmacological treatment	Output

113	Resources	Patients and their family/carers have access to practical and emotional support	Output
114	Resources	Whether patients are offered equipment to help them in daily activities such as cooking, entering the shower/bath, moving outside their home, driving, etc.	Output
115	Resources	Whether the patient receives support for work re-entry (training, occupational therapy, professional orientation, vocational rehabilitation programmes, etc.)	Output
116	Resources	Whether the organisation/the region offers services to assist the person to reintegrate into the community (e.g. services that encourage stroke survivors to socialize, to exercise, and to participate in meaningful activities)	Output
117	Resources	Whether the organisation/the region offers caregiver assessment and training	Output
118	Resources	Whether the organisation/the region offers respite services to caregivers	Output
119	Resources	Average amount of direct therapy received from each rehabilitation discipline each day (Min/Day)	Input
120	Resources	Hours of rehabilitation therapy per week	Input
121	Resources	Average total hours of therapy (average number of weeks * sessions per week * length of session in minutes). Calculated for each type of therapy (physical, occupational, speech) and for each setting (primary care, community day hospital, residential rehabilitation, outpatient rehabilitation, nursing home, community team rehabilitation, community stroke team)	Input
122	Resources	Total cost of in-patient rehabilitation care	Input
123	Resources	Annual hospital beds for stroke rehabilitation spent in the region	Input
124	Resources	Days spent in a rehabilitative care facility (i.e. in-patient care)	Input
125	Resources	Days spent in a long-term care facility or nursing home / Cost of stay in a nursing home/residential home/sheltered home (mean length of stay in days & unit cost per week)	Input
126	Resources	National Average Hours of Physiotherapy for Stroke Survivors in a nursing home (the same but for occupation therapy and speech and language therapy)	Input
127	Resources	National Average Hours of Physiotherapy for Stroke Survivors in outpatient rehabilitation (non-acute) (the same but for occupation therapy and speech and language therapy)	Input
128	Resources	hours of paid home nursing	Input
129	Resources	hours of paid home help/ use of paid home help * national mean hourly wage rate	Input
130	Resources	unpaid home caregiving hours (+ converted to money, e.g. Using the hourly gross cost of social care)/ use of unpaid home care * hourly wage for over 65 years of age, unemployed or economically inactive carers	Input
131	Resources	Cost of providing community services for stroke survivors	Input
132	Resources	Number of meals on wheels received by stroke patients discharged home at 90 days	Input
133	Resources	Number of medical consultations	Input
134	Resources	Number of follow-up visits with a neurologist	Input

135	Resources	Number of visits with a GP/ visits * unit cost	Input
136	Resources	Number of physical therapy sessions /visits with a physiotherapist (* unit cost)	Input
137	Resources	Visits with an occupational therapist * unit cost	Input
138	Resources	Number of speech therapy sessions/visits with a speech therapist (* unit cost)	Input
139	Resources	Number of visits with a nurse	Input
140	Resources	Cost of drug consumption (Antihypertensive, Antithrombotic, antidepressant, etc.)	Input
141	Resources	The regions' Stroke Rehabilitation Program counts with an interdisciplinary team of professionals experienced in and dedicated to the care of the patient with stroke	Input
142	Resources	Number of medical doctors specialising in rehabilitation in the health centre who mainly focus on stroke patients	Input
143	Resources	Number of physical therapists in the health centre/region/rehabilitation unit (e.g. Divided by the number of stroke survivors discharged with disability)	Input
144	Resources	Number of occupational therapists in the health centre/region/rehabilitation unit (e.g. Divided by the number of stroke survivors discharged with disability)	Input
145	Resources	Number of speech and language therapists in the health centre/region/rehabilitation unit (e.g. Divided by the number of stroke survivors discharged with disability)	Input
146	Resources	Number of clinical psychologists in the health centre/region/rehabilitation unit	Input
147	Resources	Number of geriatricians in the health centre/region/rehabilitation unit	Input
148	Resources	Number of social workers in the health centre/region/rehabilitation unit	Input
149	Resources	Number of orthotists in the health centre/region/rehabilitation unit	Input
150	Resources	Number of nurses in the rehabilitation unit	Input
151	Resources	Total cost of rehabilitation personnel in the region	Input
152	Resources	Total Whole Time Equivalent (WTE) for each staff disciplines within each service type	Input
153	Resources	Whole Time Equivalent per 10 stroke beds (in-patient care)	Input
154	Resources	Whole Time Equivalent per 100 stroke patients (outpatient care, domiciliary services)	Input
155	Secondary prevention	Whether regions have set a plan and targets for secondary prevention	Input
156	Secondary prevention	Whether there is collaboration between multi-disciplinary teams for implementing secondary stroke prevention strategies on modifiable risk factor control	Output
157	Secondary	Whether there are integrated care services/ continuum of care for secondary stroke prevention	Output

	prevention		
158	Secondary prevention	% of stroke survivors who are discharged from acute care with a personalised plan for secondary prevention (i.e. with an appropriate prescription, addressing risk factors)	Output
159	Secondary prevention	% of stroke survivors who are evaluated for cardiovascular and stroke risk factors (at discharge, during a follow-up consultation)	Output
160	Secondary prevention	Whether patients' adherence and tolerance to treatment (either medical treatment or re-education) is assessed	Output
161	Secondary prevention	% of stroke survivors who are re-evaluated after a recurrent stroke	Output
162	Secondary prevention	% of stroke survivors who engage in secondary prevention	Output
163	Secondary prevention	% of stroke survivors who receive secondary prevention advice/ educational intervention (i.e. advice on changes to lifestyle or medications for preventing another stroke)	Output
164	Secondary prevention	% of stroke survivors who are informed about stroke symptoms and the need to call emergency services if they have these symptoms	Output
165	Secondary prevention	% of stroke survivors' caregivers who receive training on secondary prevention (e.g. risk factors, control measures, etc.)	Output
166	Secondary prevention	% of stroke survivors who follow a medical treatment to prevent a second stroke	Output
167	Secondary prevention	% of stroke survivors who are prescribed aspirin one year after discharge	Output
168	Secondary prevention	% of stroke survivors discharged with a prescription of an antiplatelet agent / antiaggregant	Output
169	Secondary prevention	% of stroke survivors who are offered oral anticoagulation (and under which criteria)	Output
170	Secondary prevention	% of stroke survivors discharged with a blood pressure lowering therapy	Output
171	Secondary prevention	% of stroke survivors who are prescribed anti-hypertensives for secondary prevention	Output
172	Secondary prevention	% of stroke survivors who follow Statin therapy (lipid modification therapy)	Output
173	Secondary prevention	% of stroke survivors who receive antithrombotic therapy	Output
174	Secondary prevention	% of stroke survivors with diabetes who have their haemoglobin under control	Outcome/impact
175	Secondary prevention	% of stroke survivors who have their glucose levels under control	Outcome/impact
176	Secondary prevention	% of stroke survivors who have their levels of LDL-cholesterol under control	Outcome/impact

177	Secondary prevention	Whether patients with 70–99% stenosis have Carotid endarterectomy (CEA) (+ when does this take place)	Output
178	Secondary prevention	Whether patients with less than 50% stenosis have Carotid endarterectomy (CEA) (not recommended)	Output
179	Secondary prevention	Whether patients have carotid percutaneous transluminal angioplasty and/or stenting (CAS)(only recommended in selected patients)	Output
180	Secondary prevention	% of stroke survivors who are examined to detect atrial fibrillation	Output
181	Secondary prevention	% of stroke survivors who stop smoking	Outcome/impact
182	Secondary prevention	% of stroke survivors who limit their alcohol consumption	Outcome/impact
183	Secondary prevention	% of stroke survivors who have a diet low in salt and saturated fat, high in fruit and vegetables, and rich in fibre	Outcome/impact
184	Secondary prevention	% of stroke survivors with an elevated body mass index that adopt a weight- reducing diet	Output
185	Secondary prevention	% of stroke survivors who do regular physical activity	Outcome/impact

10.3. Selection of indicators: Round 2

				Aragon		Balearic Islands		Navarre		ARS Norte		Occitanie		TOTAL			
Dimension	Indicator description	Type	Do you have this information?	Is this indicator relevant for the study?	Do you have this information?	Is this indicator relevant for the study?	Do you have this information?	Is this indicator relevant for the study?	Do you have this information?	Is this indicator relevant for the study?	Do you have this information?	Is this indicator relevant for the study?	Do you have this information?	Is this indicator relevant for the study?	Do you have this information?	Is this indicator relevant for the study?	Total score
1	Pathway	Whether the hospital provides on-site in-patient rehabilitation services for stroke patients prior to discharge	Output	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	4	5	9
2	Pathway	% of stroke survivors who return home and do not follow outpatient rehabilitation	Output	Yes	Yes	No	Yes	Yes	No	No	No	Yes	Yes	3	3	6	
3	Pathway	% of stroke survivors who return home and follow outpatient rehabilitation (e.g. Day Hospital, visits with a therapist)	Output	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	3	5	8	
4	Pathway	% of stroke survivors who return home and follow an intensive rehabilitation program at home	Output	No	Yes	No	Yes	No	No	No	No	No	No	0	2	2	

5	Pathway	% of stroke survivors who return home and follow maintenance therapy offered by home care services	Output	No	No	No	Yes	No	No	No	Yes	No	No	0	2	2
6	Pathway	% of stroke survivors who follow a rehabilitation program at an inpatient rehabilitation facility (e.g. SSR institution in France)	Output	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	No	No	4	4	8
7	Pathway	% of stroke survivors who are referred to a long-term care facility (e.g. USLD in France)/nursing home	Output	Yes	No	No	Yes	No	No	Yes	Yes	No	Yes	2	3	5
8	Pathway	% of stroke survivors transferred to inpatient rehabilitation facility specialised in neurological issues	Output	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	4	3	7
9	Pathway	% of stroke survivors transferred to inpatient rehabilitation facility specialised in geriatrics	Output	Yes	No	No	No	No	No	No	No	Yes	Yes	2	1	3
10	Pathway	Time between discharge or referral and when the service started to treat the patient	Output	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	4	3	7
11	Pathway	Early discharge from acute care (to inpatient rehabilitation unit or to community) is supported for medically stable patients with mild or moderate impairment	Output	No	No	No	no	No	No	No	No	No	No	0	0	0
15	Pathway	Whether stroke patients can be re-referred back to a service (after the patient has been discharged by the same service for the same condition at the same location)	Output	Yes	No	No	No	Yes	No	No	No	Yes	Yes	3	1	4

16	Pathway	Duration of the rehabilitation treatment/services (in number of appointments, or in weeks/months)	Output	No	Yes	Yes	Yes	Yes	No	No	Yes	No	No	2	3	5
20	Pathway	Whether a coordinated plan for rehabilitation is established between the different health professionals who treat the patient	To be defined	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	4	4	8
21	Pathway	Whether there are set discharge criteria (and if yes, mention which ones)	To be defined	No	No	No	No	Yes	Yes	No	No	No	No	1	1	2
22	Pathway	Whether there are set criteria to determine the patient pathway (and if yes, mention which ones) (e.g. Disability level, age, physical/occupational/speech/psychology therapy services available)	To be defined	No	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes	2	4	6
25	Pathway	Whether the hospital refers discharged stroke patients to community rehabilitation services	To be defined	No	No	Yes	No	No	No	No	No	No	No	1	0	1
26	Follow up	Whether patients' situation is assessed at the point of discharge/Whether the organisation or the region performs an initial stroke rehabilitation assessment	Output	Yes	Yes	No	No	No	No	No	No	No	No	1	1	2
29	Follow up	Patients are assessed for rehabilitation needs within the first three days after admission and provided with rehabilitation by multidisciplinary staff on the basis of need	Output	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	No	3	3	6

32	Follow up	Whether patients are assessed 3 months after starting rehabilitation therapy	Outcome/ impact	No	No	Yes	No	No	No	Yes	Yes	No	No	2	1	3
34	Follow up	Whether 6 month reviews are performed	Outcome/ impact	No	No	Yes	No	No	No	Yes	Yes	Yes	Yes	3	2	5
35	Follow up	Amount (degree) of recovery (at different points of time, % of recovery after rehabilitation) for stroke survivors (average)	Outcome/ impact	No	Yes	No	Yes	No	No	No	Yes	Yes	No	1	3	4
39	Follow up	% of stroke patients who are returned to the community after their stroke and then within six-months or one-year require admission to a long-term care facility	Outcome/ impact	No	No	No	No	No	No	No	No	No	No	0	0	0
40	Follow up	% of deaths during rehabilitation	Outcome/ impact	No	Yes	No	No	No	No	No	No	No	No	0	1	1
42	Follow up	Stroke severity computed using the National Institutes of Health Stroke Scale (NIHSS)	Outcome/ impact	Yes	Yes	No	No	No	No	No	No	Yes	Yes	2	2	4
47	Follow up	Fugl-Meyer Assessment Scale (FMAS)	Outcome/ impact	No	No	No	No	No	No	No	No	No	No	0	0	0
48	Follow up	Barthel Index (BI)	Outcome/ impact	Yes	Yes	Yes	No	Yes	Yes	No	No	No	Yes	3	3	6
50	Follow up	Modified Rankin Scale (mRS)	Outcome/ impact	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	4	3	7

59	Follow up	Charlson score of co-morbidities	Outcome/ impact	No	No	Yes	No	No	Yes	No	No	No	No	1	1	2
60	Follow up	Orpington Prognostic Scale (OPS)	Outcome/ impact	No	No	No	No	No	Yes	No	No	No	No	0	1	1
63	Follow up	Gait speed	Outcome/ impact	No	No	Yes	No	No	No	No	No	No	No	1	0	1
67	Follow up	% of patients with speech and language impairments/ communication problems	Outcome/ impact	No	Yes	No	Yes	No	No	No	Yes	No	Yes	0	4	4
68	Follow up	% of patients with swallowing impairments	Outcome/ impact	Yes	Yes	No	Yes	No	No	No	Yes	No	No	1	3	4
70	Follow up	% of patients with cognitive impairments	Outcome/ impact	No	Yes	No	Yes	Yes	Yes	No	Yes	No	No	1	4	5
72	Follow up	% of patients who were employed before the stroke that do not return to work	Outcome/ impact	No	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	1	5	6
73	Follow up	Average time to work re-entry	Outcome/ impact	No	Yes	No	Yes	No	No	No	Yes	No	No	0	3	3
76	Follow up	% of patients who return to work but in different conditions (e.g. a permanent change of job or employer, reduction of working hours, the survivor is officially accredited as a handicapped worker)	Outcome/i mpact	No	Yes	No	Yes	No	No	No	No	No	No	0	2	2

79	Follow up	Health-related quality of Life	Outcome/ impact	No	Yes	No	Yes	No	No	No	Yes	No	No	0	3	3
81	Follow up	Frenchay activities index (FAI)	Outcome/ impact	No	No	No	No	No	No	No	No	No	No	0	0	0
83	Follow up	% of patients who suffer depression	Outcome/ impact	No	Yes	No	No	No	No	No	Yes	No	No	0	2	2
84	Follow up	Level of social participation of stroke patients	Outcome/ impact	No	No	No	No	No	No	No	No	No	No	0	0	0
86	Follow up	% of caregivers who have emotional problems after one year of caring for a stroke victim	Outcome/ impact	No	No	No	No	No	No	No	Yes	No	No	0	1	1
87	Follow up	% of informal caregivers (relatives) who are experiencing an important burden	Outcome/ impact	No	No	No	No	No	No	No	No	No	No	0	0	0
89	Follow up	Satisfaction With Life Scale (SWLS) (for caregivers)	Outcome/ impact	No	No	No	No	No	Yes	No	Yes	No	No	0	2	2
96	Resources	Number of stroke rehabilitation units in the region	Input	Yes	Yes	Yes	No	Yes	No	No	No	Yes	Yes	4	2	6
97	Resources	Number of rehabilitation beds available (e.g. rehabilitation beds per million population)	Input	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	4	4	8

98	Resources	% of patients who follow a task-specific therapeutic approach	Output	No	Yes	No	No	No	No	No	No	No	No	0	1	1
99	Resources	% of patients who follow high-intensity therapy	Output	No	Yes	No	No	Yes	Yes	No	No	No	No	1	2	3
101	Resources	Whether the patient follows an exercising programme/ aerobic exercise training/ fitness training	Output	No	No	No	No	No	No	No	Yes	No	No	0	1	1
102	Resources	% of patients who follow occupational therapy	Output	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	3	4	7
107	Resources	Whether the organisation/the region provides stroke rehabilitation to improve cognition	Output	No	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	1	5	6
108	Resources	Whether the organisation/the region provides stroke rehabilitation of swallowing and dysphagia	Output	Yes	Yes	No	Yes	No	Yes	No	No	No	No	1	3	4
109	Resources	Whether the organisation/the region provides stroke rehabilitation to improve communication and aphasia	Output	Yes	Yes	No	Yes	Yes	Yes	No	No	No	Yes	2	4	6
110	Resources	% of patients who use telemedicine service/ tele-rehabilitation	Output	No	Yes	No	Yes	No	No	No	No	Yes	Yes	1	3	4
111	Resources	% of patients who use virtual reality in their treatment	Output	No	No	No	No	No	No	No	No	No	No	0	0	0
116	Resources	Whether the organisation/the region offers services to assist the person to reintegrate into the community (e.g. services that encourage stroke survivors to socialize, to exercise, and to participate in meaningful activities)	Output	Yes	Yes	No	Yes	Yes	No	No	Yes	No	No	2	3	5

117	Resources	Whether the organisation/the region offers caregiver assessment and training	Output	Yes	Yes	No	Yes	No	Yes	No	No	No	No	1	3	4
119	Resources	Average amount of direct therapy received from each rehabilitation discipline each day (Min/Day)	Input	Yes	Yes	Yes	No	Yes	No	No	Yes	No	No	3	2	5
121	Resources	Average total hours of therapy (average number of weeks * sessions per week * length of session in minutes). Calculated for each type of therapy (physical, occupational, speech) and for each setting (primary care, community day hospital, residential rehabilitation, outpatient rehabilitation, nursing home, community team rehabilitation, community stroke team)	Input	Yes	Yes	No	Yes	Yes	Yes	No	No	No	No	2	3	5
122	Resources	Total cost of in-patient rehabilitation care	Input	No	Yes	No	Yes	Yes	No	No	No	No	No	1	2	3
123	Resources	Annual hospital beds for stroke rehabilitation spent in the region	Input	No	No	No	No	No	No	No	No	No	No	0	0	0

124	Resources	Days spent in a rehabilitative care facility (i.e. in-patient care)	Input	Yes	No	No	Yes	Yes	No	No	No	No	No	2	1	3
126	Resources	National Average Hours of Physiotherapy for Stroke Survivors in a nursing home (the same but for occupation therapy and speech and language therapy)	Input	No	No	No	Yes	No	No	No	No	No	No	0	1	1
127	Resources	National Average Hours of Physiotherapy for Stroke Survivors in outpatient rehabilitation (non-acute) (the same but for occupation therapy and speech and language therapy)	Input	No	Yes	No	No	No	No	No	No	No	No	0	1	1
131	Resources	Cost of providing community services for stroke survivors	Input	No	No	No	No	No	No	No	No	No	No	0	0	0
133	Resources	Number of medical consultations	Input	Yes	No	No	No	Yes	Yes	No	No	No	No	2	1	3
136	Resources	Number of physical therapy sessions /visits with a physiotherapist (* unit cost)	Input	Yes	No	No	No	Yes	Yes	No	No	No	No	2	1	3
137	Resources	Visits with an occupational therapist * unit cost	Input	Yes	No	No	No	No	No	No	No	No	No	1	0	1
138	Resources	Number of speech therapy sessions/visits with a speech therapist (* unit cost)	Input	Yes	No	No	No	No	No	No	No	No	No	1	0	1
141	Resources	The regions' Stroke Rehabilitation Program counts with an interdisciplinary team of professionals experienced in and dedicated to the care of the patient with stroke	Input	Yes	Yes	No	Yes	Yes	Yes	No	No	No	No	2	3	5

142	Resources	Number of medical doctors specialising in rehabilitation in the health centre who mainly focus on stroke patients	Input	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No	No	2	4	6
143	Resources	Number of physical therapists in the health centre/region/rehabilitation unit (e.g. Divided by the number of stroke survivors discharged with disability)	Input	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No	No	2	4	6
144	Resources	Number of occupational therapists in the health centre/region/rehabilitation unit (e.g. Divided by the number of stroke survivors discharged with disability)	Input	Yes	Yes	No	Yes	No	No	No	Yes	No	No	1	3	4
145	Resources	Number of speech and language therapists in the health centre/region/rehabilitation unit (e.g. Divided by the number of stroke survivors discharged with disability)	Input	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	2	5	7
146	Resources	Number of clinical psychologists in the health centre/region/rehabilitation unit	Input	Yes	No	No	Yes	No	No	No	No	No	No	1	1	2
148	Resources	Number of social workers in the health centre/region/rehabilitation unit	Input	Yes	Yes	No	Yes	No	No	Yes	Yes	No	No	2	3	5
149	Resources	Number of orthotists in the health centre/region/rehabilitation unit	Input	Yes	Yes	No	Yes	No	No	No	No	No	No	1	2	3

150	Resources	Number of nurses in the rehabilitation unit	Input	Yes	Yes	No	Yes	No	No	yes	yes	No	No	2	3	5
151	Resources	Total cost of rehabilitation personnel in the region	Input	No	Yes	No	Yes	No	No	No	No	No	No	0	2	2
155	Secondary prevention	Whether regions have set a plan and targets for secondary prevention	Input	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	3	3	6
156	Secondary prevention	Whether there is collaboration between multi-disciplinary teams for implementing secondary stroke prevention strategies on modifiable risk factor control	Output	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	3	2	5
157	Secondary prevention	Whether there are integrated care services/ continuum of care for secondary stroke prevention	Output	Yes	Yes	No	No	Yes	Yes	No	No	No	No	2	2	4
158	Secondary prevention	% of stroke survivors who are discharged from acute care with a personalised plan for secondary prevention (i.e. with an appropriate prescription, addressing risk factors)	Input	No	Yes	Yes	No	No	No	No	No	No	No	1	1	2
159	Secondary prevention	% of stroke survivors who are evaluated for cardiovascular and stroke risk factors (at discharge, during a follow-up consultation)	Output	Yes	No	Yes	No	No	Yes	No	No	No	No	2	1	3
160	Secondary prevention	Whether patients' adherence and tolerance to treatment (either medical treatment or re-education) is assessed	Output	No	Yes	Yes	No	No	Yes	No	No	No	No	1	2	3
161	Secondary prevention	% of stroke survivors who are re-evaluated after a recurrent stroke	Output	Yes	Yes	Yes	No	No	No	No	No	No	No	2	1	3

162	Secondary prevention	% of stroke survivors who engage in secondary prevention	Output	No	Yes	Yes	No	No	Yes	No	No	No	No	1	2	3
163	Secondary prevention	% of stroke survivors who receive secondary prevention advice/ educational intervention (i.e. advice on changes to lifestyle or medications for preventing another stroke)	Output	Yes	Yes	Yes	No	No	Yes	No	No	No	No	2	2	4
164	Secondary prevention	% of stroke survivors who are informed about stroke symptoms and the need to call emergency services if they have these symptoms	Output	No	Yes	Yes	No	No	No	No	No	No	No	1	1	2
165	Secondary prevention	% of stroke survivors' caregivers who receive training on secondary prevention (e.g. risk factors, control measures, etc.)	Output	No	Yes	No	Yes	No	No	No	No	No	No	0	2	2
166	Secondary prevention	% of stroke survivors who follow a medical treatment to prevent a second stroke	Output	Yes	Yes	Yes	No	Yes	Yes	No	No	No	No	3	2	5
167	Secondary prevention	% of stroke survivors who are prescribed aspirin one year after discharge	Output	Yes	No	Yes	No	No	No	No	No	Yes	No	3	0	3
168	Secondary prevention	% of stroke survivors discharged with a prescription of an antiplatelet agent / antiaggregant	Output	Yes	No	Yes	No	No	No	No	No	Yes	Yes	3	1	4
169	Secondary prevention	% of stroke survivors who are offered oral anticoagulation (and under which criteria)	Output	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	3	2	5

170	Secondary prevention	% of stroke survivors discharged with a blood pressure lowering therapy	Output	Yes	No	Yes	No	No	No	No	No	Yes	Yes	3	1	4
171	Secondary prevention	% of stroke survivors who are prescribed anti-hypertensives for secondary prevention	Output	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	3	2	5
172	Secondary prevention	% of stroke survivors who follow Statin therapy (lipid modification therapy)	Output	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	3	2	5
173	Secondary prevention	% of stroke survivors who receive antithrombotic therapy	Output	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	3	2	5
174	Secondary prevention	% of stroke survivors with diabetes who have their haemoglobin under control	Outcome/impact	Yes	No	Yes	No	Yes	Yes	No	No	No	Yes	3	2	5
175	Secondary prevention	% of stroke survivors who have their glucose levels under control	Outcome/impact	Yes	Yes	Yes	No	No	No	No	No	No	Yes	2	2	4
176	Secondary prevention	% of stroke survivors who have their levels of LDL-cholesterol under control	Outcome/impact	Yes	No	Yes	No	Yes	Yes	No	No	No	Yes	3	2	5
177	Secondary prevention	Whether patients with 70–99% stenosis have Carotid endarterectomy (CEA) (+ when does this take place)	Output	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	4	3	7
178	Secondary prevention	Whether patients with less than 50% stenosis have Carotid endarterectomy (CEA) (not recommended)	Output	Yes	Yes	Yes	No	No	No	No	No	No	No	2	1	3

179	Secondary prevention	Whether patients have carotid percutaneous transluminal angioplasty and/or stenting (CAS)(only recommended in selected patients)	Output	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	3	2	5
180	Secondary prevention	% of stroke survivors who are examined to detect atrial fibrillation	Output	No	Yes	Yes	No	Yes	Yes	No	No	No	Yes	2	3	5
181	Secondary prevention	% of stroke survivors who stop smoking	Outcome/ impact	No	Yes	No	No	No	Yes	No	No	No	Yes	0	3	3
182	Secondary prevention	% of stroke survivors who limit their alcohol consumption	Outcome/ impact	No	Yes	No	No	No	No	No	No	No	No	0	1	1
183	Secondary prevention	% of stroke survivors who have a diet low in salt and saturated fat, high in fruit and vegetables, and rich in fibre	Outcome/ impact	No	Yes	No	No	No	No	No	No	No	No	0	1	1
184	Secondary prevention	% of stroke survivors with an elevated body mass index that adopt a weight- reducing diet	Output	No	Yes	No	No	No	No	No	No	No	No	0	1	1
185	Secondary prevention	% of stroke survivors who do regular physical activity	Outcome/ impact	No	Yes	No	Yes	No	No	No	Yes	No	Yes	0	4	4

10.4. Selection of indicators: Round 3

	Dimension	Indicator description	Type
1	Pathway	Whether the hospital provides on-site in-patient rehabilitation services for stroke patients prior to discharge	Output
2	Pathway	% of stroke survivors who return home and do not follow outpatient rehabilitation	Output
3	Pathway	% of stroke survivors who return home and follow outpatient rehabilitation (e.g. Day Hospital, visits with a therapist)	Output
6	Pathway	% of stroke survivors who follow a rehabilitation program at an inpatient rehabilitation facility (e.g. SSR institution in France)	Output
7	Pathway	% of stroke survivors who are referred to a long-term care facility (e.g. USLD in France)/nursing home	Output
10	Pathway	Time between discharge or referral and when the service started to treat the patient	Output
16	Pathway	Duration of the rehabilitation treatment/services (in number of appointments, or in weeks/months)	Output
20	Pathway	Whether a coordinated plan for rehabilitation is established between the different health professionals who treat the patient (and if yes indicate what does it include, eg. disability level, age, physical/occupational/speech/psychology therapy services available)	To be defined
29	Follow-up	Patients are assessed for rehabilitation needs within the first three days after admission and provided with rehabilitation by multidisciplinary staff on the basis of need	Output
32	Follow-up	Whether patients are assessed 3 months after starting rehabilitation therapy	Outcome/impact
34	Follow-up	Whether 6 month reviews are performed	Outcome/impact
35	Follow-up	Amount (degree) of recovery (at different points of time, % of recovery after rehabilitation) for stroke survivors (average)	Outcome/impact
42	Follow-up	Stroke severity computed using the National Institutes of Health Stroke Scale (NIHSS)	Outcome/impact
48	Follow-up	Barthel Index (BI)	Outcome/impact
50	Follow-up	Modified Rankin Scale (mRS)	Outcome/impact
68	Follow-up	% of patients with swallowing impairments	Outcome/impact
70	Follow-up	% of patients with cognitive impairments	Outcome/impact
72	Follow-up	% of patients who were employed before the stroke that do not return to work	Outcome/impact
96	Resources	Number of stroke rehabilitation units in the region	Input
97	Resources	Number of rehabilitation beds available (e.g. rehabilitation beds per million population)	Input
102	Resources	% of patients who follow occupational therapy	Output
107	Resources	Whether the organisation/the region provides stroke rehabilitation to improve cognition	Output
108	Resources	Whether the organisation/the region provides stroke rehabilitation of swallowing and dysphagia	Output
109	Resources	Whether the organisation/the region provides stroke rehabilitation to improve communication and aphasia	Output
110	Resources	% of patients who use telemedicine service/ tele-rehabilitation	Output
116	Resources	Whether the organisation/the region offers services to assist the person to reintegrate into the community (e.g. services that encourage stroke survivors to socialize, to exercise, and to participate in meaningful activities)	Output
117	Resources	Whether the organisation/the region offers caregiver assessment and training	Output
121	Resources	Average total hours of therapy (average number of weeks * sessions per week * length of session in minutes). Calculated for each type of therapy (physical, occupational, speech) and for each setting (primary care, community day hospital, residential rehabilitation, outpatient rehabilitation, nursing home, community team rehabilitation, community stroke team)	Input
141	Resources	The regions' Stroke Rehabilitation Program counts with an interdisciplinary team of professionals experienced in and dedicated to the care of the patient with stroke	Input
142	Resources	Number of medical doctors specialising in rehabilitation in the health centre who mainly focus on stroke patients	Input
143	Resources	Number of physical therapists in the health centre/region/rehabilitation unit (e.g. Divided by the number of stroke survivors discharged with disability)	Input
144	Resources	Number of occupational therapists in the health centre/region/rehabilitation unit (e.g. Divided by the number of stroke survivors discharged with disability)	Input
145	Resources	Number of speech and language therapists in the health centre/region/rehabilitation unit (e.g. Divided by the number of stroke survivors discharged with disability)	Input

148	Resources	Number of social workers in the health centre/region/rehabilitation unit	Input
150	Resources	Number of nurses in the rehabilitation unit	Input
155	Secondary prevention	Whether regions have set a plan and targets for secondary prevention	Input
157	Secondary prevention	Whether there are integrated care services/ continuum of care for secondary stroke prevention	Output
163	Secondary prevention	% of stroke survivors who receive secondary prevention advice/ educational intervention (i.e. advice on changes to lifestyle or medications for preventing another stroke)	Output
166	Secondary prevention	% of stroke survivors who follow a medical treatment to prevent a second stroke	Output
168	Secondary prevention	% of stroke survivors discharged with a prescription of an antiplatelet agent / antiaggregant	Output
169	Secondary prevention	% of stroke survivors who are offered oral anticoagulation (and under which criteria)	Output
170	Secondary prevention	% of stroke survivors discharged with a blood pressure lowering therapy	Output
171	Secondary prevention	% of stroke survivors who are prescribed anti-hypertensives for secondary prevention	Output
172	Secondary prevention	% of stroke survivors who follow Statin therapy (lipid modification therapy)	Output
173	Secondary prevention	% of stroke survivors who receive antithrombotic therapy	Output
174	Secondary prevention	% of stroke survivors with diabetes who have their haemoglobin under control	Outcome/impact
175	Secondary prevention	% of stroke survivors who have their glucose levels under control	Outcome/impact
176	Secondary prevention	% of stroke survivors who have their levels of LDL-cholesterol under control	Outcome/impact
177	Secondary prevention	Whether patients with 70–99% stenosis have Carotid endarterectomy (CEA) (+ when does this take place)	Output
179	Secondary prevention	Whether patients have carotid percutaneous transluminal angioplasty and/or stenting (CAS)(only recommended in selected patients)	Output
180	Secondary prevention	% of stroke survivors who are examined to detect atrial fibrillation	Output

10.5. Final selection of indicators for the evaluation of rehabilitation pathways and resources: round 4

#	Type	Indicator description	Territorial coverage	Type of output	Comments
1	Indicator	Does the patient receive rehabilitation during the acute phase (before discharge)?	Hospital level	Yes/no	
2	Indicator	Whether a coordinated plan for rehabilitation is established between the different health professionals who treat the patient	Regional level	yes/no	Sanitary areas in some cases
3	Indicator	Patients are assessed for rehabilitation needs within the first three days after admission and provided with rehabilitation by multidisciplinary staff on the basis of need	hospital level	yes/no	
4	Indicator	Whether patients are assessed 3 months after starting rehabilitation therapy	hospital level	yes/no	
5	Indicator	Whether patients are assessed 6 months after starting rehabilitation therapy	hospital level	Yes/no	
6	Indicator	Whether National Institutes of Health Stroke Scale (NIHSS) is registered on the database after discharge on M3, M6, M12	Regional level	Yes/no	
7	Indicator	Whether Barthel Index (BI) is registered on the database after discharge on M3, M6, M12	Regional level	yes/no	
8	Indicator	Whether Modified Rankin Scale (mRS) is registered on the database after discharge on M3, M6, M12	Regional level	yes/no	
9	Indicator	Number of stroke rehabilitation units per region/inhabitants in the regions	regional level	#	
10	Indicator	Number of rehabilitation beds available per hospital	regional level	#	
11	Indicator	Whether the hospital counts with referral facilities to improve cognition during stroke rehabilitation	hospital level	yes/no	
12	Indicator	Whether the hospital counts with referral facilities for rehabilitation of swallowing and dysphagia during stroke rehabilitation	hospital level	yes/no	
13	Indicator	Whether the hospital counts with referral facilities to improve communication and aphasia during stroke rehabilitation	hospital level	yes/no	
14	Indicator	Whether the hospital counts with referral facilities to assist patients in reintegrating into the community	hospital level	yes/no	
15	Indicator	Whether the hospital counts with referral facilities for caregiver assessment and training	hospital level	yes/no	
16	Indicator	Whether the regions' Stroke Rehabilitation Program counts with an interdisciplinary team of professionals experienced in and dedicated to the care of the patient with stroke	hospital level	yes/no	
17	Indicator	Number of medical doctors specialising in rehabilitation in the hospital whose main focus are stroke patients/inhabitant in the region?	Regional level	#	

18	Indicator	Is the whole rehabilitation pathway of the patient integrated in the database	Regional level	Yes/no	The availability of a database that integrates the full rehabilitation process (not only in hospital, but also on outpatient centres, etc.) is key to be able to retrieve the sub-indicators (19-34).
19	Sub-indicator	% of stroke survivors who return home and do not follow outpatient rehabilitation	Hospital level	%	
20	Sub-indicator	% of stroke survivors who return home and follow outpatient rehabilitation	Hospital level	%	
21	Sub-indicator	% of stroke survivors who follow a rehabilitation program at an inpatient rehabilitation facility	Hospital level	%	
22	Sub-indicator	% of stroke survivors who are referred to a long-term care facility	Hospital level	%	
23	Sub-indicator	Average time between discharge or referral and when the rehabilitation service starts treating the patient	Hospital level	Time figure	
24	Sub-indicator	Average time of the rehabilitation treatment/services number of appointments with rehabilitation professionals	hospital level	Time figure	
25	Sub-indicator	% of patients with swallowing impairments at the moment of discharge	hospital level	%	
26	Sub-indicator	% of patients with cognitive impairments at the moment of discharge	hospital level	%	
27	Sub-indicator	% of patients who were employed before the stroke and that did not return to work one year after stroke	regional level	%	
28	Sub-indicator	% of patients who follow occupational therapy	hospital level	%	
29	Sub-indicator	Whether patients use telemedicine service/tele-rehabilitation	hospital level	yes/no	
30	Sub-indicator	Number of physical therapists in the region/number of patients	Regional level	#	
31	Sub-indicator	Number of occupational therapists in the region/number of patients	Regional level	#	
32	Sub-indicator	Number of speech and language therapists in the region/number of patients	Regional level	#	
33	Sub-indicator	Number of social workers in the region/number of patients	Regional level	#	
34	Sub-indicator	Number of nurses in the region/number of patients	Regional level	#	

10.6. Final selection of indicators for the evaluation of secondary prevention pathways and resources: round 4

#	Type	Indicator description	Territorial coverage	Type of output	Comments
1	Indicator	Whether regions have set a plan and targets for secondary prevention	Regional level	Yes/no	
2	Indicator	Is the whole secondary prevention pathway of the patient integrated in the database	Regional level	yes/no	The availability of a database that integrates the full secondary prevention process (not only in hospital, but also on outpatient centres, etc.) is key to be able to retrieve the sub-indicators (3-13).
3	Sub-indicator	Whether discharge reports are shared with primary care	hospital level	yes/no	
4	Sub-indicator	Whether stroke plan includes secondary prevention advice/educational intervention	hospital level	yes/no	
5	Sub-indicator	Number of stroke survivors who follow a medical treatment to prevent a second stroke	hospital level	#	
6	Sub-indicator	Number of stroke survivors discharged with a prescription of an antiplatelet agent / antiaggregant	hospital level	#	
7	Sub-indicator	Number of stroke survivors who are offered oral anticoagulation	hospital level	#	
8	Sub-indicator	Number of stroke survivors discharged with a blood pressure lowering therapy	hospital level	#	
9	Sub-indicator	Number of stroke survivors who are prescribed anti-hypertensives for secondary prevention	hospital level	#	
10	Sub-indicator	Number of stroke survivors who follow Statin therapy (lipid modification therapy)	hospital level	#	
11	Sub-indicator	Number of stroke survivors who are examined to detect atrial fibrillation	hospital level	#	
12	Sub-indicator	Whether patients with 70–99% stenosis have Carotid endarterectomy (CEA)	hospital level	yes/no	
13	Sub-indicator	Whether patients have carotid percutaneous transluminal angioplasty and/or stenting (CAS)	hospital level	yes/no	

