

Brussels, 13 November 2018

COST 099/18

## DECISION

---

Subject: **Memorandum of Understanding for the implementation of the COST Action “Implementation Research Network in Stroke Care Quality - IRENE” (IRENE) CA18118**

---

The COST Member Countries and/or the COST Cooperating State will find attached the Memorandum of Understanding for the COST Action Implementation Research Network in Stroke Care Quality - IRENE approved by the Committee of Senior Officials through written procedure on 13 November 2018.

---



## MEMORANDUM OF UNDERSTANDING

For the implementation of a COST Action designated as

### **COST Action CA18118 IMPLEMENTATION RESEARCH NETWORK IN STROKE CARE QUALITY - IRENE (IRENE)**

The COST Member Countries and/or the COST Cooperating State, accepting the present Memorandum of Understanding (MoU) wish to undertake joint activities of mutual interest and declare their common intention to participate in the COST Action (the Action), referred to above and described in the Technical Annex of this MoU.

The Action will be carried out in accordance with the set of COST Implementation Rules approved by the Committee of Senior Officials (CSO), or any new document amending or replacing them:

- a. "Rules for Participation in and Implementation of COST Activities" (COST 132/14 REV2);
- b. "COST Action Proposal Submission, Evaluation, Selection and Approval" (COST 133/14 REV);
- c. "COST Action Management, Monitoring and Final Assessment" (COST 134/14 REV2);
- d. "COST International Cooperation and Specific Organisations Participation" (COST 135/14 REV).

The **main aim and objective** of the Action is to **implement existing treatments in acute stroke more effectively, which will be achieved through development of an implementation framework, and through testing of implementation effectiveness**. The **IRENE Action is designed to provide a platform to collect and share data for countries, which are at varying stages of implementing modern stroke treatments**. This will be achieved through the specific objectives detailed in the Technical Annex.

The economic dimension of the activities carried out under the Action has been estimated, on the basis of information available during the planning of the Action, at EUR 60 million in 2018.

The MoU will enter into force once at least seven (7) COST Member Countries and/or COST Cooperating State have accepted it, and the corresponding Management Committee Members have been appointed, as described in the CSO Decision COST 134/14 REV2.

The COST **Action will start from the date of the first Management Committee meeting** and shall be implemented for a period of **four (4) years**, unless an extension is approved by the CSO following the procedure described in the CSO Decision COST 134/14 REV2.

---

**OVERVIEW**

**Summary**

Stroke is second leading cause of death and the leading cause of life-long disability worldwide. Effective methods for stroke treatment exist; however the implementation of these treatment methods is very low and therefore constitutes the most challenging problem in current stroke management. In many countries and many hospitals, patients do not receive effective treatment because implementation framework is missing.

The interdisciplinary consortium aims to understand contextual factors, develop implementation framework and test its effectiveness. Effective implementation framework will have break-through impact on public health. Research results of this Action can save tens of thousands of lives, eliminate hundreds of thousands of disabilities after stroke, and save millions of euros in healthcare costs. Networking is essential part of such large-scale implementation project.

The **core activity** of the IRENE COST Action is **to improve public health through**; a) **Networking** which will facilitate understanding of contextual factors, in between-country differences in innovation-values fit and implementation climate, b) a **quality registry** that will provide a cohesive picture of the implementation of stroke treatments; followed by c) the **dissemination of results** to the main stakeholders (e.g. hospitals and Ministries of Health) to implement new mechanisms to improve the outcome of stroke.

The IRENE COST Action will be conducted mainly in European countries where the burden of stroke is higher (Action focus countries) while quality of stroke care is lower and resources for healthcare are less developed compared to other European countries. IRENE COST Action will alleviate disparities in stroke care and improve outcomes after stroke.

<p><b>Areas of Expertise Relevant for the Action</b></p> <ul style="list-style-type: none"> <li>• Health Sciences: Health services, health care research</li> <li>• Clinical medicine: Clinical neurology</li> <li>• Health Sciences: Databases, data mining, data curation, computational modelling</li> </ul>	<p><b>Keywords</b></p> <ul style="list-style-type: none"> <li>• Stroke Care Quality</li> <li>• Implementation Research</li> <li>• Health Care Registry</li> <li>• Implementation Strategy</li> </ul>
---	--

**Specific Objectives**

To achieve the main objective described in this MoU, the following specific objectives shall be accomplished:

**Research Coordination**

- **To develop the implementation strategy for stroke care quality measurement** in focus countries and testing its feasibility through the IRENE COST Action lifetime.
- **To provide an evidence on stroke care quality** in all involved inclusiveness target countries through coordination of data collection and provision of web-based registry.

**Capacity Building**

- **To create a solid international network of stroke professionals** involving representatives and relevant stakeholders from as much as possible COST member countries and NNCs and develop communication channels to make the network functional and effective.
- **To interconnect IRENE COST Action network with international bodies and initiatives** to achieve synergy effects of individual efforts and **develop cooperation plan with at least 4 international initiatives** or organisations.
- **To develop tools for increasing professional skills and knowledge of IRENE COST and sharing best practice between COST members** during the IRENE COST Action period.

# 1. S&T EXCELLENCE

## 1.1. CHALLENGE

### 1.1.1. DESCRIPTION OF THE CHALLENGE (MAIN AIM)

Approximately 17 million strokes (equivalents of stroke are ictus, cerebrovascular accidents, cerebrovascular diseases) occur annually in the world. Stroke is the second cause of death globally after coronary heart disease and the first cause of long-term disability in adults. Evidence for how to save lives and improve outcomes for stroke patients does however exist, and includes stroke unit treatment, thrombolysis, mechanical thrombectomy, hemicraniectomy, early secondary prevention, and many others.

The uptake of above described well-researched and proven interventions is very slow: e.g. only 5% of stroke patients receive effective treatment such as thrombolysis and in many Eastern European countries it is much less. Basically, the large number and even majority of stroke victims in Eastern European countries does not have access to the effective stroke therapies representing the biggest challenge in treatment of the one most devastating diseases such as stroke.

The major challenge in stroke treatment is therefore not to discover new treatments, but to implement existing treatments more effectively. This requires the development of an implementation framework, and the ability to test implementation effectiveness. Meeting these two goals is the aim of this Action, the Implementation REsearch NEtwork for Stroke Care Quality (IRENE).

In 2001 The Institute of Medicine (USA) published the “Crossing the Quality Chasm: A New Health System for the 21st Century” Report. In this report the Institute stated, that healthcare providers should measure and monitor the quality of the care they offer. Monitoring healthcare quality allows focusing on specific aims for improvement and achieving thus improvement. No improvement is possible without monitoring and measuring at first. This report has been partly adopted by the World Health Organization (2006) and by healthcare providers around the world. After 17 years of publishing this Report the health care, resp. stroke care quality is still not measured in many countries at all. The IRENE COST Action finds this challenge very serious as not following this recommendation has negative impact on patient’s outcomes.

Currently existing registries are typically limited to local or national utilization, and so do not allow for international comparison of common quality of care metrics. The few existing quality registries that do allow for international participation are poorly optimized for low and middle-income countries, both in terms of the targeted metrics collected, as well as the human and infrastructure resources required for participation.

IRENE COST Action is designed to provide a platform to collect and share data for countries, which are at varying stages of implementing modern stroke treatment programmes. The focus is on identifying and monitoring the key quality indicators for effective implementation based on recognized international standards, the quality indicators are shown in Fig. 1 and Fig. 2. IRENE COST Action is more than just a platform for data collection however, as it provides a network of collaborating

hospitals and countries which is essential for the exchange of expertise, the development of public policy, and the sharing of effective implementation strategies.

### 1.1.2. RELEVANCE AND TIMELINESS

An implementation framework to improve uptake of evidence-based treatment in stroke is missing in most of the world, although implementation research has potentially the biggest promise in terms of benefit for patients. Because our study will test implementation effectiveness, it is highly relevant. This area of research is highly relevant, especially now, as many advances in stroke treatment, such as mechanical thrombectomy, are very recent with the first data generated in 2015 or later. New discoveries in stroke treatment will not impact the burden of stroke as long as an implementation framework does not exist.

IRENE COST Action also has high geographical relevance focusing on some specific countries in Europe and Central Asia which are the IRENE COST Action focus countries (hereafter focus countries) for two primary reasons. First, the burden of stroke is higher in Eastern Europe (and developing countries) as compared to Western European countries. Second, disparities in stroke care are much more prominent in Eastern Europe so a quality improvement program will have a larger impact.

Till now many organisations, as the World Health Organization as well as the American Heart Association defined the need for health care quality measuring. This is not done in many countries as neither the platform nor the network for such measurement currently exists. The Action consortium developed a platform, the registry for health care quality measurement and established a network of hospitals, which contributes to and improves this registry continuously. This is the first network of its kind for Central European, Eastern European, and post-soviet Central Asian countries.

The registry platform was developed using metrics published in scientific journals, which are generally recognized by European Stroke Organisation and American Heart Association and most of organisations dealing with stroke care. The variables were adapted to reflect stroke care system in focus countries.

Fig. 1 Screen of the form for data collection – variables – part 1

Basic Information	
Age: <input type="text" value="23"/> * (years)	Sex: <input type="text" value="Male"/> *
Last seen normal	
Date: <input type="text" value="12-Feb-2016"/> * (DD-MMM-YYYY)	Time: <input type="text" value="unknown"/> * (HH:MM)
Admission to the first hospital	
Date: <input type="text" value="12-Feb-2016"/> * (DD-MMM-YYYY)	Time: <input type="text" value="unknown"/> * (HH:MM)
Stroke in the hospital: <input type="checkbox"/> Yes	
Treatment	
Stroke type: <input type="text" value="ischemic"/> *	Level of consciousness on admission: <input type="text" value="drowsy"/> *
NIHSS on admission: <input type="text" value="not performed"/> *	Score: <input type="text"/> *
Head CT/MRI was: <input type="text" value="performed"/> *	Time performed: <input type="text" value="within 1 hour after admission"/> *
Recanalization procedures: <input type="text" value="IV tPA+endovascular treatment"/> *	
IV tPA: <input type="text" value="(select one)"/> *	Door to needle time: <input type="text"/> (minutes)
Admission time: <input type="text"/> (HH:MM)	Bolus given at: <input type="text"/> (HH:MM)
IV tPA: <input type="text" value="bolus time"/>	Door to needle time: <input type="text"/> (minutes)
Admission time: <input type="text" value="12:20"/> (HH:MM)	Bolus given at: <input type="text" value="13:10"/> (HH:MM)

Fig. 2 Screen of the form for data collection – variables – part 2

Atrial fibrillation/flutter: <input checked="" type="checkbox"/> screened <input type="checkbox"/> <input type="checkbox"/> *	Holter-type monitoring for: 24 hours <input type="checkbox"/> <input type="checkbox"/> *
Was AFib detected? <input type="checkbox"/> Yes *	<input checked="" type="radio"/> No
<input type="radio"/> N/A	
<b>Hospitalization</b>	
The patient was hospitalized to the Stroke Unit/ICU: <input checked="" type="checkbox"/> Yes *	Carotid arteries imaging within 7 days after admission to the hospital: <input type="checkbox"/> not performed *
	<input checked="" type="radio"/> performed
The patient was assessed for rehabilitation needs by PT/OT/S< within the first 72 hours after the admission to the hospital: <input checked="" type="radio"/> Yes *	Was hemicraniectomy performed? <input checked="" type="radio"/> Yes *
<input type="radio"/> No	<input type="radio"/> No
	<input type="radio"/> N/A
<b>Discharge</b>	
Which antithrombotic at discharge? anticoagulants <input type="checkbox"/> <input type="checkbox"/> *	Was the patient discharged on a statin? <input type="checkbox"/> Yes *
	<input checked="" type="radio"/> No
Was the patient prescribed antihypertensive medications before the discharge from the hospital? <input type="checkbox"/> Yes *	If the patient is a current smoker, was he given advice to quit? <input checked="" type="radio"/> Yes *
<input checked="" type="radio"/> No	<input type="radio"/> No
Symptomatic carotid stenosis more than 70%? <input checked="" type="radio"/> Yes *	Was carotid endarterectomy or angioplasty/stenting done within first two weeks after the stroke onset? no, but planned later on <input type="checkbox"/> <input type="checkbox"/> *
<input type="radio"/> No	
Patient able to walk <input checked="" type="radio"/> Yes *	Discharge destination: rehabilitation facility <input type="checkbox"/> <input type="checkbox"/> *
<input type="radio"/> No	

In 2017 the platform was opened for the first official data collection period, with excellent results. There were multiple presentations at international meetings utilizing data based on this. The first data collection period involved approximately 230 hospitals and data from 9 000 patients. It was also a valuable source of feedback regarding collected metrics. The initial questionnaire focused on 23 recognized metrics of stroke care quality related to hospital processes and treatment delivery. During 2017, the questionnaire was refined, adding 3 further variables, as well as 2 additional stroke types, and improved response options for more complex patient pathways. The infrastructure was also enhanced to provide automatic report generation, allowing us to provide site- and national-level descriptive statistics, graphs and customizable presentations on a quarterly basis. This reporting functionality has permitted countries, which previously did not have the resources to synthesize raw performance data into measurable quality indicators to easily generate accurate and meaningful reports. Improvements to the technical platform, as well as the expansion of our network of partner organisations has enabled us to extend the reach of the programme into 42 countries and over 450 hospitals. The results for the 2018 data collection period included data from more 20 000 patients, for a total of 35 000 enrolled patients.

Based on that successful testing of the platform and of the feasibility of data collection coordination the IRENE COST Action can be implemented in IRENE COST Action focused countries.

## 1.2. OBJECTIVES

The goal of IRENE COST Action is to provide measurement of quality of stroke care in countries, where it has never been done before. To achieve such goal, both capacity and research coordination is required-see below. Also, measurement of quality of stroke care is one of the critical and initial steps to decrease disparities in stroke care and improve outcome by increasing uptake of evidence based stroke treatments.

### 1.2.1. RESEARCH COORDINATION OBJECTIVES

1. To develop the implementation strategy for stroke care quality measurement in focus countries and testing its feasibility throughout the IRENE COST Action lifetime.
2. To provide an evidence on stroke care quality in all involved inclusiveness target countries through coordination of data collection and provision of web-based registry.

### 1.2.2. CAPACITY-BUILDING OBJECTIVES

1. To create a solid international network of stroke professionals involving representatives and relevant stakeholders from as many as possible COST member countries and NNCs and develop communication channels to make the network functional and effective.
2. To interconnect IRENE COST Action network with international bodies and initiatives to achieve synergy effects of individual efforts and develop cooperation plan with at least 4 international initiatives or organisations.
3. To develop tools for increasing professional skills and knowledge of IRENE COST and sharing best practice between COST members during the IRENE COST Action period.

## 1.3. PROGRESS BEYOND THE STATE-OF-THE-ART AND INNOVATION POTENTIAL

### 1.3.1. DESCRIPTION OF THE STATE-OF-THE-ART

Currently, in the vast majority of European countries, implementation of evidence-based stroke treatment is low and there is no system to monitor the quality of stroke care. Therefore, health care systems are frequently not efficient, safe, person-centred, or responsive due to low uptake of proven interventions as described above. The implementation conceptual framework was partially developed in only one country. Similar approach has been proven to be successful in improving stroke services in other countries (USA, UK, Australia, China).

### 1.3.2. PROGRESS BEYOND THE STATE-OF-THE-ART

IRENE COST Action will provide a completely new and unique system because it will pioneer a large-scale stroke care quality improvement project that will test the implementation effectiveness. This system will improve understanding of contextual factors; it will lead to improved uptake of proven interventions; and it will decrease disparities in stroke care in low and middle-income countries in Eastern Europe. This developed implementation conceptual framework could then be used elsewhere and have a large health-improvement effect, in terms of both geographical area and medical field.

### 1.3.3. INNOVATION IN TACKLING THE CHALLENGE

Innovation is threefold. Firstly, the implementation effectiveness of stroke care at large scale in the focus countries has not been tested before. Secondly, innovative IT infrastructure is being developed to decrease implementation challenges respecting technological limitations of the Eastern Europe. Third, the innovation in management will be used. For implementing its goals the Action will use the dyad management, which was defined and used in Mayo Clinic, USA and is based on “pairing” of clinical expert and manager and both participates on tasks together. This leads to high effectiveness due to combining both clinical and administrative-management knowledge. The IRENE COST Action will try to use both clinical expert and manager for coordinating the Action goals in all IRENE COST Action focused countries. The clinical expert and manager will work together on tasks defined for working groups.

In countries of Eastern Europe and Central Asia, there is a higher incidence of stroke than in Western countries. Thus, most of strokes occur in Eastern than in Western Europe. The principles can be transferred from other countries but the specific innovative strategy and tailored plan need to be

developed for these countries. Such implementation strategy never existed before. Combination of providing leadership, providing registry platform, providing feedbacks on data and creating tailored implementation strategies within network is comprehensive approach, that is also innovated in the field of stroke care in IRENE COST Action focus countries.

Further, developing new innovative treatments in stroke will not lead to improvement of patients' outcome, as far as the treatment is not implemented into health care system. No more lives will be saved by innovations, if nobody implements those innovations. Without implementation strategies, the investments into the treatment innovation could be lost.

## **1.4. ADDED VALUE OF NETWORKING**

### **1.4.1. IN RELATION TO THE CHALLENGE**

In general, networking is the essence of any international quality improvement program. Specific added value is fourfold:

- a) Evaluation of implementation process in different countries will facilitate understanding of potential internal and external contextual factors that contribute to the implementation process.
- b) Networking will allow for the identification of between-country differences in innovation-values fit and implementation climate.
- c) Networking will allow identification of implementation champions and create strong motivation for other countries.
- d) Implementation framework developed in one country can be modified and used in the other countries facilitating the implementation process.
- e) The networking of clinical experts and managers will enable to use innovative "dyad management" to maximize effect of our effort.
- f) Networking will enable to learn from each other and to organize tailored short-term scientific missions based of good knowledge of each country situation.

### **1.4.2. IN RELATION TO EXISTING EFFORTS AT EUROPEAN AND/OR INTERNATIONAL LEVEL**

The Action will test in real life theoretical concepts of the World Stroke Organization, which were outlined in the Roadmap for delivering Quality Stroke Care (<http://www.world-stroke.org/>). Further, the Action will test the implementation effectiveness in different parts of the world after the only large-scale quality improvement program initiated in the USA as "Get with the Guidelines" program (<http://goo.gl/eJLAFI>). The US programme is very inspiring, but several aspects limits the adaptability, e.g. the platform and data feed back is needed to be paid by users/hospitals.

Recently, in March 2018, the European Stroke Organisation released the Stroke Action Plan 2018 – 2030 which defines priorities. The implementation needs to be done by professional community. The IRENE COST Action helps to implement this Action Plan.

Not only stroke, but also implementation methodology in different fields is accepted. The proposers of Network follows the Society for implementation Research Collaboration and European Implementation Collaborative and uses opportunities to learn at the international meetings in implementation science (UK, 2018) to draw from all available approaches which could be used.

All these available strategies are taken into consideration of the Proposers and will be followed as far as they are implementable for the Eastern European and central Asian environment.

## **2. IMPACT**

### **2.1. EXPECTED IMPACT**

#### **2.1.1. SHORT-TERM AND LONG-TERM SCIENTIFIC, TECHNOLOGICAL, AND/OR SOCIOECONOMIC IMPACTS**

- a) Short-term and long-term scientific impacts:



IRENE COST Action will develop an implementation framework to improve understanding of contextual factors that contribute to the implementation process. Such knowledge is essential to diminish and even remove inequalities: currently hospitals and countries provide very different levels of stroke care. The data will provide comparisons of hospitals and country performances. Based on such data, country and hospital-specific interventions will be applied to remove inequalities in the provision of the most important multidisciplinary evidence-based treatment. The effect of the intervention will be easily measurable, because the same performance measures will be collected annually. The Action therefore aims to create a self-perpetuating mechanism working in the following cycle: collection of performance measures → information on performance of health care system → intervention to improve areas of underperformance → new collection of performance measures → new information on performance of health care system → new intervention to improve areas of underperformance and so on. Such a cycle is self-perpetuating because it is to a large extent self-motivating. In the medium and long-term, it will largely improve the functionality and sustainability of health systems. It will also be very reflective of patients needs and will be more effective and safe.

The difference between existing systems and our new medical registry is that the existing registries helped to understand the mechanisms of stroke (e.g. how treatment with thrombolysis influence the outcome of stroke) while IRENE COST Action **will help to understand the processes involved in how stroke is treated within health systems** (e.g. how many patients are treated with thrombolysis in each hospital and country). Such information is important for physicians, hospitals and especially policy-makers and politicians so they can facilitate the transfer of evidence-based treatment (e.g. thrombolysis) into clinical practice. Such transfer into clinical practice may include changing physicians attitude, hospital policies, guidelines, reimbursements and other insurance policies, regulatory documents by Ministry of Health etc.

b) Technological impact:

The development of the quality care database, which is one of the objectives of this Action, will provide a shared, customizable, and easily extensible tool that can be contributed to, and be utilized by, participating members throughout Europe and around the world. The platform will provide an easy to use, shared repository to encourage collaboration between clinicians and researchers both within a participating country, and between all countries. The platform also provides an accessible source of real data to demonstrate both the need for new treatment initiatives, and the effectiveness of those initiatives to policy makers. The ability to provide a unified technological platform to measure stroke care quality is essential to driving change in stroke research and treatment, this Action will provide this and make it available to everyone that is interested in participating.

c) Socio-economic impacts:

IRENE COST Action thus provides opportunity that every citizen, who would suffer from a stroke, can benefit.

**Impact on health** – The primary impact of IRENE COST Action will be on health care. The Action will collect multidisciplinary measures of implementation of the most important evidence-based stroke treatments. The Action aims at improving at least half of them by 30%. Such improvement will save about 10% more stroke patients from death or disability. This should constitute about 100 thousands patients saved by IRENE COST Action in Eastern Europe (first and second wave countries) giving the stroke crude incidence around 250/100 000 population. For example, the Action expects that number of patients treated with thrombolysis will increase from current below 1% to 5%, which would be average in the western world now. This should hugely improve outcomes for around 2000 patients more. The Action will also increase the number of patients treated in stroke units, the number of patients receiving anticoagulation therapy, etc., which will save another thousands of patients during the length of the IRENE COST Action. In summary, strokes are diseases where quality of health care system is tremendously important for the outcome. IRENE COST Action will scale up implementation of evidence based stroke treatment and even a small change if applied in a large scale, will have a large impact on society.

**Social impact** – this Action will have a significant impact on decreasing the negative social effects of stroke. Stroke impacts social life through different mechanisms such as: a) stroke survivors suffer from social isolation because of their disability, b) stroke survivors suffer from depression and other changes in their behaviour, c) stroke survivors are frequently taken care of by family members who cannot work although they are at productive age. It has also been proven that family members and other caregivers suffer more frequently from depression. Therefore, improving organisation of stroke care and decreasing number of disabled patients will have many direct and indirect social impacts.

**Economic impact** – this Action will decrease costs of stroke in health care budgets which are currently incurred due to the following mechanisms a) loss of productive people (caused by death of working people or by disabled stroke survivors who lost ability to work), b) increasing of social benefits for stroke survivors, c) costs for follow-up care and for longer hospitalization of treated patients. On an individual level the loss of income and costs for care giving, and for compensating of disabilities are very significant factors affecting the economic situation of stroke survivors. In the EU27 countries, the annual economic cost of stroke is an estimated €27 billion: €18.5 billion (68.5%) for direct costs and €8.5 billion (31.5%) for indirect costs. An additional €11.1 billion is calculated for the value of informal care. As the number of stroke events in Europe is projected to rise from 1.1 million in 2000 to 1.5 million per year by 2025, the costs will also increase. The Action is expected to have a significant impact on decreasing costs connected to stroke care, namely of part of direct costs by decreasing hospital stay and eliminating need for follow-up care and indirect costs involving such items as lost of productivity and loss of income by decreasing number of disabled patients after stroke.

This Action **brings new knowledge** a) for the Health care systems of involved countries (with potential to bring this knowledge to any country that will use the registry for self-evaluation, b) for participants who will get new knowledge in implementation research, health care assessment, clinical procedures, clinical logistics, software development and project management. The knowledge of participants will bring new data about the state of the health care in involved countries and will be used for its improvement.

**Impact on growth of private companies** – This Action will provide summary data (not individual, not personalized) to biomedical companies about the state of the health care quality of each country on the country level and also at the hospital level. E.g. this Action will identify if certain drugs or devices are used and in what volume. Therefore, IRENE COST Action can identify new markets stimulating growth of private companies. The biggest biotechnologies companies are already interested in this Action and are willing to help it to succeed because it opens new market opportunities.

**Impact on global market** – 1) The penetration of pharmaceutical and medical device companies to new markets will strengthen economies of involved low- and middle-income countries. Opening business subsidiaries of the foreign companies will create new job positions. Potentially, part of production can be moved to these countries. The higher competition will lead to increasing level of local business. 2) This Action will increase knowledge of clinical and implementation research in involved countries. It will lead to an increase in their performance in research and innovation which can improve the economic situation of the country.

## 2.2. MEASURES TO MAXIMISE IMPACT

### 2.2.1. PLAN FOR INVOLVING THE MOST RELEVANT STAKEHOLDERS

The plan describing the acquisition and involvement of suitable and relevant stakeholders is included in the dissemination and exploitation plan. See the Table below (Section 2.2.2).

### 2.2.2. DISSEMINATION AND/OR EXPLOITATION PLAN

The draft of the plan for the dissemination and exploitation of the Action's results is shown in Table 1. The table defines:

- Who the Action users are;
- What innovations IRENE COST Action proposes;
- Communication channels available to users/stakeholders;
- How the users can augment Action impact.

Table 1 Dissemination/Exploitation plan targeted at stakeholders

Beneficiary/ Stakeholder	Benefit created by the IRENE COST Action for the stakeholder	Methods through which IRENE COST Action outcomes will be disseminated to the stakeholder	Impact on the IRENE COST Action goals of stakeholder communication interaction

Professional societies	The Action will solidify the role of professional societies through awareness of the level of stroke care, which: a) Will support the improvement of health care. b) Will provide rationales when negotiating with other entities, such as insurance companies.	1) All societies will receive a summary of the results in brochures distributed through their national representatives. 2) Data sets generated by the quality registry will be made available to professional societies for further analysis, within the legal framework afforded by their respective countries. 3) Publication will be available at scientific journals for approaching the professional community.	Professional societies can: 1) Create educational programs tailored to study significant issues identified by the quality registry. 2) Initiate discussion with insurance companies and/or the Ministry of Health based on the information provided in the quality registry. 3) Produce guidelines and other publications to examine difficulties in stroke care.
Hospitals and physicians	There is significant value for hospitals & physicians in knowing whether they comply with current treatment standards. The implementation of a quality registry is a requirement in numerous guidelines, therefore participation will ensure that hospitals are in compliance with guidelines that require a quality assurance.	Hospitals will receive feedback on their results through online channels. Hospitals will be able to compare their measured quality of stroke care with other sites within their own country, as well as around the world. Disclosure of information is possible only within data protection laws applicable to each country.	When hospitals and physicians are aware of the quality of health care that they provide, and how they compare to others, it usually creates a strong motivation to improve. Therefore, feedback is one of the essential mechanisms supporting the goal of the Action, i.e. improving stroke care.
Ministries of Health	The Action will allow for cost-effective strategic planning and educated decisions that will be conducive to savings due to improved stroke care in their country.	Our consortium and/or professional societies will inform Ministries of Health in participating countries about the Action evolution and its outcomes. Brochures / yearly reports with country specific outcomes and targeted recommendations will also be disseminated.	1) Regulations for stroke care organisation, physician education, stroke unit equipment, staff requirements, 2) Funding provision from the state budget and/or EU, 3) Negotiation with health insurance companies, 4) Creation / support of public awareness campaigns.
Health Insurance Companies	Insurance companies will have information pertaining to the suboptimal use of effective and budget-conscious treatments, thereby mitigating potential financial loss in health care and social systems.	Through 1) Regulation authorities (usually the Ministry of Health) and 2) professional societies will write guidelines for hospitals and draft regulations that will be approved and issued by the Ministry of Health.	Tailoring the reimbursement policy to promote cost-effective treatments will dramatically improve stroke care. E.g. motivating healthcare providers to admit stroke patients to stroke units will increase stroke unit admissions.
Supranational organisations (WHO, WSO, AHA/ASA, other international initiatives)	Will fill strategies defined by these organisations, enables these organisations implement their plans in target countries of IRENE COST Action	Through personal contacts and as the proposers belong to recognized experts, the organisations will be directly addressed, the personal meetings will be organized. Brochures with stroke care quality	Providing credibility to the IRENE COST Action, approaching national governments, strengthening the impacts of the IRENE COST Action as the cooperation can have a synergy effect

		reports will be presented.	through joining effort
European Commission	This Action aims at minimizing disparities in stroke care amongst EU member countries.	Information provided through yearly brochures.	1) Can provide future funding for stroke care improvement. 2) Can make recommendations to EU countries regarding stroke care policies.
Patients (also represented by patient organisations)	1) Enhancing the quality of stroke care. 2) The best and most accessible treatment for stroke should be covered by health insurance.	Information provided through yearly brochures.	Patient organisations will participate as key players in discussions between professional societies and Ministries of Health, as well as other authorities.
Public	1) Increase public awareness and knowledge of stroke. 2) Awareness that stroke care is/will be covered by health insurance, which is especially important in countries where patients must pay for stroke treatment.	A PR (public relations) plan will include: 1) Press conferences or press releases in each country, 2) Public campaigns will organized twice a year (World Stroke Days), 3) Action members will conduct campaigns focused on increasing stroke awareness in their countries (complimentary activities outside of this Action's scope).	The type of stroke care that can be provided to a patient is highly dependent on the time of the patient's arrival to the hospital. If the patient arrives late, no treatment is efficient and if they survive they will have a permanent brain deficit. If the public 1) recognizes stroke symptoms and 2) knows how to respond, treatment may be provided to the patient in time.
Industry companies marketing drugs or devices for stroke care	An understanding of the healthcare level in specific countries contributes to identifying / penetrating new markets.	1) The industry have a vested interest in this type of projects, and will generally offer support for similar initiatives. 2) Via conferences and publications which are monitored by companies.	1) Investment into cost-effective drug- and device-discovery could improve stroke care. 2) Industry is an important source of funding for this type of initiatives, as they have dedicated research support funds. This contributes to a rapid improvement in health care.
All groups	Social media channels will be used to approach all the target groups.		

#### Management of IPR

This Action does not develop a new product with the potential of licensing. All tools developed within this Action will be accessible for all relevant users. Data are owned by the hospitals, which provide it. The burden of consent for using the data for the research purposes outlined in this Action lies with the hospital providing the data, following common best practices adopted by most health registries.

The Action will collect a lot of data from different countries with different infrastructures and health care systems. This data will be interesting for so many people with different scientific perspectives, so that data available based on the request for scientific usage of the data. Special care will be additionally given to possibility to support the open data initiatives.

## 2.3. POTENTIAL FOR INNOVATION VERSUS RISK LEVEL

### 2.3.1. POTENTIAL FOR SCIENTIFIC, TECHNOLOGICAL AND/OR SOCIOECONOMIC INNOVATION BREAKTHROUGHS

In the first stage, this Action will improve understanding of contextual factors that influence the potential of proven interventions to become a routine part of health care. Acquiring this knowledge is essential to improving stroke care and carries no risk. Therefore, this Action has an excellent risk-return ratio. The second stage, encompassing the development of the implementation framework, depends on a large set of contextual factors, many of them not controllable by researchers (a situation typical in implementation research). The second stage can have a significant socio-economic impact, but it inherently carries some risk. Therefore, this Action has the potential for a maximal return with minimal risk in the first stage. For the second stage, although the risk is higher (developing an implementation framework), the potential return is a greatly increased benefit to patients, as well as advances in stroke treatment. Additionally, the Main Proposer is experienced in the development of implementation frameworks, and has had breakthroughs with socio-economic impact; this diminishes the risk of this Action.

As the network of proposers tested the platform and the feasibility of this concept, many potential risks are not relevant any more, as the poor entry by hospital staff (230 hospitals entered 9.000 patients during one month at the first testing data collection in 2017, 450 hospitals entered 20.000 patients during one month at the second testing data collection in 2018). No problem with limited accessing computers, a paper version was offered, which is then transferred into the electronic record. Based on the knowledge of preferences of the hospital staff, despite some hospitals do not have computers; most of physicians have smart phones, so the app version for data collection could be launched soon.

## 3. IMPLEMENTATION

### 3.1. DESCRIPTION OF THE WORK PLAN

#### 3.1.1. DESCRIPTION OF WORKING GROUPS

There are 4 Working Groups within the IRENE COST Action, which are focused on all aspects of a successful Action implementation. The work groups are supported by the professional expertise of the WG members.

The Working Groups are as follows: WG 1 – Leadership, WG 2 – Country Coordinators, WG 3 – Registry Management, WG 4 – Dissemination

#### **WG 1 – Leadership**

##### Objectives:

- O1.1 Provide scientific leadership
- O1.2 Develop and manage the network, consociate members
- O1.3 Accelerate knowledge exchange in leadership
- O1.4 Establish leadership in stroke care in focus countries

##### Tasks:

- T1.1 Facilitate knowledge exchange in stroke treatment implementation between members of the IRENE COST Action network
- T1.2 Define the scientific framework for implementation strategy
- T1.3 Develop the implementation strategy
- T1.4 Provide methodology support to Country Coordinators
- T1.6 Conduct a survey on level of leadership in stroke in target countries
- T1.7 Provide leadership training to Country Coordinators
- T1.8 Organize Short-Term Scientific Missions for the IRENE COST Action members
  - a) Advanced scientists will visit the focus countries to collect contextual data for developing a host-country tailored implementation strategy.
  - b) Scientists from less developed countries will travel to benchmark countries to learn methodology and apply it in their countries.
  - c) Advanced scientists will test devised implementation strategies in low- and middle-income countries.

##### Milestones:

M = month of delivery

- M1.1 Leadership workshop for Country Coordinators organized (M18)
- M1.2 5 Short-Term Scientific Missions organized (M24)
- M1.3 15 Short-Term Scientific Missions organized (M48)

Deliverables:

- D1.1 Implementation strategy for stroke care measurement for Eastern European and Central Asian countries – methodology (M48)
- D1.2 Survey of level of leadership in stroke care in IRENE COST Action inclusiveness target countries (M12)
- D1.3 Three success stories on national or international leadership as a tool of stroke care measurement strategy implementation (M24)

**WG 2 – IRENE COST Action Members**

Objectives:

- O2.1 Develop a national network for stroke care quality measurement
- O2.2 Involve national stakeholders
- O2.3 Define a National Implementation Strategy

Tasks:

- T2.1 Establish National Working Groups, which involve key opinion leaders in the country. Organize regular meetings of the National Working Groups.
- T2.2 Coordinate data collection in their respective countries
- T2.3 Establish cooperation with professional societies and national governments
- T2.4 Organize Annual Meetings of all IRENE COST Action Members
- T2.5 Share Best Practices across countries
- T2.6 Adapt implementation strategies to country-specific needs and develop a National Action Plan

Milestones:

- M2.1 50% of the participating target countries will establish a National Working Group (M12)
- M2.2 100% of the participating target countries will establish a National Working Group (M24)
- M2.3 All National Working Groups Conference (M36)

Deliverables:

- D2.1 Document of National Work Group establishment in 15 IRENE COST Action inclusiveness target countries incl. list of members (M24)
- D2.2 Tailored National Implementation Strategy and Stroke Care Quality Action Plan in 80% of target countries (M24)

**WG 3 – Registry Management**

Objectives:

- O3.1 From research concept to implementation: description of methodology and technical solution
- O3.2 Platform enhancement focused on meeting diverse country demands
- O3.3 Automated inclusion of data points from existing registries
- O3.4 Appropriate and up-to-date security
- O3.5 Alignment with applicable legal frameworks

Tasks:

- T3.1 Augment and customize the registry platform and the registry presentation website
- T3.2 Provide and implement the methodology for data collection, ensuring adequate technical support
- T3.3 Data analysis and data mining
- T3.4 Generate and disseminate national- and site-level reports, as results of each data collection period
- T3.5 Data Quality Control and Assurance
- T3.6 Create tools focused on aligning disparate data pools
- T3.7 Develop an information management programme focused on data protection and security
- T3.8 Ensure alignment with new legislation, such as General Data Protection regulation (GDPR)

Milestones:

- M3.1 50.000 patients enrolled in the registry (M24)
- M3.2 Annual data collection is done (M6, M18, M30, M42)
- M3.3 Data collection protocol is reviewed and updated yearly (M4, M16, M28, M38)

Deliverables:

- D3.1 Data Dictionary and Data Collection Methodology are developed and circulated (M2)
- D3.2 Set of national- and site-level data reports are provided to countries (M8, M20, M32, M44)
- D3.3 Data Quality Standard developed, approved by key clinicians and disseminated (M3)
- D3.4 Information management system following a recognized quality standard (M12)
- D3.5 GDPR Alignment to Best Practices Statement (M2)

**WG 4 – Dissemination**

Objectives:

- O4.1 Enhance the impact of the IRENE COST Action through: A) The involvement of diverse stakeholders. B) Information activities targeted at stroke professionals and stakeholders in other geographical areas. C) Campaigns to motivate professionals in other medical fields to follow the IRENE COST Action results.
- O4.2 Inform the lay public about stroke risks and stroke care, in order to increase their awareness and potential interest to be involved in the implementation process.

Tasks:

- T4.1 Develop a Communication Strategy & a Dissemination Plan and distribute to all IRENE COST Action members
- T4.2 Develop, maintain and update presentation website and social media
- T4.3 Access the professional community from other geographical areas (focused on low and middle-income countries) and other medical fields through promotion in medical communities, i.e. conferences (the European Stroke Organisation Conference), journals, professional communication platforms etc.
- T4.4 Prepare and annually update brochures with progress and data collection results in each country
- T4.5 Organize public-oriented and patient-oriented activities (including Stroke Days twice a year) based on Dissemination plan

Milestones:

- M4.1 Public dissemination events about stroke, stroke care quality and other opportunities (15. 5. and 29. 10. each year on Stroke Days)

Deliverables:

- D4.1 Communication Strategy & Dissemination Plan (M8)
- D4.2 Website and social media accounts (M6)
- D4.3 Annual summary brochures with results from the registry showing the level of care, benchmarks (M12, M24, M36, M48)
- D4.4 PR articles in journals and newsletters on the Action progress (4 per year – M12, M24, M36, M48)
- D4.5 12 Scientific papers on stroke care quality evidence based on registry data and/or implementation strategy development, testing, or effectiveness in target countries (M48)

**3.1.2. GANTT DIAGRAM**

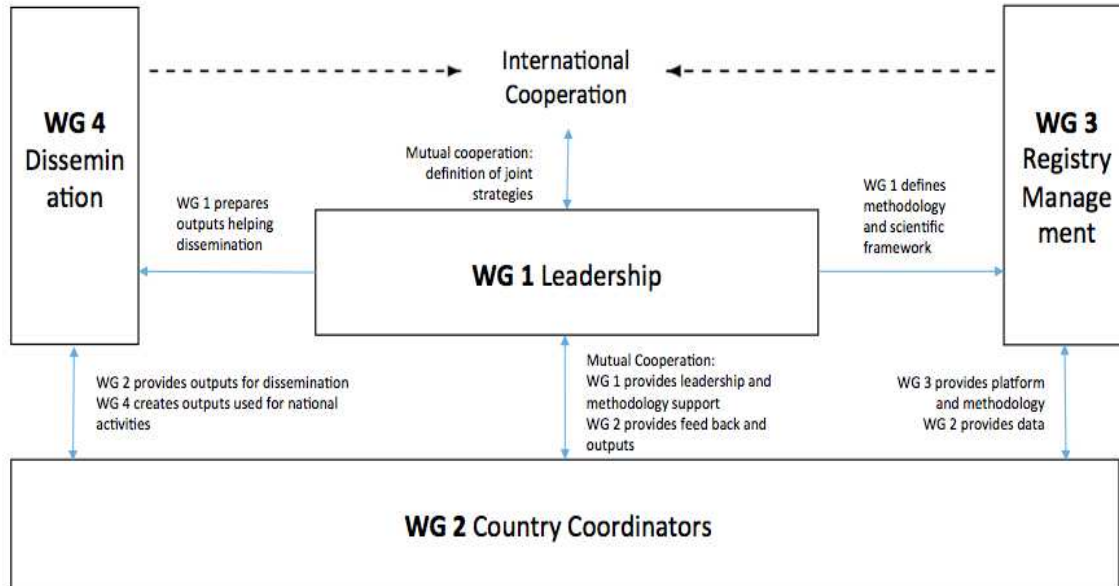
The Action will last for 4 years. All the Working Groups will run continuously and parallel for the whole period of the IRENE COST Action implementation. The more specific timeline is provided by noting a delivery month for deliverables and milestones in each Work Group description (see above).

Tab. 2 Gantt diagram

	M3	M6	M9	M12	M15	M18	M21	M24	M27	M30	M33	M36	M39	M42	M45	M48
WG1																
WG2																
WG3																
WG4																

### 3.1.3. PERT CHART (OPTIONAL)

Figure 3 below is a Pert chart describing relationships between work groups.



### 3.1.4. RISK AND CONTINGENCY PLANS

The following list of risks includes Description of risk (indicate level of likelihood) and Proposed risk-mitigation measures.

1. Centres (=hospitals) not motivated to participate (Low)

**Proposed risk-mitigation measures:** Different strategies to motivate centres to participate such as: a) user friendly interface + technical support provided, b) participation of countries that already collect data + countries that have established leadership for data collection + transparent process of data handling + involvement of centres in data analysis and publications, c) promotion in local and international meetings, d) in some countries, mandatory national registries exist, and already collect stroke care quality indicators, e) the involvement of the Ministry of Health, which can either support centre involvement or can make data collection mandatory. In the past this was designated as a high risk. The registry has been launched for a year and has participation from over 400 hospitals, thus this risk has been almost eliminated. From our current experience, hospitals are regularly requesting data reports to evaluate their quality of care and justify requirements for improvement, further minimizing the risk of low participation.

2. Poor data quality, i.e. not representative (Medium)

**Proposed risk-mitigation measures:** a) Panel of experts will review each country data collection methodology. b) If limited participation from hospitals in a specific country introduce a bias in the data, the Country Representative should support the data collection process, for example by having a dedicated study coordinator manually enter data to the registry. c) Even if data are not representative, the results will still be useful to participating sites as it will allow them to weigh themselves against similar facilities within or outside of their country.

3. The IT platform will be overloaded by data upload (Low)

**Proposed risk-mitigation measures:** The system is extensible and based on a virtualized platform. In the event of system overloading, duplicate systems can be created, and load balanced accordingly. Throughout the pilot phase and the data collection period the system has performed adequately.

4. Partners will leave the Action: The goals of the Action will not be met (Low)



**Proposed risk-mitigation measures:** Partners a) Will be well informed + Will obtain technical support + Are motivated by funding + In an extreme situation, they can be replaced by other partners who meet the same criteria and can join the COST Action. Leaving partners have no influence on the data collection. Data is collected from any country interested to join, not only from centres participating in this Action.

5. Ministry of Health or professional societies will not support goals of the Action (Low)

**Proposed risk-mitigation measures:** a) Members of this consortium are already members of the boards of different professional societies and are opinion leaders in their countries. b) Most national professional societies have already signed the Endorsement of Country Coordinators to support the stroke care improvement implementation programme. c) Professional societies are partners of the Ministry of health for health care policies in most of the participating countries. d) Hospitals may still be motivated to participate even without support/endorsement from Ministry of Health.

6. The enrolment and data utilization will be threatened by a competing registry. (Low)

**Proposed risk-mitigation measures:** There is currently no similar registry (measured by focus, scope, files and impact). The IRENE COST Action can cooperate with other programmes, and share the results from our implementation strategies. Using national registries collecting quality of stroke care metrics is possible, as is the case in 2 of the participating countries.

### 3.2. MANAGEMENT STRUCTURES AND PROCEDURES

The Management Committee (MC) will coordinate and monitor the Action, review all strategic decisions, approve annual reports and annual working plans. The MC members will be elected during the kick-off meeting: Chair, Vice-chair, WG Leaders and Task Coordinators, if relevant for the character of the task. The MC will meet physically at least once a year (when the yearly meeting is organized).

The internal decision-making process of the MC will follow the COST Rules of Procedure. Each Work Group will meet once a year during the yearly meeting and monthly through teleconferences.

### 3.3. NETWORK AS A WHOLE

The Action will involve clinical scientists and other experts in the field of stroke treatment, stroke care, health care delivery, stroke advocacy and strategy management, which guarantees successful tackling of identified challenge and meeting objectives of the IRENE COST Action. The consortium will consist of experts acting on top positions in professional organisations. They can bring the leadership as well as their scientific and strategy expertise into the IRENE COST Action.

Representatives of countries with excellent results in medical data collection and biggest contributors to the global disease-based registers will be also involved and their experience in developing the culture of data collecting, using and results sharing will be used for the IRENE COST Action implementation. The shortest door-to-needle time (from patient's arrival at hospital to the treatment) due to very good logistics, as well as the highest thrombolytic rate – two of the most relevant parameters of the level of stroke care quality have been achieved in the participating countries. This is result of long-term effort, which has built knowledge necessary for meeting goals of the IRENE COST Action. These countries has also developed and successfully implemented the model of effective stroke care logistics.

The network will involve key leaders from countries, which are the IRENE COST Action plans to implement a stroke care improvement initiatives. These key leaders have the authority and competency to organize data collection and networking in their countries, implement strategies and changes in their countries. They are endorsed by national professional organisations to have such mandate.

The Action will involve managers and coordinators skilled in health care management representing quality improvement initiatives in different countries. The cooperation of clinical professionals and managers allows using the “dyad management” (described in Chapter 1.3.3), which enables achieving goals better and faster.

The Action will be supported by participation of the European Stroke Organisation (ESO). ESO enables the IRENE COST Action to use ESO media for dissemination for reach the big mass of stroke professionals and stakeholders, will provide umbrella to this initiative namely in communication

to supranational bodies. The presence of ESO will have a significant impact on delivery the results of the IRENE COST Action.

The IRENE COST Action have a cooperation lasting several years. The Network will be geographically well distributed; gender and age balanced and is opened to the experts interested in stroke care quality measurement and implementation. The IRENE COST Action has a potential to grow geographically in the future and help significantly stroke patients, develop and achieve stroke care improvement.