8- 10 avril 2015

Novotel Paris Tour Eiffel

42ème CONGRÈS ANNUEL de la Société Française de NeuroRadiologie

Président du congrès : Pr Frédéric Ricolfi

Président de la SFNR : Pr Alain Bonafé

Téléradiologie Télé AVC - SFNV

« Organisation du télé AVC, de la téléradiologie et de la place de la neuroradiologie dans la filière AVC »

Etats des lieux, organisation pratique, avantages, inconvénients, perspectives

Région Franche-Comté

Thierry Moulin

CHU Besançon

FACULTY DISCLOSURE

- Past-président de la société Française NeuroVasculaire
- Président Elu de la société Française de Télémédecine
- Coordinateur du Réseau Urgences Neurologiques en Franche-Comté (RUN-FC)
- Membre du comité scientifique des sociétés Olea-medical, Covalia,
- **Aucune autre relation financière** à déclarer

"Evidence-based treatments" in Stroke

Population: 1 million inhabitants (2,400 strokes / year)

End-point: Death or dependence.

Adapted from Hankey & Warlow, 1999

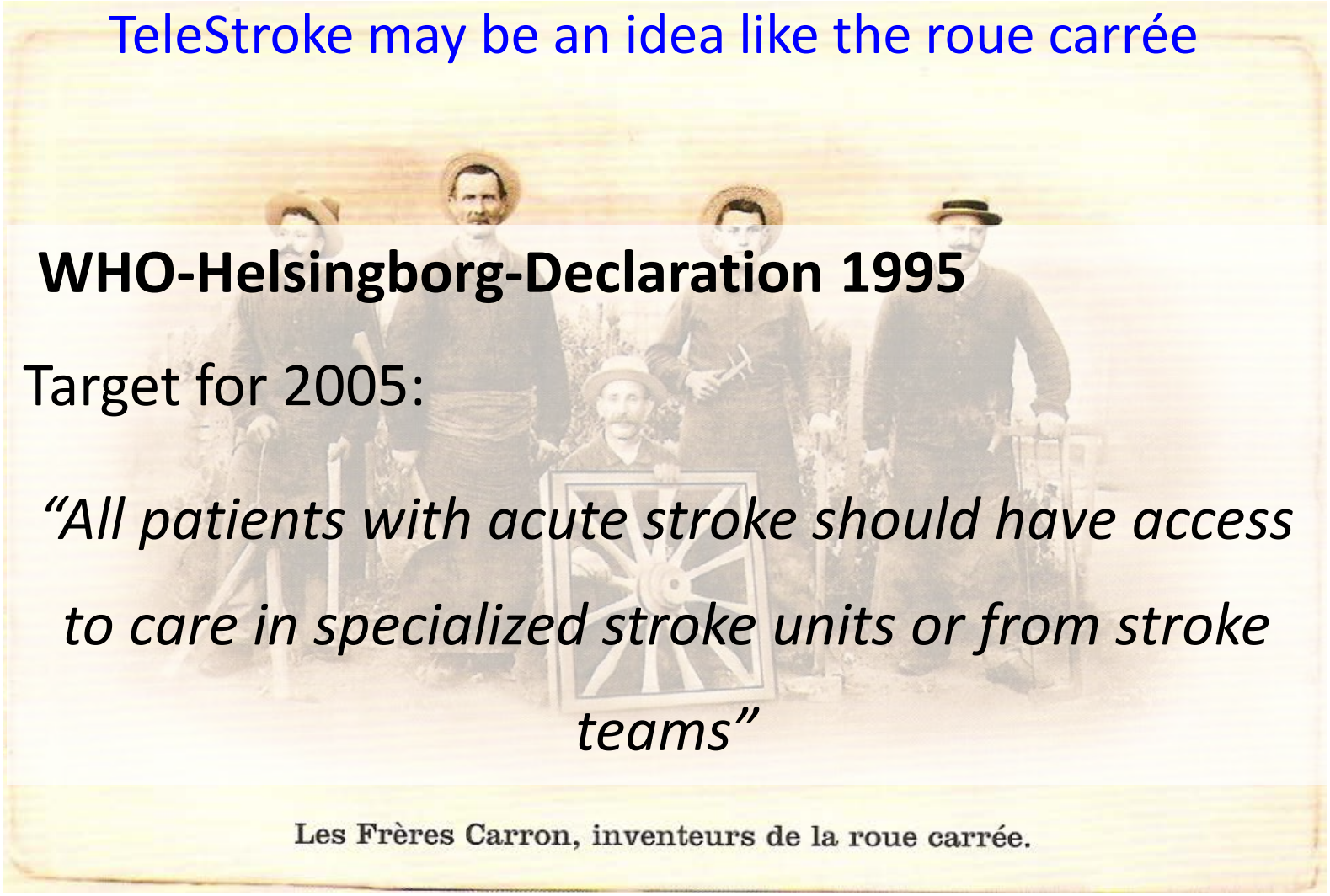
	Events avoided (1,000 pts treated)	NTT to avoid 1 event	Target population (%)	Events avoided
Stroke Unit	50	20	100%	120
Aspirin	12	83	80%	23
rt-PA	142	7	10% ?	34
EVT	220	4	5% ?	28
Craniectomy	500	2	<1% ?	2

TeleStroke may be an idea like the roue carrée

WHO-Helsingborg-Declaration 1995

Target for 2005:

"All patients with acute stroke should have access to care in specialized stroke units or from stroke teams"



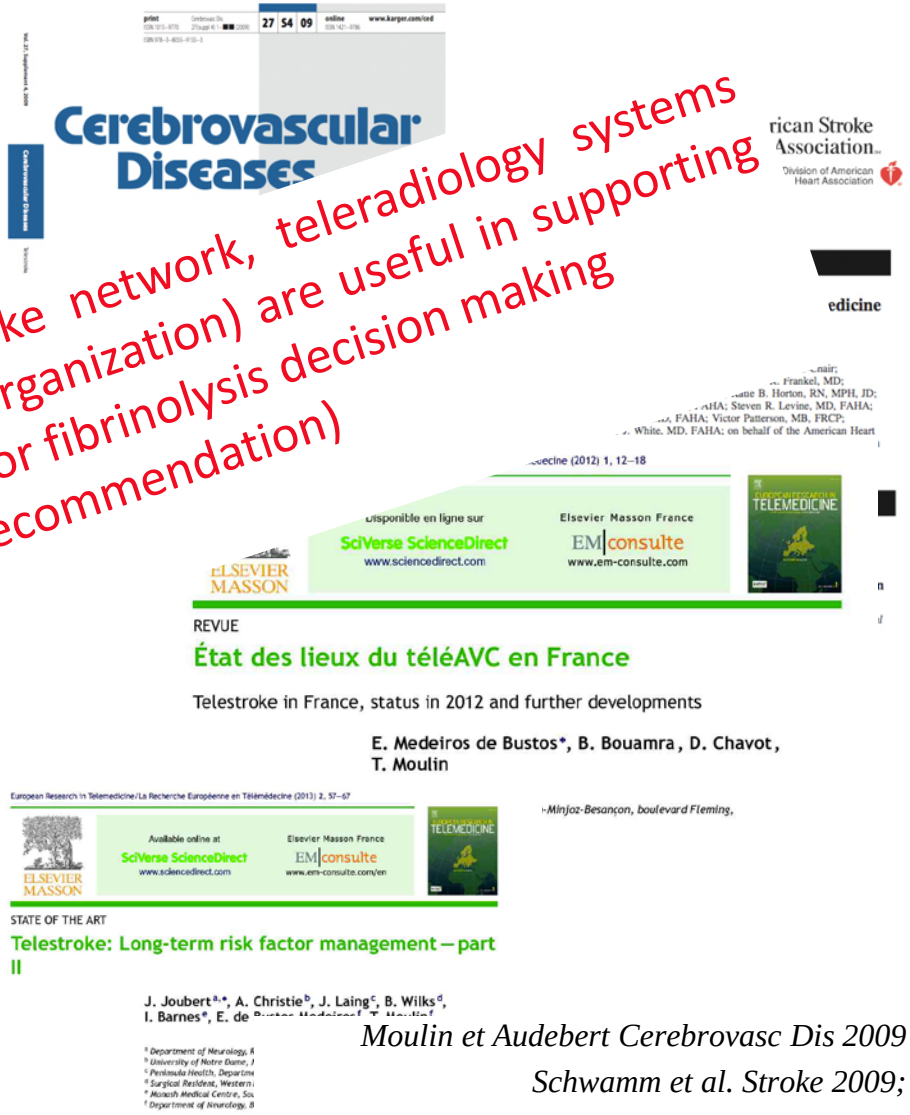
Les Frères Carron, inventeurs de la roue carrée.

TéléAVC : « Guidelines »

Summary of Scientific Results and Recommendations for the Use of Telemedicine in Stroke Care

- Remote neurological examination via high-quality bi-directional videoconferencing allows a reliable and valid assessment of stroke patients. Class I, level A
- Remote expert interpretation of brai… equivalent to on-site evaluatio… transmitted and viewe… olution. Class I …
- A co… view… suffici… stroke … …ss I, level B
- Increase… …olysis have been consisten… …nplementation of tele-medicine … …ion in multiple different net-works. Clas… IIa, level B
- Beyond thrombolysis, telemedicine can improve the quality of acute care and health outcomes for stroke patients when used to support an organized system of Stroke Unit-based care. Class I, level B

When implemented within a telestroke network, teleradiology systems approved by the FDA (or equivalent organization) are useful in supporting rapid imaging interpretation in time for fibrinolysis decision making (Class I; Level of Evidence B). (New recommendation)



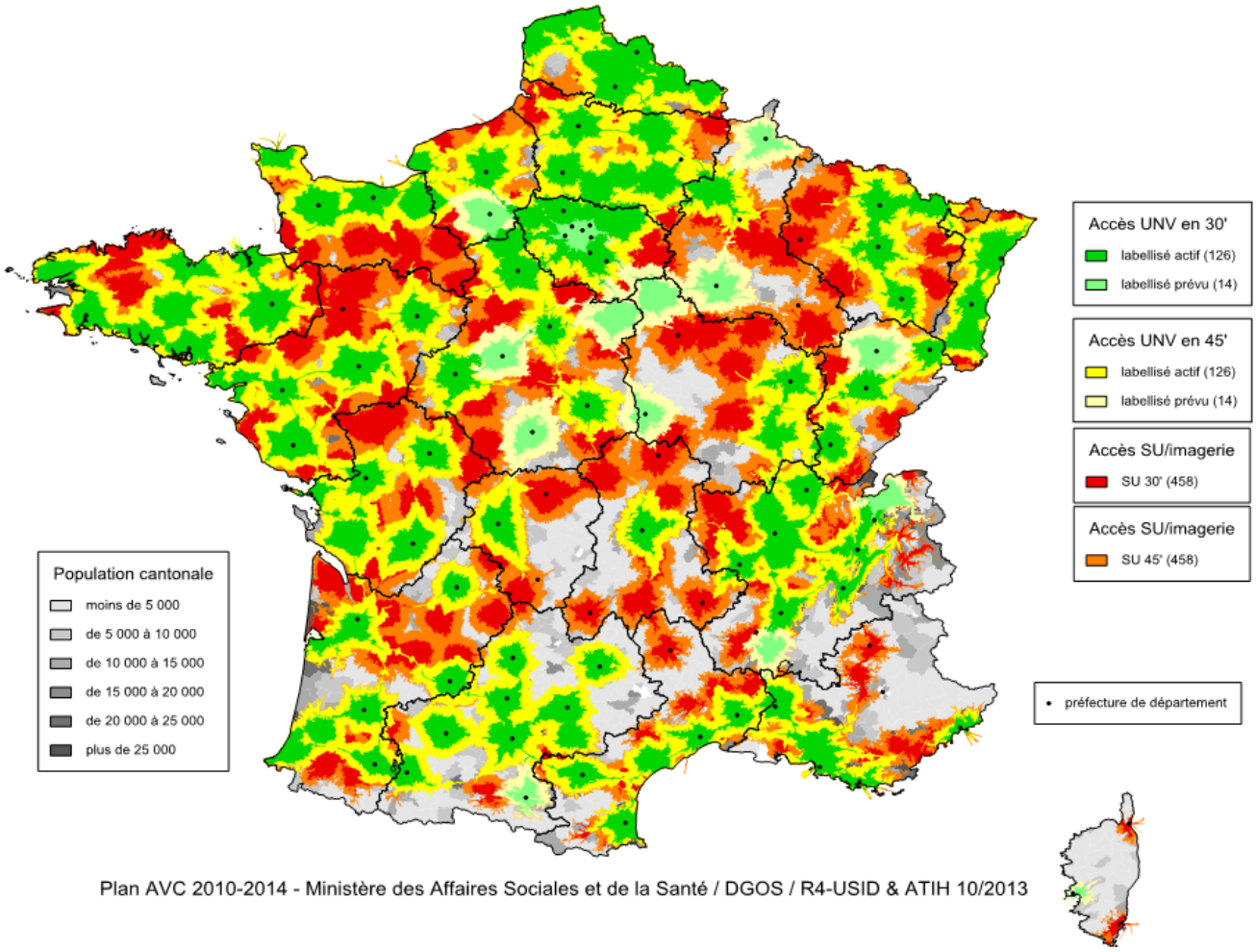
Moulin et Audebert Cerebrovasc Dis 2009

Schwamm et al. Stroke 2009;

Medeiros et al. Eur Res Telemed 2012

Joubert et al. Eur Res Telemed 2013

Temps d'accès aux Unités NeuroVasculaires (UNV) actuelles et prévues et aux Urgences avec plateau d'imagerie



Plan AVC 2010-2014 - Ministère des Affaires Sociales et de la Santé / DGOS / R4-USID & ATIH 10/2013

How Telemedicine works

To improve the quality of stroke care and to rationalise patient management? Access – Efficacy - Safety

To provide equal access to stroke expertise for all citizens wherever they are.

- TeleStroke programmes could be developed within an stroke systems of care model (SSCM) framework, in order:
  - to establish procedures emergency (telethrombolysis, acute hospital stage and management (Stroke unit - Stroke wards/teleSU)
  - to organise long term care (i.e., telestroke rehabilitation)
  - to educate physicians (risk factors, symptom management, stroke prevention) and the public, as well.
  - to minimise the medico-social impact of stroke.
- Stroke services (centralised system) and Stroke networks:

  North-american or European and Australian models?

Weir and Buchan. JNNP 2005; Moulin and Hommel. JNNP 2006;
Audebert. Lancet Neurol 2006
Joubert. Journal of clinical neuroscience 2006 – Joubert. CVD 2008

Stroke and Telemedicine

Experiment in Franche-Comté

- Stroke Identification: the burden
- StrokeTreatment: access to Thrombolysis
- Management: The Stroke unit effect
- Follow-up – Stroke prevention

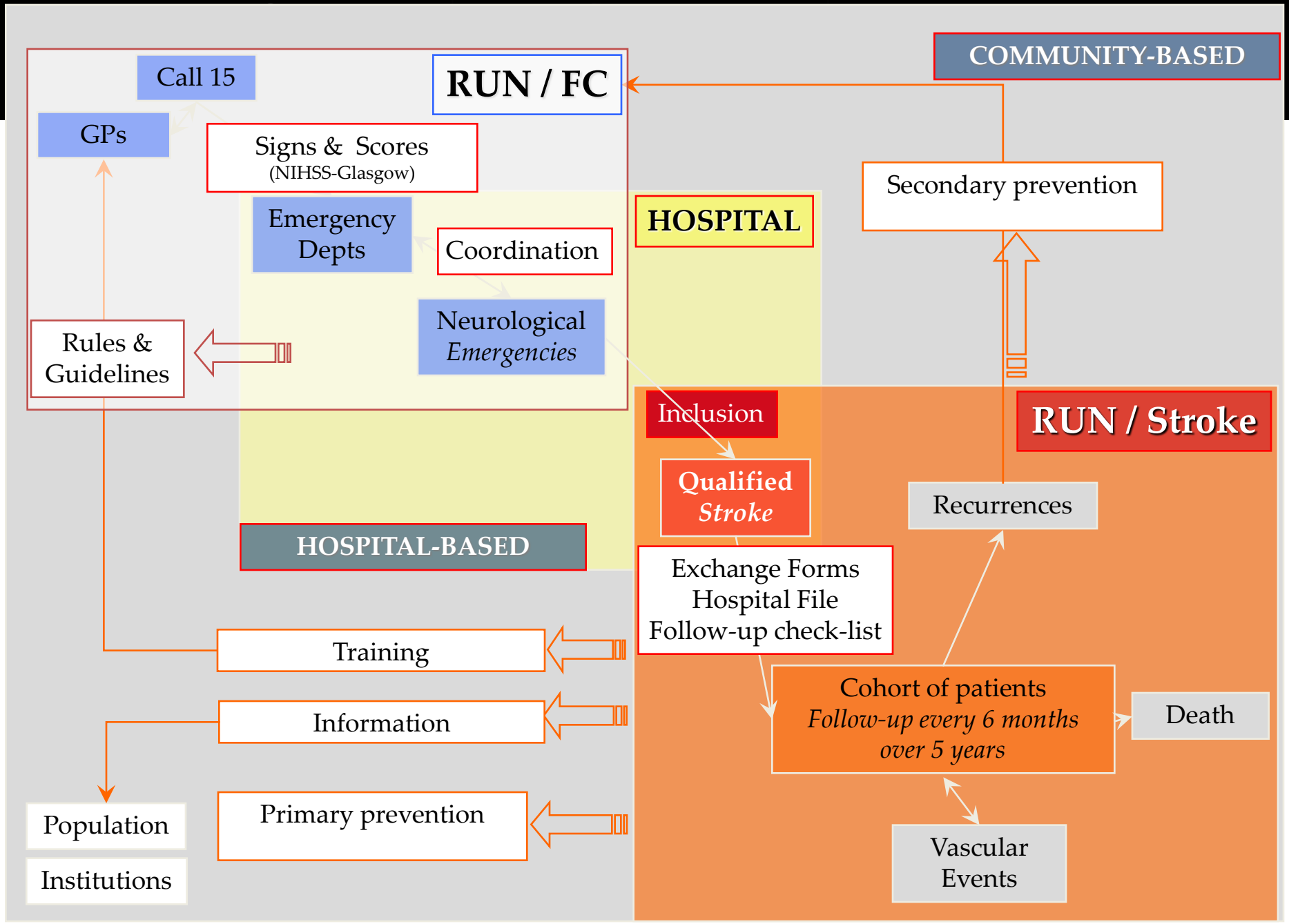
Network Concept

- The emeRgency neUrology Network in the Franche-Comté (RUN-FC)

to identify stroke from other neurological emergencies and so enhance and expedite patient management

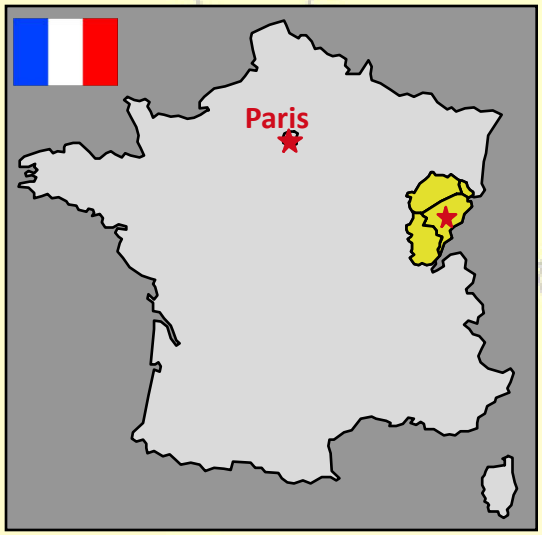
- The emeRgency neUrology Network-Stroke (RUN-Stroke)

to organise the in-hospital and follow-up care of qualified stroke patients


COMMUNITY-BASED
Call 15
RUN / FC
GPs
Signs & Scores
(NIHSS-Glasgow)
Secondary prevention
HOSPITAL
Emergency Depts
Coordination
Neurological Emergencies
Rules & Guidelines
Inclusion
RUN / Stroke
Qualified Stroke
Recurrences
HOSPITAL-BASED
Exchange Forms
Hospital File
Follow-up check-list
Training
Information
Cohort of patients
Follow-up every 6 months
over 5 years
Death
Primary prevention
Population
Institutions
Vascular Events

Operational objectives

- **Step 1 - Organising links between professionals within a regional network:**
  - Working groups adapting their own rules and guidelines *(since1999)*
  - Multidisciplinary stroke team centred around Besançon expertise and using telemedicine and medical/diagnostic techniques
- **Step 2 – Implementing specific tools:**
  - Internet computerised databases
  - Networks (techniques)
- **Step 3 – Including patients:**
  - Prospective cohort 2001 (telemedicine, emergency patients)
  - Prospective cohort 2003 (stroke patients)
- **Further Steps - Reinforcing working links:**
  - FC-Sante.org: Training, knowledge updating, e-mail
  - Evaluation, statistics,
  - Quality control



Franche-Comté

Population: 1.2 Million

Stroke unit

Hospital

Champagne-Ardenne

Lorraine

Alsace

Luxeuil

HAUTE-SAÔNE

Lure

Belfort

Vesoul

Gray

Montbéliard

Suisse

U

U

DOUBS

Besançon

Dole

Pontarlier

JURA

Champagnole

Lons

Saint-Claude

Rhône-Alpes

Typologie des communes

Pôles urbains

Espaces périurbains

Rural polarisé

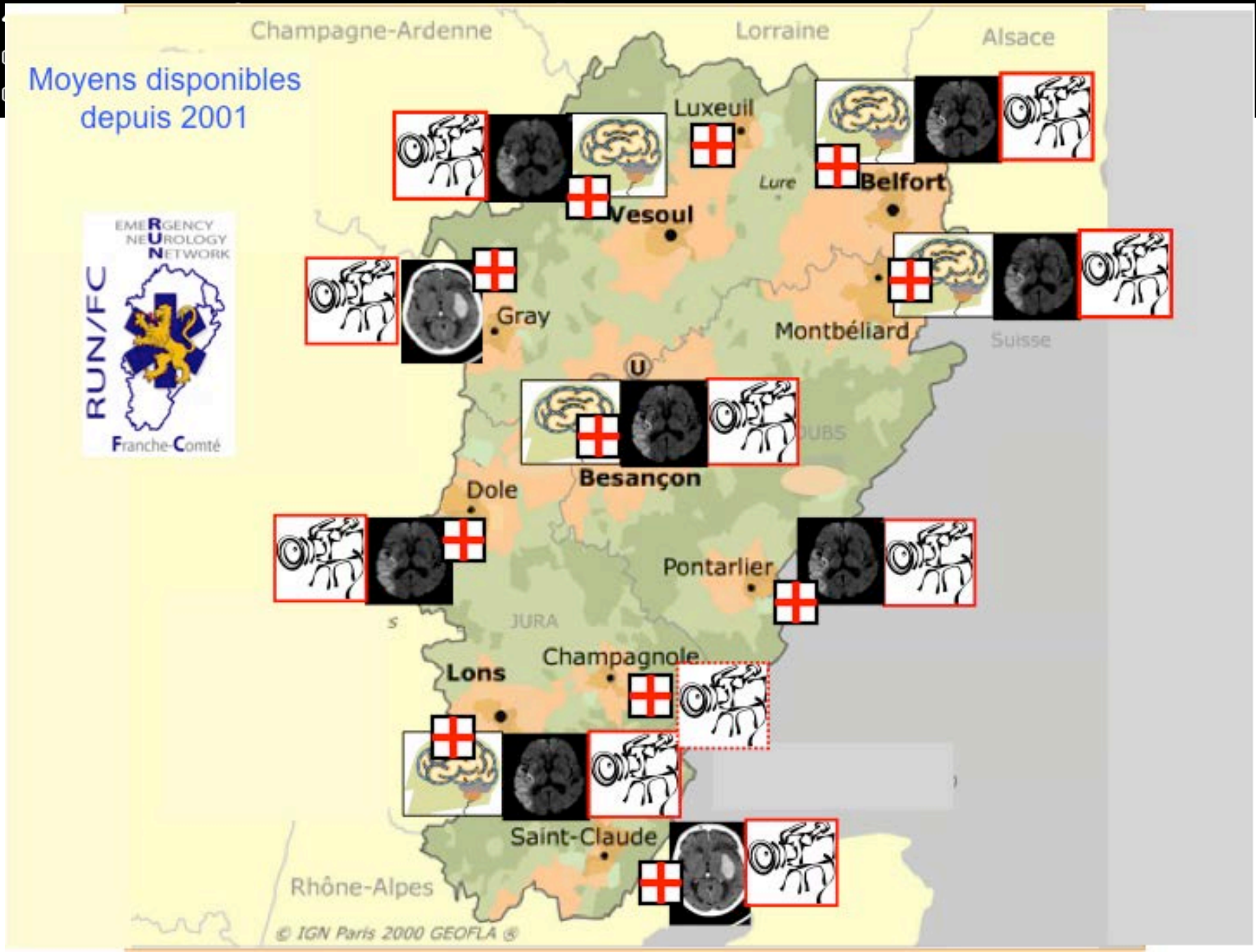
Rural isolé

Source : INSEE - INRA - RP90

0 25 50

km

© IGN Paris 2000 GEOFLA ®


Moyens disponibles
depuis 2001
EMERGENCY NEUROLOGY NETWORK
RUN/FC
Franche-Comté
Champagne-Ardenne
Lorraine
Alsace
Luxeuil
Lure
Belfort
Vesoul
Gray
Montbéliard
Suisse
U
Besançon
Dole
Pontarlier
JURA
Champagnole
Lons
Saint-Claude
Rhône-Alpes
© IGN Paris 2000 GEOFLA ®

Telestroke tools: integrative solution

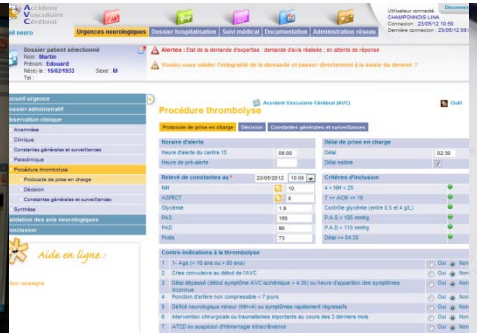
Regional Hub in Besancon
- -Neurologist
- -Neurosurgeon
- -Neuroradiologist

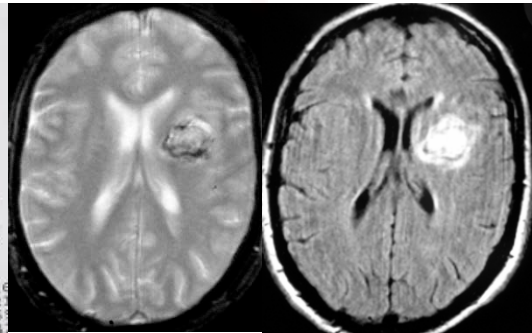
Video system

Shared files

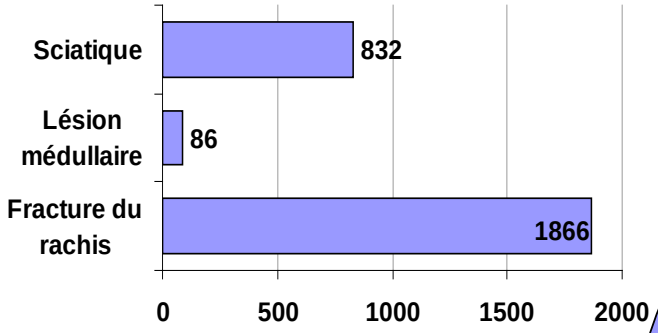
Biological data

Neuroimaging

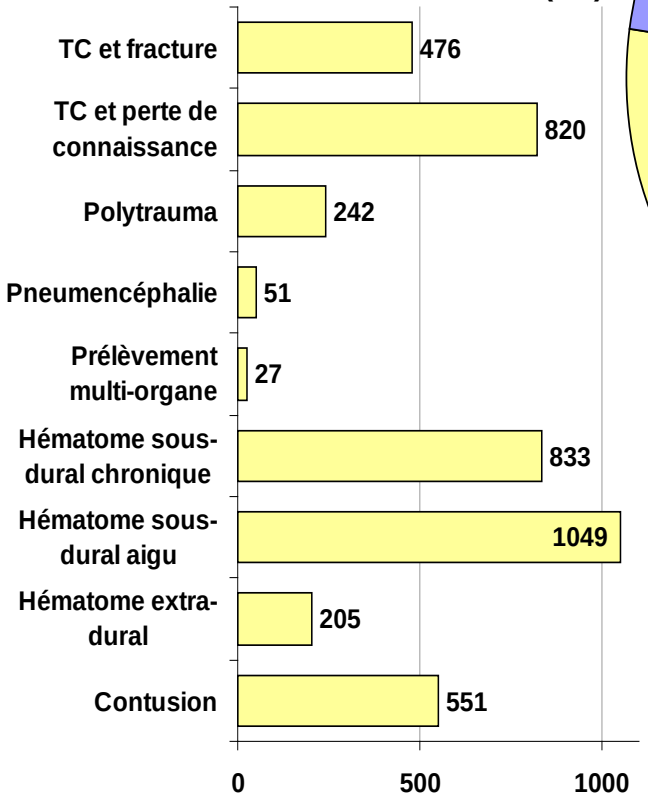


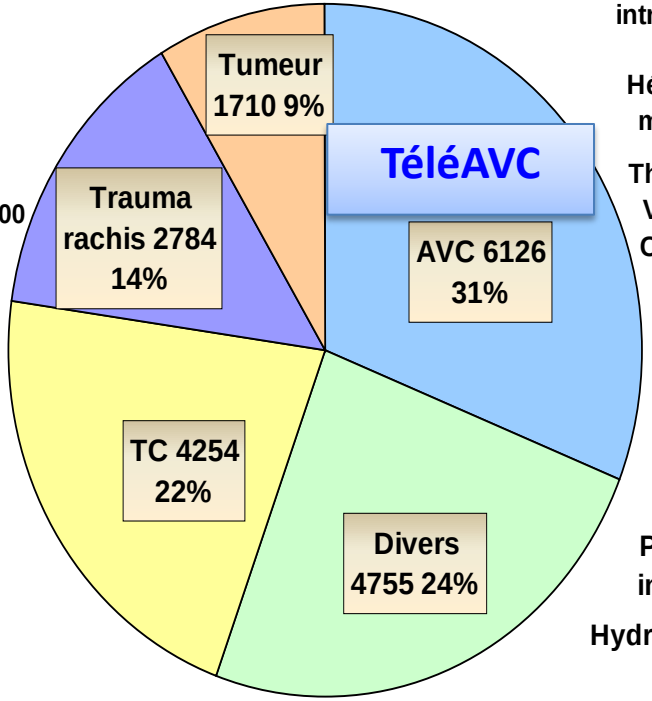


Nombre de traumatismes rachidiens

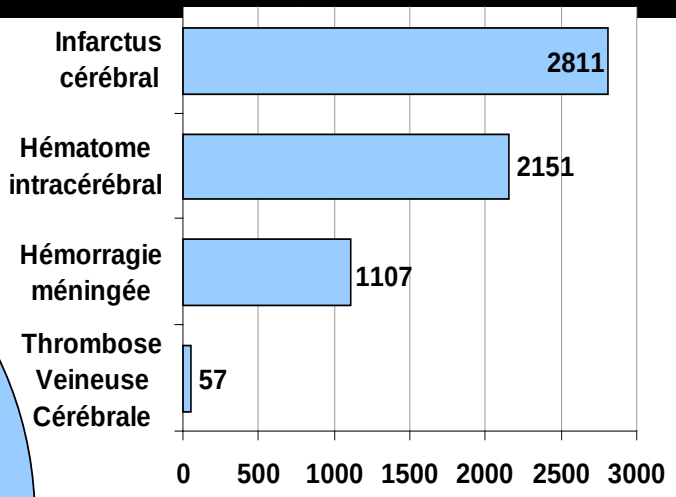


Nombre de traumatismes crâniens (TC)

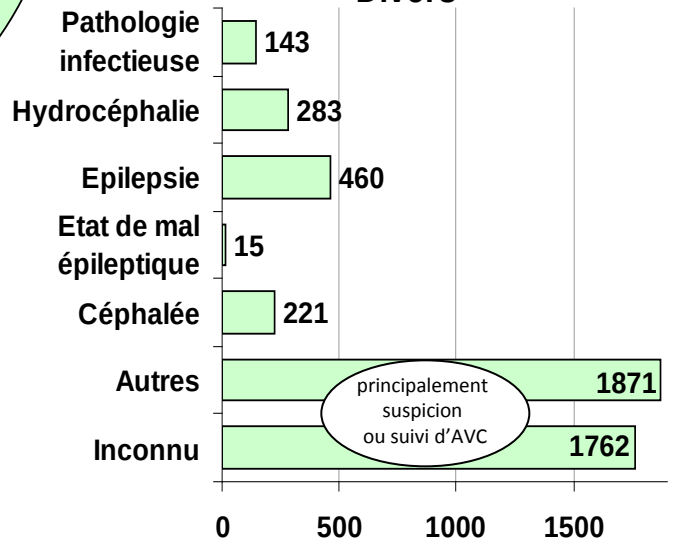


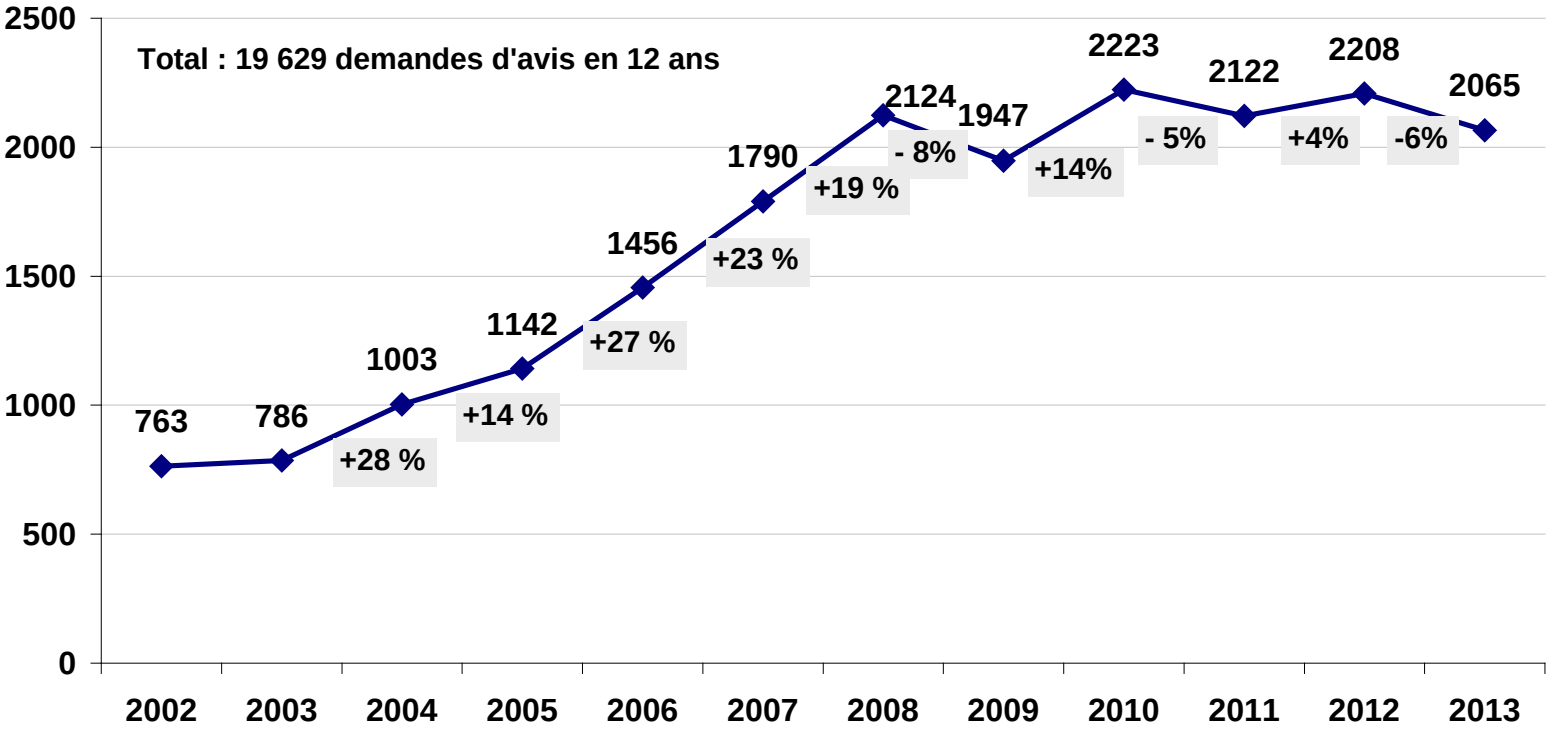


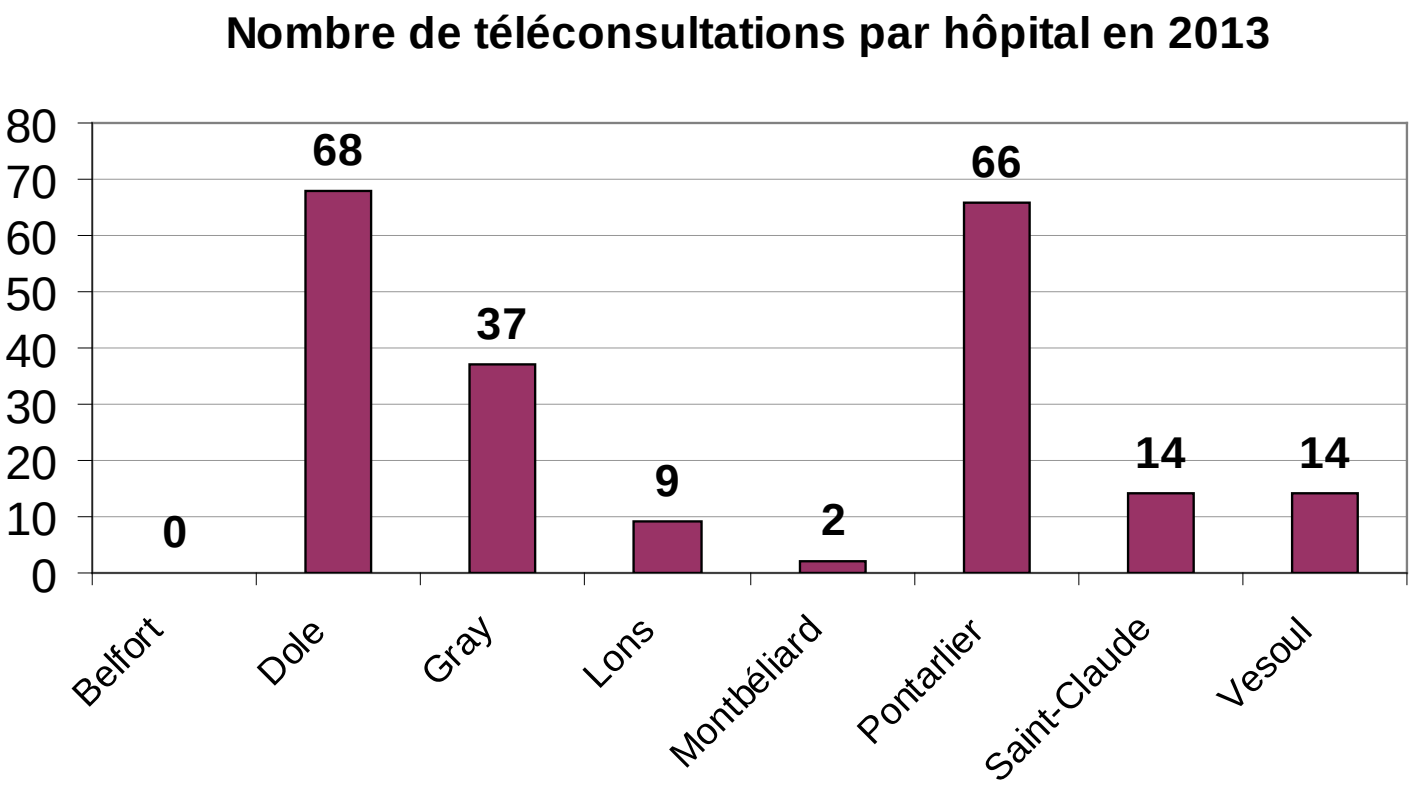
Total : **19 629** demandes d'avis par télémédecine de 2002 à 2013



Divers

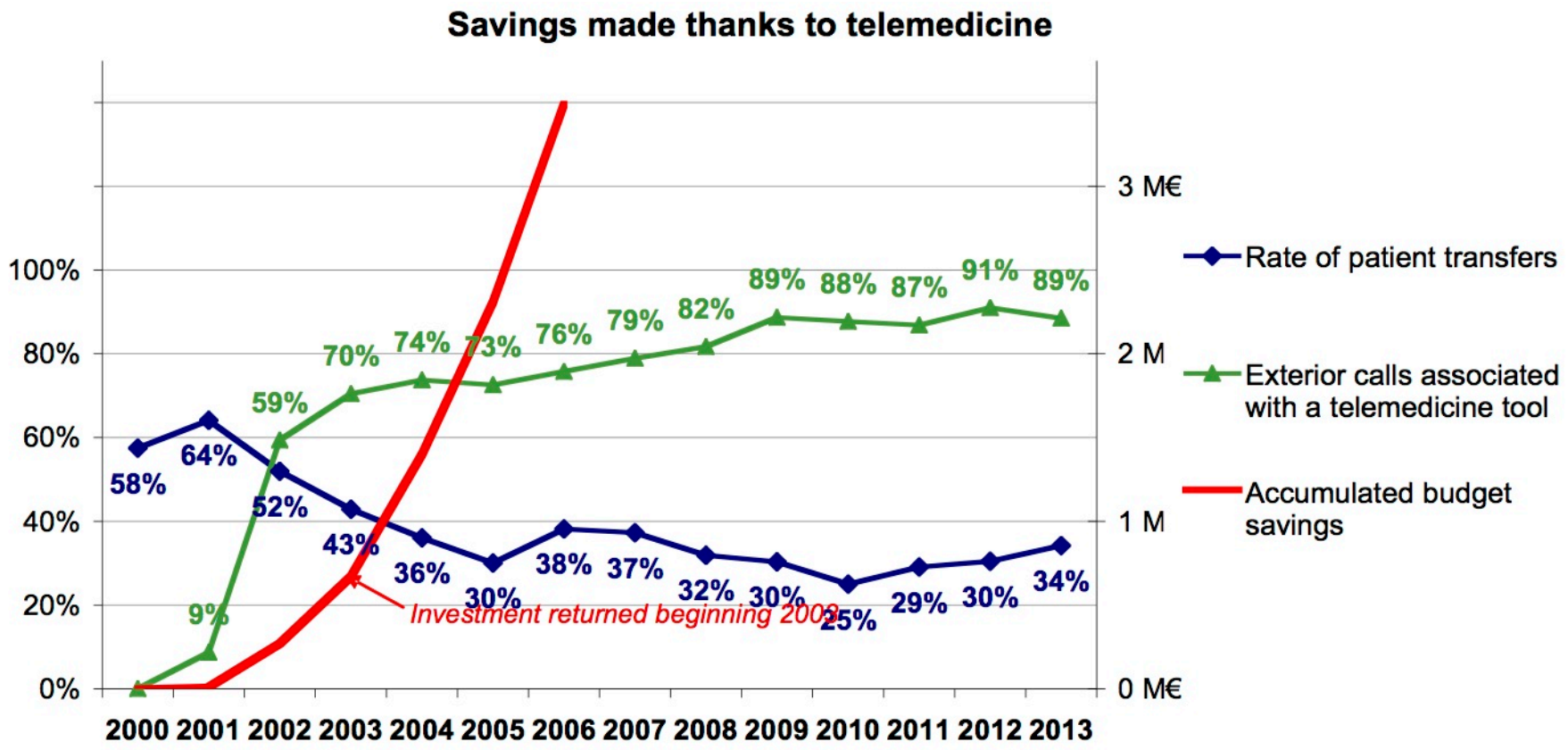



Nombre de demandes d'avis neurologiques par télémédecine par an
Total : 19 629 demandes d'avis en 12 ans
2500
2000
1500
1000
500
0
763
786
1003
1142
1456
1790
2124
1947
2223
2122
2208
2065
+28 %
+14 %
+27 %
+23 %
+19 %
- 8%
+14%
- 5%
+4%
-6%
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013



210 avis par vidéoprésence

Overall Economic Impact of the Network



The rate of transfer has been divided by 50% after 4 years.
Over the first 5 years, the economy is estimated at 3.5 million € (due to cost of transport).

Experiment in Franche-Comté

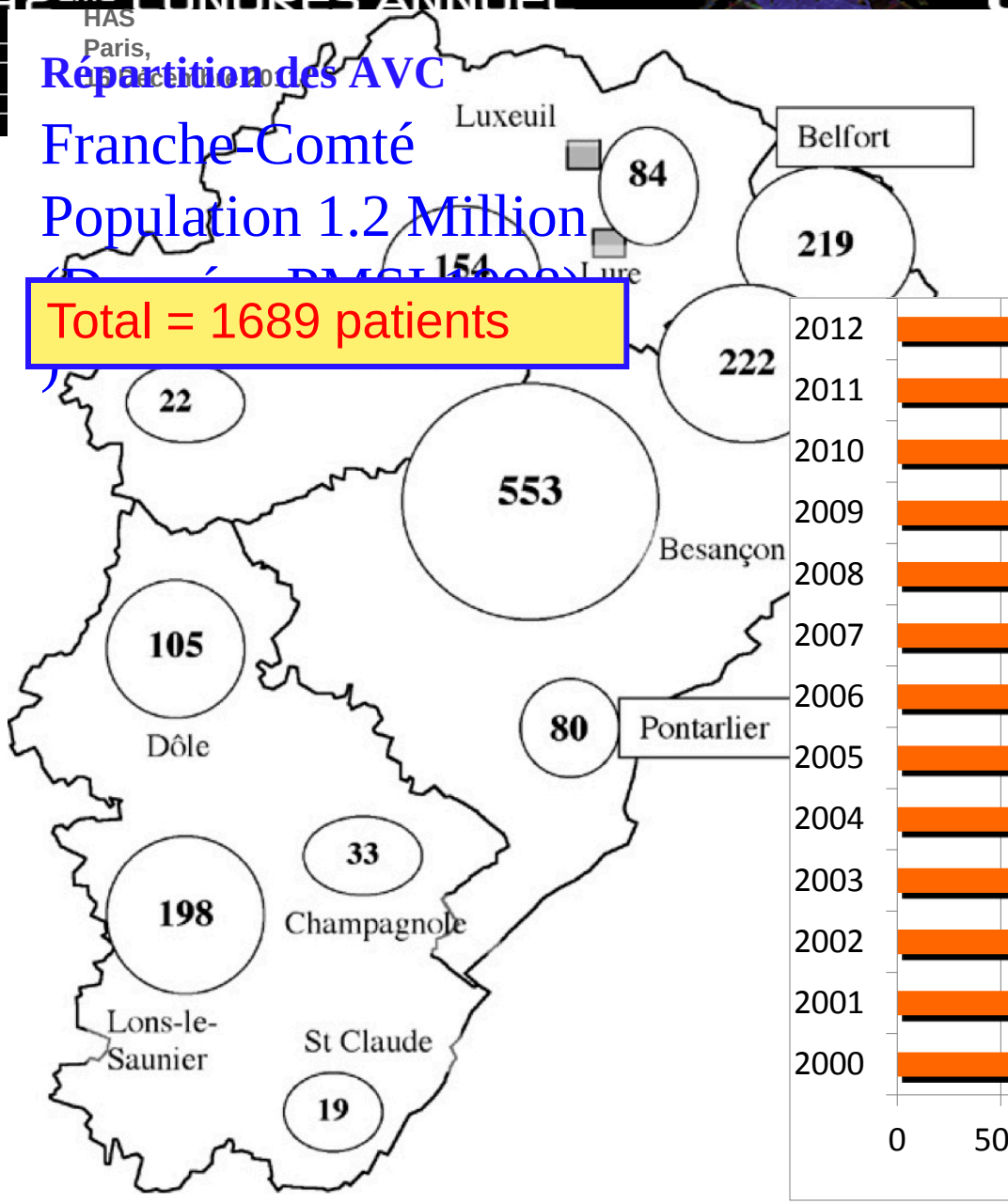
- **Stroke Identification: the whole burden**
- StrokeTreatment: access to Thrombolysis
- Management: The Stroke unit effect
- Follow-up – Stroke prevention

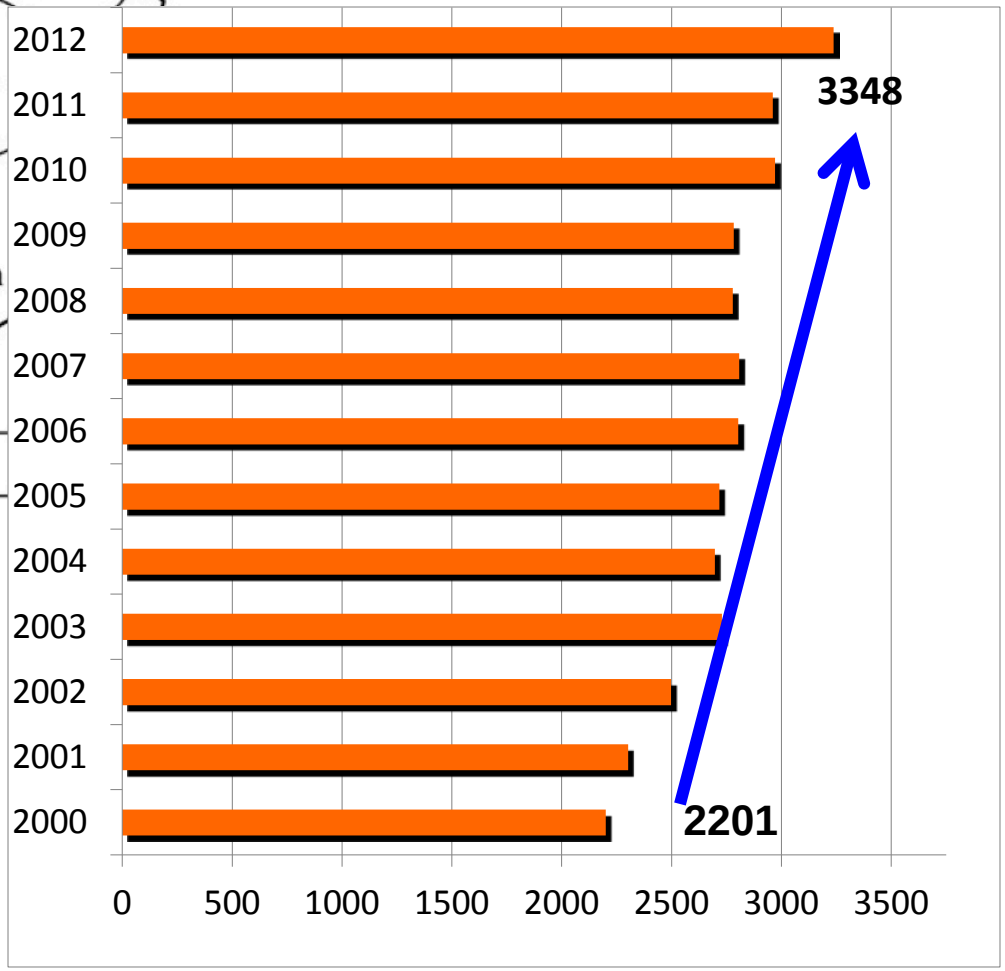
Répartition des AVC

Franche-Comté

Population 1.2 Million

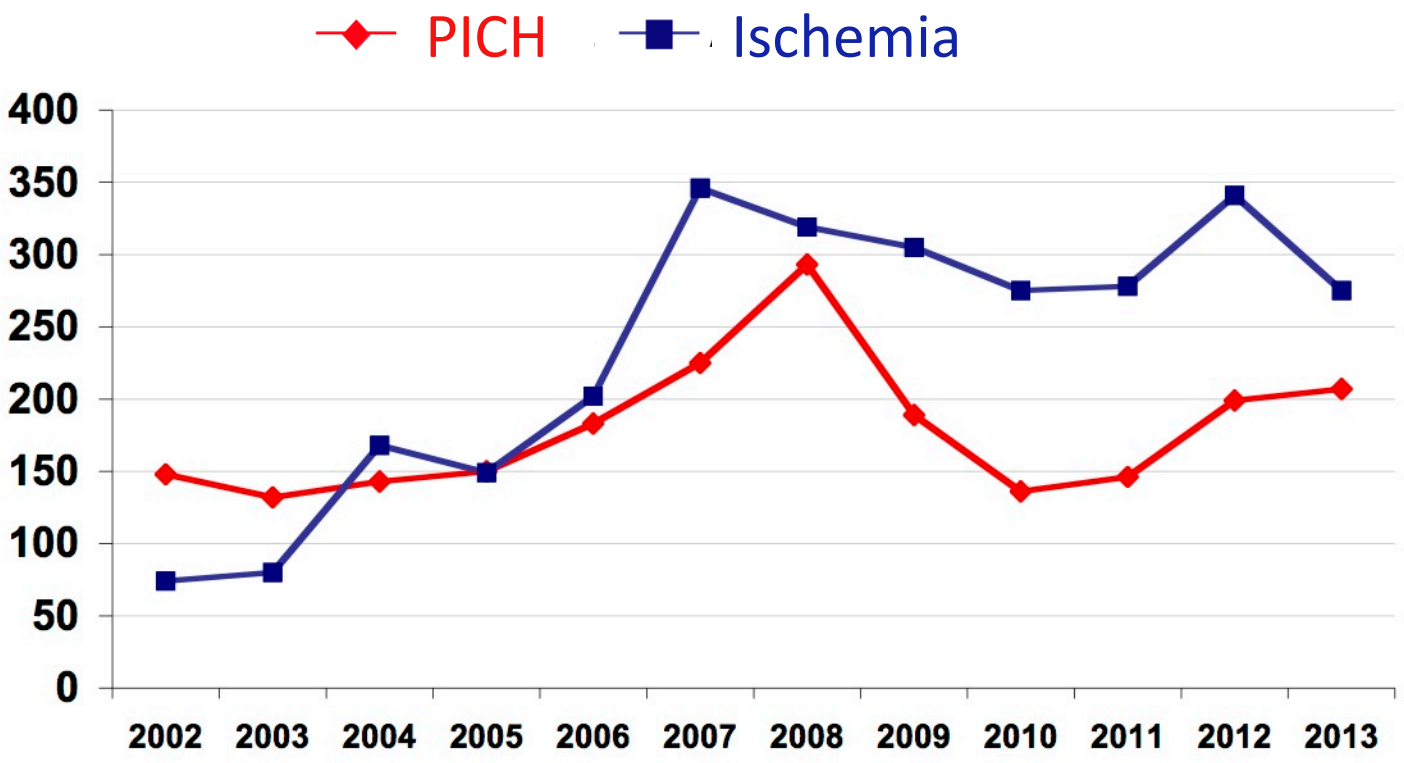
Total = 1689 patients





Nombre d'AVC

Evolution of requests according to the stroke types since 2002



Experiment in Franche-Comté

- Stroke Identification: the burden
- **StrokeTreatment: access to Thrombolysis**
- Management: The Stroke unit effect
- Follow-up – Stroke prevention

Critères d'appels du TéléAVC

Obligatory indication for a teleconsultation:

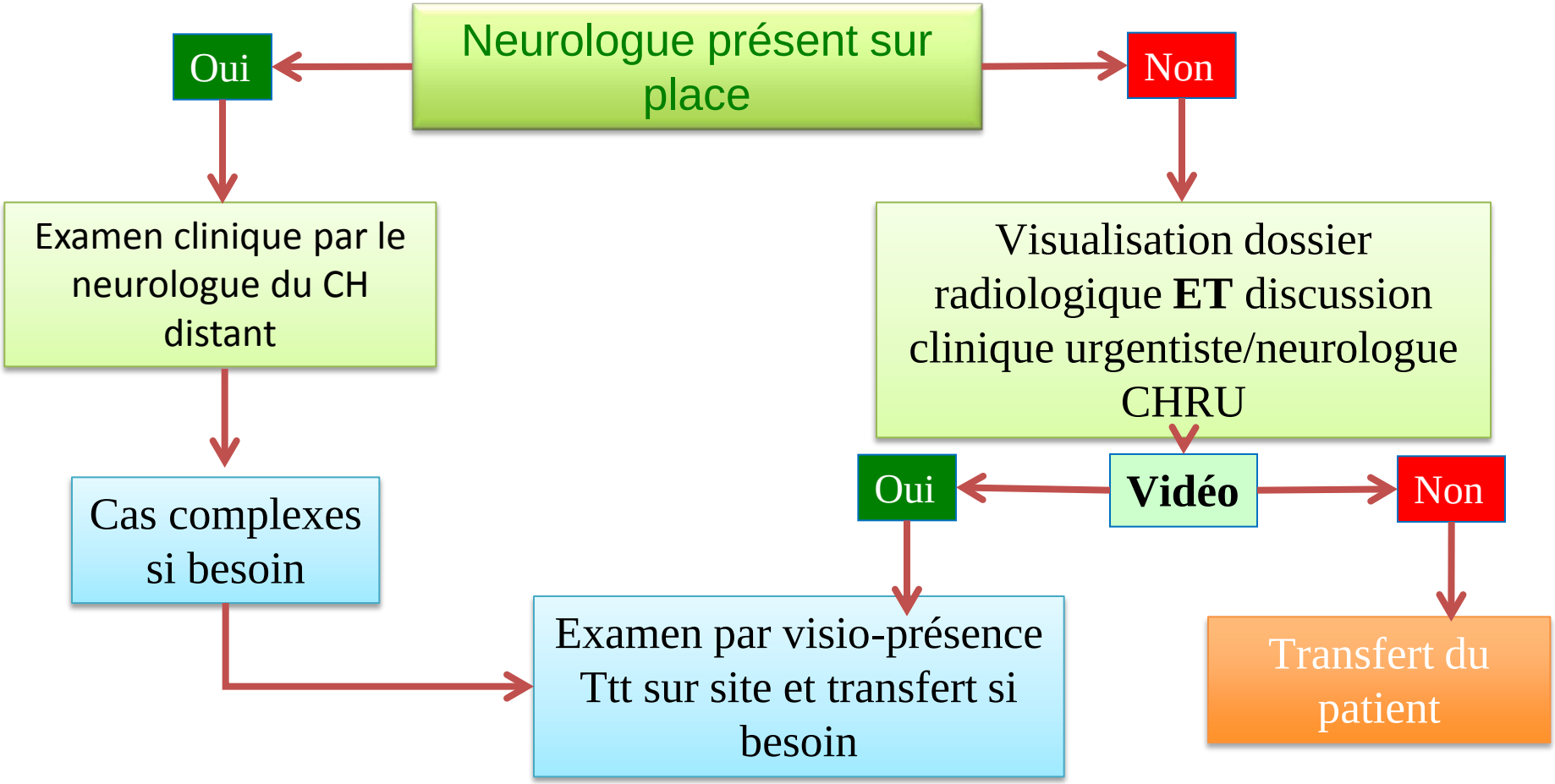
- onset of symptoms within 4.5 hours
- intracranial hemorrhage
- impaired consciousness
- progressive stroke
- brainstem symptoms
- NIH-SS ≥ 12
- stroke patients aged < 60 years

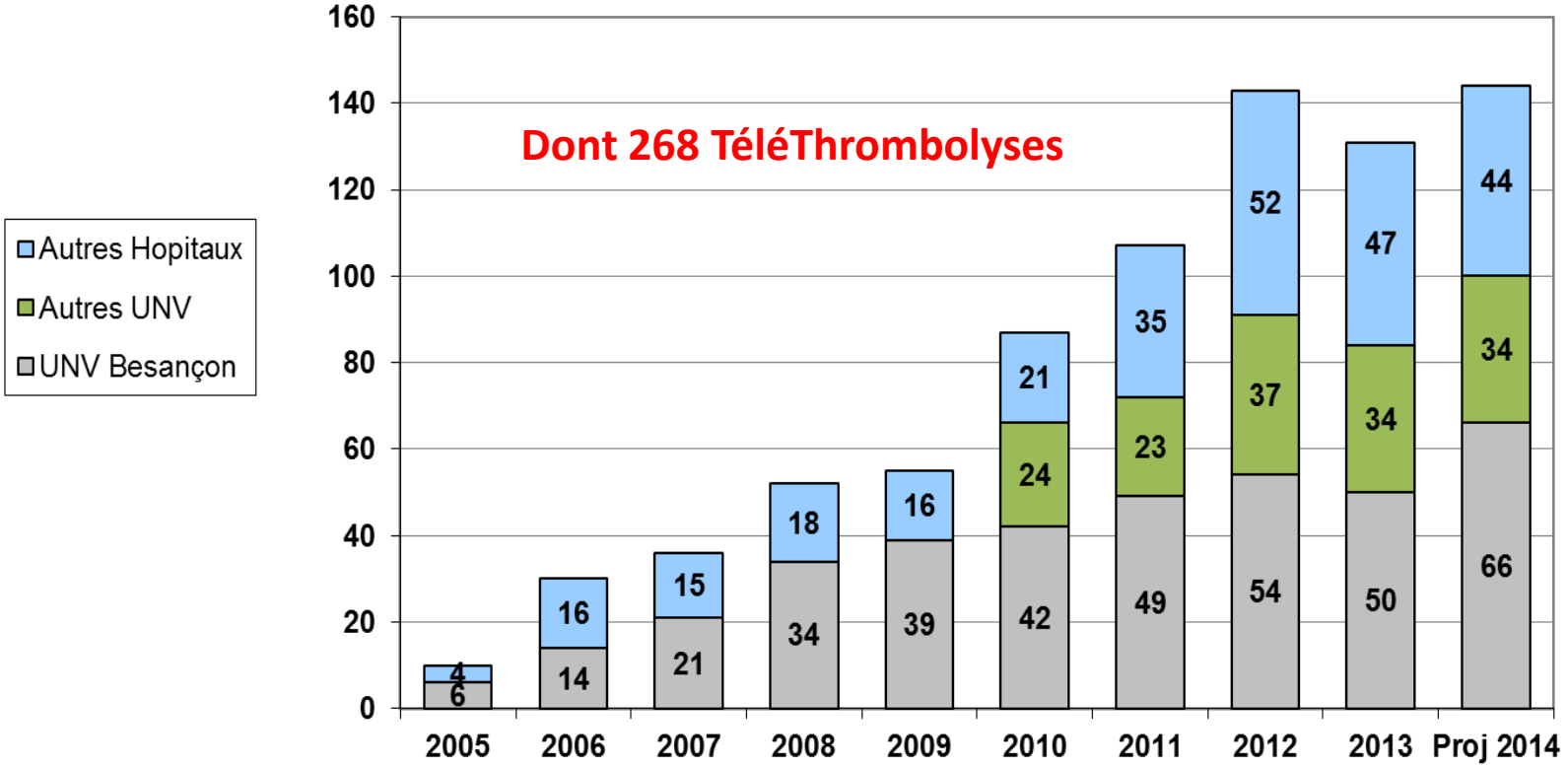
A voluntary teleconsultation is possible whenever requested !

TEMPIS

Procédure RUN-FC

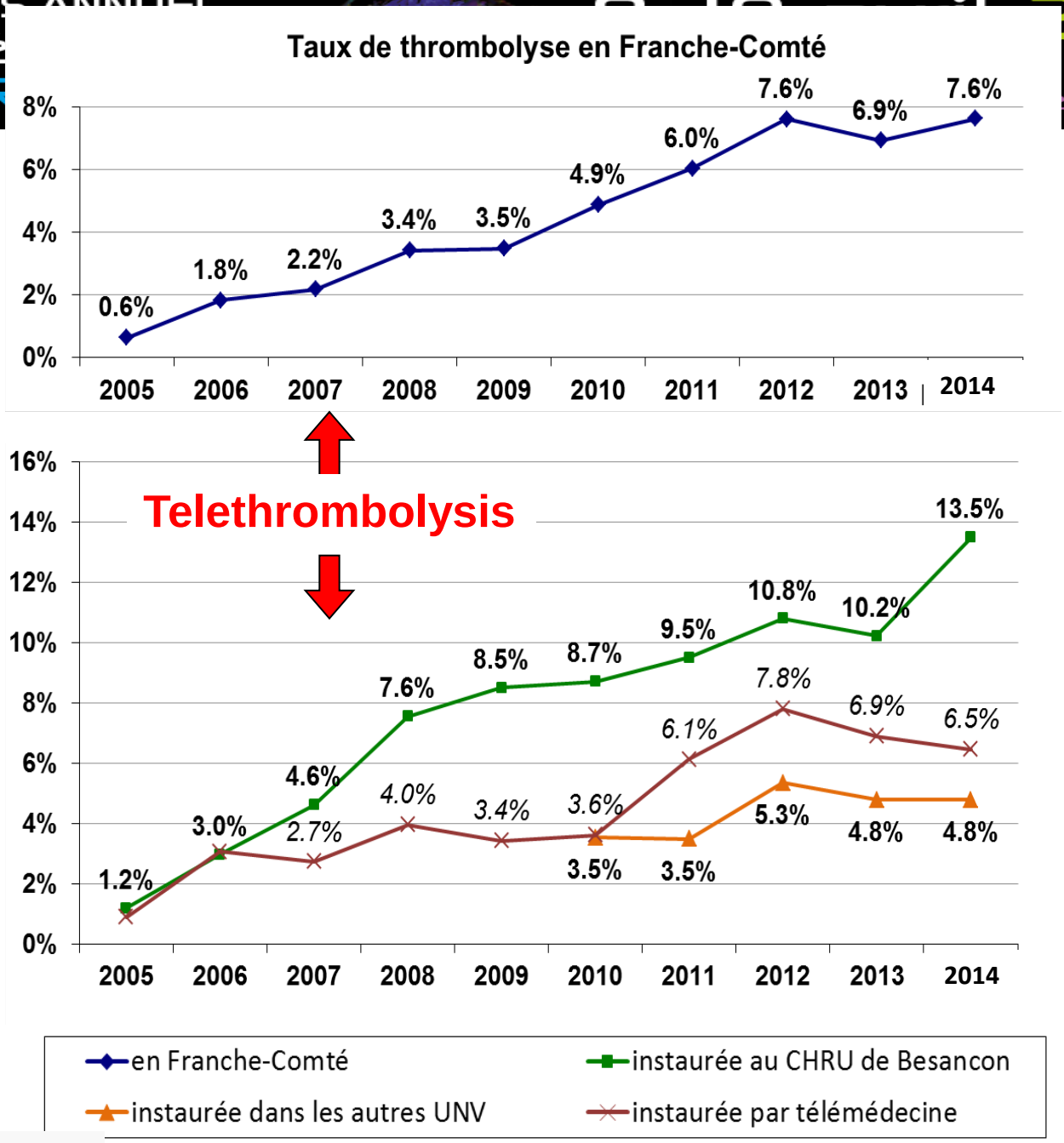
Critères d'appel dans le cadre de la télémédecine





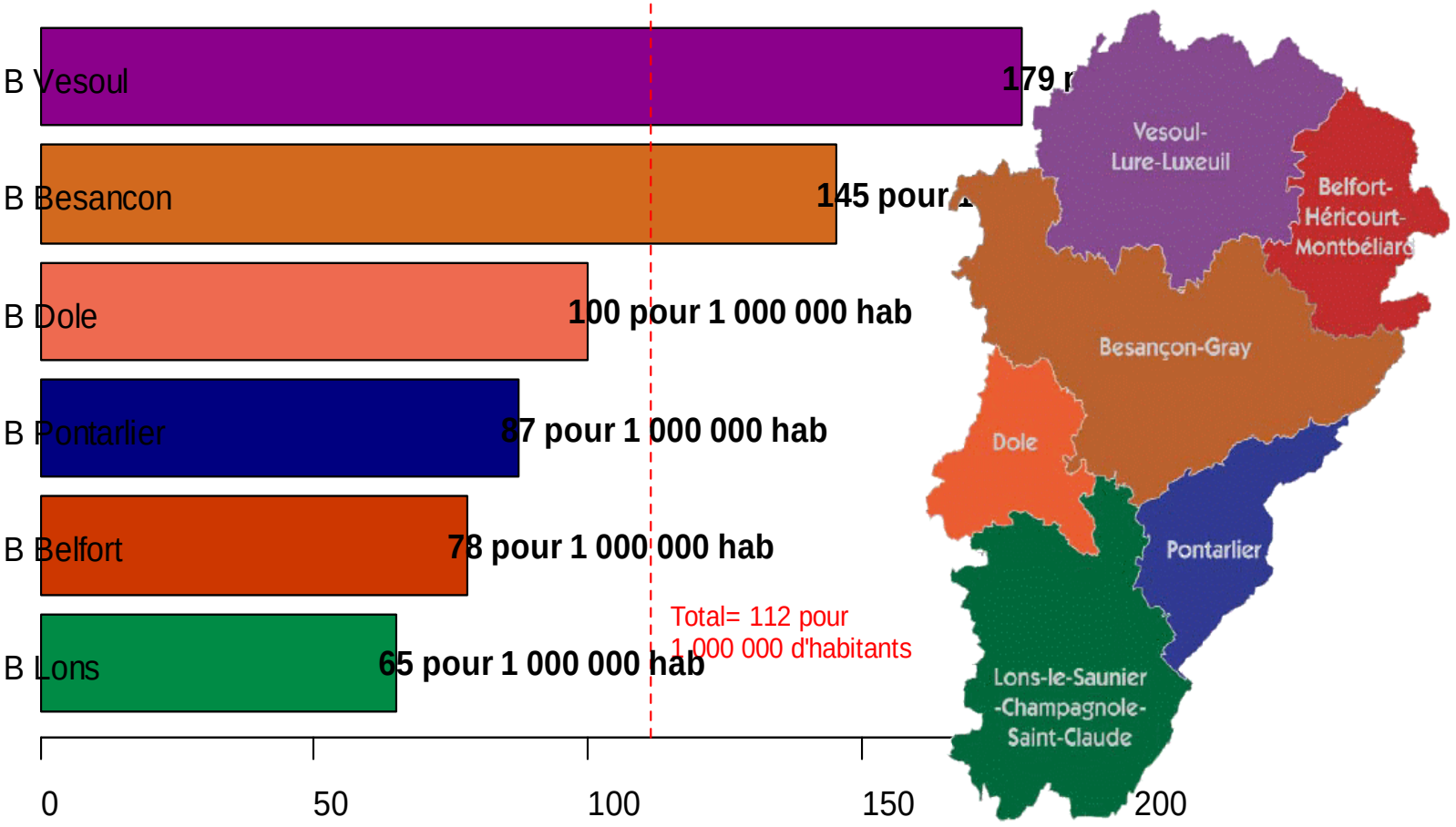
Nombre de thrombolyses	10	30	36	52	55	87	107	143	131	144
Taux d'augmentation du nombre de thrombolyses par rapport à l'année précédente	-	+ 200%	+ 20%	+ 44%	+ 6%	+ 58%	+ 23%	+ 64%	-8%	+ 10%
Taux de thrombolyse	0.6%	1.8%	2.2%	3.4%	3.5%	4.9%	6.0%	7.6%	6.9%	7.6%

$$\text{Taux de thrombolyse} = \frac{\text{Nombre de thrombolyses}}{\text{Nombre d'hospitalisations pour infarctus cérébral d'après le PMSI}}$$



Allibert et al. 2011 Rev Neurol

Taux de thrombolyse par million d'hab par bassin selon l'hôpital d'origine en 2

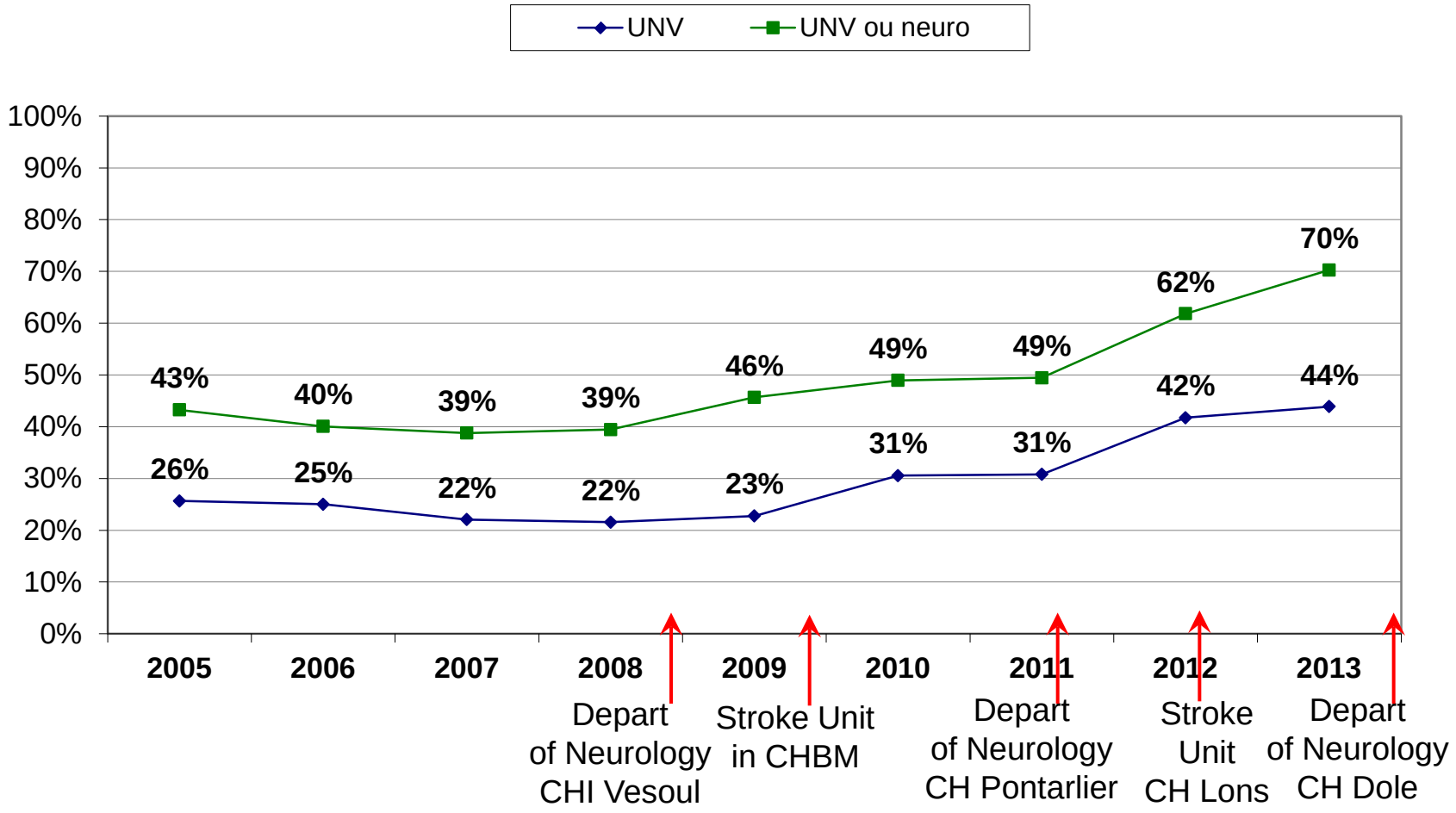


Source INSEE - Populations légales municipales 2011 en vigueur au 1er janvier 2014

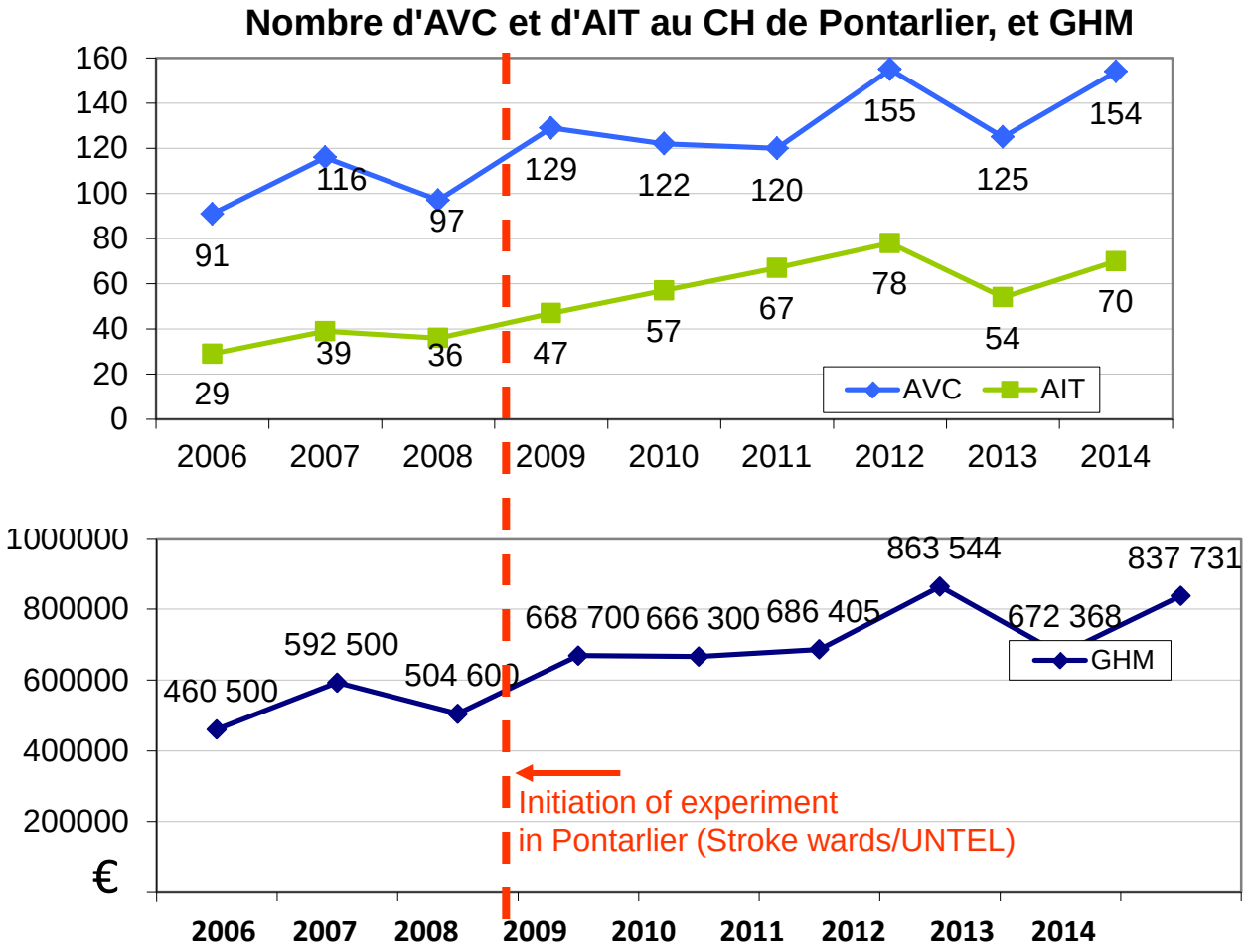
Experiment in Franche-Comté

- Stroke Identification: the burden
- StrokeTreatment: access to Thrombolysis
- **Management: toward the « Stroke Unit effect »**
- Follow-up – Stroke prevention

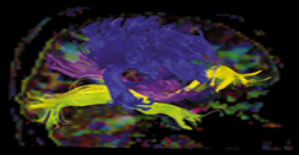
% of stroke patients referred to a department of neurology or a stroke unit in Franche-Comté



Influence of the direct management of stroke patient by neurologists (on-site and remote by telemedicine): the hospital economical point of view



The effect of the implementation of an integrative stroke programme including telestroke on an hospital with no neurologist on site, previously.
An 85% increase of stroke:
the 'epidemic' of stroke by neurologists



Stroke Wards ou UN-TEL

- **Stroke Wards:**

- modèle bavarois TEMPIS [1]
- unités médicales d'hospitalisation de proximité prenant en charge des AVC
- reliées à un centre expert pour une téléexpertise/téléassistance en urgence
- personnels formés, procédures formalisées

- **Unité de Neurologie en Télémédecine (UN-TEL)**:

- Unité Neurologique avec Télémédecine (médecin formé, référent sur site, lits regroupés accueillant les patients neurologiques, AVC,…)
- Application française du modèle TEMPIS?
- Cadre du décret de télémédecine (*Décret n° 2010- 1229)* et de la circulaire de mars 2012 (*DGOS/R4/R3/PF3 n° 2012-106*)
- Tous les modes de télémédecine (téléconsultation/téléexpertise/télésurveillance médicale/téléassistance médicale)
- A tous les stades de prise en charge: urgence-hospitalisation-suivi

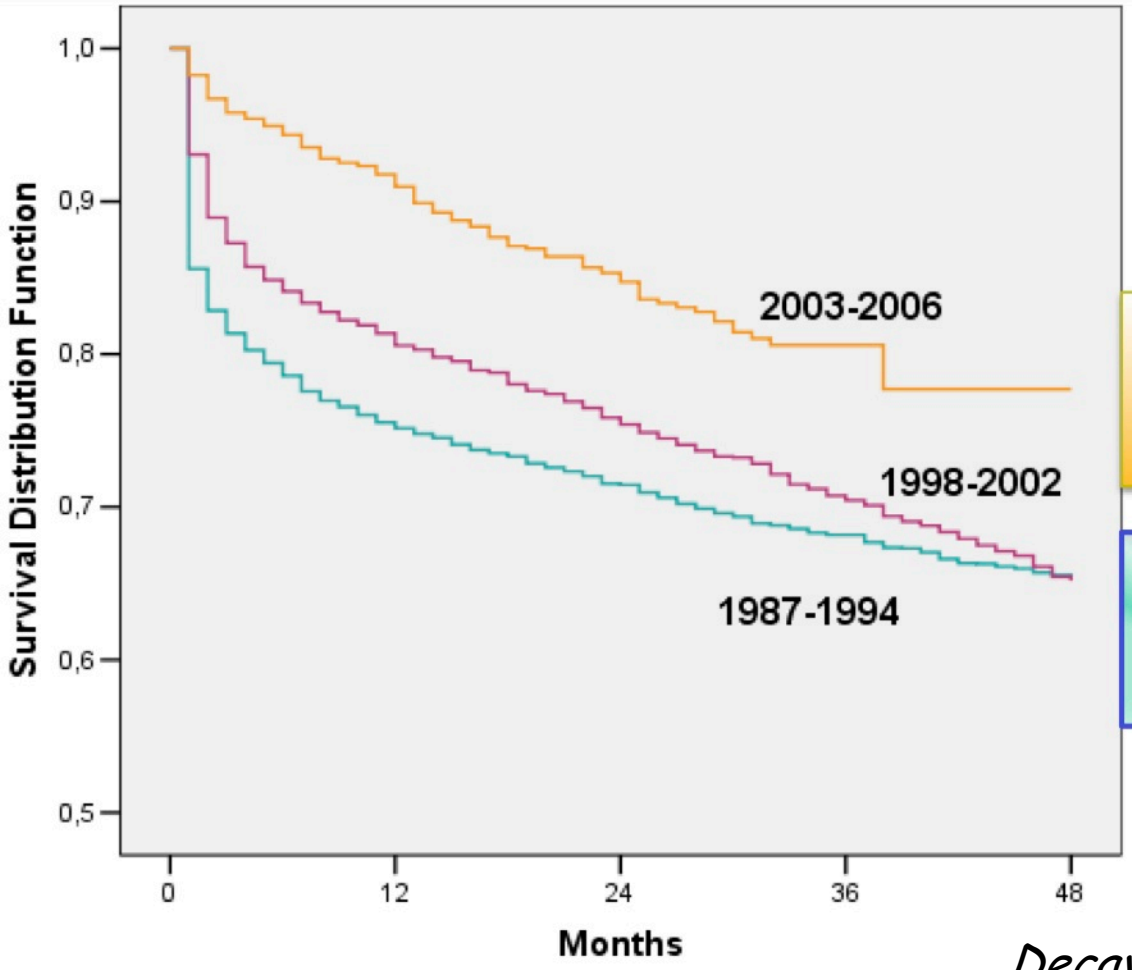
1 Stroke **Long-Term Effects of Specialized Stroke Care With Telemedicine Support in Community Hospitals on Behalf of the Telemedical Project for Integrative Stroke Care (TEMPiS)**
Heinrich J. Audebert stroke 2009;40:902-908

Experiment in Franche-Comté

- Stroke Identification: the burden
- StrokeTreatment: access to Thrombolysis
- Management: The Stroke unit effect
- **Follow-up – Stroke prevention**

Step 3: Cohortes prospectives

First cohorte 1987-1994	2.500 patients	median follow-up 80 months
Second cohorte 1998-2002	2.351 patients	median follow-up 32 months
Third cohorte 2003-2006	1.835 patients	median follow-up 9 months



After implementing programme

Before implementing programme

Decavel et al. CVD 2006

Step 3: Cohortes prospectives

European Research in Telemedicine/La Recherche Européenne en Télémédecine (2013) 2, 11–15

Available online at SciVerse ScienceDirect www.sciencedirect.com

Elsevier Masson France EM|consulte www.em-consulte.com/en

ELSEVIER MASSON

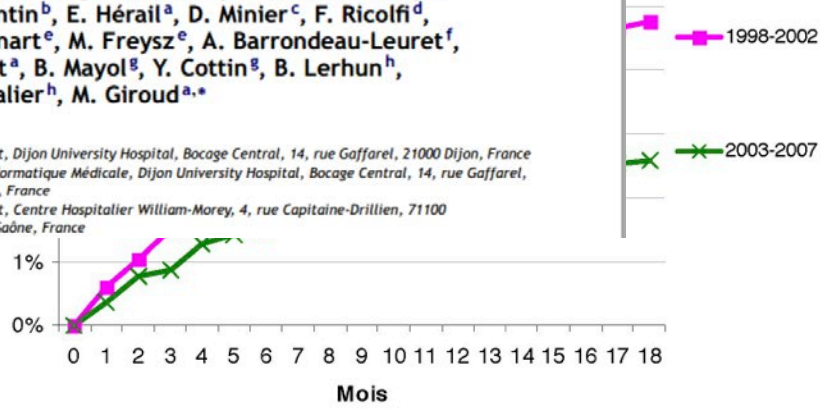
ORIGINAL ARTICLE / REMOTE MEDICAL ASSISTANCE

The role of the clinical nurse within a combined stroke and telefibrinolysis network: The G5 pilot study in Burgundy, France

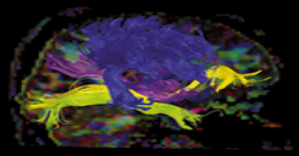
Le rôle de l'infirmier clinique au sein d'un réseau AVC et téléfibrinolyse : l'expérience pilote G5 dans la Bourgogne, France

M. Hervieu-Begue[a], A. Jacquin[a], G.-V. Osseby[a], C. Quantin[b], E. Hérail[a], D. Minier[c], F. Ricolfi[d], D. Honnart[e], M. Freysz[e], A. Barrondeau-Leuret[f], Y. Béjot[a], B. Mayol[g], Y. Cottin[g], B. Lerhun[h], M. Cavalier[h], M. Giroud[a,*]

[a] Stroke Unit, Dijon University Hospital, Bocage Central, 14, rue Gaffarel, 21000 Dijon, France
[b] Service Informatique Médicale, Dijon University Hospital, Bocage Central, 14, rue Gaffarel, 21000 Dijon, France
[c] Stroke Unit, Centre Hospitalier William-Morey, 4, rue Capitaine-Drillien, 71100 Chalon-sur-Saône, France



Decavel et al. CVD 2006



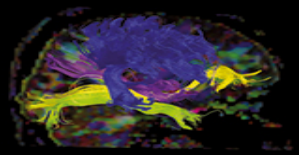
Points clés

« Risks – Weakness »

- Accès pour tous les patients
- Hôpital compétition
- Difficultés d'identification des patients AVC
- Compétition entre professionnels (MD, engineering,…)
- Expertises (manque de neurologues, neuro-radiologues technique, ….)
- Guidelines / Multidisciplinarité
- Financements :
  - fragmented sources?
  - Identical whatever organisation?
- ….

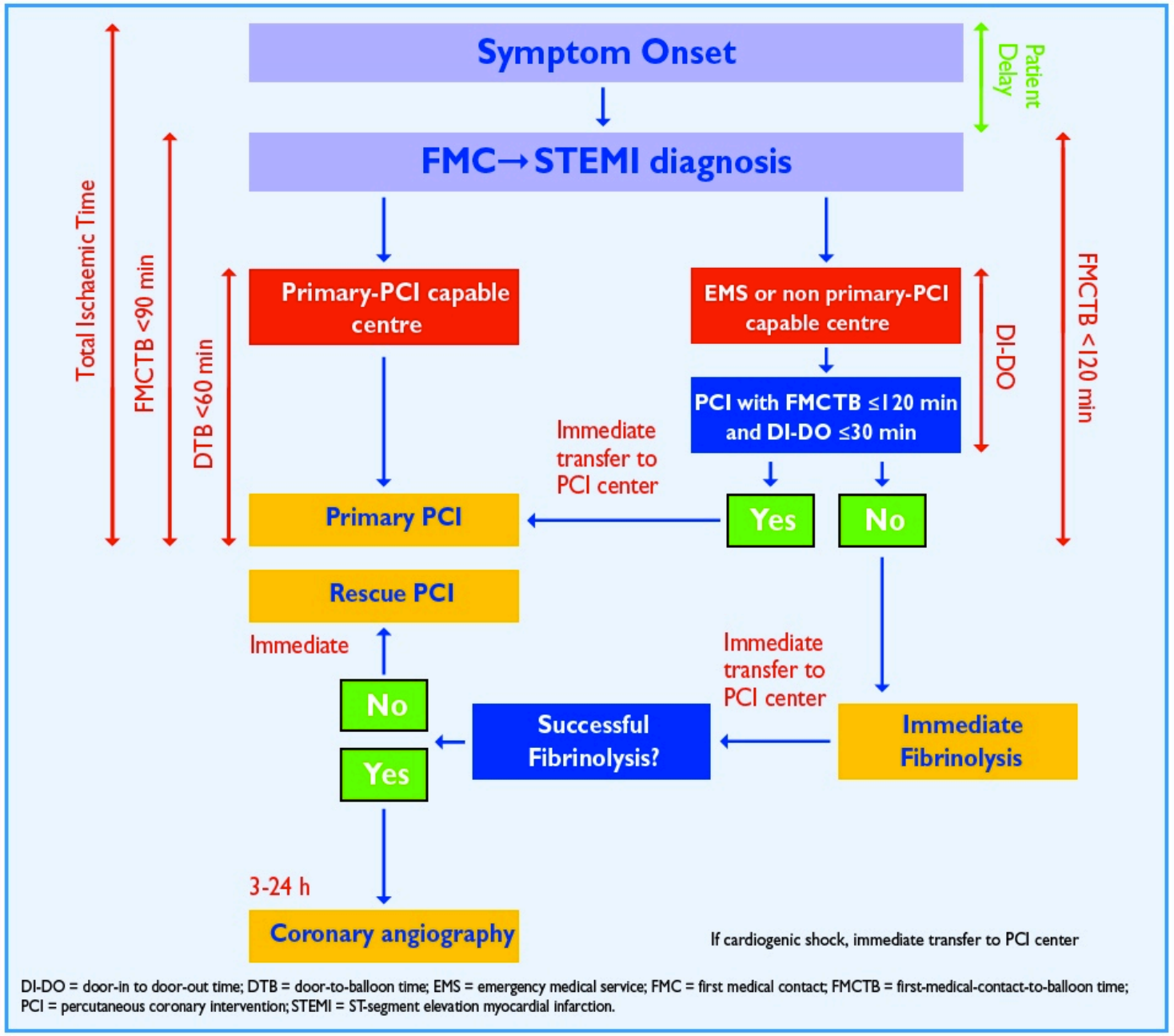
« Positive aspects »

- Patients présents à l'hôpital
- Hôpital organisation
- Formation pour l'identification des patients AVC
- Liens entre professionnels
- Expertises (*stroke unit cornerstone of the network; State-of-the-art of IT supports*)
- Procédures / process partagés
- Financements:
  - Shared
  - According to organisation
- ….



Conclusion

- Public information / éducation (C15)
- Organisation des filières et des réseaux
- Accès complet à l'UNV (direct)
- 'RCP AVC' / Expertise neurovasculaire
- Accès à des avis spécialisés ("Shared Care component")
- Flux d'information bi-directionnel ("Hospital, coordinator, GP, patient and careers")



DI-DO = door-in to door-out time; DTB = door-to-balloon time; EMS = emergency medical service; FMC = first medical contact; FMCTB = first-medical-contact-to-balloon time; PCI = percutaneous coronary intervention; STEMI = ST-segment elevation myocardial infarction.

EMERGENCY NEUROLOGY NETWORK
RUN/FC
Franche-Comté

- **Federation of Neurological Sciences - University Hospital**
  - ✓ Department of Neurology *(Pr F Vuillier, Dr Medeiros)*
  - ✓ Department of Neurosurgery *(Pr A Czorny, Dr J Godard)*
  - ✓ Department of Radiology *(Pr A Biondi, Dr F Cattin)*
  - ✓ Department of Rehabilitation *(Pr B Parratte)*
  - ✓ Department of Neurophysiology*(Pr L Tatu)*
- **Scientific and Steering Committees** (GPs, Emergency physicians, Radiologists, Intensive Care Physicians, Neurologists, Engineers, etc)
- **Hospital Coordination (*RUN-FC*)**
  - ✓ **Medical Coordinator:** *Thierry Moulin*
  - ✓ ***Animator:*** *Benjamin Bouamra*
  - ✓ **Secretary:** *Valérie Cassard*
  - ✓ **Engineering:** *Vincent Bonnans, Alexandre Comte*

EMERGENCY NEUROLOGY NETWORK
RUN/STROKE
Stroke

- **Follow-up Coordination *(RUN-Stroke)***
  - ✓ **Private Practice Coordinator:** *Didier Chavot*
  - ✓ **Secretary:** *Nadège Vidinha*
  - ✓ **Nurse Coordinator:** *Véronique Roy-Cote*
  - ✓ **Methodologist-Biostatistician:** *Lina Vaconnet*
  - ✓ **Research Assistant:** *Nathalie Elias*
  - ✓ **Programmer:** *Richard Renaud*
- **Follow-up Steering Committee**
- **Working groups of different healthcare professionals**

www.run-fc.org