

The role of emergency neurology in Italy: outcome of a consensus meeting for a intersociety position

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Abstract A possible definition of clinical, educational and organizing aspects of emergency neurology in Italy is reported in this position paper of Emergency Neurology Intersociety Group, created in 2008 among the two neurological Societies in Italy: Società Italiana di Neurologia

and Società di Neuroscienze Ospedaliere. The aim of this Group has been the evaluation of the role of neurologist in the emergency setting of Italian hospitals, as well as of the description of different scenarios in which a ward dedicated to a semi-intensive care of neurological emergencies could have a role in the actual organization of academic or general hospitals in our Country. The actual great relevance of neurologist activity in the inpatients treatment, in fact, is actually misleded as it is the considerable significance of neurological expertise, techniques and support in hospital care pathways also involving neurological manifestations throughout the course of other diseases. Finally, the possible contents of educational programs orienting neurological specialty towards a better comprehension and management of emergency neurological problems either in terms of specific formation or of techniques to be learned by emergency neurologist, are reported as a results of the Consensus Workshop hold in Castiglioncello (LI) in September 12th, 2009.

On behalf of the Emergency Neurology Intersociety (SIN–SNO) Group.

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Introduction

Most neurological conditions have an acute onset or present as emergency situations requiring urgent intervention. Consequently, neurological diseases account for a considerable share of the medical emergencies dealt with in any hospital setting [1]. Furthermore, neurological emergencies are often severe conditions associated with high mortality and high costs, the latter not only generated by the emergency care provided in the acute phase, but also resulting from their frequent disabling outcomes. Thirty-day

mortality is as high as 50% in cases of intraparenchymal haemorrhage, 50% in subarachnoid haemorrhage, 29% in cranial trauma and 20% in status epilepticus [2]. These conditions are frequent in the general population and the treatment provided within the first hours of the acute event may be crucial for patient survival and functional outcome. Other diseases (e.g. acute spinal cord injuries), though less frequent, are associated with similar high mortality, morbidity and costs.

Whereas there is a large amount of epidemiological and clinical data on the specific problems associated with single neurological disorders, there is a lack of updated, large-scale data sets describing the hospital management of neurological emergencies. In 2004, the National Institute of Neurological Disorders and Stroke (NINDS) in the US proposed the creation of a multicentre network focusing on neurological emergencies as a whole, rather than on specific neurological disorders, aimed at creating opportunities for clinical research in this area, and thus to improve acute neurological care and patient outcomes [3].

There is no doubt that the frequency and impact of neurologist assessments in the emergency room (ER) are still greatly underestimated, and not only in Italy [4, 5]. In the UK, around one patient in 10 attending an A&E department has a neurological problem [6], neurological disorders account for 10–20% of acute hospital admissions, and 10% of adults consult their GP at least once a year in connection with neurological symptoms, even though less than 10% of these patients are then referred to a hospital [7, 8]. Furthermore, again in the UK, patients admitted to hospital with acute neurological problems are rarely seen by a consultant neurologist [9]. In USA the figure of “neurohospitalist” (neurology hospitalist specialized in the care of patients admitted to the hospital) is emerging since the increased complexity of inpatient neurology care [10–12].

According to the Italian Health Ministry data, neurological disorders, i.e., those falling into the Major Diagnostic Category 1 (MDC 1), accounted for 7.6% of all hospital admissions in Italy in 2003 (639,000 out of a total of 8,433,471), a figure basically in line with the 7.4% (731,008 out of 9,875,106) recorded in 2000. The Disease-Related Groups (DRGs) covering non-surgical neurological diseases, stroke (DRG 14), transient ischaemic attack (DRG 15) and “seizures and headache” (DRGs 24–26) by themselves account for 42.3% of patients discharged from hospital with a neurological diagnosis, a proportion that rises to 49.8% if non-surgical head traumas are added (DRGs 27–30).

Moreover, many patients with acute conditions that fall into non-neurological MDCs—such as syncope/collapse, balance disorders (44,217 discharges in 2003), and several psycho-organic syndromes—receive neurological

treatment in the ER, or are admitted to specialized neurology units. It is also worth pointing out, again on the basis of Italian Ministry of Health data for 2003 [13], that even though acute cerebrovascular diseases ranks eighth in the top 50 DRGs classified by number of discharges (135,012 discharges) and acute myocardial infarction ranks fourteenth (114,632 discharges), the latter receives far more attention (in terms of dedicated beds, technologies and funding) than does stroke.

If the annual number of hospital admissions for acute neurological conditions is high, the number of patients seen in ER settings for neurological or presumed neurological problems will obviously be even higher, given that only a limited proportion of these cases are actually admitted to hospital. The demand for emergency neurological assessments is actually very high. As well as for life-threatening conditions, such as stroke, status epilepticus and encephalitis, neurological assessment is also often sought for clinical pictures that, while requiring careful evaluation, do not usually have severe prognostic implications (e.g., vertiginous symptoms or syncope). Neurological assessments are thus fraught with responsibility and carry considerable litigation risks [14, 15] as, for instance, it is indicated by the high incidence of ER visits for headache, a notoriously “insidious” symptom [16, 17], for minor head injury [18] especially in hospitals without a neurosurgery unit, and for “transient loss of consciousness” [19], etc. Stroke is undoubtedly the most important neurological emergency, in terms both of frequency [4, 5, 20] and of the need, shown by evidence-based medical data [21, 22], for prompt intervention with diagnostic-treatment protocols designed to reduce mortality and improve outcome.

Whereas, in the past, neurology was not generally considered a discipline connected with emergency situations, the situation is now very different: with greater understanding of the pathophysiology of acute neurological conditions, advances in the field of diagnostic imaging and the availability of new treatment options [23] the diagnostic-therapeutic approach to neurological emergencies has now changed completely and the neurologist is emerging as an increasingly important figure in emergency departments [16]. Yet, even though neurology units frequently admit patients with acute problems requiring high-quality care, neurology continues to be classed as a medium care specialisation. Furthermore, these units often do not have sufficient medical staff to provide round-the-clock care. Evidence shows that the neurologist can make a fundamental contribution within the emergency department, changing the initial diagnosis in a high proportion (up to 52.5%) of cases [4], contributing to the clinical evaluation and therapeutic planning of patients and adequately select hospital admissions and providing pathways of care more efficient and less expensive in terms of

instrumental investigations and consultations. According to data from the NEU study [24], which evaluated the work of Italian hospital neurology units in the emergency setting, the main cause of neurological consultations in the ER is acute cerebrovascular disease, followed by headache, vertigo, head trauma, acute impairment of consciousness, and epilepsy (Fig. 1).

Acute cerebrovascular disease is the clinical condition most frequently requiring neurological attention in the ER, accounting for 27% of all emergency neurological consultations. Prompt “recognition” of the clinical symptoms of cerebrovascular diseases, early diagnosis of the site and nature of the injury, and rapid therapeutic decision-making, particularly as regards the decision to perform thrombolysis in ischaemic stroke, will influence the patient’s clinical course and outcome.

Between 1.2 and 4.5% of all adults seeking emergency care do so because of headache [11]. Of these, between 4.3 and 6.4% are affected by secondary headaches [25]. The NEU data show that, in Italy, 23% of neurological consultations in the ER are for headache. Subarachnoid haemorrhage is a rare condition, occurring in less than one in 1,000 patients arriving at the ER with headache [26]; prompt diagnosis of the condition is crucial, given its severe prognosis. In a large, prospective observational study of 455 patients arriving at an emergency department with headache, 107 had a severe acute-onset form and, of these, 19% had a subarachnoid haemorrhage; this was diagnosed by cranial CT scan in 18 patients and by lumbar puncture in the two who had a negative CT scan [27]. Obviously, the expertise of the consultant neurologist working in the ER is fundamental in order to ensure a correct clinical-anamnestic approach and thus a timely differential diagnosis between primary and secondary (e.g. meningoencephalitic, neoplastic or acute vascular) headache forms. In a Spanish study, the percentage of secondary headaches diagnosed thanks to the presence of a consultant neurologist in the ER was very high (13.4% of the evaluations requested); furthermore, the presence of a

neurologist was found to halve the number of hospital admissions for headache [28].

The epileptic seizure is another acute neurological condition demanding prompt and expert diagnostic-therapeutic assessment in the ER. Status epilepticus is a non infrequent medical emergency, having an incidence of 18–28/100,000 people/year and a mortality of 5–10%. Tonic–clonic convulsions and convulsive status epilepticus are generally easy to recognise; conversely, the non-convulsive forms can be difficult to identify, as the state of coma with general clinical deterioration and lack of overt motor manifestations can sometimes delay the diagnosis. Functional manifestations, too, characterizing pseudosyncope episode, can require differential diagnosis.

Neurotraumatological injuries make up quite a large share of the workload of neurology units, particularly those based in hospitals where there are no neurosurgery facilities. On average, head injury is the fourth most frequent clinical problem (12%) that the consultant neurologist in the ER will be called upon to deal with, after acute cerebrovascular disease, headache, and vertigo. The absence of a neurosurgery unit on site is associated with a highly significant increase in the frequency of specialist neurological consultations for head injury in the ER.

Disturbances of consciousness are other clinical situations frequently requiring the intervention of a neurologist, and account for 12% of neurological consultations in Italian hospital ERs. Disturbances of consciousness are a clinical group embracing a wide range of different disorders, from epileptic seizures to syncope, acute intoxication, and metabolic imbalances. For this reason they need particularly skilled neurological assessment. In a Scandinavian study, 1.2% of all ER visits were for transient loss of consciousness [19].

While the impact of neurological disorders in the emergency setting has thus been illustrated, the advantage, in the treatment of acute neurological disorders, of having a neurologist on call in the ER has not yet been adequately demonstrated.

As indicated earlier, in the study conducted by Moulin et al. [4], a high percentage of incorrect diagnoses (37.3% false positives and 36.6% false negatives) are recorded in ERs where no neurologist is on call. Furthermore, in 52% of cases subsequent neurological assessment completely changed the initial diagnosis.

Similar results were reported in an Irish study, in which neurological referral resulted in a significant change in diagnosis in 55% of patients and in management in nearly 70%; in 65% it also facilitated earlier discharge [29].

In a further study, published in 2008, the initial diagnosis made by the ER physician agreed with the final diagnosis in 60.4% of cases (298/493); instead, it disagreed or was uncertain in 35.7% (19.1 and 16.6%, respectively) [30].

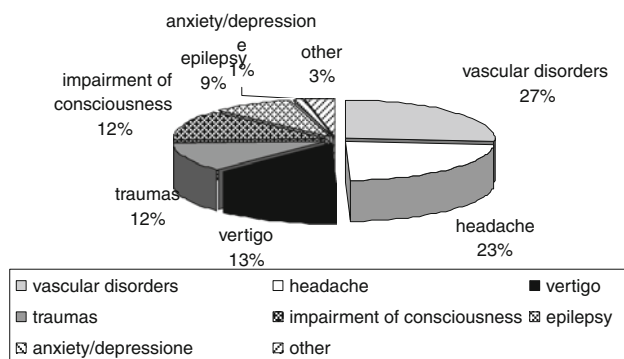


Fig. 1 Main causes of neurological consultations in the ER

Emergency neurology and the healthcare model of “intensity of care-based hospital”

Emergency neurology is a concept stressing the importance, from the epidemiological, organisational and professional perspectives, of ensuring acute treatment of the neurological disorders so frequently seen in ER settings. It is also a concept that fits with the “intensity of care-based hospital”, a new model of hospital organization which is more and more frequently realized in Italy.

This model is based on the division of hospital healthcare services into three different levels of intensity: level 1, *unified*, covering intensive and semi-intensive care; level 2, organised by functional area and covering ordinary and short-term (day hospital/overnight) hospital admissions; and level 3, *unified*, devoted to post-acute treatment, or low care.

For the area of neurology, this organisational framework might generate some important problems. Indeed, this system:

- fails to take into account the need for nurses specially trained in the care of acute stroke patients, since within it nurses would also be required to deal with other medical emergencies
- does not favour the development of a *stroke care pathway*, considering that within it patients would be transferred first to a medium care centre, and then to a rehabilitation facility
- entrusts the *disease management* to a team of medical operators probably differing from one another as regards their main area of activity (i.e., a single unit could have neurologists mainly involved in high care, others more involved in medium care, and others still whose main interest is the long-stay rehabilitation phase).

Implementation of this organization would lead to the loss of much of the multidisciplinary and multiprofessional integration that had previously proved effective.

Basing on the evidence that some healthcare models as stroke units have been shown to offer clear benefits over “non-dedicated” care, and taking account of the obvious peculiarities of neurological disorders also in the emergency setting, Italian scientific societies (Società Italiana di Neurologia, SIN and Società di Neuroscienze Ospedaliere, SNO) are now formulating working hypotheses and proposals for improving the care of neurological patients.

First of all, it seems necessary to distinguish clearly between hospitals of different levels and different organisational complexity. The “non-specialistic” bed could and should remain the hallmark of the small, primary-level hospital. Instead, to ensure expertise and continuous training, both of which are fundamental to guarantee

adequate high-quality care of neurological conditions, provision should be made in the secondary-level hospital for dedicated areas and teams. This is important, above all, from the perspective of the “hub” function that these units, located in more specialised and complex hospitals, are required to fulfill: they must have the capacity to respond, in real time, to the requests of the surrounding area and of smaller hospitals, and this applies particularly in the emergency setting. In a modern, quality-oriented vision of integration of territorial and hospital healthcare, this specialist hub function cannot be neglected or delegated to non-specialist emergency departments. The structuring and size of these specialist units must take into account the local epidemiology of the various neurological acute disorders. In tertiary-level or highly specialised hospitals, which should ensure services of clinical excellence as well as fulfill their specific mission in the field of training and advanced research, the specialisation and specific functional purpose of the specialist area/team must be considered unavoidable.

It also seems useful to identify two distinct operational settings within the field of neurology: that of elective interventions and that of more strictly emergency interventions.

As to emergency setting is considered, for some diseases, like stroke, strong evidence, gathered over the years, has made it possible to identify the best models of care: stroke units have been shown to produce highly significant reductions in disability and mortality (9% absolute risk reduction in the PROSIT study), even within the Italian healthcare system where these units are not yet sufficiently widespread.

There are many reasons why the creation of an adequate number of stroke units should be a cornerstone of national healthcare planning in Italy: this direction is supported by consolidated scientific evidence, as well as by national and international guidelines, by the indications emerging from the 2005 State-Regions Conference, by the AIFA (Italian Medicines Agency) decree on thrombolysis, by healthcare legislation already implemented or planned in many Italian regions. Finally, these units show a good cost–benefits ratio, which can be correlated with real savings linked to the reduced disability of stroke patients who received critical care in stroke units.

On the other hand, singling out the stroke unit as the only high-level neurological healthcare target (intensive or semi-intensive) appears extremely limiting, as it precludes our discipline to express its full potential. In the same way, the neurologist must become a professional figure able to manage all neurological emergencies, also through his/her gaining of an adequate expertise in special diagnostic techniques, such neurosonology (echo-color Doppler, TSA and transcranial), and neurophysiological applications

which (EEG in particular) currently tend to be confined to the elective setting, but whose use in the emergency setting would considerably enhance the neurologist diagnostic “capacities”.

As a consequence of the above considerations, emergency neurology should be regarded as a major part of the neurological discipline of the coming years. It should be seen as a high-care setting concerned with the treatment not only of stroke, but also of less frequent neurological disorders, with high care burden (Guillain–Barré syndrome, myasthenia gravis crisis, acute confusional states, epileptic seizures and status epilepticus, “urgent” headaches, vertiginous syndromes, syncope and transitory impairment of consciousness generally). This setting should constitute a clearly defined area characterised by a specialised care pathways (clinical, medical, nursing etc.), developed using the operating approach, based on discussion and consensus, as it happened for stroke unit.

It ensues that we need the creation, within the “critical” care area, of specific emergency neurology and stroke unit, to be staffed by physicians specialising in the diagnosis and treatment of neurological emergencies, but also able to deploy competences acquired in the field of stroke.

However, a similar proposal is worthless unless the serious administrative support (regional government) and the guarantee of relevant changes in the field of specialist training.

On the basis of the above, the SIN–SNO intersociety group, meeting in Castiglioncello (LI) in September 2009, decided to issue the following recommendations:

General directional guidelines

Neurological emergencies, including stroke, must be assessed and managed in neurologist-run healthcare settings.

Although organisational aspects may vary according to the local situation, patients must be guaranteed fast initiation of treatment and continuity of care under a consultant neurologist.

Moreover, considering the epidemiological impact of acute cerebrovascular disease and the scientific evidence demonstrating the efficacy of neurologist-run stroke units, these units remain the optimal organisational model for the management of stroke patients throughout their pathway of care and should be created wherever possible.

Diagnostic neurophysiology and neurosonology facilities must be available in neurological emergency settings.

It is always essential to guarantee prompt access to the neuroradiology facilities necessary for the management of neurological emergencies.

These proposed organisational models must be supported by adequate (in terms of quality and quantity) adjustments of staffing.

It is highly recommended, in emergency neurology settings, to develop and validate diagnostic and treatment pathways agreed by all the professionals and specialists involved (neuroradiologists, neurosurgeons, vascular surgeons, interventional radiologists, emergency physicians)

General directional guidelines

Recommended procedure when receiving patients with neurological emergencies presenting at:

- hospitals with an ER but no neurology unit:
 - Patients with a clear neurological emergency, in accordance with protocols also implemented by the Italian emergency medical services (tel. 118), should be sent directly to the reference hospital for neurology.
 - Patients with the above profile presenting spontaneously should be sent, by the ER, directly to the reference hospital for neurology.
 - These hospitals should in any case be linked, both in the traditional way (telephone and through consultations) and through telemedicine, with the hospital of reference.
- hospitals with an ER and a neurology/stroke unit:
 - The emergency neurology inpatient facility should, whenever possible, be located in a specifically created area with dedicated staff and beds (the solution already adopted in stroke units); if not, it must be located in the neurology unit, where it will have the characteristics listed above; 24 h neurological ward must always be available.
- hospitals with an ER and department of neurosciences, including neurosurgery and neuroradiology units:
 - The emergency neurology inpatient facility should, whenever possible, be located within the department of neurosciences, unless another solution is deemed opportune or necessary.

In the hospital organised by intensity of care, the neurology inpatient facility will be located in the semi-intensive care area, and must be managed by neurologists.

Training/re-training of neurologists in the management of neurological emergencies

Emergency Neurology constitutes both a challenge and an opportunity for cultural enrichment and professional growth of all the neurologists. However, specialist training in this area appears currently inadequate, also in those clinical conditions which are not necessarily neurological in nature but in which acute complications can be expressed by neurological signs and/or symptoms requiring urgent attention.

For these reasons, there is now a pressing and absolute need to train neurologists in the management of neurological emergencies.

To this purpose, it is deemed a priority:

1. To explore the possibility of creating, within the existing framework of schools of specialisation, a specific course in emergency neurology.

Alternatively, three training models are proposed:

1. The integration, within the neurology specialty programme, of mandatory credits in the management of neurological emergencies. Within this context, the option of training in interventional neurology should be offered;
2. Creation of a professional level III Master's degree in emergency neurology;
3. Organisation of a continuing medical education (CME) summer school to provide more in-depth education on issues relating to the field of neurological emergencies, based mainly on the interactive management of clinical cases and possibly supported by the use of advanced simulation techniques. Each regional government should guarantee, within the next 5 year period, specific courses dealing with issues characteristically arising in the field of neurological emergencies.

Aims and objectives of the school of specialty in neurology special program

To optimise the neurologist's training with regard to the field of emergency neurology through the development of a specific training course in the care and treatment of patients with neurological emergencies.

The aim of the training course is to furnish the knowledge and skills needed to:

1. guarantee high-level assessment and care (diagnostic work up, treatment and general management) of patients with neurological emergencies, as well as critically ill patients presenting neurological complications

2. work effectively with multidisciplinary teams
3. develop the ability to teach others the methods and concepts of emergency neurology.

Possible emergency neurology topics (applicable to all three training models)

1. Intracranial haemorrhage
2. Ischaemic stroke
3. Syncope
4. Acute-onset headaches
5. Vertigo
6. Status epilepticus
7. Cerebral oedema
8. Encephalopathies and Delirium
9. Herniation syndromes
10. Hydrocephalus
11. Cerebral venous thrombosis
12. Acute medullary syndrome
13. Cerebral abscesses
14. Encephalitis: bacterial and viral
15. Meningitis: bacterial and viral
16. Toxic-dysmetabolic encephalopathies
17. Brain trauma
18. Acute polyneuritis
19. Myasthenia gravis
20. Acute complications of neurodegenerative diseases
21. Coma, vegetative state and other acute state of consciousness disorders
22. Brain death

Technical instruments and equipment

(when necessary in collaboration with other disciplines)

- Cardiovascular and respiratory monitors
- Intracranial pressure monitor
- Echo-colour doppler, extra- and intracranial
- Multislice CT
- Multimodal MR
- Angiograph
- EEG
- EMG/ENG

Specific issues for the management of neurological emergencies

Agitation and pain
 Airways and spontaneous breathing
 Nutrition
 Volaemia and arterial blood pressure
 Anticoagulant therapy
 Thrombolytic therapy
 Intracranial pressure

Neurological complications of the critical patient
 Systemic complications of the critical patient
 Respiratory complications
 Cardiac complications
 Acid–base imbalances and hyper/hypotonic states
 Gastrointestinal complications
 Nosocomial infections
 Antiepileptic therapy
 End-of-life decision-making
 Transplants and organ donations

Diagnostic and therapeutic procedures

- Echo-colour doppler, extra- and intracranial
- Brain CT
- Multimodal MR
- Angiography in endovascular treatments (for those opting for training in interventional neurology)
- Lumbar puncture
- EEG
- EMG/ENG
- i.v. administration of t-PA (ischaemic stroke)
- Other emergency treatments
- Introduction of intracranial pressure monitoring
- i.v. sedation
- General emergency management procedures (including performance and interpretation of blood gas analysis, arterial catheter insertions, central venous catheter insertion)

The document drawn up by this Intersociety Group on Neurological Emergencies needs to be widespread and used in a way that will allow it to achieve the broadest possible consensus and efficacy.

In particular:

- it is to be brought to the attention of the Board of Full Professors, particularly in connection with the planning of School of Specialty courses;
- it is to be presented to the scientific societies SIN and SNO, which will adopt it and each nominate representatives who, on behalf of the NEU Intersociety Group, will liaise with government ministers, regional administrators, Scientific Institutes for Research, Hospitalisation and Health Care National Institutes and various media channels.

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