



# The future of neurology after the COVID-19 pandemic according to neurology residents

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## Abstract

**Background** The ongoing COVID-19 pandemic has resulted in significant changes in the delivery of neurological disease care and in neurology training in academic departments.

**Objective** We aimed to investigate how neurology residents viewed the future of neurology after the COVID-19 pandemic with regard to three main aspects: (i) organization of neurological activity, (ii) patient care, and (iii) funding availability for neurological diseases.

**Methods** We surveyed Italian neurology residents in order to investigate how they viewed the future of neurology after the COVID-19 pandemic.

**Results** Responses were collected from 254 residents who reported: a high risk of reduction of hospital neurological beds, of worsening of the quality of neurological patient management, and of lack of funding for neurological care and research.

**Conclusion** The survey results demonstrate the views of future neurologists regarding the direction of neurology after the COVID-19 emergency. It is important to focus on these aspects in order to adapt neurology training to the societal changes introduced by the pandemic, and to safeguard the essential role of neurology in the management and prevention of chronic degenerative illnesses and emergencies.

**Keywords** COVID-19 · Neurology resident · Tele-neurology · SIgN · Neurology training · Future neurology

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## Introduction

Over the last 2 years, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has resulted in the worldwide spread of the coronavirus disease 2019 (COVID-19) pandemic. Although vaccines were rapidly developed, healthcare systems continue to struggle. As frontline workers in clinical departments, neurology residents have experienced significant changes in the routine practice of neurological patient management and in neurology residency programs [1–3]. However, the educational mission is paramount to all neurology academic departments, and recently developed fund flow models regard it as a major goal for neurology chairs [4]. The ongoing pandemic has also significantly affected the management of neurological conditions and has catalyzed the modernization and digitalization of standard care [5].

As young members of the Italian Society of Neurology (SIgN) [6], we aimed to investigate how neurology residents viewed the future of neurology after the COVID-19 pandemic with regard to three main aspects: (i) organization

of neurological activity, (ii) patient care, and (iii) funding availability for neurological diseases.

## Methods

An online questionnaire was administered to Italian neurology residents at 36 teaching hospitals in Italy during April/May 2020. The questionnaire was composed of six items: two dealt with the organization of neurological activities, two related to patient care, and the last two were on the allocation of economic resources for neurological care. For each question, participants indicated their level of agreement on a 4-point Likert scale (Fig. 1). Full methods of the online survey are reported elsewhere [2].

## Results

Two hundred and fifty-four out of 620 neurology residents (41%) working in Italy during the study period participated in the survey. Females were 128/254 (50.2%) participants, while the mean age of residents was  $29.3 \pm 2.3$  years. During the study, 36/254 (14.2%) residents were in the first year of training, 68/254 (26.8%) the second year, 94/254 (37%) the third year, and 56/254 (22%) the last year. We received responses from all the 36 Italian schools of neurology. One hundred twelve from the North (44%), 64 from the Center

(25%), and 78 from the South (31%). Participants' responses to the online questionnaire are shown in Fig. 1.

## Organization of neurological activity

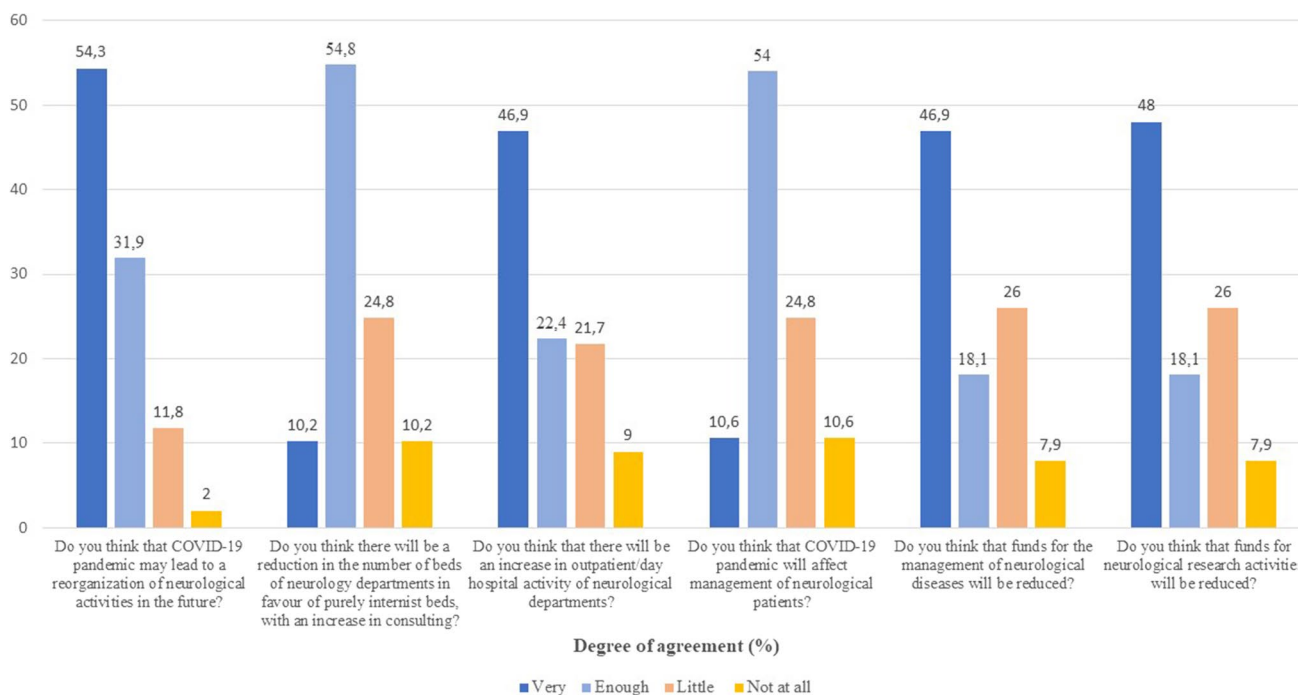
Most of the participants (219/254, 86.2%) predicted that the COVID-19 pandemic would lead to a general reorganization of neurological activity in the future. More than half of residents (138/254, 54.3%) were very confident about this. About two thirds of residents (165/254, 65%) thought that neurological inpatient beds would decrease in the future, with a consequent increase in internist/generic inpatient beds and neurological consultations.

## Patient care

About two thirds of residents (176/254, 63.9%) predicted an increase in outpatient activities, with a parallel reduction in ward assistance and hospital services. One hundred and sixty-four participants (64.6%) thought that changes in neurological activity caused by the COVID-19 outbreak would reduce the quality of neurological patient management.

## Funding availability for neurological diseases

Neurological disease management and neuroscience research were predicted to receive less funding in the future, according to 165/254 (65%) and 168/254 (66.1%) residents, respectively.



**Fig. 1** Neurology residents' responses (%) to the 6 items of the online questionnaire. For each question, participants indicated their level of agreement on a 4-point Likert scale

## Discussion

The COVID-19 outbreak has had a huge impact on the activity of neurology departments in Italy [7] and has resulted in significant changes to the daily work routine of neurology residents [2]. Our survey investigated the views of neurology residents regarding the future of neurological practice after the COVID-19 pandemic. Participants predicted profound changes to neurological activity in all three aspects explored by this study: organization of neurology services, patient care, and allocation of economic resources for neurological diseases.

As outlined from the answers from our fourth question (Fig. 1) the majority of respondents were predicting that COVID-19 pandemic could affect the management of neurological patients. This perception is in line with the early reports. Indeed, a significant proportion of neurological patients were forced to postpone their follow-up visits and hospitalization due to the COVID-19 pandemic [2, 7]. This has had a considerable negative impact on patients and caregivers and the healthcare system in general.

Indeed, neurological diseases are among the most relevant causes of mortality and disability worldwide, with a huge social impact [8]. In the European Union, neurological diseases are the third most frequent source of disability and premature death [8]. In addition, the demand for neurological assistance is expected to increase during the next decade as a result of the increase in average life expectancy and the increasing number of people affected by neurological and neuropsychiatric COVID-19 sequelae [9–11].

The COVID-19 pandemic has highlighted the limitations of neurology training and practice in emergency situations, which the most important is definitely acute stroke [12]. Interestingly, in a retrospective observational study it was found a significant 25–28% decrease of confirmed strokes cases managed in emergency department during the pandemic peaks compared with the same month of previous years, confirming the “hospital avoidance” phenomenon that has grown as the pandemic spread out. At the same time the pandemic forced stroke operators to better refine their operational settings (inside and outside the hospital) in order to guarantee an optimal care [12].

A prompt reorganization of the stroke network can guarantee optimal performances at times of crisis [13].

It is therefore important to identify aspects that need to be re-considered to provide an optimal standard of care. Due to the reorganization of neurology services during the first and second wave, emergency neurology represents a compelling area to address, and neurology residents should be prepared to independently manage these situations. Residency programs should include remote simulation courses to train emergency neurologists to evaluate

critical neurological patients and complex cases [13]. At the same time, outpatient clinics should manage patients as long and as in-depth as possible on an outpatient-only basis and should develop preferential multidisciplinary pathways to perform all necessary investigations in a short period of time.

Another important point is the successful expansion of teleneurology during the pandemic, which should be used as a model for the provision of remote neurological care in the future [5]. It is therefore necessary to improve residents' confidence in the use of telemedicine and new digital technologies. Moreover, resource allocation should guarantee that educational systems are working to meet the healthcare demand of the population. Contextually, since great expectations are placed on research into new neurologic treatments, particularly in the field of neurodegenerative diseases, it is fundamental to provide researchers with adequate funding.

Our questionnaire included only six questions, which may not be enough to fully investigate this difficult matter. The questionnaire was administered during the initial phase of the COVID-19 pandemic, when some neurology units were converted into COVID-19 wards and only acute neurological patients were admitted to COVID-19 hospitals. Nonetheless, our survey results demonstrate the views of future neurologists regarding the direction of neurology after the COVID-19 emergency. Their responses highlight the need for future strategies to safeguard the essential role of neurology in the management and prevention of chronic degenerative illnesses and emergencies.

Notably, the responses of this national survey are currently being discussed at the youth section of the European Academy of Neurology for possible shared initiatives [1, 3].

The COVID emergency has shifted many resources toward the intensive care area, leaving less space for chronic diseases, such as those that represent the majority of neurological diseases. From this point of view, the pandemic could lead to a partial change even in the neurological education process, with greater attention to the sector of neurological emergencies and fewer resources on the chronicity sector which could be approached in “super-specializations” rather than in a basic education process.

In the words of Abraham Lincoln, “The dogmas of the quiet past are inadequate to the stormy present. As our case is new, we must think anew and act anew”.

**Data availability** Not applicable.

**Code availability** Not applicable.

## Declarations

**Ethical approval** None.

**Conflicts of interest** The authors declare that they have no competing interests.

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