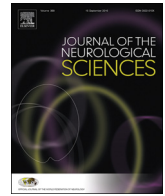




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Letter to the Editor

The impact of an early strict nationwide lockdown on the pattern of consultation for neurological diseases



Dear Editor,

The COVID-19 outbreak has rapidly spread around the world causing a massive disruption of healthcare systems, a profound economic depression and a distressing social situation [1]. Most countries entered into a lockdown in an attempt to slow the spread of the virus once they were already suffering a serious hit. Based on the experience observed in Europe, Argentina closed its borders on March 15th only one week after the first person died of COVID-19, and implemented an early nationwide lockdown limiting the circulation of 90% of its population, on March 20th, with 128 cases and 3 deaths of COVID-19 [2–3]. Most health care resources were reassigned in anticipation of a catastrophic situation. The massive communication media and the medical community warned the population about the necessity of avoiding “non-urgent” consults to the emergency rooms to avoid the overload of the system.

To evaluate the impact of the national lockdown policy during the COVID-19 pandemic, we compared the pattern of consultation to a tertiary neurological center. Patients who attended to our ED have primary neurological complaints or presented chronic neurological conditions with varied medical problems. The period evaluated was the quarantine period (March 20st to April 26th 2020) with the same timeframe of 2019. Descriptive summaries are presented as mean or median (standard deviation, SD) for continuous variables and proportions for categorical variables. The t-test or Mann-Whitney test were used to compare quantitative variables as appropriate. Pearson Chi-Square test or Fisher's exact test were used to compare frequencies of categorical variables as appropriate. A p-value < 0.05 was considered significant. The statistical analysis was performed with R-3.6.1, and the tidyverse, ggpubr, and ggplot2 packages. This research has been approved by the Institutional Ethics Committee.

1. Operational changes in the times of lock-down

As mandated by the Ministry of Health, our center suspended all non-urgent surgical procedures and most in-person outpatient visits. Selected patients were evaluated in-person according to the criteria of the attending physician and most consults were done via telemedicine or telephone.

2. Results and discussion

The number of consults due to neurological conditions or chronic neurological conditions with other medical problems during the quarantine period was revised. The number of outpatient visits dropped 64%, from $n = 12,681$ in the same period 2019 to $n = 4583$ in 2020. Hospital admissions decreased 50% (2019 $n = 493$ vs. 2020 $n = 248$). The drop was significant when non-urgent and urgent admissions were

compared (60% vs 40%, $X^2 6.14$, $p = 0.013$). Only interventional neuroradiology and neuro-oncology did not experience significant changes.

The performance of diagnostic tests decreased by 60%. (Fig. 1).

The mean (SD) number of daily visits to the ED decreased from 67.5 (10) in 2019 to 39.7 (27.7) in 2020 ($p < 0.001$). The consults started to decline on March 3rd, coincident with the first diagnosis of COVID-19 in Argentina and initial recommendations for precautions.

The number of patients admitted with acute cerebrovascular disorders during the quarantine decreased 60% compared to 2019. Remarkably, while the number of intracerebral hemorrhages remained constant, the number of patients with ischemic stroke and transient ischemic attacks (TIA) decreased 50% and 80% respectively. No differences were found in either the age of patients ($p = 0.21$) or in the severity of the events measured by the mean of the National Institute of Health stroke scale (NIHSS) ($p = 0.23$). However, looking at the distribution of the NIHSS, it appears that the decrease in the number of stroke admissions was mainly driven by minor events (NIHSS < 5). The number of patients who consulted to the emergency department with MS relapses and seizures decreased 50% and 83% respectively.

During the same timeframe, 19 subjects with respiratory complaints were suspected to have COVID-19 in our center. Testing for SARS-CoV2 was negative in all cases. While several PCR tests may be needed to rule out COVID-19 with certainty, our patients were tested once. This was done decided in their clinical context, the epidemiological situation and the guidelines in our country at that time.

These data show a dramatic drop in the consultations and admissions to a tertiary neurological center during a 37-days quarantine period. We considered this an adverse, non-desired consequence of the otherwise successful effect of the strict lockdown.

Many patients who may have benefited from immediate in person evaluation systematically avoided the emergency department. While patients with serious conditions still reach the health system, those with minor events, which may still carry serious risks, avoided the hospital. We hypothesize that these changes may have detrimental short- and medium-term consequences. This becomes particularly relevant in stroke. Like the findings of colleagues from Spain and China revised by Aguiar de Souza et al. [4]. The decrease in admissions for minor strokes and TIAs. This point is particularly concerning because of the high risk of major recurrences in the short term [5–7]. Also, patients with chronic conditions benefit from early evaluation and treatment. For example, chronic MS patients who experience a relapse may benefit from acute treatment with steroids or from changing their disease modifying treatments, in order to avoid future severe disability [8]. Similarly, patients with chronic epilepsy who experience an increase in the frequency of seizures need a careful evaluation to rule out common triggers and to re-adjust their antiepileptic medication to avoid severe consequences such as status epilepticus [9]. The decrease in consults to

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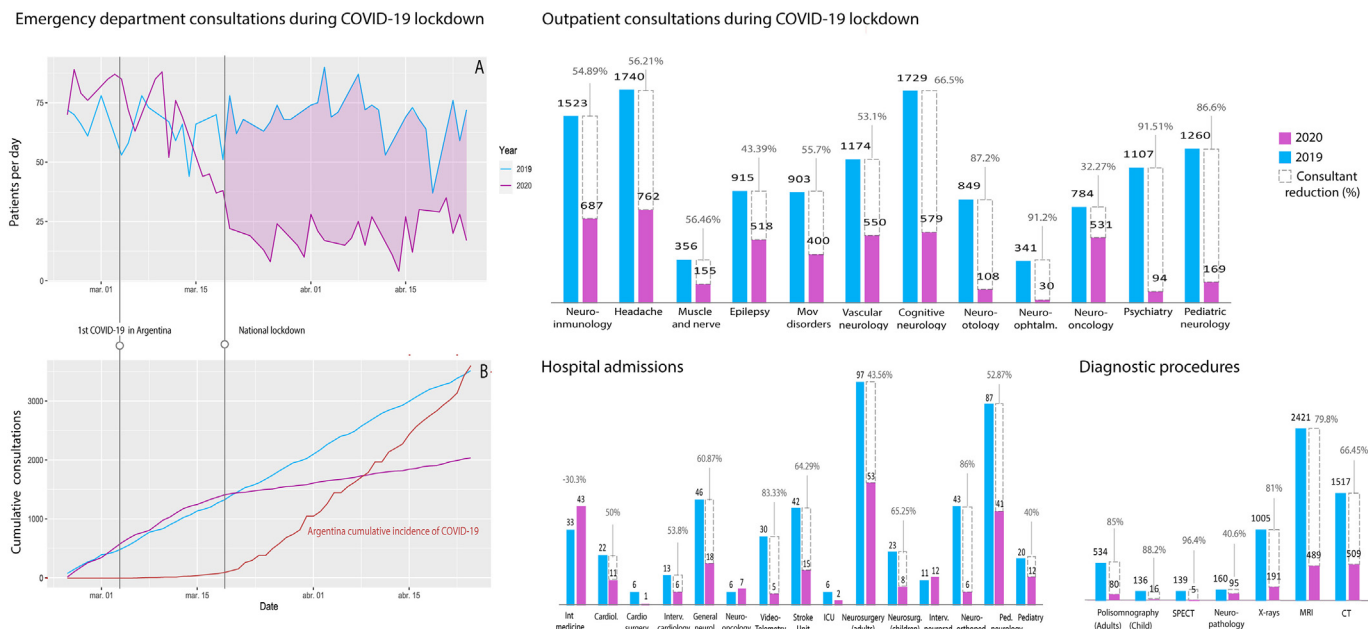


Fig. 1. Emergency department consultation. Daily (A) and cumulative (B) number of visits to the emergency department overtime. The vertical lines indicate the date of the first COVID-19 case and the beginning of the nationwide lockdown in Argentina, respectively. Outpatient consultations, hospital admission and diagnostic procedures in lockdown compared with 2019.

the ED also includes patients affected by chronic neurological conditions who usually present with mild medical decompensations, particularly infections. Delaying the treatment of these conditions expose patients to unnecessary risks and may create a future surge in avoidable hospitalizations. We suspect this may be our case, since we observed a 30% increase on admissions to internal medicine. All these changes may increase the demand of the system in the coming months, with more severe neurological conditions due to delay to consult, creating a significant burden of avoidable neurological diseases.

Our report should also allow for better design of policies and communication to the general population. We believe that lockdown measures should be tailored to the epidemiological situation of each country and complemented by a smart utilization of health resources (e.g. concentrate specialized medical attention of non-COVID-19 patients in subspecialty hospitals). Lastly, a clear communication strategy should emphasize the continuous need for paying attention to the other potentially catastrophic conditions and should assure the population that the health system is still available to treat common medical emergencies while keeping them safe.

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Disclosures

None of the authors have any conflict of interest related with this

article.

References

- [1] C. Huang, Y. Wang, X. Li, et al., Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China, *Lancet*. 395 (2020) 497–506.
- [2] Argentinean National Ministry of Health, April 27th Daily Report, www.argentina.gob.ar/coronavirus/informe-diario.
- [3] www.worldometers.
- [4] D. Aguiar de Sousa, E.C. Sandset, M.S.V. Elkind, The Curious case of the Missing Strokes During the COVID-19 pandemic, *Stroke*. 51 (7) (2020) 1921–1923.
- [5] P. Amarenco, P.C. Lavallée, J. Labreuche, et al., One-year risk of stroke after transient ischemic attack or minor stroke, *N. Engl. J. Med.* 374 (16) (2016) 1533–1542.
- [6] S.C. Johnston, D.R. Gress, W.S. Browner, S. Sidney, Short-term prognosis after emergency department diagnosis of TIA, *JAMA* 284 (2000) 2901–2906.
- [7] J.K. Lovett, M.S. Dennis, P.A. Sandercock, J. Bamford, C.P. Warlow, P.M. Rothwell, Very early risk of stroke after a first transient ischemic attack, *Stroke*. 34 (8) (2003) e138–e140.
- [8] F.D. Lublin, M. Baier, G. Cutter, Effect of relapses on development of residual deficit in multiple sclerosis, *Neurology*. 61 (11) (2003) 1528–1532.
- [9] N.B. Fountain, Status epilepticus: risk factors and complications, *Epilepsia*. 41 (Suppl. 2) (2000) S23–S30.

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