ASPETTANDO IL IV MEETING DELLE NEUROSCIENZE TOSCANE

WEBINAR ECM

NEUROLOGIA E COVID-19 IN TOSCANA

22 settembre 2020 Ore 14.00 - 16.30

Neuro-COVID-19: sintomi e sindromi

Università di Pisa
Dip. di Medicina Clinica e Sperimentale
UO Neurologia

Prof. Gabriele Siciliano

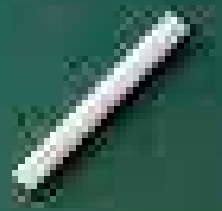
22/09/2020


SPECIAL REPORT: HEROES OF THE FRONT LINES
TIME
'WE MUST GET IT INTO OUR HEADS THAT OUR LIVES HAVE CHANGED'
FRANCESCO MENCHISE
ANESTHESIOLOGIST.
RAVENNA, ITALY

April 2020

OUTLINE

- ✓History
- ✓Pathomechanisms
- ✓What neurological manifestations?
- ✓Changing perspective: from neurological manifestations in Covid to Covid impact in care of neurological patients: the past, the present, the future



Overview

173.730 casi di COVID-19* di cui:

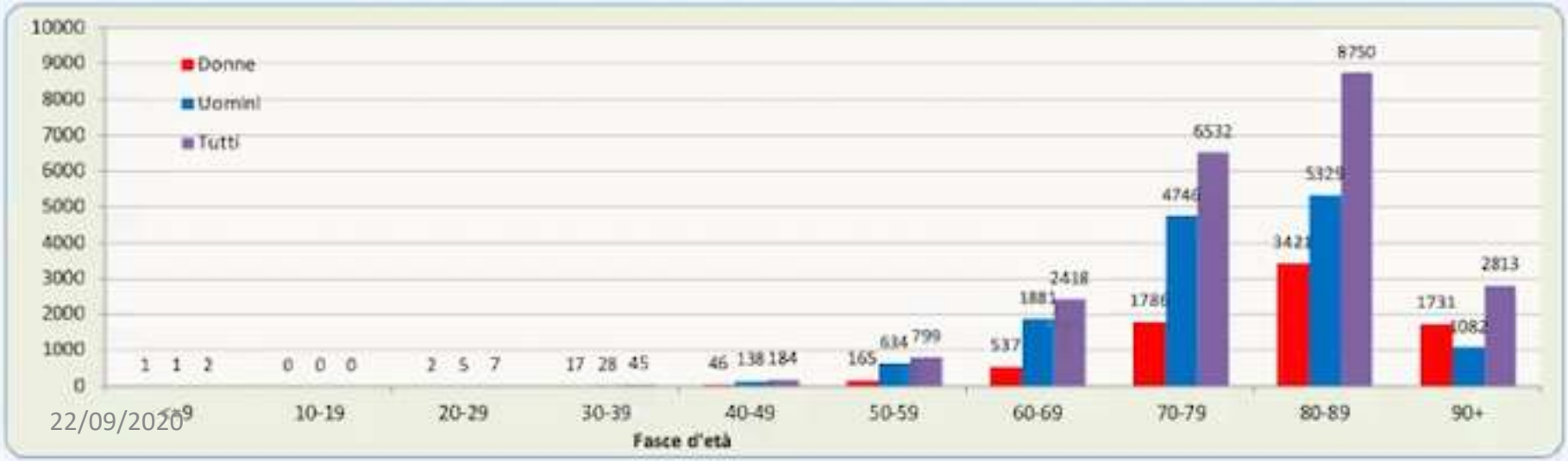
18.553 operatori sanitari $

22.586 deceduti

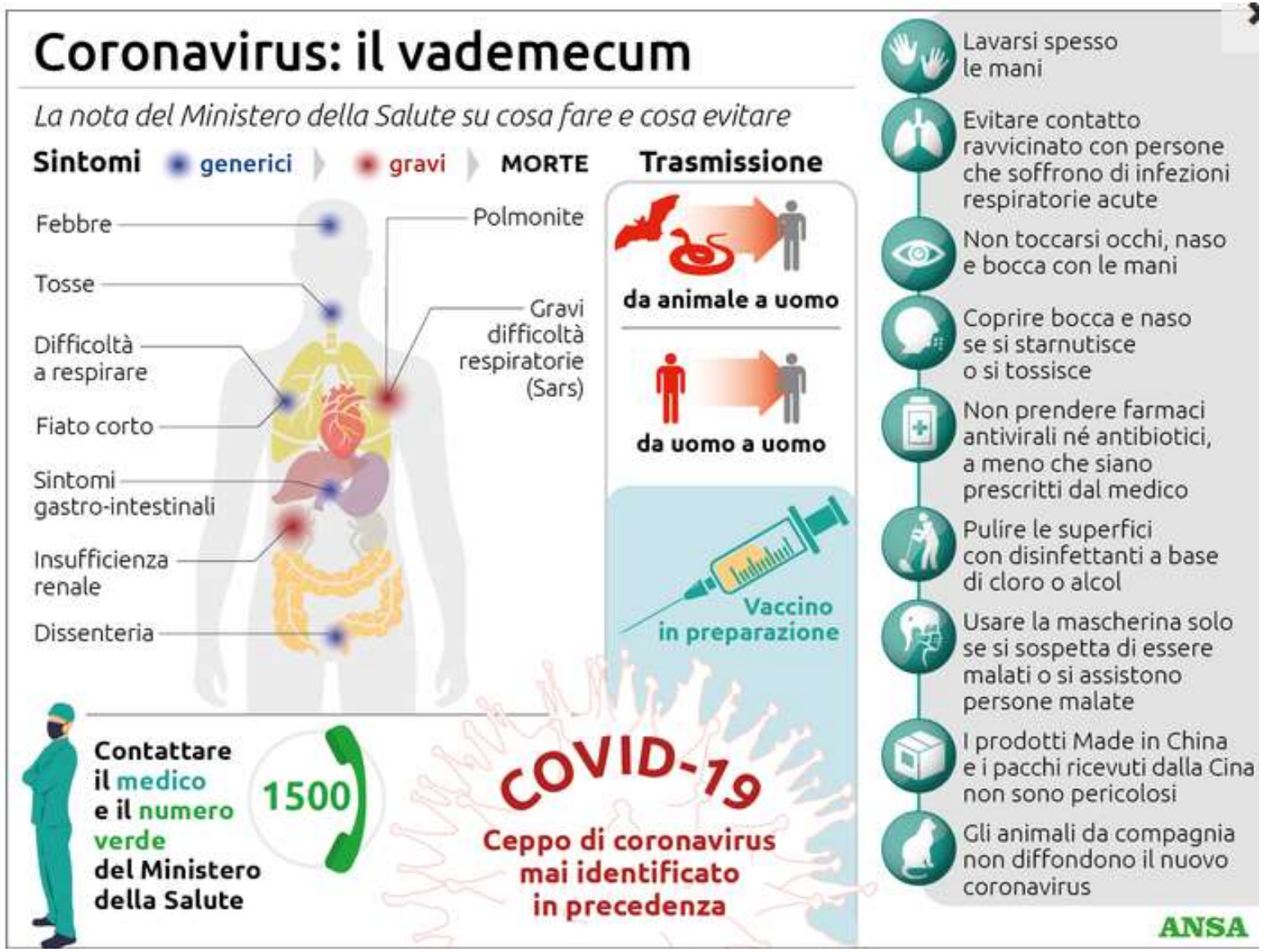
Età mediana dei casi: **62 anni**

ISS 22.04.2020-Sorveglianza Integrata COVID-19 Italia

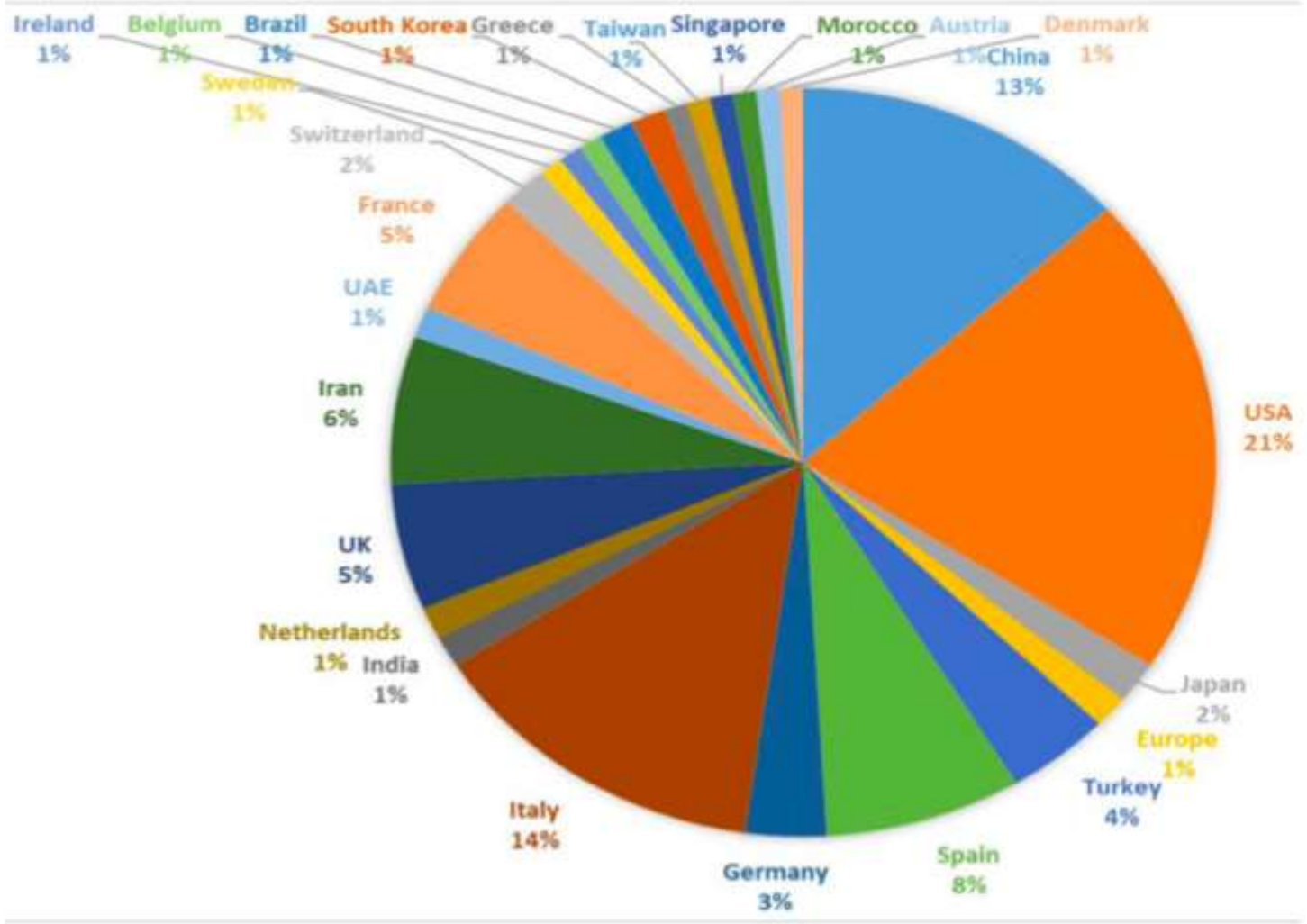
Decessi per Covid al 22 aprile 2020



All’inizio la manifestazione neurologica non è stata subito apprezzata…..



Rate of published articles from Jan 1, 2000, to July 7

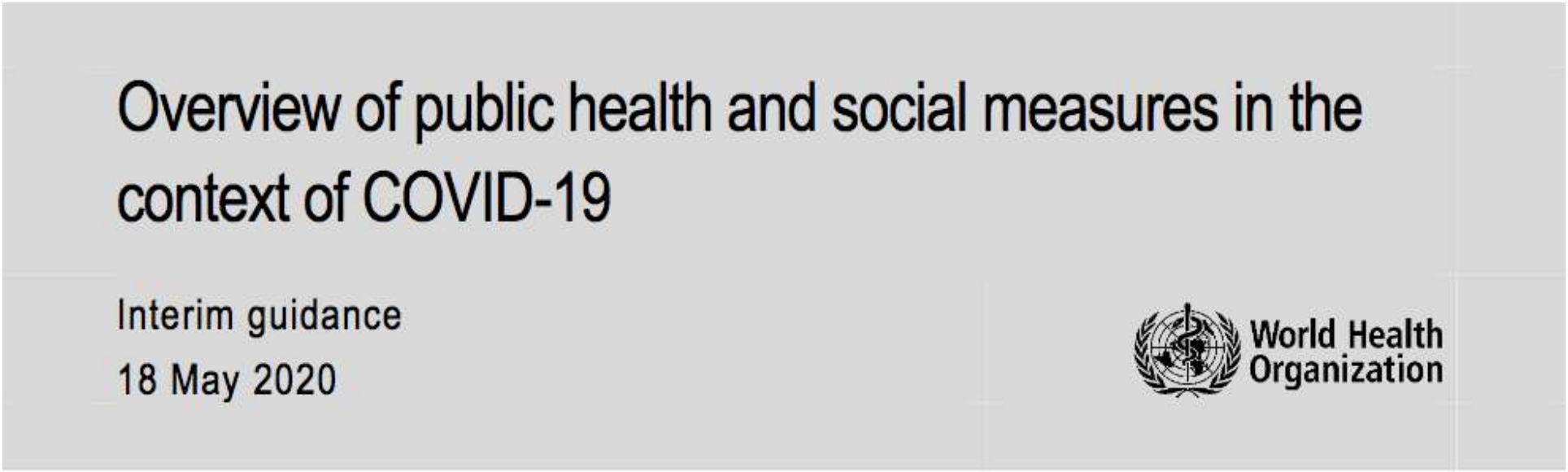


Review Article

Neurological complications of coronavirus infection; a comparative review and lessons learned during the COVID-19 pandemic

Maryam Sharifian-Dorche[a,b], Philippe Huot[a], Michael Osherov[a], Dingke Wen[a,c], Alexander Saveriano[a], Paul S Giacomini[a], Jack P Antel[a], Ashkan Mowla[d,*]

Journal of the Neurological Sciences 417 (2020) 117085



https://www.who.int/publications/i/item/overview-of-public-health-and-social-measures-in-the-context-of-covid-19

Response of the multiple sclerosis community to COVID-19

Mult Scler. 2020 Sep;26(10):1134–1136.

Olga Ciccarelli, Jeffrey A Cohen and Alan Thompson

COVID-19 and Multiple Sclerosis: Predisposition and Precautions in Treatment

SN Compr Clin Med 2020 Sep 3;1-6

Shaghayegh Sadeghmousavi [1,2] · Nima Rezaei [3,4,5]

Neuromuscular diseases and Covid-19: Advices from scientific societies and early observations in Italy

Corrado Angelini (1), Gabriele Siciliano (2)

Eur J Transl Myol 30 (2): 286-290, 2020

- → *Are people with neuromuscular disease (NMD) at higher risk?*
- → *What do people with NMD need to do to avoid infection?*
- → *What consequences does the risk of Covid-19 infection have for treatments used in people with NMD?*
- → *What needs to be done to assure ventilatory services during self-isolation (LVR bags, home ventilators etc.)*
- → *When should people with NMD seek admission if they develop symptoms of infection?*
- → *Can treatments for Covid-19 have effects on neuromuscular disease?*
- → *What should neuromuscular specialists do to assist Emergency Medical and Intensive Care decisions on admission to units, escalation of treatment, and ceilings of care in neuromuscular patients?*
- → *What patient support should neuromuscular centres provide?*

Dealing with immune-mediated neuropathies during COVID-19 outbreak: practical recommendations from the task force of the Italian Society of Neurology (SIN), the Italian Society of Clinical Neurophysiology (SINC) and the Italian Peripheral Nervous System Association (ASNP)

> Neurol Sci. 2020 May 4;1–4. doi: 10.1007/s10072-020-04448-9.

Raffaele Dubbioso[1] · Eduardo Nobile-Orazio[2] · Fiore Manganelli[1] · Lucio Santoro[1] · Chiara Briani[3] · Dario Cocito[4] · Gioacchino Tedeschi[5] · Vincenzo Di Lazzaro[6] · Gian Maria Fabrizi[7] · on behalf of SIN, SINC and ASNP

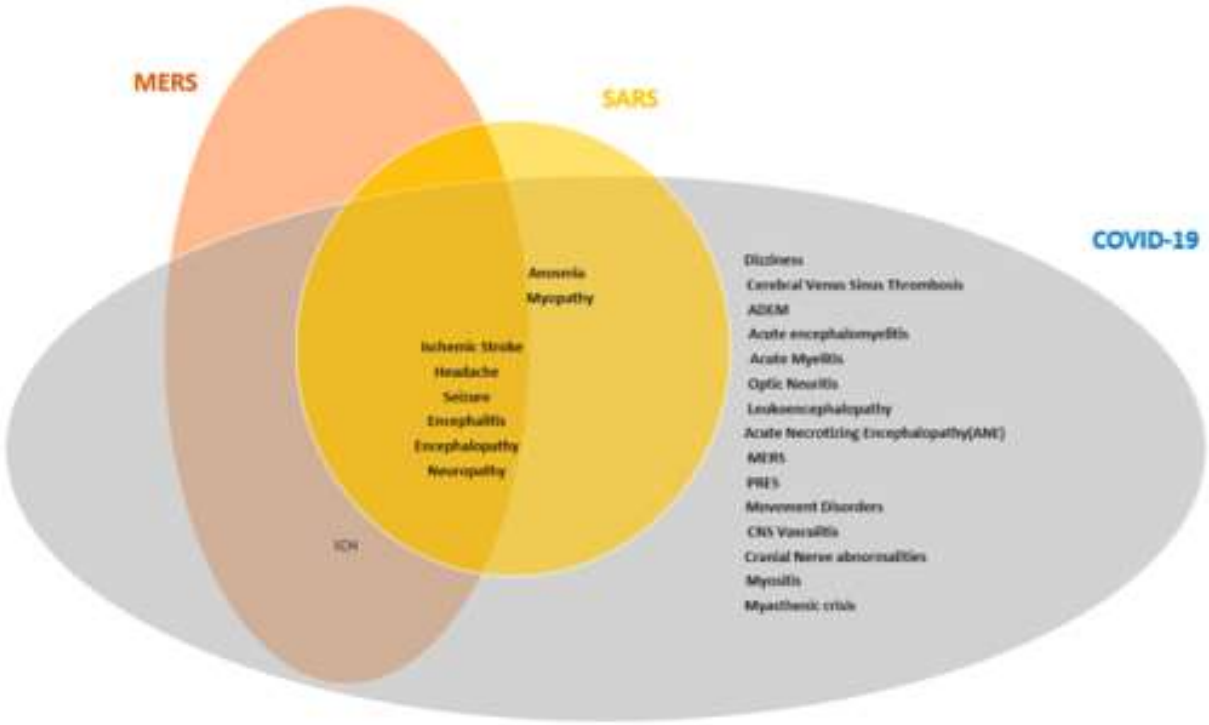
Do patients with immune-mediated neuropathy have an increased risk of contracting SARS-CoV-2 infection?

What to do if a patient is on immunoglobulin therapy?

What to do if a patient is treated with plasmapheresis?

What to do if a patient with immune-mediated neuropathy is positive for SARS-CoV-2?

Can I start treatment in a patient with immune-mediated neuropathy?



Neurological symptoms
Headache
Dizziness
Nausea/vomiting
Hypogeusia/ageusia
Hyposmia/anosmia
Impaired consciousness
Central respiratory failure
Myalgia

Neurological manifestations of COVID-19 caused by SARS-CoV-2

Acute	Post-viral
• Anosmia	• Acute disseminated encephalomyelitis
• Myalgia/myositis	• Acute necrotizing hemorrhagic encephalopathy
• Encephalopathy	• Transverse myelitis
• Stroke/transient ischemic attack	• Guillain-Barré syndrome
• Meningitis/encephalitis	• Multisystem inflammatory syndrome (Kawasaki's disease)
• Seizures	• Myalgic encephalomyelitis/chronic fatigue syndrome
• Peripheral neuropathy	• Dysautonomia
• Rhabdomyolysis	

> J Intern Med. 2020 Apr 30;10.1111/joim.13089. doi: 10.1111/joim.13089.
Online ahead of print.

Clinical and Epidemiological Characteristics of 1,420 European Patients With Mild-To-Moderate Coronavirus Disease 2019

Characteristic	All patients (N=1420)	Cured patients (N=264)	15-39 yo (N=793)	40-59 yo (N=551)	>60 yo (N=76)
Age					
Mean (SD) - yo	39.17 ± 12.09	34.1 ± 12.4	30.14 ± 4.8	48.4 ± 5.5	66.9 ± 6.9
Gender (N - %)					
Male	458 (32.3)	168 (63.6)	231 (29.0)	190 (34.5)	37 (48.7)
Female	962 (67.7)	96 (36.4)	562 (71.0)	361 (65.5)	39 (51.3)
Ethnicity (N - %)					
European/Caucasian	1298 (91.4)	242 (91.7)	715 (90.2)	512 (92.9)	71 (93.4)
Symptoms (N - %)					
Asthenia	514 (63.3)*	200 (76.0)*	264 (59.7)*	215 (65.7)*	35 (81.4)*
Myalgia	887 (62.5)	154 (58.3)	480 (60.5)	370 (67.2)	37 (48.7)
Dysphagia	274 (19.3)	39 (14.8)	163 (20.6)	97 (17.6)	14 (18.4)
Comorbidities					
Neurological diseases	13 (0.9)	0 (0)	3 (0.4)	4 (0.7)	6 (7.9)

Exploring the clinical association between neurological symptoms and COVID-19 pandemic outbreak: a systematic review of current literature

· J Neurol. 2020 Aug 1;1–9

Davide Tiziano Di Carlo[1,2] · Nicola Montemurro[1,2] · Giandomenico Petrella[1,2] · Gabriele Siciliano[3] · Roberto Ceravolo[3] · Paolo Perrini[1,2]

→ 19 studies
(from March 1th to May 29th)

→ 12,157 patients

	Raw data	Rate (95% CI)	N of articles
Demographic data			
N patients included in the analysis	12157		19
Male patients	2261/4460	50.6% (49.2–51.6%)	14
Age (median, IQR)	50.3 (11.9)	-	9
Comorbidity			
Hypertension	1969/6321	31.1% (30–32.3%)	10
Diabetes	384/6321	13.5% (12.3–14.8%)	8
Cardiovascular disease	297/2842	10.5% (9.3–11.6%)	7
Malignancy	85/2561	3.3% (2.6–4%)	6
Smoking	277/3082	9% (8–10%)	6
Neurological symptoms			
CNS			
Dizziness	136/2227	6.1% (5.1–7.1%)	3
Headache	237/3163	7.5% (6.6-8.4%)	10
PNS			
Hypo/anosmia	407/869	46.8% (43.5–50.2%)	5
Gustatory disorders	402/769	52.3% (48.7–55.8%)	4
Muscular injury manifestation			
Myalgia	441/2806	15.7% (14.4–17.1%)	7
Fatigue	667/2732	24.8% (23.2–26.4%)	6
Fatigue or myalgia	117/384	30.5% (25.9–35.1%)	3
Other symptoms			
Fever	3222/3999	80.6% (79.3–81.8%)	13
Cough	1908/3964	48.1% (46.6–49.7%)	12
Dyspnea	1009/2976	33.9% (32.2–35.6%)	98
Pharyngodynia	124/1502	8.3% (7–9.8%)	7
Digestive symptoms	357/1320	27.1% (24.7–29.5%)	10

	Nonsevere	95% CI	Severe	95% CI	*P*-value	N. studies
Comorbidity						
Hypertension	151/973	15.5% (13.4–17.9%)	121/371	32.6% (28–37.6%)	< 0.01	6
Cardiovascular disease	41/1127	3.6% (2.7–4.9%)	40/465	8.6% (3.4–11.5%)	< 0.01	5
Diabetes	66/973	6.8% (5.4–8.6%)	64/371	17.3% (13.7–21.4%)	< 0.01	6
Malignancy	19/915	2% (1.3–3.2%)	24/346	6.9% (4.7–10.2%)	< 0.01	5
Smoking	35/447	7.8% (5.7–10.7%)	18/164	11% (7–16.8%)	0.26	2
Neurological symptoms						
CNS						
Dizziness	24/228	10.5% (7.2–15.2%)	25/124	20.1% (14–28.1%)	0.02	2
Headache	67/837	8% (6.3–10%)	40/308	13% (9.7–17.2%)	0.01	6
PNS						
Hypo/anosmia	8/126	6.4% (3.1–11%)	3/88	3.4% (0.7–9%)	0.5	1
Gustatory disorders	9/126	7.1% (36.4–13.2%)	3/88	3.4% (0.7–9%)	0.7	1
Muscular injury manifestation						
Myalgia or fatigue	140/1189	11.8% (10.1–13.7%)	127/432	29.4% (25.3–33.9%)	< 0.01	7

Infezione Covid19- Severa o non severa

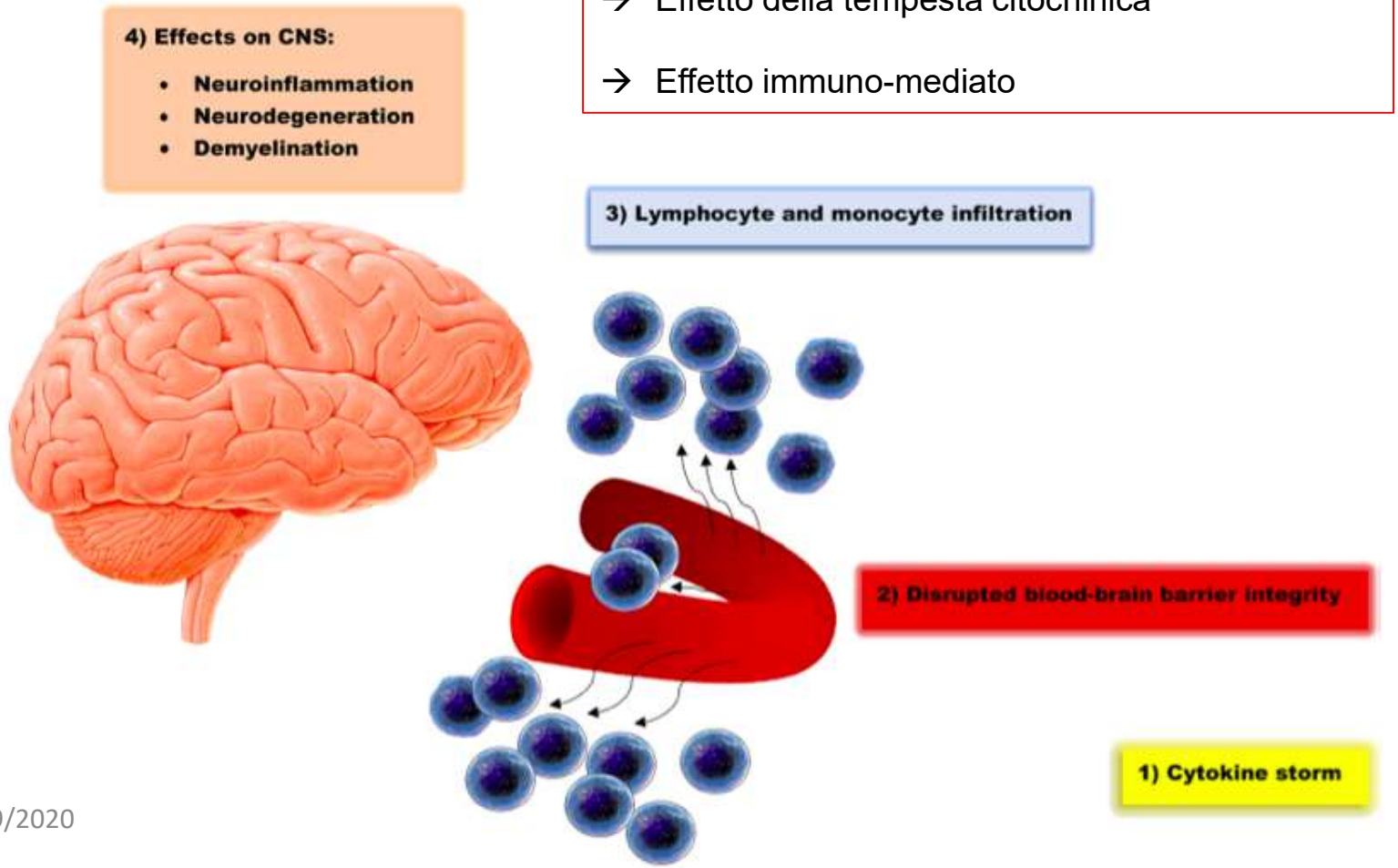
PUTATIVE MECHANISMS

→ Azione diretta del virus a livello di SNC e SNP

→ Effetto mediato da azione del virus su endotelio

→ Effetto della tempesta citochinica

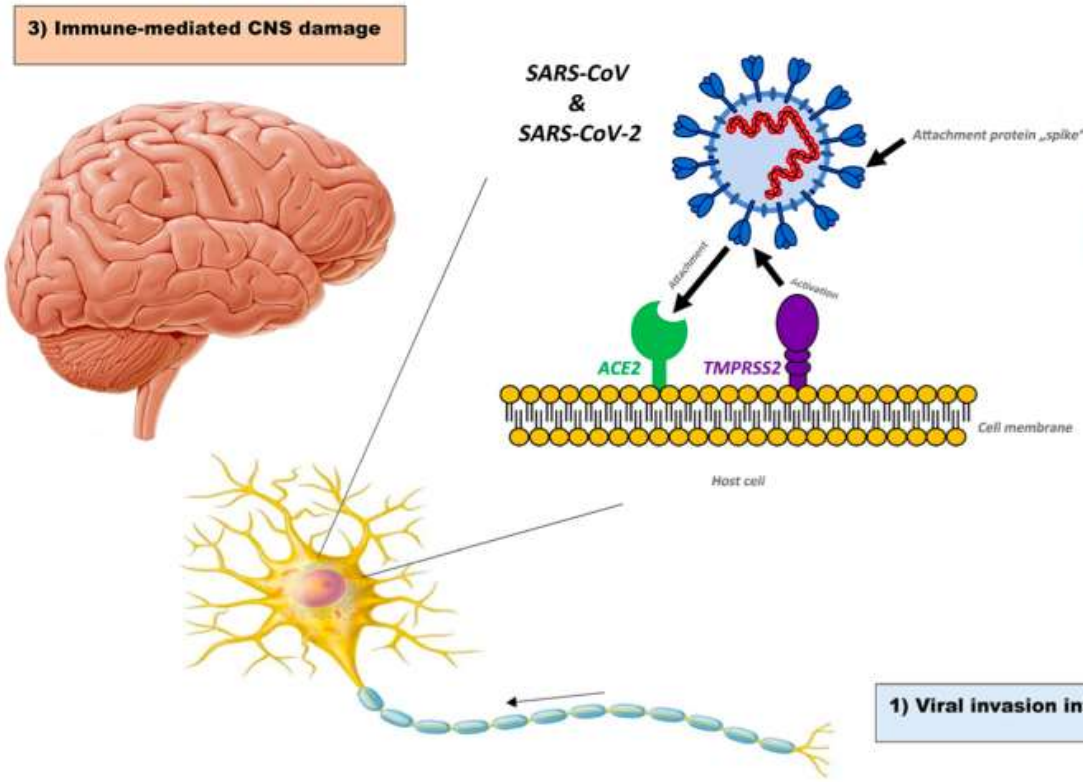
→ Effetto immuno-mediato

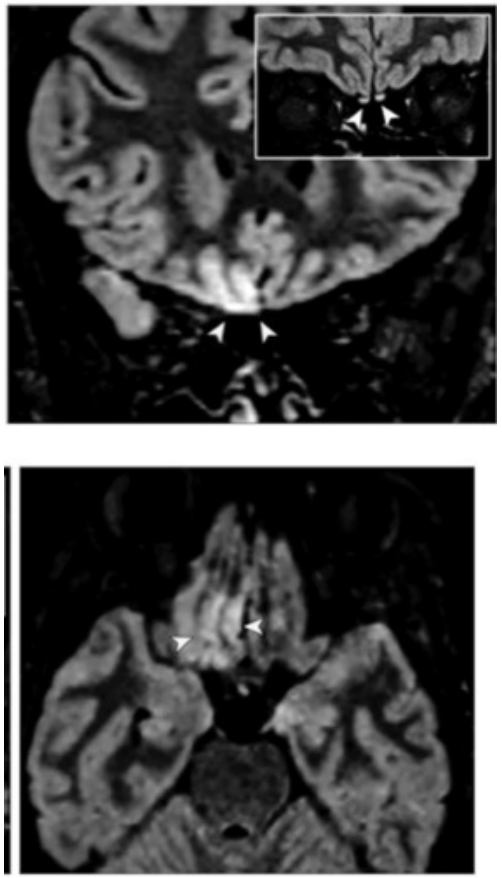


Understanding the Immunologic Characteristics of Neurologic Manifestations of SARS-CoV-2 and Potential Immunological Mechanisms

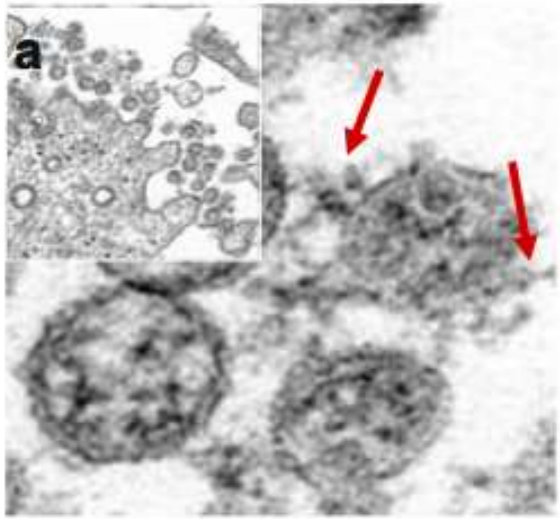
Molecular Neurobiology, 2020

Soheil Mohammadi [1,2] · Fatemeh Moosaie [1,2] · Mohammad Hadi Aarabi [1]

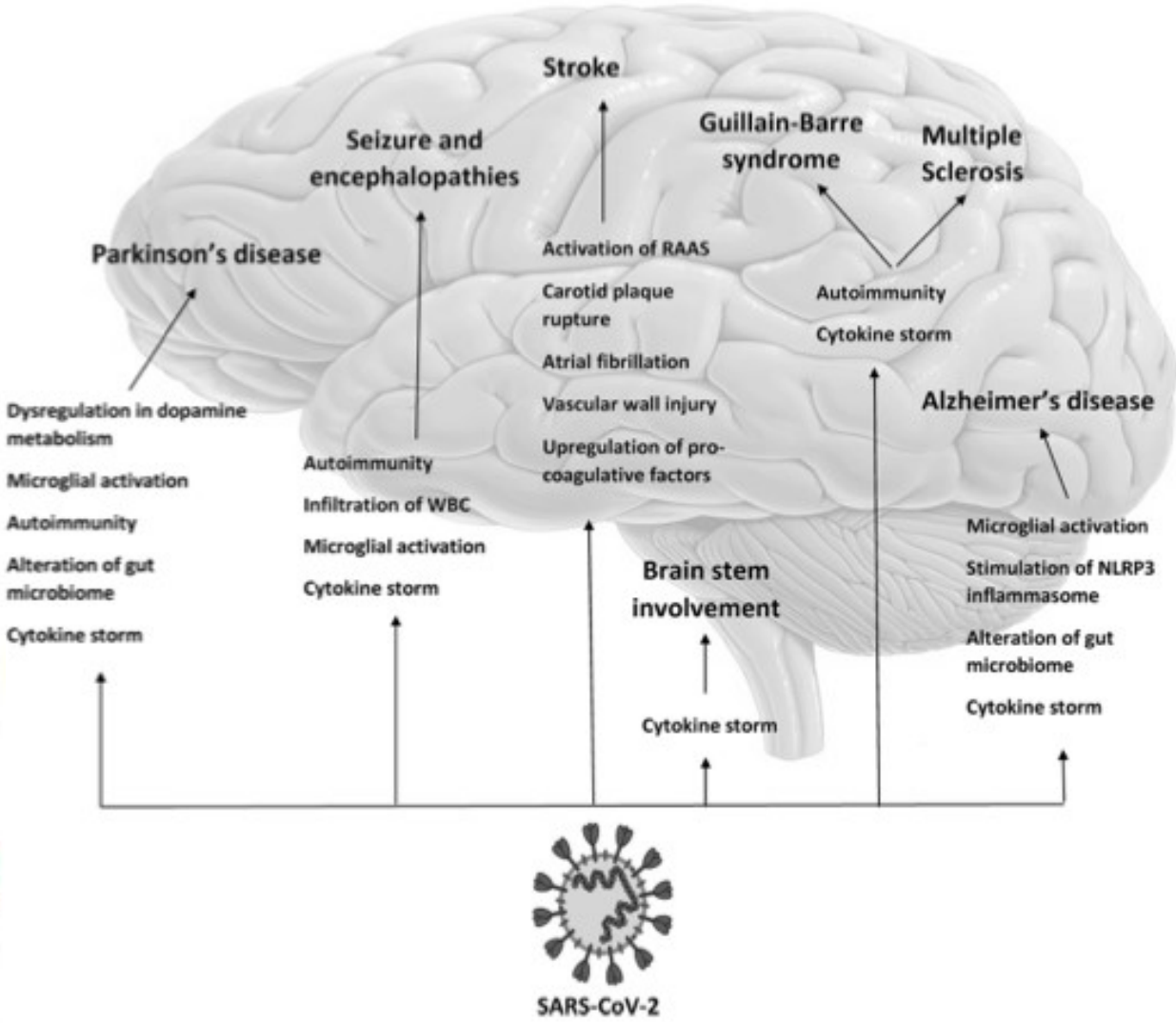




FLAIR image shows cortical hyperintensity in the right gyrus (yellow arrowheads) in both axial and coronal sections and subtle hyperintensity in the bilateral olfactory bulbs (white arrowheads) in the coronal section.



Electron microscope images of crown-shaped SARS-CoV-2 with protein spikes (red arrows)



The spectrum of neuropathology in COVID-19

Neuropathol Appl Neurobiol. 2020 Sep 16.

Safa Al-Sarraj[1,2#*], Claire Troakes[2*], Brian Hanley[3], Michael Osborn[3], Mark P. Richardson[4], Matthew Hotopf[4,5], Edward Bullmore[6], Ian Everall[4].

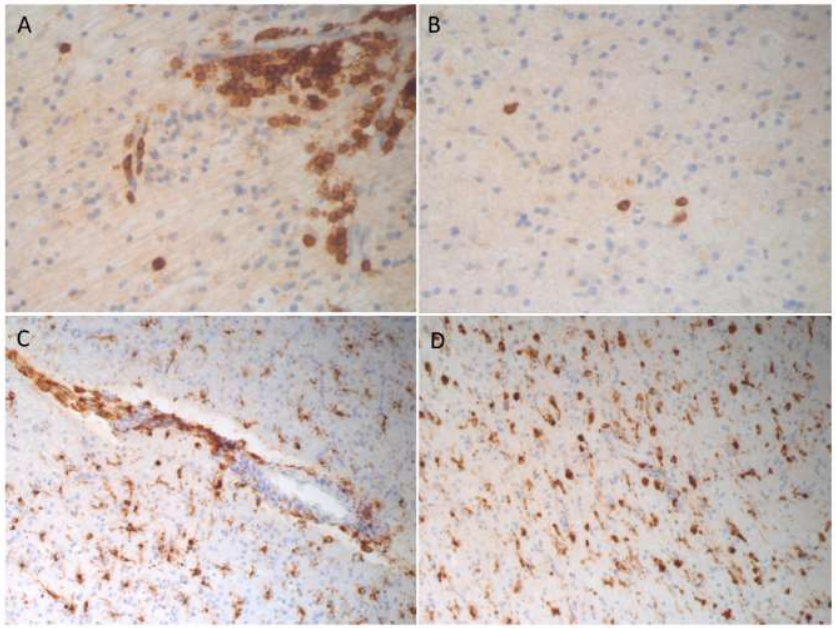


Figure 1: A: Perivascular T lymphocyte infiltration in the frontal lobe (CD3). B: occasional T lymphocytes in the white matter of the frontal lobe (CD3). C: activated microglial cells in the white matter and perivascular spaces in the frontal lobe (CD68), D: activated microglial cells in the white matter frontal lobe (CD68) (A, B x640, C, D x400)

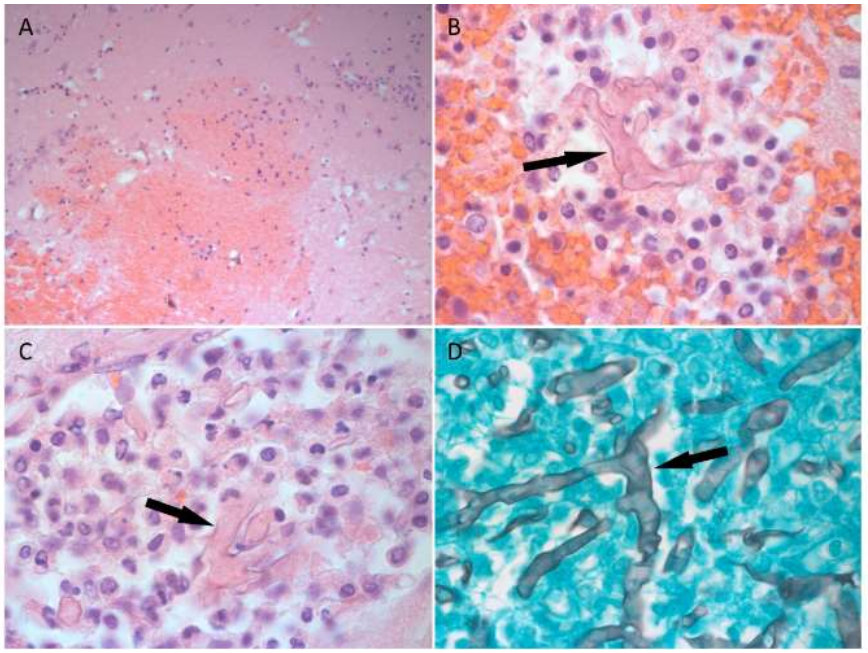


Figure 2: A: Haemorrhagic infarction demonstrating necrotic areas and areas of recent haemorrhages associated with focal macrophage infiltration and mild proliferation of capillaries (haematoxylin and eosin stain) x100, B and C higher power of necrotic and haemorrhagic areas in A showing macrophage infiltration and mucormycosis (arrows) (haematoxylin and eosin stain) x630. D: mucormycosis (arrow) showing broad and non-septate hyphae (Grocott sliver stain) x630

The spectrum of neuropathology in COVID-19

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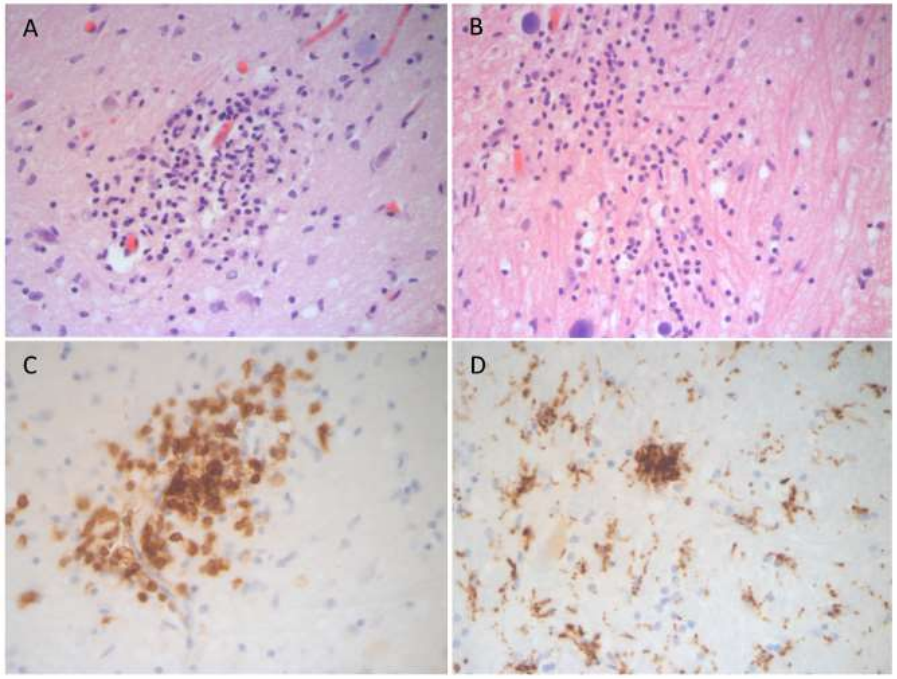
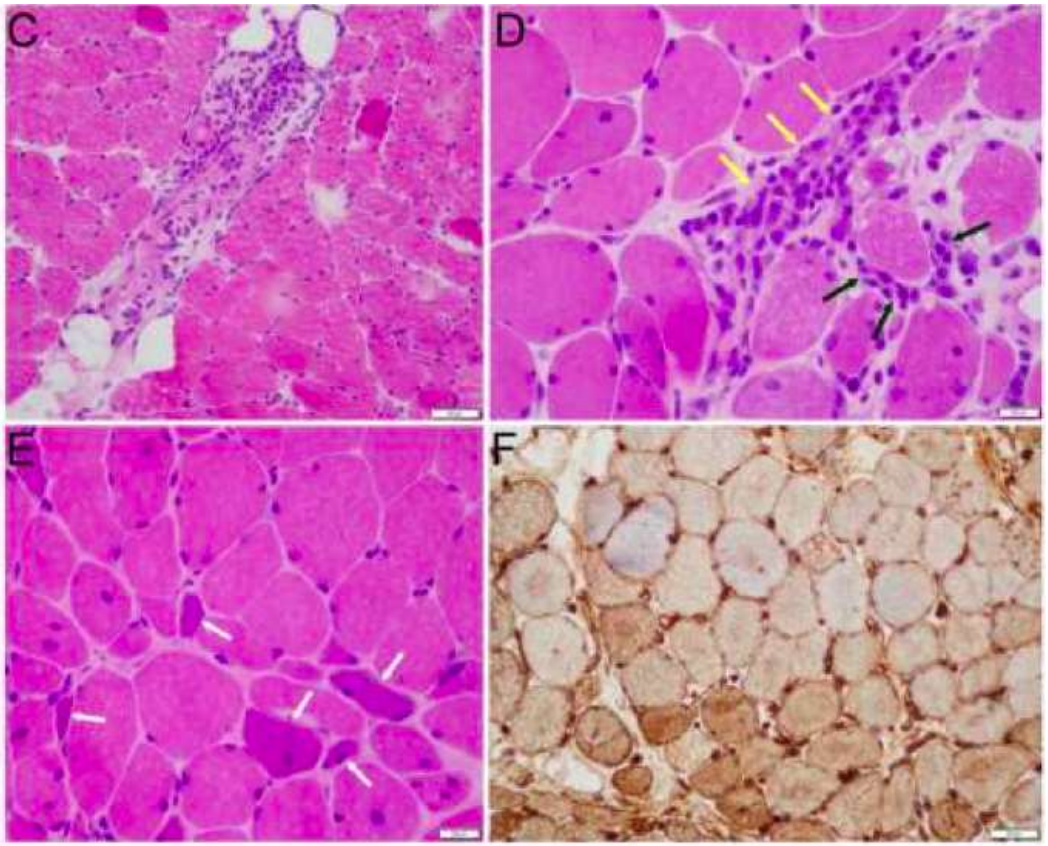


Figure 3: A and B: focal heavy infiltration of the parenchyma of the medulla by inflammatory cells typical of what is called micro glial nodule but with no necrosis x400. C: The inflammatory cells are T lymphocytes in the same spot as A (CD3) and D: intense microglial cell activation in the same spot as B (CD68) x400.

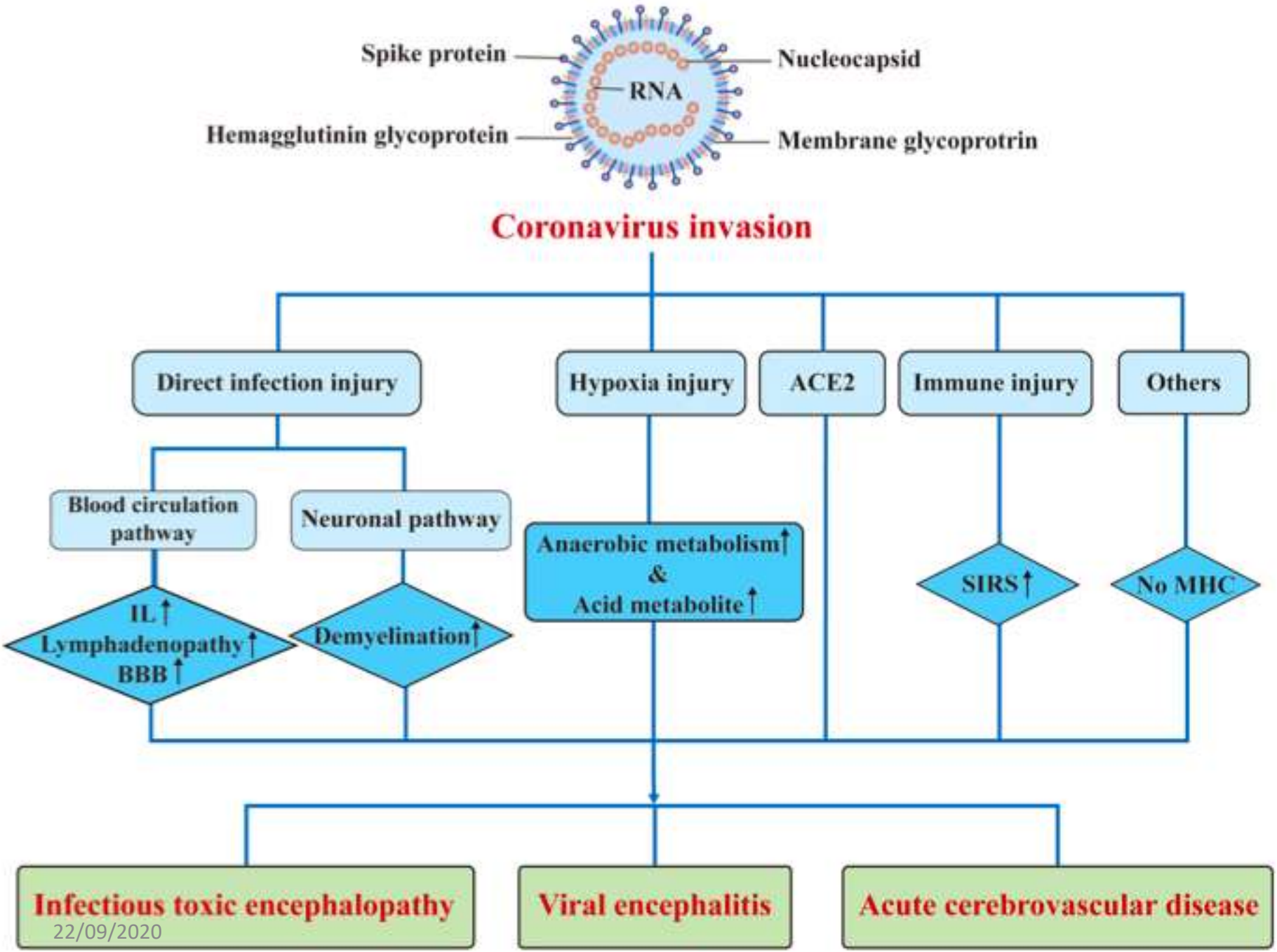
COVID-19 associated myositis with severe proximal and bulbar weakness.

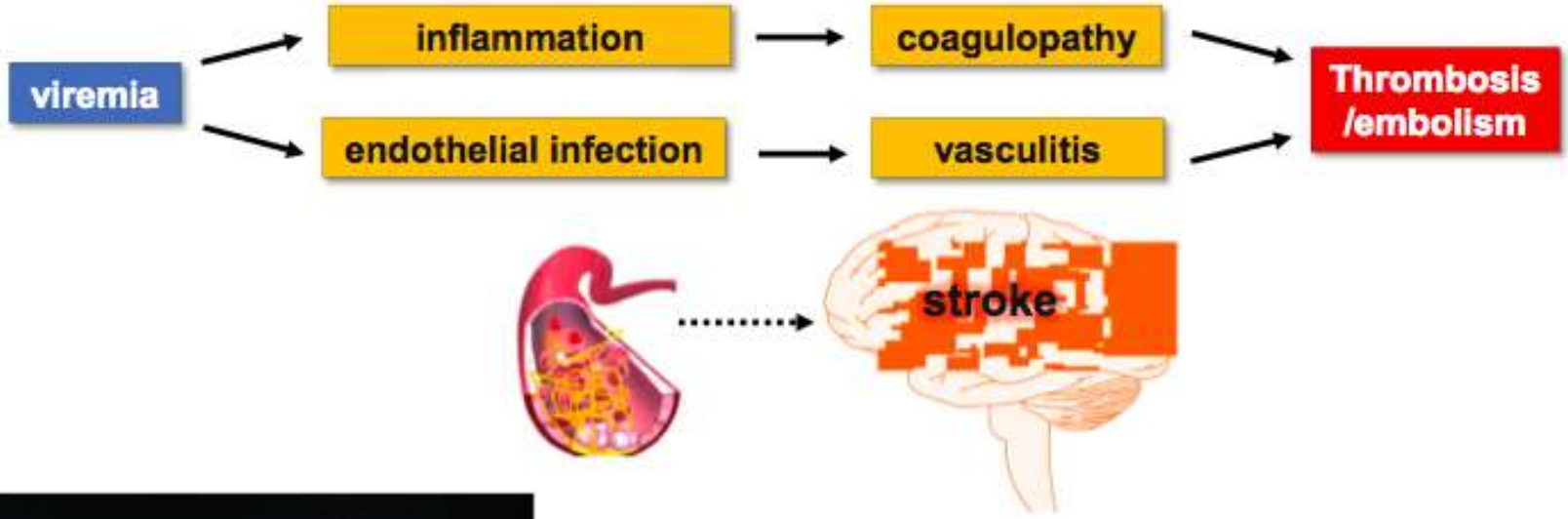
Muscle Nerve 2020 Sep;62(3):E57-E60.

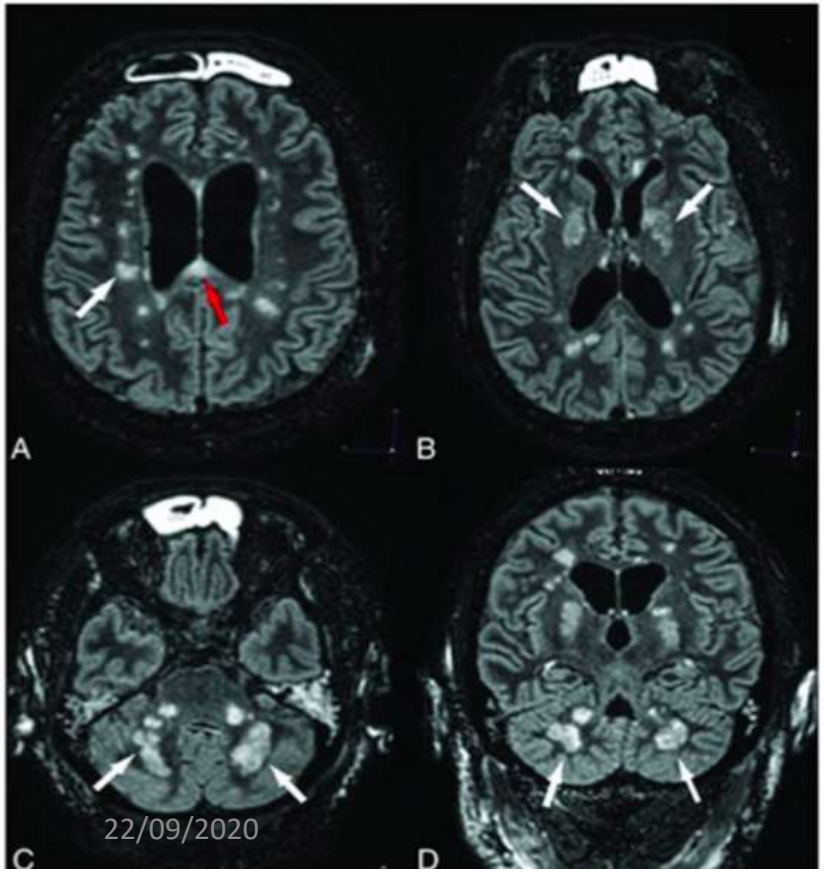
Hui Zhang[1,*], MD, PhD; Zeinab Charmchi[1,*], MD; Roberta J Seidman[2],
M.D. Yaacov Anziska[1], MD; Vinodkumar Velayudhan[3], DO; Jonathan Perk[1,#], MD, PhD



Biopsy of the left quadriceps muscle. Hematoxylin and eosin cryostat sections demonstrate multifocal predominantly perimysial perivascular lymphocytic inflammation (C and yellow arrows in D), with focal endomysial extension (black arrows in D). Multiple regenerating myofibers (white arrows in E) are recognized by their mild sarcoplasmic basophilia and enlargement of visible nuclei. There is upregulation of human leucocyte antigen (HLA) Class ABC on myofiber surfaces and sarcoplasmic staining by immunohistochemistry are identified by the brown staining of myofibers which was most consistent with an inflammatory myopathy (F). (scale bar = 50 microns)


Spike protein
Nucleocapsid
RNA
Hemagglutinin glycoprotein
Membrane glycoprotrin
Coronavirus invasion
Direct infection injury
Hypoxia injury
ACE2
Immune injury
Others
Blood circulation pathway
Neuronal pathway
Anaerobic metabolism↑ & Acid metabolite↑
SIRS↑
No MHC
IL↑ Lymphadenopathy↑ BBB↑
Demyelination↑
Infectious toxic encephalopathy
Viral encephalitis
Acute cerebrovascular disease





Hyperintense lesions within the periventricular white matter, cerebellar peduncles and basal ganglia (white arrows), and the corpus callosum (red arrow) indicative of diffuse ischemic lesions on the FLAIR image

Venous and arterial thromboembolic complications in COVID-19 patients admitted to an academic hospital in Milan, Italy

Thrombosis Research 191 (2020) 9–14

Corrado Lodigiani[a,b,*], Giacomo Iapichino[c], Luca Carenzo[c], Maurizio Cecconi[b,c], Paola Ferrazzi[a], Tim Sebastian[d], Nils Kucher[d], Jan-Dirk Studt[e], Clara Sacco[a], Bertuzzi Alexia[f], Maria Teresa Sandri[g], Stefano Barco[d,h], on behalf of the Humanitas COVID-19 Task Force

Baseline characteristics of COVID-19 patients.

	Intensive care unit (n = 61)		General ward (n = 327)		Total (N = 388)	
Age (years), median (Q1-Q3)	61 (55–69)		68 (55–77)		66 (55–75)	
Men	49/61	80.3%	215/327	65.7%	264/388	68.0%
Body mass index (kg/m2)						
≤25	20/57	35.1%	110/306	35.9%	130/361	36.0%
25–30	20/57	35.1%	126/306	41.2%	144/361	39.9%
≥30	17/57	29.8%	70/306	22.9%	87/361	24.1%
Overall duration of hospitalization (days), median (Q1-Q3)	18 (14–24)		9 (6–13)		10 (7–15)	
Cardiovascular risk factors						
Arterial hypertension on treatment	27/61	44.3%	156/327	47.7%	183/388	47.2%
Diabetes mellitus on treatment	11/61	18.0%	77/327	23.5%	88/388	22.7%
Dyslipidemia on treatment	7/61	11.5%	69/327	21.1%	76/388	19.6%
Chronic renal dysfunction	9/61	14.8%	52/327	15.9%	61/388	15.7%
Smoking	3/61	4.9%	42/327	12.8%	45/388	11.6%
Active cancer	2/61	3.3%	23/327	7.0%	25/388	6.4%
Solid	1		16		17	
Hematological	1		9		10	
Ongoing cancer therapy	1/61	1.6%	10/327	3.1%	11/388	2.8%
Hormonal therapy	1		3		4	
Chemo/immuno-therapy	0		5		5	
Radiotherapy	0		2		2	
History of cancer	0/61	0%	2/327	0.6%	2/388	0.5%
Chronic obstructive pulmonary disease	1/61	1.6%	34/327	10.4%	35/388	9.0%
Prior thromboembolic events						
Coronary artery disease	7/61	11.5%	47/327	14.4%	54/388	13.9%
Prior stroke	1/61	1.6%	19/327	5.8%	20/388	5.2%
Peripheral atherosclerosis	5/61	8.2%	48/327	14.7%	53/388	13.7%
Prior venous thromboembolism	0/61	0.0%	12/327	3.7%	12/388	3.1%
Use of co-medications						
Aspirin	17/61	27.9%	77/320	24.1%	93/379	24.5%
Vitamin K antagonists	0/61	0%	16/329	4.9%	16/388	4.1%
Direct oral anticoagulants	2/61	3.3%	15/329	4.6%	17/388	4.4%
ACE-inhibitors	6/61	9.8%	47/329	14.3%	53/388	13.7%

Venous and arterial thromboembolic events in hospitalized COVID-19 patients.

	Intensive care unit			General ward			Total		
Thromboembolic events	n	% of closed cases (n = 48)	% of imaging tests performed*	n	% of closed cases (n = 314)	% of imaging tests performed*	n	% of closed cases (n = 362)	% of imaging tests performed
At least one thromboembolic event	8	16.7% (95%CI 8.7%–29.6%)	–	20	6.4% (95%CI 4.2%–9.6%)	–	28	7.7% (95%CI 5.4%–11.0%)	–
VTE	4	8.3%	22%	12	3.8%	46%	16	4.4%	36%
PE (± DVT)	2	4.2%	25%	8	2.5%	36%	10	2.8%	33%
Isolated pDVT	1	2.1%	7%	3	1.0%	44%	4	1.1%	21%
Isolated dDVT	0	–	–	1	0.3%	13%	1	0.3%	13%
Catheter-related DVT	1	2.1%	50%	0	–	–	1	0.3%	50%
Ischemic stroke	3	6.3%	–	6	1.9%	–	9	2.5%	–
ACS/MI	1	2.1%	–	3	1.0%	–	4	1.1%	–

3.02.2020–10.04.2020:

388 patients:

→ median age 66 years,
→ 68% men,
→ 16% ICU)

The rate of ischemic stroke and ACS/MI was 2.5% and 1.1%, respectively

Clinical characteristics and outcomes of inpatients with neurologic disease and COVID-19 in Brescia, Lombardy, Italy

> Neurology. 2020 May 22;10.1212

ALL PATIENTS

	Total (n=173)	non-COVID-19 (n=117)	COVID-19 (n=56)	*p*-value
Admitting neurological diagnosis				0.035
Cerebrovascular disease	111 (64.2%)	68 (58.1%)	43 (76.8%)	
Epilepsy	23 (13.3%)	19 (16.2%)	4 (7.1%)	
Inflammatory/Infectious disease	9 (5.2%)	9 (7.7%)	0 (0.0%)	
Neoplastic	3 (1.7%)	3 (2.6%)	0 (0.0%)	
Other	27 (15.6%)	18 (15.4%)	9 (16.1%)	

PATIENTS WITH CEREBROVASCULAR DISEASE

	Total (n=111)	non-COVID-19 (n=68)	COVID-19 (n=43)	*p*-value
Cerebrovascular event				0.560
Transient ischemic attack	13 (11.7%)	8 (11.8%)	5 (11.6%)	
Ischemic stroke	85 (76.6%)	50 (73.5%)	35 (81.4%)	
Hemorrhagic stroke	13 (11.7%)	10 (14.7%)	3 (7.0%)	

→ COVID-19 and non-COVID patients with stroke had similar baseline characteristics

→ patients with COVID-19 had higher MRS scores at discharge (5.0, IQR 2.0-6.0 vs 2.0, IQR 1.0-3.0, p<0.0 01), with a significantly lower number of patients with a good outcome (n=11, 25.6% vs n=4 8, 70.6%, p<0 .001).

Large-Vessel Stroke as a Presenting Feature of Covid-19 in the Young

Oaxley et al

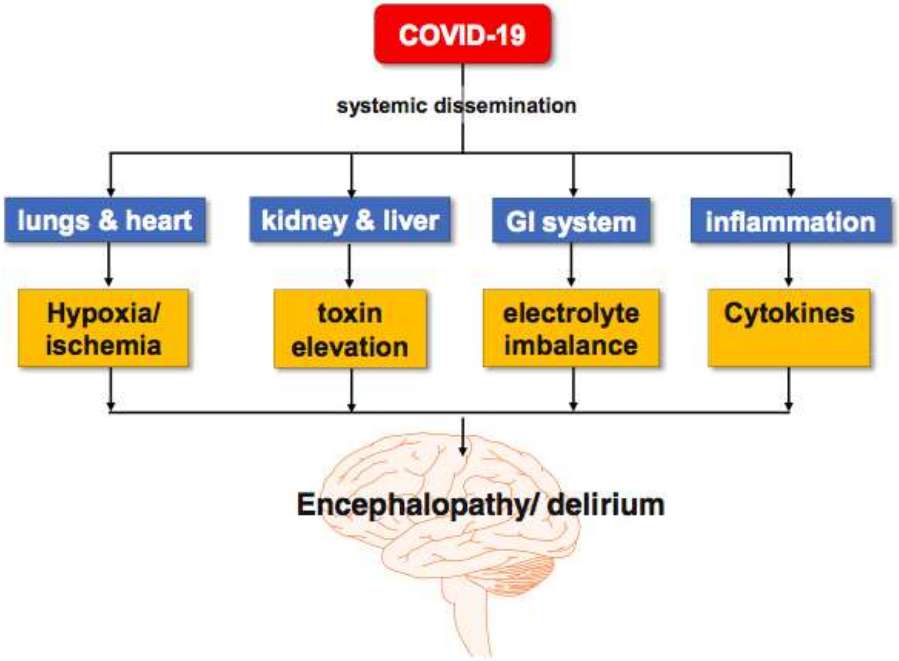
N ENGL J MED 382;20 NEJM.ORG MAY 14, 2020

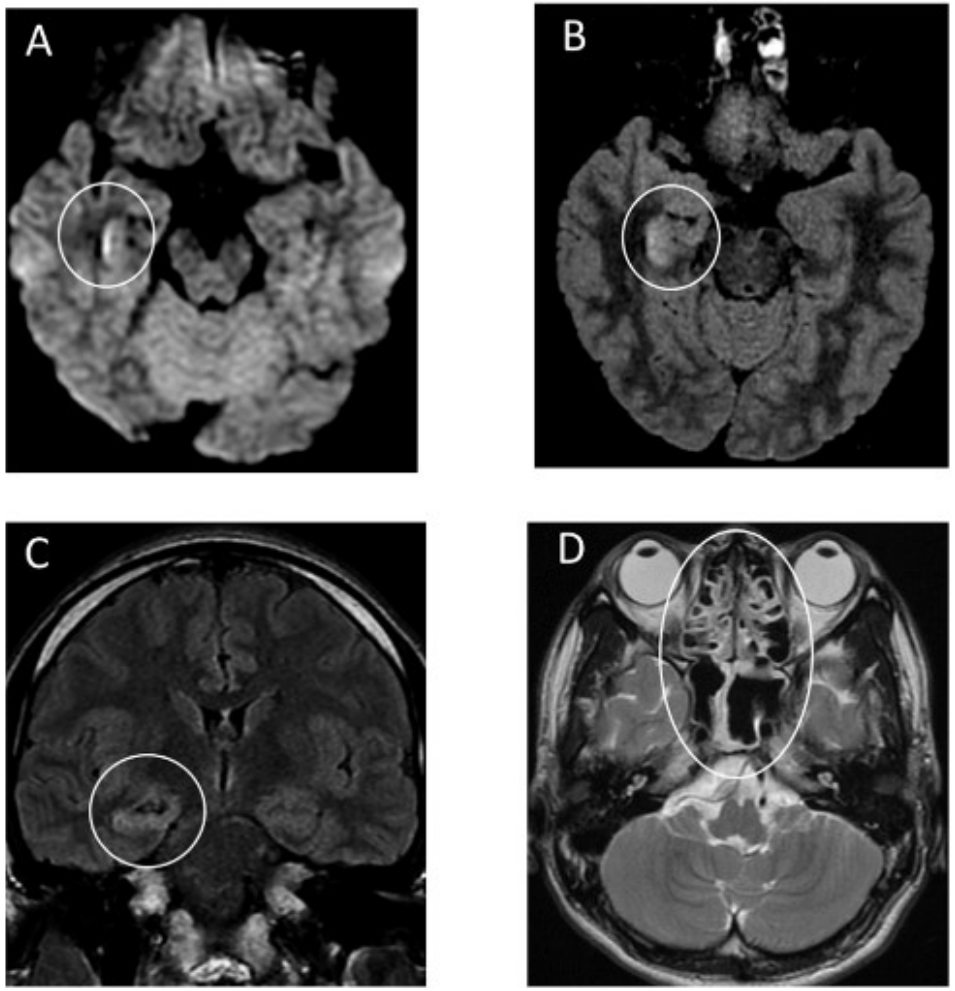
Variable	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5
Age — yr	33	37	39	44	49
Sex	Female	Male	Male	Male	Male
Medical history and risk factors for stroke†	None	None	Hyperlipidemia, hypertension	Undiagnosed diabetes	Mild stroke, diabetes
Medications	None	None	None	None	Aspirin (81 mg), atorvastatin (80 mg)
NIHSS score‡					
On admission	19	13	16	23	13
At 24 hr	17	11	4	19	11
At last follow-up	13 (on day 14)	5 (on day 10)	NA; intubated and sedated, with multiorgan failure	19 (on day 12)	7 (on day 4)
Outcome status	Discharged to rehabilitation facility	Discharged home	Intensive care unit	Stroke unit	Discharged to rehabilitation facility
Time to presentation — hr	28	16	8	2	8
Signs and symptoms of stroke	Hemiplegia on left side, facial droop, gaze preference, homonymous hemianopia, dysarthria, sensory deficit	Reduced level of consciousness, dysphasia, hemiplegia on right side, dysarthria, sensory deficit	Reduced level of consciousness, gaze preference to the right, left homonymous hemianopia, hemiplegia on left side, ataxia	Reduced level of consciousness, global dysphasia, hemiplegia on right side, gaze preference	Reduced level of consciousness, hemiplegia on left side, dysarthria, facial weakness
Vascular territory	Right internal carotid artery	Left middle cerebral artery	Right posterior cerebral artery	Left middle cerebral artery	Right middle cerebral artery
Imaging for diagnosis	CT, CTA, CTP, MRI	CT, CTA, MRI	CT, CTA, CTP, MRI	CT, CTA, MRI	CT, CTA, CTP
Treatment for stroke	Apixaban (5 mg twice daily)	Clot retrieval, apixaban (5 mg twice daily)	Clot retrieval, aspirin (81 mg daily)	Intravenous t-PA, clot retrieval, hemicraniectomy, aspirin (81 mg daily)	Clot retrieval, stent, aspirin (325 mg daily), clopidogrel (75 mg daily)
Covid-19 symptoms	Cough, headache, chills	No symptoms; recently exposed to family member with PCR-positive Covid-19	None	Lethargy	Fever, cough, lethargy

A first case of meningitis/encephalitis associated with SARS-Coronavirus-2

International Journal of Infectious Diseases 94 (2020) 55–58

Takeshi Moriguchi[a,*], Norikazu Harii[b], Junko Goto[a], Daiki Harada[a], Hisanori Sugawara[a], Junichi Takamino[a], Masateru Ueno[a], Hiroki Sakata[a], Kengo Kondo[a], Natsuhiko Myose[a], Atsuhito Nakao[c], Masayuki Takeda[d], Hirotaka Haro[e], Osamu Inoue[f], Katsue Suzuki-Inoue[g], Kayo Kubokawa[h], Shinji Ogihara[i], Tomoyuki Sasaki[g], Hiroyuki Kinouchi[j], Hiroyuki Kojin[k], Masami Ito[k], Hiroshi Onishi[l], Tatsuya Shimizu[l], Yu Sasaki[l], Nobuyuki Enomoto[m], Hiroshi Ishihara[n], Shiomi Furuya[k], Tomoko Yamamoto[k], Shinji Shimada[o]





Neuromuscular presentations in patients with COVID-19

Vimal Kumar Paliwal [1] · Ravindra Kumar Garg [2] · Ankit Gupta [1] · Nidhi Tejan [3]

Neurol Sci, Sep 2020

GBS

Table 4 Frequency of various demographic, clinical, and electrophysiological features and good outcome in patients with COVID-19-related GBS

Feature	Frequency
Number	39
Age (data available in 36 patients)	21–85 years, mean = 60.55, median = 61, mode = 70
Males (data available in 35 patients)	26 (74.28%)
Hyposmia/ageusia	6 (15.4%)/7 (17.9%)
Time to onset of GBS (data available in 35patients)	3–28 days, mean = 13.91 days, median = 14, mode = 10
Bifacial paralysis	18 (46.15%)
Other cranial neuropathies	9 (23.07%)
Respiratory involvement	17 (43.58%)
Demyelinating/axonal (data available in 32 patients)	24 (75%)/7 (22%)
Outcome (data available in 38 patients)	GOOD = 25 (65.8%), POOR = 11 (28.9%), DIED = 2 (5.3)

Guillain-Barré syndrome: The first documented COVID-19–triggered autoimmune neurologic disease

More to come with myositis in the offing

Marinos C. Dalakas, MD

Neurol Neuroimmunol Neuroinflamm 2020;7:e781.

- → Acute paralytic disease-like GBS, encephalomyelitis or myositis, even without systemic symptoms, may represent the first manifestation of COVID-19.
- → Anosmia, ageusia, other cranial neuropathies and lymphocytopenia are red-flags enhancing early diagnostic suspicion.
- → In Miller-Fisher Syndrome,ganglioside antibodies against GD1b, instead of QG1b, were found; because the COVID-19 spike protein also binds to sialic acid-containing glycoproteins for cell-entry and anti-GD1b antibodies typically cause ataxic neuropathy, cross-reactivity between COVID-19–bearing gangliosides and peripheral nerve glycolipids was addressed.
- → Elevated Creatine Kinase (>10,000) is reported in10% of COVID-19–infected patients; two such patients presented with painful muscle weakness responding to IVIg indicating that COVID-19–triggered NAM is an overlooked entity.

Neuromuscular presentations in patients with COVID-19

Vimal Kumar Paliwal [1] · Ravindra Kumar Garg [2] · Ankit Gupta [1] · Nidhi Tejan [3]

Neurol Sci, sep 2020

NEUROPATHIES

Table 5 Neuropathy in COVID-19 patients

Reference/ country	Type	Age/ sex	Clinical presentation	Respiratory involvement	Blood parameters/ RT-PCR	Electrophysiology	Neuroimaging	Treatment/outcome
Ghiasvand et al./Iran [66]	Symmetrical polyneuropathy	68/F	Fever, dry cough, myalgia, B/L lower limbs hypotonia with weakness with areflexia	Ground-glass opacities	Raised creatinine, CRP, lymphopenia	Not performed	Normal	Lopinavir/ritonavir, oseltamivir, mechanical ventilation, IV methylprednisolone/died
Abdelnour /UK [67]	Motor neuropathy	69/M	Lower limb weakness, knee/ankle areflexia, gait ataxia, sensory normal	Lower lobe pneumonia	Lymphocytopenia, raised CRP, LDH, ferritin	Not performed	Normal	Spontaneous recovery
Chaumont /France [68]	Encephalopathy with peripheral neuropathy	62/M	Confusion, memory loss, dysphagia, left facial palsy, asymmetrical quadriparesis, lower limb areflexia, upper limb hyperreflexia, action myoclonus, dysautonomia	Mild ARDS	Positive IgM, IgG for SARS-CoV-2, positive RT-PCR nasopharyngeal swab	Demyelinating asymmetric motor polyradiculoneuropathy and moderate axonal sensorimotor neuropathy	Right MCA recent stroke, spine normal	Hydroxychloroquine, azithromycin, IVIg, rehab centre after 36 days, mRS 2
		72/M	Confusion, delusion, hallucinations, memory impairment, dysphagia, slow saccades, quadriparesis, hyperreflexia, dysautonomia	ARDS	Positive IgM, IgG for SARS-CoV-2, positive RT-PCR nasopharyngeal swab	Demyelinating asymmetric motor polyradiculoneuropathy and moderate axonal sensorimotor neuropathy	Normal brain/spine MRI	Hydroxychloroquine, azithromycin, IVIg, rehab center after 50 days, mRS 4
		50/M	Confusion, delusion, hallucinations, memory impairment, dysphagia, slow saccades, quadriparesis, hyperreflexia, dysautonomia	ARDS	Positive IgM, IgG for SARS-CoV-2, positive RT-PCR nasopharyngeal swab	Lower motor neuron involvement, denervation of four limbs	Normal brain/spine MRI	Hydroxychloroquine, azithromycin, IVIg, methyl prednisolone, rehab centre after 76 days, mRS 4
		66/M	Confusion, delusion, hallucinations, memory impairment, dysphagia, slow saccades, quadriparesis, hyperreflexia, dysautonomia	ARDS	Positive IgM, IgG for SARS-CoV-2, positive RT-PCR nasopharyngeal swab	Demyelinating motor polyradiculoneuropathy	Normal brain/spine MRI	Hydroxychloroquine, azithromycin, IVIg, methyl prednisolone, discharged to home after 40 days, mRS 2

Neuromuscular presentations in patients with COVID-19

Neurol Sci, Sep 2020

Vimal Kumar Paliwal [1] · Ravindra Kumar Garg [2] · Ankit Gupta [1] · Nidhi Tejan [3]

Author/year	Meta-analysis/study	Prevalence of myalgia (%)	Other presenting symptoms
Huang et al./Feb, 2020 [7]	Study ($N = 41$)	44	Fever 98%, cough 76%, dyspnoea 55%, expectoration 28%, headache 8%, haemoptysis 5%, diarrhoea 3%
Xu et al./Feb, 2020 [8]	Study ($N = 62$)	52	Fever 77%, cough 81%, expectoration 56%, headache 34%, diarrhoea 8%, dypnoea 3%
Liu et al./March, 2020 [9]	Study ($N = 30$ HCW with pneumonia)	70	Cough 83.33%, fever 76.67%, headache 53.33%, GI symptoms 30%, dypnoea 46.67%
Li et al./March, 2020 [10]	Meta-analysis ($N = 1995$)	35.8	Fever 88.5%, cough 68.6%, expectoration 28.2%, Dyspnoea 21.9%, headache 12.1%
Wang et al./Apr, 2020 [11]	Study ($N = 80$, HCW)	23.75	Fever 81.25%, cough 58.75%, fatigue 35%, expectoration 23.75%, diarrhoea 18.75%
Wei et al./Apr, 2020 [12]	Study ($N = 14$, pneumonia)	100	Fever 86%, dry cough 71%
Lechien et al./Apr, 2020 [13]	Study ($N = 1420$)	62.5	Headache 70.3%, anosmia 70.2%, nasal obstruction 67.8%, cough 63.2%, asthenia 63.3%, rhinorrhoea 60.1%, gustatory dysfunction 54.2%, sore throat 52.9%, fever 45.4%
Lai et al./May, 2020 [14]	Study ($N = 110$ HCW)	45.5	Fever 60.9%, cough 56.4%, sore throat 50%
Zhu et al./May, 2020 [15]	Meta-analysis	21.9	Fever 78.4%, cough 58.3%, fatigue 34%, expectoration 23.7%, anorexia 22.9%, chest tightness 22.9%, dyspnoea 20.6%
Lapostolle et al./May 2020 [16]	Study ($N = 1487$)	57	Fever 92.5%, dry cough 94%, headache 55%, asthenia 28%, ageusia 28%, chest pain 21%, hemoptysis 3%
Chen et al./June, 2020 [17]	Study ($N = 38$, fatalities)	15.79	Fever 65.78%, cough 42.10%, dyspnoea 60.52%, chest tightness 26.31%
Korkmaz et al./June, 2020 [18]	Study ($N = 80$, children)	19	Fever (58%), cough (52%)
Reilly et al./June, 2020 [19]	Study ($N = 14$)	67	Dyspnea (77%), fatigue (100%), diarrhoea (67%)
Gaur et al./July, 2020 [20]	Study ($N = 26$)	38.46	Fever (61.54%), sore throat (53.84%), cough (42.3%), dyspnea (23.07%)
Aggarwal et al./July, 2020 [21]	Study ($N = 32$, ARDS)	43.75	Dyspnea (90%), cough (84.4%), fever (68%)

Myositis/rhabdomyolisis

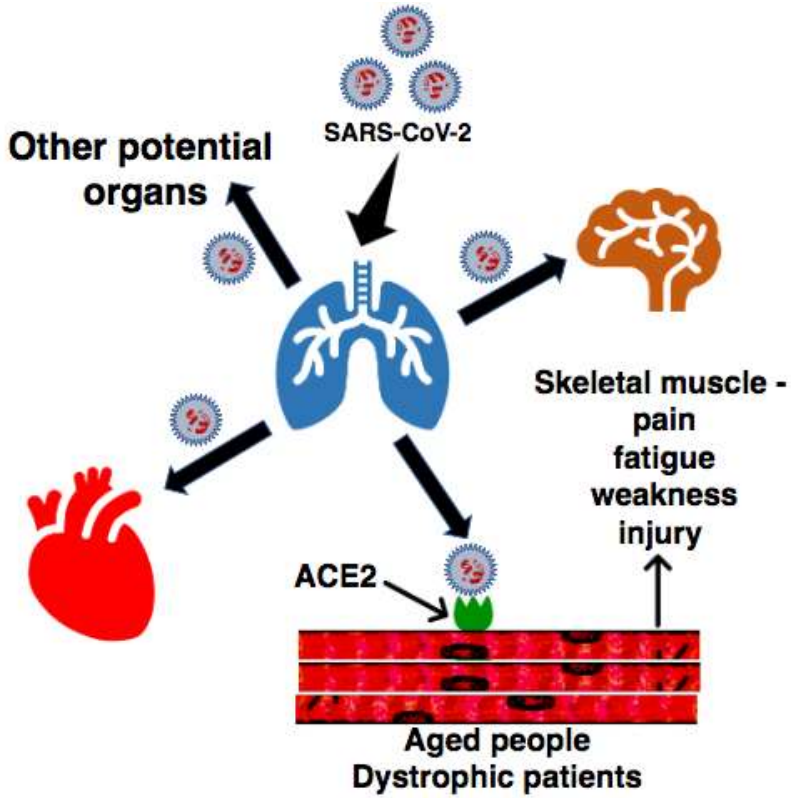
Table 2 Demographic, clinical, and laboratory parameters and outcome of patients with myositis/rhabdomyolysis secondary to COVID-19

Reference/ country	Age/sex	Clinical presentation	Respiratory involvement	Blood parameters	Chest imaging	Neuroimaging	Treatment/outcome
Uysal et al./Turkey [22]	60/M	Myalgia, fatigue	Yes	Raised CK, CRP, LDH, ferritin	B/L ground-glass opacities	NA	HCQ, anti-viral, azithromycin
Valente-Acosta et al./Mexico [23]	71/M	Fever, dyspnea, cough, myalgia, generalized weakness	Yes	CK 8720 U/L, raised myoglobin, creatinine, LDH, IL-6, ferritin	B/L ground-glass opacities	NA	Ventilator, HCQ, anti-viral, tocilizumab
Beydon et al./France [24]	NA	Myalgias, lower limb proximal weakness, fever	No	Raised CPK, CRP, lymphocytopenia	B/L ground-glass opacities	B/L external obturator muscle and quadricipital oedema with contrast enhancement	NA/critical
Suwanwongse et al./USA [25]	88/M	Acute onset B/L thighs pain and weakness, fever, dry cough	No	Raised CPK, LDH	Left pleural effusion	Normal	IV fluids, furosemide, HCQ/improved
Zhang et al./USA [26]	38/M	Fever, dyspnoea, myalgia	Yes	Raised CPK, CRP, LDH	Right upper and middle lobe consolidation	NA	Azithromycin, IV fluids, HCQ, doxycycline/improved
Jin et al./China [27]	60 years M	Fever, cough, pain, and weakness in B/L lower limbs	Yes	Raised CPK, myoglobin, CRP, LDH, leukopenia	B/L ground-glass opacities	NA	Oxygen inhalation, opinavir, moxifloxacin, IV fluids, gamma globulin, plasma transfusion/improved
Chan et al./USA [28]	75 years M	Generalized weakness, reduced appetite	Yes	Elevated CK, AST, ALT, troponin, LDH, CRP, D dimer, ferritin hematuria, normal EKG	Left lower lobe patchy opacity	NA	Antibiotics, hydroxychloroquine/improved
	71 years M	Repetitive leg twitching, generalized weakness, tingling/numbness legs	Yes	Elevated CK, BUN, creatinine, troponin, hematuria, EKG–AF	Multifocal pneumonia	Old lacunar infarct	Antibiotics, hydroxychloroquine, heparin, IV fluids/on mechanical ventilator
Gefen et al./USA [29]	16 years M	Fever, myalgia, shortness of breath, cola-coloured urine, muscle tenderness	No	Elevated CK (427,656 U/L), AST, ALT, procalcitonin, LDH, CRP	NA	NA	IV fluids/improved

The interaction between SARS-CoV-2 and ACE2 may have consequences for skeletal muscle viral susceptibility and myopathies

[1,3]Peter J. Ferrandi, [2,3]Stephen E. Alway, [1,3]Junaith S. Mohamed*

l Physiol (1985) , sep 2020



- → Skeletal muscles and other cells in the muscles like satellite cells, leukocytes, fibroblasts, and endothelial cells express ACE-2. Therefore, it is postulated that skeletal muscles are susceptible to direct muscle invasion by SARS- CoV-2.
- → Other possible mechanisms suggested are immune complex deposition in muscles, release of myotoxic cytokines, damage due to homology between viral antigens and human muscle cells, and adsorption of viral protein on muscle membranes leading to expression of viral antigens on myocyte surface.
- → Whether these postulated mechanisms for COVID-19- related myositis are also responsible for myalgia is also not known.

22/09/2020

Presente: esiti e bilanci

Acute stroke management pathway during Coronavirus-19 pandemic

Neurological Sciences (2020) 41:1003–1005

Claudio Baracchini[1] · Alessio Pieroni[1] · Federica Viaro[1] · Vito Cianci[2] · Anna M. Cattelan[3] · Ivo Tiberio[4] · Marina Munari[5] · Francesco Causin[6]

(…) "Compared with the same period in 2019, we have observed ***a half of minor strokes, TIAs, and transfers from spokes,*** *along with longer onset-to-door and door-to-treatment times for major strokes. As a result, the number of patients who have undergone* ***intravenous thrombolysis or bridging therapy*** *(combined intravenous and thrombectomy) is decreased (****– 26% and – 30% respectively****),* ***while the number of primary thrombectomies is increased by 41%*** *" (…)*

Sanità24 | Il Sole 24 ORE

21 lug 2020

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AZIENDE E REGIONI

Coronavirus: urgente un Piano nazionale di "rientro" delle liste di attesa

di *Tonino Aceti**

Post-discharge persistent symptoms and health-related quality of life after hospitalization for COVID-19

J Infect. 2020 Aug 25;S0163-4453(20)30562-4.

Eve Garrigues [1], Paul Janvier [2], Yousra Kherabi [1], Audrey Le Bot [1], Antoine Hamon [1], Hélène Gouze [1], Lucile Doucet [1], Sabryne Berkani [1], Emma Oliosi [1], Elise Mallart [1], Félix Corre [1], Virginie Zarrouk [1], Jean-Denis Moyer [3], Adrien Galy [1], Vasco Honsel [1], Bruno Fantin [1], Yann Nguyen [4]

ESITI E BILANCI…

	Overall	Ward patients	ICU patients	P value
	N = 120	*N* = 96	*N* = 24	
Age, *years*	63.2 (15.7)	64.1 (16.1)	59.6 (13.7)	0.208
Sex, male	75 (62.5)	56 (58.3)	19 (79.2)	0.099
Comorbidities				
Diabetes	26 (21.7)	22 (22.9)	4 (16.7)	0.698
Hypertension	56 (46.7)	45 (46.9)	11 (45.8)	1.000
Body mass index (kg/m²)				<0.001
<25, n (%)	35 (29.2)	32 (33.3)	3 (12.5)	
≥25, n (%)	57 (47.5)	37 (38.5)	20 (83.3)	
Missing, n (%)	28 (23.3)	27 (28.1)	1 (4.2)	
Clinical features at admission				
Confusion	7 (5.8)	6 (6.2)	1 (4.2)	1.000
Cough	87 (72.5)	69 (71.9)	18 (75.0)	0.959
Dyspnoea	88 (73.3)	68 (70.8)	20 (83.3)	0.327
Myalgia	19 (15.8)	16 (16.7)	3 (12.5)	0.851
Diarrhoea	29 (24.2)	25 (26.0)	4 (16.7)	0.488
Admission data				
Length of stay in hospital, *days*	11.2 (13.4)	7.4 (5.4)	26.5 (22.3)	<0.001
Length of stay in ICU, *days*	-	-	17.1 (15.7)	-
Persistent symptoms				
Cough	20 (16.7)	14 (14.6)	6 (25.0)	0.358
Chest pain	13 (10.8)	11 (11.5)	2 (8.3)	0.941
Fatigue	66 (55.0)	52 (54.2)	14 (58.3)	0.891
Dyspnoea	50 (41.7)	38 (39.6)	12 (50.0)	0.487
Ageusia	13 (10.8)	9 (9.4)	4 (16.7)	0.509
Anosmia	16 (13.3)	14 (14.6)	2 (8.3)	0.638
Hair loss	24 (20.0)	18 (18.8)	6 (25.0)	0.690
Attention disorder	32 (26.7)	28 (29.2)	4 (16.7)	0.327
Memory loss	41 (34.2)	36 (37.5)	5 (20.8)	0.194
Sleep disorder	37 (30.8)	29 (30.2)	8 (33.3)	0.535

ESITI E BILANCI: OLFATTO

- donna, 55 anni
- Infezione da SARS-CoV2 in marzo
- 15 marzo comparsa di anosmia ed ageusia, nega altri segni e sintomi
- Tamponi nasali negativi, titolo anticorpale positivo (in agosto IgG index = 6.505)
- Permane anosmia, percezione dei gusti primari senza chiara distinzione

Acute-onset smell and taste disorders in the context of COVID-19: a pilot multicentre polymerase chain reaction based case–control study

Á. Beltrán-Corbellini[a], J. L. Chico-García[a], J. Martínez-Poles[b,c], F. Rodríguez-Jorge[a], E. Natera-Villalba[a], J. Gómez-Corral[a], A. Gómez-López[a], E. Monreal[a], P. Parra-Díaz[a], J. L. Cortés-Cuevas[a], J. C. Galán[d], C. Fragola-Arnau[e], J. Porta-Etessam[c,f], J. Masjuan[a] and A. Alonso-Cánovas[a]

European Journal of Neurology 2020, **0**: 1–4

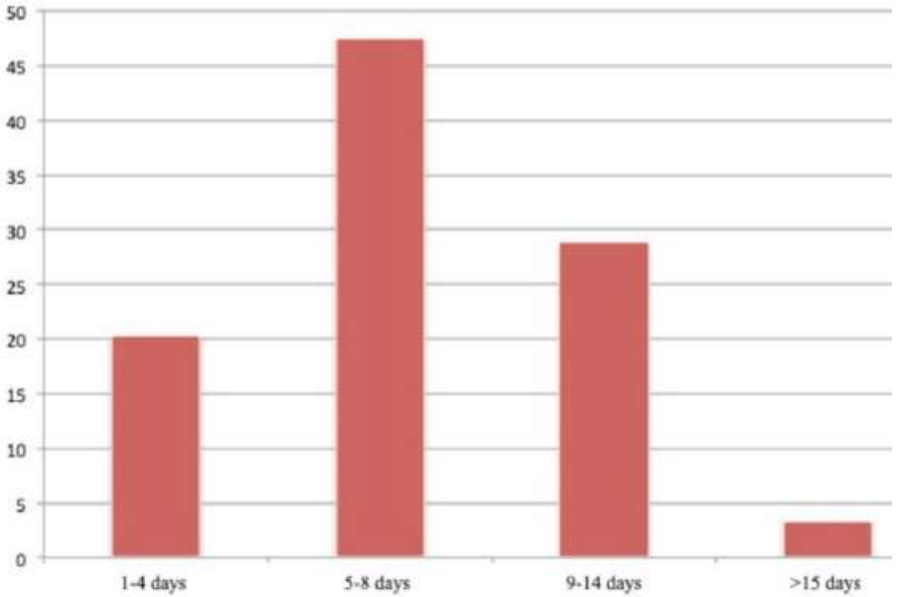
Table 2 Description of smell and/or taste disorder (STD) features in COVID-19 and influenza patients

STD characteristic	COVID-19 (n = 31)	Influenza (n = 5)
Nasal obstruction, *N* (%)	4 (12.9%)	4 (80%)
Smell disorder pattern		
Anosmia, *N* (%)	14 (45.2%)	0 (0%)
Hyposmia, *N* (%)	9 (29.0%)	4 (80%)
Dysosmia, *N* (%)	2 (6.5%)	0 (0%)
Taste disorder pattern		
Ageusia, *N* (%)	14 (45.2%)	4 (80%)
Hypogeusia, *N* (%)	7 (22.6%)	1 (20%)
Dysgeusia, *N* (%)	8 (25.8%)	2 (40%)
Capable of distinguishing sweetness/saltiness/bitterness, *N* (%)	21 (67.7%)	5 (100%)
Pattern of onset of STD		
Acute, *N* (%)	21 (67.7%)	2 (40%)
Subacute, *N* (%)	10 (32.3%)	3 (60%)
Duration of taste/smell disorder, mean (SD), days	7.1 (3.1)	9.8 (4.8)

Olfactory and gustatory dysfunctions as a clinical presentation of mild-to-moderate forms of the coronavirus disease (COVID-19): a multicenter European study

Jerome R. Lechien[1,2,3,4] · Carlos M. Chiesa-Estomba[1,5] · Daniele R. De Siati[1,6] · Mihaela Horoi[4] · Serge D. Le Bon[4] · Alexandra Rodriguez[4] · Didier Dequanter[4] · Serge Blecic[7] · Fahd El Afia[1,3] · Lea Distinguin[1,3] · Younes Chekkoury-Idrissi[1,3] · Stéphane Hans[3] · Irene Lopez Delgado[1,8] · Christian Calvo-Henriquez[1,9] · Philippe Lavigne[1,10] · Chiara Falanga[1,11] · Maria Rosaria Barillari[1,11] · Giovanni Cammaroto[1,12] · Mohamad Khalife[13] · Pierre Leich[14] · Christel Souchay[14] · Camelia Rossi[15] · Fabrice Journe[2] · Julien Hsieh[1,16] · Myriam Edjlali[17,18] · Robert Carlier[18] · Laurence Ris[19] · Andrea Lovato[20] · Cosimo De Filippis[20] · Frederique Coppee[21] · Nicolas Fakhry[1,22] · Tareck Ayad[1,10] · Sven Saussez[1,2,4,13]

Eur Arch Otorhinolaryngol 2020 Aug;277(8):2251-2261



367 cases of Covid

→ 86% olfactory dysfunction
→ 80% anosmya, 20% hyposmia

→ **67-73% recovered within 8 days**

ESITI E BILANCI: MIALGIE

Autoimmune and rheumatic musculoskeletal diseases as a consequence of SARS-CoV-2 infection and its treatment

Rheumatol Int 2020 Oct;40(10):1539-1554.

Sanket Shah[1] · Debashish Danda[2] · Chengappa Kavadichanda[1] · Saibal Das[3] · M. B. Adarsh[1] · Vir Singh Negi[1]

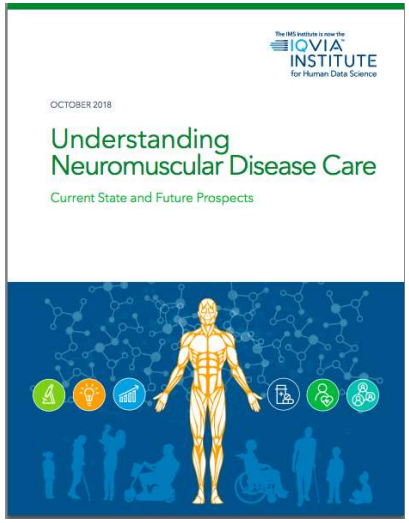
	Reported with SARS-CoV-2	Clinical characteristics	Refs.
Musculoskeletal manifestations			
Arthralgia-Myalgia	In 14.4–44% of the cases	Early and transient features Resolves in 10–15 days	[21]
Acute Myositis	Case report	Symptom of myalgia and proximal muscle weakness preceded respiratory symptom of COVID-19 Elevate Creatine kinase (CK) level (25,384 IU/L) MRI showed muscle edema Negative MSA and MAAs	[22]

Estimating the impact of COVID-19 pandemic on services provided by Italian Neuromuscular Centers: an Italian Association of Myology survey of the acute phase

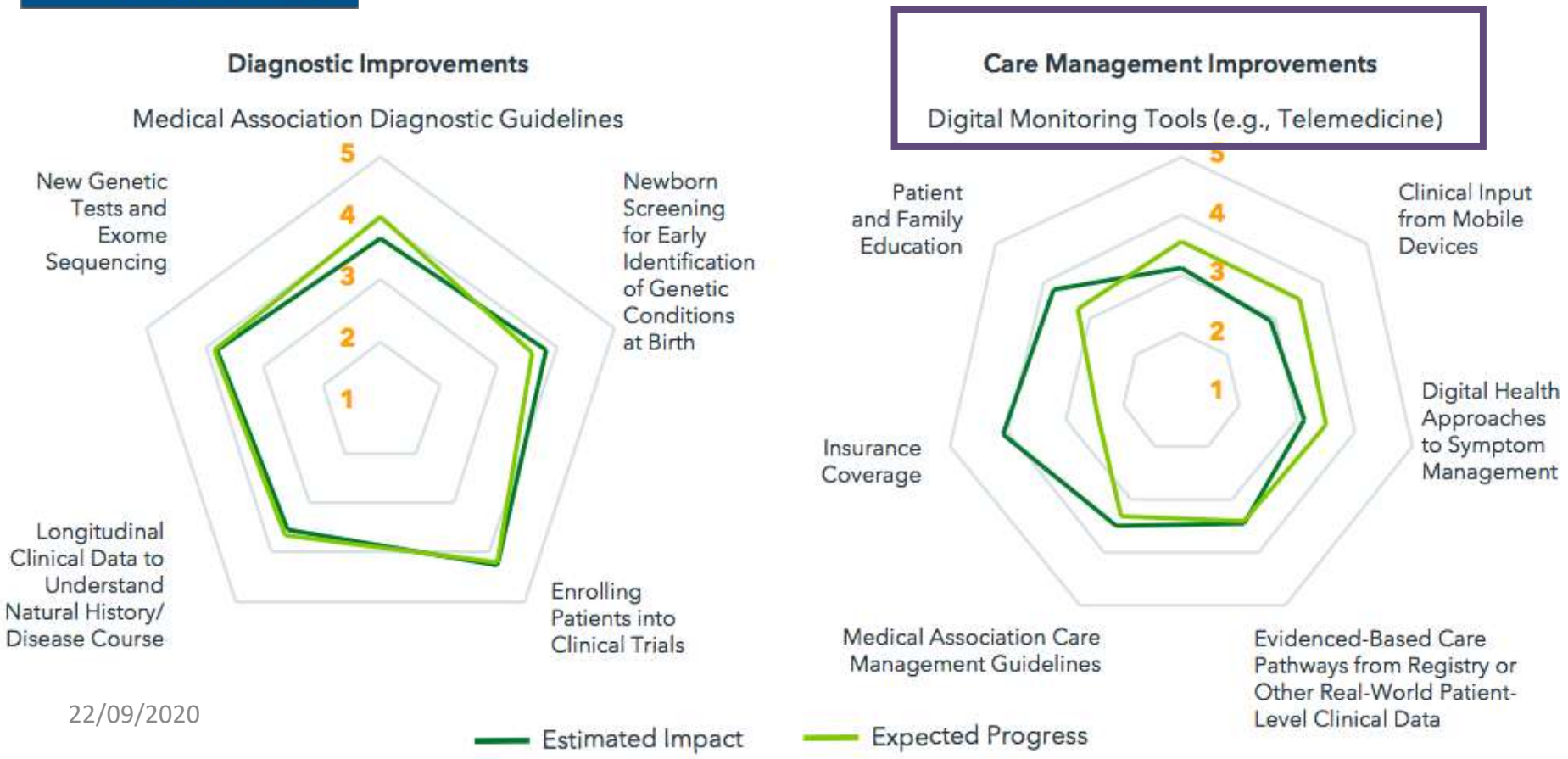
ACTA MYOLOGICA 2020; XXXIX: p. 57-66

			Therapy				Services				
		Outpatient visit and exams	Total	DH	Chronic home therapy	Clinical trials	Total	FKT	Psycho-logical support	Home nurs-ing service	Pre-natal diag-nosis
Italy	Yes	16.7%	64%	39%	93.3%	63%	43%	7%	66.7%	33%	87.5%
	No	40.%	22%	7%	3.4%	37%	57%	93%	33.3%	67%	12.5%
	Partial	43.3% (urgencies only)	14%	54% (some)	3.3% (some)						
North	Yes	11%	63.6%	41%	89%	63%	34%	0%	84%	20%	77.5%
	No	44.5%	23.4%	12%	5.5%	37%	66%	100%	16%	80%	22.5%
	Partial	44.5% (urgencies only)	13%	47% (some)	5.5% (some)						
Center	Yes	0%	73%	43%	100%	76%	57%	12.5%	50%	87.5%	100%
	No	25%	13%	0%	0%	24%	43%	87.5%	50%	12.5%	0%
	Partial	75% (urgencies only)	13%	57% (some)							
South	Yes	0%	60%	25%	100%	62%	56%	20%	50%	75%	100%
	No	50%	20%	0%	0%	38%	44%	80%	50%	25%	0%
	Partial	50% (urgencies only)	20%	75% (some)							

Futuro: telemedicina



Estimates of Progress from Diagnosis and Care Management Changes and Their Expected Impact in the Next Five Years



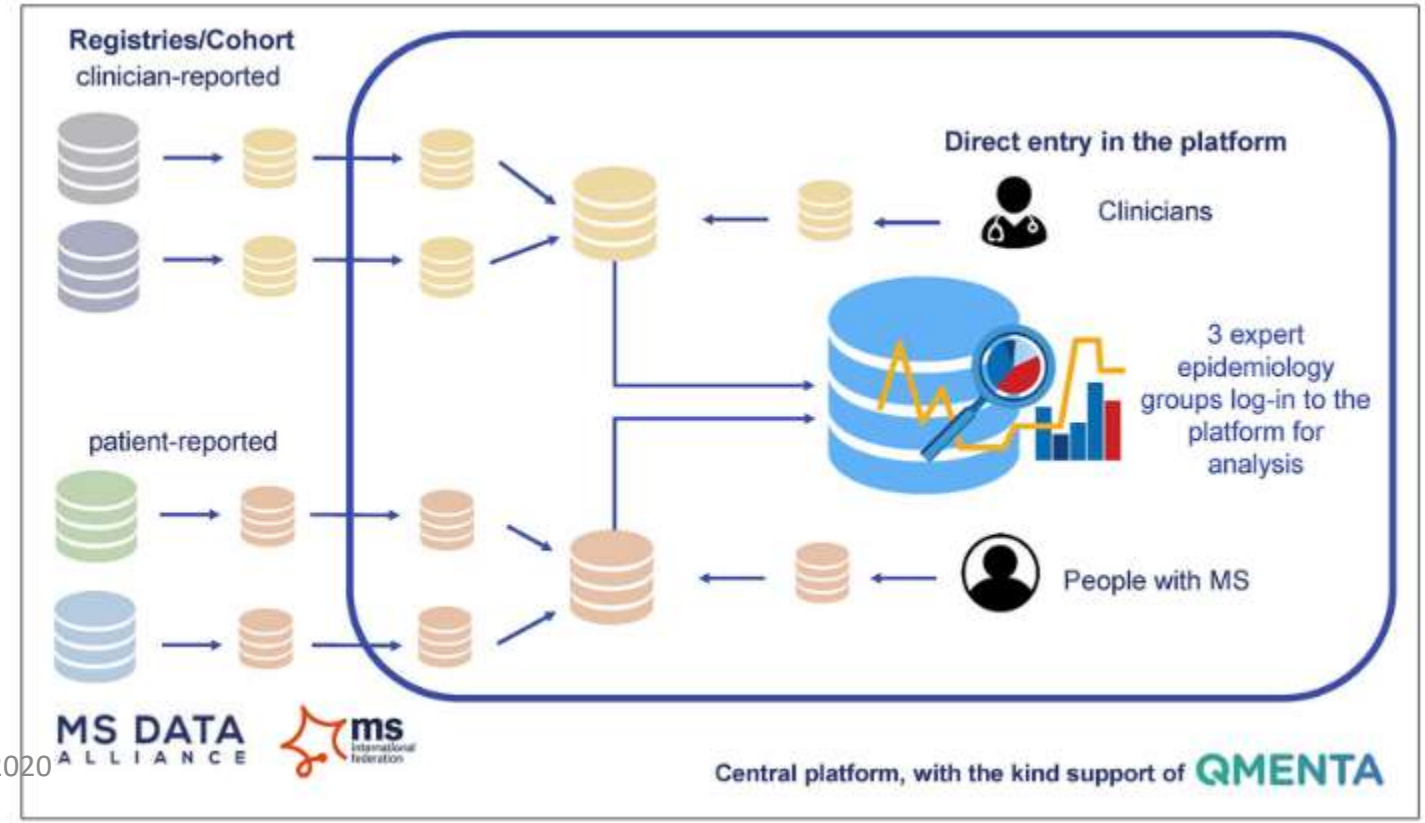
Telemedicine in care

Modality	Role
Telehealth	Replace in-person visits, reduce travel efforts and costs, maintain connection with people who have lost ability to travel to clinic
Mobile health	Allow for real-time access to clinic staff using relatively low-cost technology, dedicated apps can provide patients with information or monitor function in the patient's environment
Remote monitoring platforms	Remote monitoring of well-being based on information from treatment devices (e.g., data collected by non-invasive or invasive ventilation machines, data collected from eye-gaze or communication platforms, or other connected devices)
Patient support groups	Loaner closets, peer-to-peer support groups, funding for research and clinical care
Advocacy groups	Raise awareness about the disease, fundraising, advocate for policy changes
Philanthrophy (foundations, private donors)	Provide or help raise funding for research and clinical care
Newsletters/websites	Raise awareness about the disease and treatment and research options
Patient portal	Online access to one's own clinical and research information

COVID-19 in people with multiple sclerosis: A global data sharing initiative

Mult Scler 2020 Sep;26(10):1157-1162

Liesbet M Peeters, Tina Parciak, Clare Walton, Lotte Geys, Yves Moreau, Edward De Brouwer, Daniele Raimondi, Ashkan Pirmani, Tomas Kalincik, Gilles Edan, Steve Simpson-Yap, Luc De Raedt, Yann Dauxais, Clément Gautrais, Paulo R Rodrigues, Landon McKenna, Nikola Lazovski, Jan Hillert, Lars Forsberg, Tim Spelman, Robert McBurney, Hollie Schmidt, Arnfin Bergmann, Stefan Braune, Alexander Stahmann, Rodden Middleton, Amber Salter, Bruce F Bebo, Juan I Rojas, Anneke van der Walt, Helmut Butzkueven, Ingrid van der Mei, Rumen Ivanov, Kerstin Hellwig, Guilherme Sciascia do Olival, Jeffrey A Cohen, Wim Van Hecke, Ruth Dobson, Melinda Magyari, Doralina Guimarães Brum, Ricardo Alonso, Richard Nicholas, Johana Bauer, Anibal Chertcoff, Jérôme de Sèze, Céline Louapre, Giancarlo Comi and Nick Rijke



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1,755 results SEPTEMBER

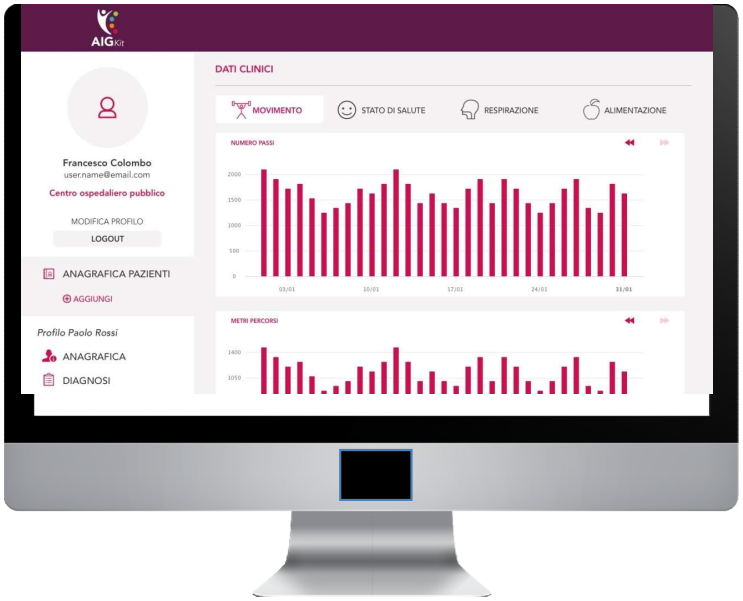
About 15% on NMD

High utility/ appropriateness	Moderate utility/appropriateness	Low utility/appropriateness
NMD follow-up PN follow-up: stable or management of neuropathic pain MG follow-up: stable Myositis follow-up: stable Inherited neuropathy or	New or unstable NMD New or unstable PN New MG: well-established diagnosis or unstable new/follow-up All patients with worsening symptoms to triage need and timeframe for further or more urgent care	All patients with discrepancy between reported symptoms and abnormal examination findings All disorders: second opinions for patients where nuances of physical examination will highly influence medical decision-making and diagnostic evaluation Primary management of unstable patients

A mobile app for patients with Pompe disease and its possible clinical applications

Neuromuscul Disord. 2018 Jun;28(6):471–475.

Giulia Ricci [a], Sigrid Baldanzi [a], Fabrizio Seidita [b], Chiara Proietti [c], Francesca Carlini [c], Silvia Peviani [c], Giovanni Antonini [d], Andrea Vianello [c], Gabriele Siciliano [a,*], Italian GSD II group



CLINICAL DATA SHARING AND ANALYSIS

Telemedicine for neuromuscular disorders during the COVID-19 outbreak

J Neurol. 2020 Jul 10:1-4.

Matteo Garibaldi[1] · Gabriele Siciliano[2] · Giovanni Antonini[1]

Valorizzazione delle scale cliniche!

"…*Validated scales for myopathies and neuropathies are quite disease-specific and difficult to use in remote consultation due to a number of predominantly examiner-dependent items.*
We conceived the ***Myo-FRS*** *and the* ***N-FRS****, two functional scales, which, rather than explore too much disease-specific tasks, are aimed to capture, basically through a functional ques- tionnaire, the overall characteristics of neuromuscular performance, both in myopathies and in neuropathies*
MYO-FRS and N-FRS have never been used before, however, they provide a practical and useful tool to assign a functional score, which reflects the overall neuromuscular impairment along the disease course"

→ The COVID-19 pandemic has forced a rapid and unprecedented reorganization of clinical care delivery worldwide, according to local geopolitic realty, local COVID-19 prevalence, practice or institutional structures.

→ Most diagnostic studies may be postponed unless in case of urgent need and the results would change management (e.g., new ALS, MG, immune-mediated neuropathy or myopathy).

→ Changes in outcomes
→ Need to improve new care metrics systems


hacking
HR
Everything will be okay in the end. If it's not okay, it's not the end
JOHN LENNON
ENGLISH SINGER, SONGWRITER

Grazie!