

LETTERS TO THE EDITOR

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Impact of COVID-19 pandemic on Physical Medicine and Rehabilitation residency: an Italian nationwide epidemiologic survey

On January 30, 2020, the World Health Organization announced the 2019-nCoV epidemic a health international emergency, naming the

disease Coronavirus disease 2019 (COVID-19). Increasing number of COVID-19 cases quickly overloaded hospitals. Several rehabilitation wards admitted COVID-19 patients, leading to major changes in daily activities.¹ With the aim of assessing pandemic impact during the first two critical months (March and April 2020) on work experience and training activities of residents of physical medicine and rehabilitation (PM&R), a nationwide online survey was sent to each Italian PM&R residency school. We stratified population according to geographical areas: zone 1 regions with >20,000 COVID-19 positive cases, zone 2 between 5000 and 20,000 cases and zone 3 <5000 cases (updated April 30, 2020). We asked subjects to evaluate differences between the period before COVID-19 pandemic (pre-COVID, until the end of February 2020) and during the pandemic (during-COVID, March and April 2020).

TABLE I.—Clinical data.

Variables		Overall	Zone 1	Zone 2	Zone 3
Q1‡ Pre-COVID internship	Muscular-skeletal	133 (45.7)	43 (34.7)	56 (49.1)	34 (64.2)
	Neurologic	108 (37.1)	48 (38.7)	45 (39.5)	15 (28.3)
	Cardiac-respiratory	4 (1.4)	1 (0.8)	2 (1.8)	1 (1.9)
	Geriatric	4 (1.4)	3 (2.4)	1 (0.9)	0 (0)
	Oncologic	1 (0.3)	0 (0)	0 (0)	1 (1.9)
	Pediatrics	9 (3.1)	4 (3.2)	5 (4.4)	0 (0)
	Other	32 (11)	25 (20.2)	5 (4.4)	2 (3.8)
	Q2* Pre-COVID service	Out-patient activity	253 (86.9)	101 (39.9)	90 (35.6)
In-patients' consultations		113 (38.8)	50 (44.2)	37 (32.7)	26 (23)
In-patients		167 (57.4)	86 (51.5)	58 (34.7)	23 (13.8)
Q3* During COVID service	Out-patient activity	69 (23.7)	22 (31.9)	32 (46.4)	15 (21.7)
	In-patients' consultations	110 (37.8)	44 (40)	38 (34.5)	28 (25.5)
	In-patients	173 (59.9)	84 (48.6)	68 (39.3)	21 (12.1)
Q4‡ Increase in working hours	No	235 (80.8)	80 (64.5)	103 (90.4)	52 (98.1)
	Yes	56 (19.2)	44 (35.5)	11 (9.6)	1 (1.9)
Q5‡ Changes in work settings	No	162 (55.7)	58 (46.8)	73 (64)	31 (58.5)
	Yes	129 (44.3)	66 (53.2)	41 (36)	22 (41.5)
Q6‡ Changes in patients' type	No	74 (25.4)	17 (13.7)	29 (25.4)	28 (52.8)
	Yes	217 (74.6)	107 (86.3)	85 (74.6)	25 (47.2)
Q7* Patients' type	Postacute neurologic	145 (49.8)	76 (52.4)	44 (30.3)	25 (17.2)
	Chronic neurologic	59 (20.3)	22 (37.3)	23 (39)	14 (23.7)
	Post traumatic orthopedic	96 (33)	38 (39.6)	40 (41.7)	18 (18.8)
	Elective orthopedic	72 (24.7)	22 (30.6)	30 (41.7)	20 (27.8)
	Cardiological	45 (15.5)	28 (62.2)	12 (26.7)	5 (11.1)
	Pneumological	126 (43.3)	79 (62.7)	37 (29.4)	10 (7.9)
Q8* Type of service	Kept home	71 (24.4)	15 (21.1)	45 (63.4)	11 (15.5)
	Rehabilitation COVID+	21 (7.2)	13 (61.9)	8 (38.1)	0 (0.0)
	Rehabilitation COVID-	35 (12.0)	18 (51.4)	13 (37.1)	4 (11.4)
	Rehabilitation post COVID	31 (10.7)	17 (54.8)	14 (45.2)	0 (0.0)
	Acute COVID+	25 (8.6)	14 (56.0)	8 (32.0)	0 (0.0)
	Non- rehabilitative pathologies	25 (8.6)	14 (56.0)	10 (40.0)	1 (4.0)
	External support COVID+	28 (9.6)	18 (64.3)	7 (25.0)	3 (10.7)
Q9‡ Post COVID-19 neuro-motor	No	196 (67.4)	65 (52.4)	80 (70.2)	51 (96.2)
	Yes	95 (32.6)	59 (47.6)	34 (29.8)	2 (3.8)

Data are shown as total number of cases and percentage in brackets.

‡In case of single choice question percentages are reported in columns; *in case of multiple choices question, percentages are reported in rows.

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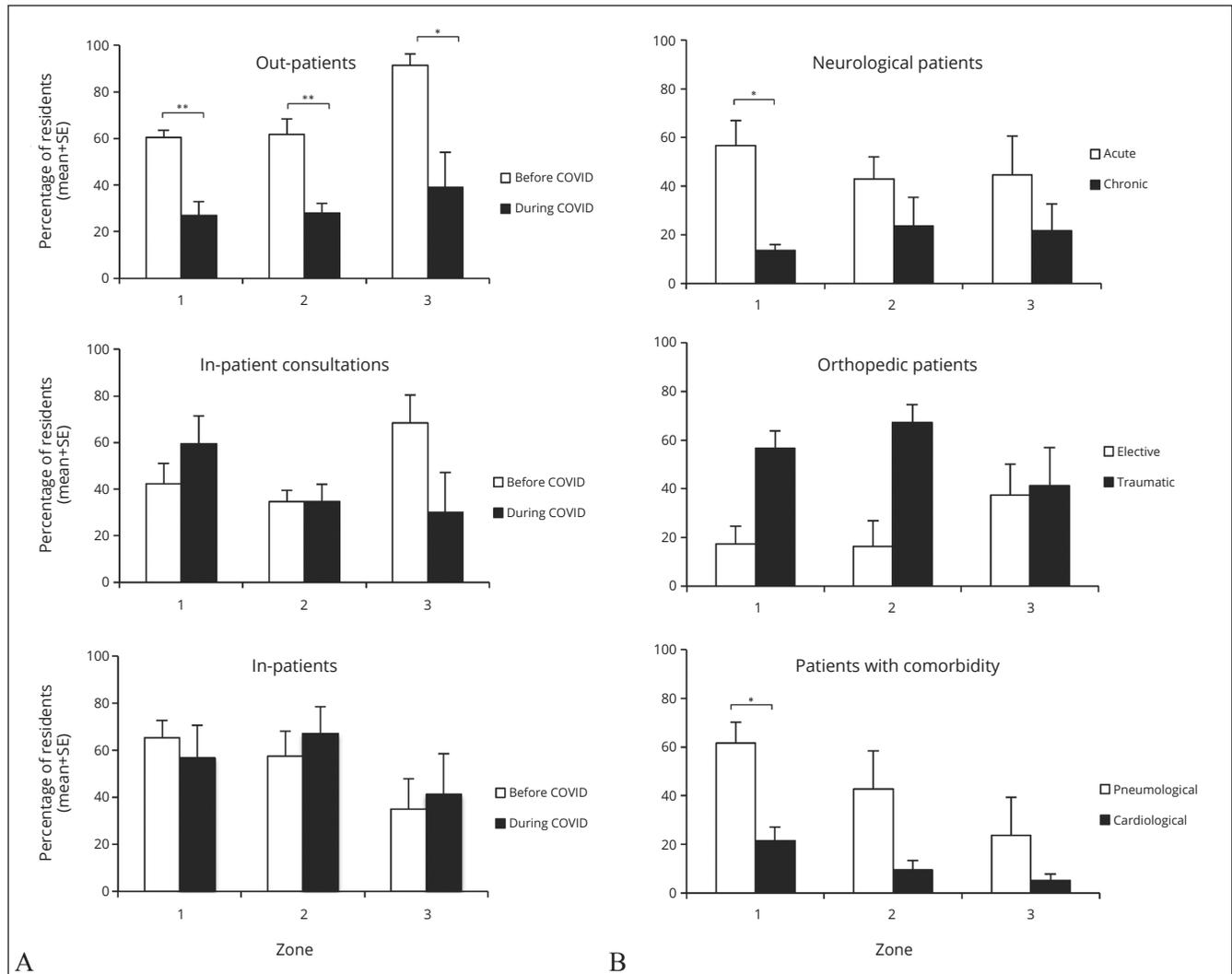


Figure 1.—A) Region distribution of type of service carried out before and during COVID; B) region distribution of type of patients mostly treated during the emergency. Graphics represent data that are normalized to the total number of single zone residents who participated in the survey.

A total of 291 subjects (51.7%) of 563 Italian PM&R residents completed the survey, distributed as follows: 124 subjects in zone 1 (women 79, 63.7%); 114 in zone 2 (women 74, 64.9%); 53 in zone 3 (women 30, 56.6%). At the time of pandemic onset, most of residents (217, 74.6%) were working in public hospitals.

In the pre-COVID, residents worked mainly in orthopedics and neurology in the three zones (Q1) (Table I). Service type, during pre-COVID included outpatient activity for 197 subjects, in patients' activities for 167 and in patients' consultations for 113 residents (Q2) (Figure 1A). Instead, during-COVID, we observed a significant decrease in outpatient activities in all three zones (P<0.005 in zone 1 and 2 and P<0.05 in zone 3) (Q3) while no significant differences were found for what concerns in-patients' activities. Regarding weekly working hours during-COVID, most of PM&R residents did not report any increase (Q4). Instead, 56

subjects did report an increase and the majority of these were from zone 1, significantly more compared to zone 2 (P<0.0001) and zone 3 (P<0.005).

Following emergency onset, 162 subjects changed work settings (Q5), with significantly higher changes in zone 1 compared only to zone 2 (P<0.01). The majority of residents (74.6%) reported changes in patients' type treated during-COVID (Q6), with a statistically significant increase for residents working in zone 1 with respect to zone 2 (P<0.05) and zone 3 (P<0.0001). There was a higher prevalence of subacute diseases, both neurological and orthopedic (Q7) (Figure 1B) and subjects treated also many patients with pneumological complications. Some residents changed also the type of service during the pandemic (Q8) and were reassigned to COVID-19-free rehabilitation departments, post-COVID-19 rehabilitation wards, external support of COVID Sub-Intensive Care

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Units (SICUs), COVID SICUs and COVID-positive rehabilitation departments. Interestingly, 71 residents were kept home during the pandemic period, mostly from zone 2.

Even more, around 32.6% of residents treated patients with neuro-motor complications (Q9) occurred after COVID-19, significantly more in zone 1 compared to zone 2 ($P<0.005$) and zone 3 ($P<0.0001$). Common complications included dysphagia, equilibrium and cognitive deficits, peripheral neuropathy, muscle hypotrophy and bed rest syndrome.

We investigated whether the program of professional activities for PM&R residents was affected by pandemic (Table II). Important changes in residents' activities were found with a decrease in functional diagnostic procedures such as gait analysis (Q1), in psychometric measures such as muscle and articular tests (Q2), in the execution of biomedical diagnostic procedures (Q3), in the prescription and testing of prostheses and daily living aids (Q4) and in mini-invasive interventions (Q5).

Regarding the educational activities and we evaluated specific

TABLE II.—Education data.

Variables	Overall	Zone 1	Zone 2	Zone 3	
Q1‡ Functional diagnostic	Not reduced	4 (1.4)	2 (1.6)	1 (0.9)	1 (1.9)
	Not performed	80 (27.5)	38 (30.6)	37 (32.5)	5 (9.4)
	Partially reduced	64 (22)	24 (19.4)	30 (26.3)	10 (18.9)
	Completely reduced	143 (49.1)	60 (48.4)	46 (40.4)	37 (69.8)
Q2‡ Psychometric measures	Not reduced	51 (17.5)	22 (17.7)	21 (18.4)	8 (15.1)
	Not performed	51 (17.5)	30 (24.2)	20 (17.5)	1 (1.9)
	Partially reduced	101 (34.7)	43 (34.7)	39 (34.2)	19 (35.8)
	Completely reduced	88 (30.2)	29 (23.4)	34 (29.8)	25 (47.2)
Q3‡ Biomedical diagnostic	Not reduced	13 (4.5)	6 (4.8)	6 (5.3)	1 (1.9)
	Not performed	57 (19.6)	28 (22.6)	25 (21.9)	4 (7.5)
	Partially reduced	110 (37.8)	47 (37.9)	44 (38.6)	19 (35.8)
	Completely reduced	111 (38.1)	43 (34.7)	39 (34.2)	29 (54.7)
Q4‡ Prostheses and daily living aids	Not reduced	32 (11)	13 (10.5)	16 (14)	3 (5.7)
	Not performed	50 (17.2)	29 (23.4)	20 (17.5)	1 (1.9)
	Partially reduced	141 (48.5)	62 (50)	50 (43.9)	29 (54.7)
	Completely reduced	68 (23.4)	20 (16.1)	28 (24.6)	20 (37.7)
Q5‡ Mini-invasive interventions	Not reduced	8 (2.7)	2 (1.6)	5 (4.4)	1 (1.9)
	Not performed	79 (27.1)	40 (32.3)	28 (24.6)	11 (20.8)
	Partially reduced	84 (28.9)	35 (28.2)	30 (26.3)	19 (35.8)
	Completely reduced	120 (41.2)	47 (37.9)	51 (44.7)	22 (41.5)
Q6* Didactic pre COVID	Frontal lessons	253 (86.9)	115 (45.5)	96 (37.9)	42 (16.6)
	Journal club	87 (29.9)	44 (50.6)	20 (23)	23 (26.4)
	Online didactic material	70 (24.1)	24 (34.3)	26 (37.1)	20 (28.6)
	Suggested article/texts	116 (39.9)	35 (30.2)	53 (45.7)	28 (24.1)
	Webinar online	22 (7.6)	6 (27.3)	3 (13.6)	13 (59.1)
Q7* Didactic during COVID	Frontal lessons	15 (5.2)	2 (13.3)	4 (26.7)	9 (60)
	Journal club	7 (2.4)	0 (0)	3 (42.9)	4 (57.1)
	Online didactic material	138 (47.4)	52 (37.7)	59 (42.8)	27 (19.6)
	Suggested article/texts	112 (38.5)	24 (21.4)	59 (52.7)	29 (25.9)
	Webinar online	224 (77)	92 (41.1)	94 (42)	38 (17)
Q8‡ Formative period	No	83 (28.5)	33 (26.6)	28 (24.6)	22 (41.5)
	Yes	208 (71.5)	91 (73.4)	86 (75.4)	31 (58.5)
Q9‡ Changes in PM&R activities	No	49 (16.8)	15 (12.1)	22 (19.3)	12 (22.6)
	Yes	242 (83.2)	109 (87.9)	92 (80.7)	41 (77.4)
Q10‡ New professionalizing activities	No	28 (9.6)	12 (9.7)	12 (10.5)	4 (7.5)
	Not performed	118 (40.5)	43 (34.7)	51 (44.7)	24 (45.3)
	Yes, partially	51 (17.5)	22 (17.7)	20 (17.5)	9 (17)
	Yes, completely	94 (32.3)	47 (37.9)	31 (27.2)	16 (30.2)
Q11‡ New skills	No	24 (8.2)	12 (9.7)	6 (5.3)	6 (11.3)
	Yes	267 (91.8)	112 (90.3)	108 (94.7)	47 (88.7)
Q12* New teachings	Online lessons	226 (77.7)	88 (38.9)	95 (42)	43 (19)
	Tele-medicine	160 (55)	69 (43.1)	63 (39.4)	28 (17.5)
	Scientific collaborations	118 (40.5)	49 (41.5)	48 (40.7)	21 (17.8)
	Practical webinar	198 (68)	79 (39.9)	84 (42.4)	35 (17.7)
	No change	24 (8.2)	12 (50)	6 (25)	6 (25)

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changes pre-COVID and during COVID (Q6 and Q7), we observed a severe reduction in lectures and Journal Club (JC) meetings during the pandemic, the reading of texts and articles did not change pre- and during COVID while an important increase in on-line didactic material and webinars was observed.

Considering all changes occurred in education during-COVID (Q8), a high percentage of residents felt they received a different, but still valid, education, although Zone 3 residents felt they received a less valid education, significantly different compared to zone 1 ($P < 0.05$). In terms of PM&R residency specific activities, the majority of residents reported important changes (Q9) during COVID. In fact, we observed the learning of new scheduled and non-scheduled activities and in some case the interruption of scheduled activities (either partial or complete).

During-COVID, residents learned also professionalizing activities not related to the PM&R program; half of them even felt these new capacities will be useful for their future job (Q10). Interestingly, almost all residents (Q11) agreed with the fact that during-COVID new ideas and teaching methodologies were born. Specifically, residents felt that telemedicine, online lessons and practical webinars were very useful, also in the future (Q12). Even more, almost half of residents agreed that during-COVID period new scientific collaborations arose.

The COVID-19 pandemic has changed the Italian National Health Service, with a great impact on PM&R education. Indeed, data from our study demonstrate that zone 1 residents experienced an increase in working hours compared to those of zone 2 and zone 3, confirming that, in zone 1, hospitals required an increased support also from PM&R residents due to the high number of COVID-19 patients. We observed that about half residents changed activities during-COVID period, with a decrease in outpatient activities. Another interesting difference was noted in the change of patients' type treated during-COVID. The percent increase of neurological and orthopedic subacute cases could be due to the fact that the Italian government stopped hospital admissions for chronic patients, in order to favor subacute cases. Another explanation of this phenomenon could be related to the fact that COVID-19 led to neurological complications,² increasing intensive rehabilitation needs. Additionally, residents in zone 1 and zone 2 treated also patients with respiratory complications who needed rehabilitation, as described in literature.²⁻⁴ As expected, all professionalizing activities decreased in all zones during-COVID.

Regarding teaching, major changes were observed in all zones, since lectures were suspended and the majority of residents attended online classes, as reported by Escalon *et al.*⁵ in the USA; in Italy, this phenomenon occurred mostly in zone 1 and 2. Through these changes, all residents acquired new knowledge and expressed their wish to continue these teaching modalities also in future. Finally, a high percentage of residents (71.5%) reported acquisition of knowledge during-COVID not strictly related to the rehabilitation program, but useful for their future job. Taken together, our findings showed the profound impact of COVID-19 pandemic on Italian PM&R Resident Program.

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