

# The deep impact of novel CoVID-19 infection in an Orthopedics and Traumatology Department: the experience of the Piacenza Hospital

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**Summary.** Since February 21<sup>st</sup>, 2020 CoVID-19 spread throughout all Italy expanding like a “tsunami” from Codogno (Lodi, Lombardy, Northern Italy) to neighboring cities. In a few days Lodi, Piacenza, Milano, Brescia and Bergamo were forced to deal with this disaster starting the lockdown at different time. No national plan had been prepared. As result, CoVID-19 has paralyzed the Italian healthcare system. At time of writing, in Italy there are 169 323 infected patients and 22 260 deaths. Italy is fighting hard to manage CoVID-19 crisis even if most hospitals were unprepared to deal with massive influx of critically ill CoVID-19 patients. Piacenza in Emilia-Romagna region (Northern Italy) is one of the epicenters of the Italian pandemic, and the local hospital – Guglielmo da Saliceto – has quickly become a “CoVID-19 hospital” with the great effort of all the medical staff. Here we report the experience of our hospital, particularly the strategy adopted in the Orthopedics and Traumatology Department. ([www.actabiomedica.it](http://www.actabiomedica.it))

**Key words:** CoVID-19, Orthopedics, Traumatology, Italian epidemic, emergency medicine, CoVID-19 pandemic, disaster management

## Introduction

Since the end of February, 2020 the words “coronavirus” and “CoVID-19” has become routinely used by Italian people because of the rapid spread of the novel coronavirus and the dramatic impact on Italy in terms of infected patients, overcrowding in hospitals and the high number of deaths.

The 2019 novel coronavirus (2019 n-CoV) has been identified in Wuhan, Hubei Province, China, in December 2019, in patients affected by viral pneumonia (1). It rapidly spread across China and all over the world causing a global health crisis. On January 12<sup>nd</sup>, 2020 the World Health Organization (WHO) named

this novel infection as CoVID-19 (coronavirus disease), and on January 30<sup>th</sup>, 2020 the WHO declared CoVID-19 as the sixth public health emergency of international concern.

The most common symptoms of CoVID-19 infection are dry cough and fever, which can turn into interstitial pneumonia with progression to acute respiratory distress syndrome (ARDS) and end-organ failure (2). ARDS is the main cause of death and must be treated promptly and appropriately (3). Hyper-inflammatory reaction and microvascular pulmonary thrombosis seem to be the cause of multiorgan failure and death in CoVID-19 patients (4).

Since February 21<sup>st</sup>, 2020 CoVID-19 spread

throughout all Italy expanding like a “tsunami” from Codogno (Lodi, Lombardy, Northern Italy) to neighboring cities (Table 1). In a few days Lodi, Piacenza, Milano, Brescia and Bergamo were forced to deal with this disaster starting the lockdown at different time. No national plan had been prepared (5). As result, CoVID-19 has paralyzed the Italian healthcare system. At time of writing, in Italy there are 169 323 infected patients and 22 260 deaths. Italy is fighting hard to manage CoVID-19 crisis even if most hospitals were unprepared to deal with massive influx of critically ill CoVID-19 patients. Piacenza in Emilia-Romagna region (Northern Italy) is one of the epicenters of the Italian pandemic, and the local hospital – “Guglielmo da Saliceto” – has quickly become a “CoVID-19 hospital” with the great effort of all the medical staff.

The exponential daily growth of CoVID-19 ill patients and the local outbreak required a rapid and

strong stance of the Medical Direction to manage the emergency and to avoid the complete collapse of our local health system (6).

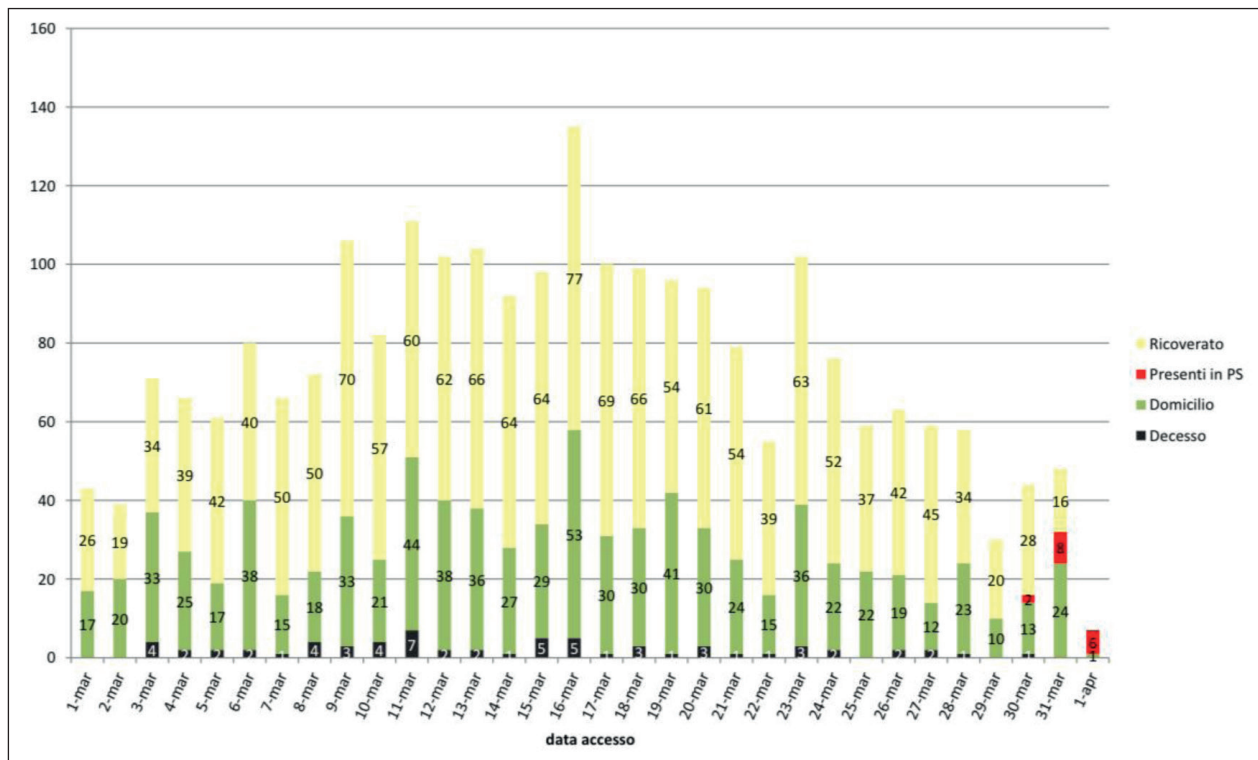
Here we report the experience of our hospital in the epidemic phase and the changes needed to develop “a survival strategy”. Particularly, we will focus the attention on the Orthopedics and Traumatology Department of “Guglielmo da Saliceto” Hospital.

## Results

For its proximity to Codogno, the hospital of Piacenza has been quickly and suddenly overcrowded by a massive flux of critically ill CoVID-19 patients firstly coming from Lombardy, but in a few days from Piacenza and nearby provinces. “Guglielmo da Saliceto” is the main hospital with a hub-and-spoke organiza-

Regione	AGGIORNAMENTO 01/04/2020 ORE 17.00							
	POSITIVI AL nCoV				DIMESSI/ GUARITI	DECEDUTI	CASI TOTALI	TAMPONI
	Ricoverati con sintomi	Terapia intensiva	Isolamento domiciliare	Totale attualmente positivi				
Lombardia	11.927	1.342	12.496	25.765	11.415	7.593	44.773	121.449
Emilia Romagna	3.898	359	7.232	11.489	1.566	1.732	14.787	58.457
Veneto	1.718	350	6.156	8.224	902	499	9.625	112.746
Piemonte	3.146	453	4.871	8.470	439	886	9.795	30.060
Toscana	1.120	297	3.015	4.432	182	253	4.867	36.575
Marche	984	168	2.304	3.456	29	477	3.962	12.296
Liguria	1.114	179	1.352	2.645	555	460	3.660	11.334
Lazio	1.131	177	1.450	2.758	337	169	3.264	35.810
Campania	478	129	1369	1.976	107	148	2.231	15.728
Trento	345	76	1.062	1.483	214	173	1.870	7.675
Puglia	637	107	1.012	1.756	61	129	1.946	15.209
Friuli V.G.	206	60	940	1.206	357	122	1.685	15.987
Sicilia	496	72	976	1.544	86	88	1.718	16.836
Abruzzo	342	71	798	1.211	102	123	1.436	9.610
Bolzano	269	57	786	1.112	190	116	1.418	11.951
Umbria	173	45	646	864	194	37	1.095	9.080
Sardegna	119	27	529	675	36	34	745	5.501
Calabria	144	16	450	610	21	38	669	9.983
Valle d'Aosta	85	27	428	540	32	59	631	1.717
Basilicata	39	15	171	225	3	9	237	2.262
Molise	32	8	91	131	19	10	160	1.157
<b>TOTALE</b>	<b>28.403</b>	<b>4.035</b>	<b>48.134</b>	<b>80.572</b>	<b>16.847</b>	<b>13.155</b>	<b>110.574</b>	<b>541.423</b>

Table 1. COVID 19: National casuistry (official data from Italian Civil Protection).



**Table 2.** COVID 19: emergency department access.

tion, a Radiology Department and an Intensive Care Unit (ICU) for all the inhabitants of Piacenza and the surrounding four valleys - Val Nure, Val d’Arda, Val Tidone, Val Trebbia (for a total of 287172 inhabitants at 2019). As result, the sudden and massive wave of CoVID-19 patients in such a short time of period has paralyzed our health system and hospital organization. It was soon clear that we needed to develop a long-term plan to avoid the complete collapse of our hospital. On Sunday 23<sup>rd</sup> February 2020 all the heads of the hospital departments have been gathered to define together a plan against CoVID-19 outbreak. While writing, we have 2516 CoVID-19 cases, 1414 out of them needed hospital admission for acute respiratory failure and 210 were admitted to ICU.

The overcrowding of our ED, the limited human resources and the poor technical skills to deal with the CoVID-19 epidemic have required a great effort to maintain the normal standard of care for each patient. For this reason, we quickly modified several times the hospital organization increasing the number of emergency clinicians thanks to the help of the EDs of “Castel San Giovanni” and “Fiorenzuola d’Arda” Hospitals,

moving away the Orthopedics and Traumatology Department in another local building in Piacenza – “Casa di Cura Piacenza”-, and designing a disaster plan.

All the planned activities were stopped, the ICU tripled its beds from 15 to 45, and the hospital has been converted into a “CoVID-19 hospital” with 80% of beds for ill CoVID-19 patients. Immediately the Emergency Department (ED) created a strategy to discriminate CoVID-19 and no CoVID-19 patients at admission in order to limit CoVID-19 spread (7).

The Emergency Room was divided in six CoVID-19 areas according to different grades of respiratory failure (50 beds), and Observation Unit was turned into a Sub-intensive Care Unit for patients with ARDS who needed CPAP/NIV (13 beds). A “temporary CoVID-19 ward” of 40 beds with an extra medical team of 2 clinicians and 2 non-expert nurses to manage the high number of recovered patients was created for patients who were waiting for admission to two CoVID-19 hospitals located in Castel San Giovanni (128 beds) and Fiorenzuola d’Arda (61 beds), and the Military Hospital, set up in Piacenza for CoVID-19 disaster (40 beds). A “free CoVID-19



**Figure 1.** General protection.

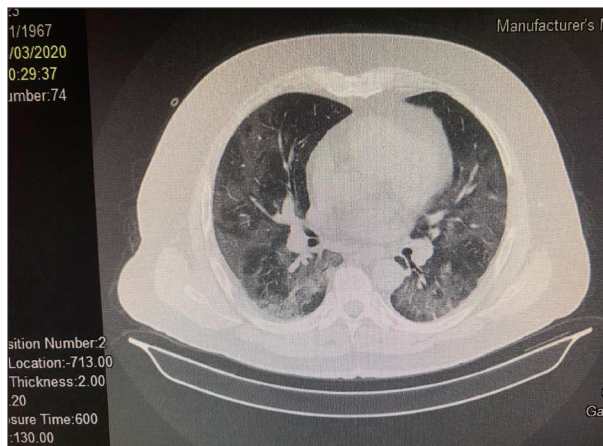


**Figure 2.** Personal Protective Equipment (PPE).

first aid station" (Advanced Medical Facility) has been arranged outside the hospital, in front of the entry of the ED, to ensure a "free CoVID-19 way". Two bed managers handled all the patients' hospitalization and transfer 7/7 days and 12/24 hours (8 a.m. – 8 p.m.). All the areas, including the Advanced Medical Facility, had an ultrasound workstation to perform point-of-care lung US (8) and a dedicated medical staff made by an emergency clinician and 1 or 2 expert nurses.

In the respect of human being and in absence of the family affection we hospitalized all the terminal patients in a dedicated CoVID-19 palliative care ward, made by 12 beds powered by a team of palliative care specialists and surgeons.

We want to point the attention on the Orthopedics and Traumatology Department, because of the strong impact of CoVID-19 due the fact that the PPE (Personal Protective Equipment) was available later than 21<sup>st</sup> February (Figure 1 and 2) (9). The medical staff of the Orthopedics and Traumatology Unit is made by 14 orthopedists, 5 general practitioners and 2 geriatrics. The available beds are usually 47, twelve of them are for prosthetic surgery (hip, knee and shoulder). Two operating rooms (one for the traumatology team) are active 12 hours a day (8 a.m. – 8 p.m.). The orthopedic emergency service is available 24/24 hours 7/7 days. Three out-patient clinics manage one hundred patients a day both for orthopedic and traumatological problems. At the beginning of the epidemic phase, seven orthopaedic surgeons had be-



**Figure 3.** CT scan findings of our colleague with severe interstitial pneumonia, intubated in critical condition in the Intensive Care Unit.

come ill causing a significant reduction of the medical staff. Six developed CoVID-19 infection with a good response to treatment. Three of them were on shift in the Emergency Room at the beginning of our local outbreak and none was confident with the right use of PPE. All the diagnoses have been confirmed by Real Time-Polymerase Chain Reaction for 2019-nCoV from the nasopharyngeal swab.

All the colleagues have been treated at home with hydroxychloroquine and antiviral therapy (10) with good response and complete remission in three weeks. Only in one case, low molecular weight heparin (LMWH) at anticoagulant dose has been used.

Unfortunately, on March 22<sup>nd</sup> one of our young colleagues has been hospitalized for ARDS (Figure 3) and he is still intubated in a critical condition in the Intensive Care Unit of another hospital. In addition, the two geriatrics resulted positive for 2019-nCoV by Real Time-Polymerase Chain Reaction from the nasopharyngeal swab, and they have been quarantined too.

In our Department 37.5% of nursing staff had have a positive nasopharyngeal swab. Most of them had complained of flu-like symptoms and none had needed to be hospitalized. Only one female nurse affected by several comorbidities died for CoVID-19 pneumonia.

The increasing number of CoVID-19 patients admitted to our ED and ICU, and the dramatic reduction of our medical staff forced our Department to adopt a “defensive strategy”, which can be summarized in two steps. First of all, on Monday 24<sup>th</sup> Febru-

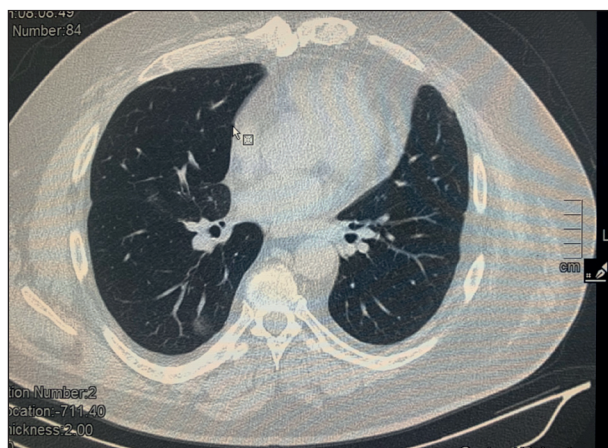
ary all the activities were stopped; and second, on 13<sup>rd</sup> March all the Department was transferred to another local building “Casa di Cura di Piacenza” to create another new “CoVID-19 ward” in the hospital powered by cardiologists, surgeons, otorhinolaryngologists and urologists.

As consequence, we have reduced our agenda: we stopped all the planned surgical activities (7 operating rooms) in order to increase the number of intensivists available for the CoVID-19 emergency, and we reduced of 50% the activity of the out-patient clinic.

Unfortunately, the director of our Department developed fever and dyspnea on March 17<sup>th</sup>. High resolution chest CT scan and nasopharyngeal swab confirmed the diagnosis of CoVID-19 pneumonia (Figure 4). Chest CT scan is considered the gold standard technique for the diagnosis and assessment of lung involvement in CoVID-19 pneumonia (11,12). The typical radiological findings are ground glass opacity, crazy-paving pattern and consolidation with the greatest severity approximately 10 days after the onset of symptoms (13). CT scan can depict the extent of lung involvement in CoVID-19 pneumonia. Data from a recent retrospective study in patients admitted to our ED for COVID-19 respiratory failure show that visual and software-based quantification of the well aerated lung on chest CT are predictors of ICU admission or death in CoVID-19 patients. In particular, the reduction of 70% well aerated lung parenchyma is a negative prognostic factor independent of clinical and demographic parameters, including inflammatory markers such as C-reactive protein (14).

We decided to leave only one orthopedist, available from 8 a.m. to 7 p.m. in the “Guglielmo da Saliceto” Hospital with these main aims: - consulting for hospitalized CoVID-19 patients and for all the patients admitted to the ED – CoVID-19 or not CoVID-19; - recovering and discharging of patients with traumatological diseases. In case of traumatological emergency, the “Emergency operating room” was always available. We planned our activities in the “Casa di Cura Piacenza” as follows:

- in-patient clinic: 25 beds powered by expert nurses and medical staff, 7/7 days, 24/24 hours.
- Out-patient clinic: from 8 a.m. to 7 p.m., one patient every 20 minutes to avoid overcrowding. Before be-



**Figure 4.** CT scan findings of paucisymptomatic patient.



Figure 5. X-Ray femur fracture.



Figure 7. X-Ray wrist fracture.

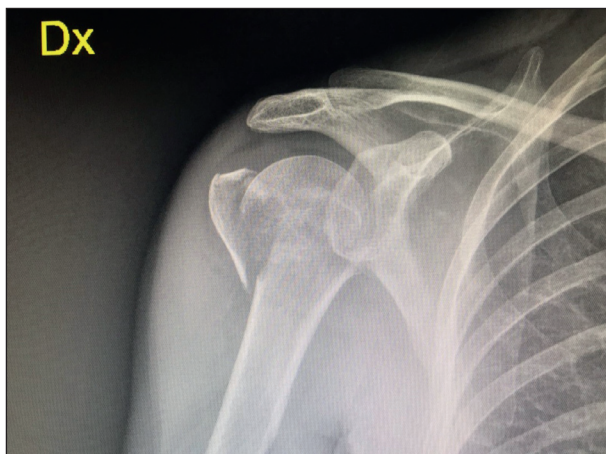


Figure 6. X-Ray humer fracture.

ing admitted to the visit, all the patient needed to fill out an easy and quick questionnaire based on clinical and epidemiological criteria, and to check body temperature.

- Orthopedic emergency service: 7/7 days, 24/24 hours. All the patients were firstly evaluated in a “triage

area” and in case of flu-like symptoms (clinical data) or epidemiological criteria, they were transferred to the ED in the “Guglielmo da Saliceto” Hospital.

- Surgical activity: one operating room from 8 a.m. to 4 p.m., from Monday to Friday, always available for traumatological emergencies (24/24 hours, 7/7 days).

The changes adopted by our Department have been paramount to create “space” in our hospital for dedicated CoVID-19 wards, and to help emergency clinicians and intensivists to manage such a disaster.

Surely, the national lockdown has contributed to limit traumatological problems. From 25<sup>th</sup> February to 31<sup>st</sup> March 2020, we have observed a significant reduction in traumatological diseases: from 281 (139 orthopedic problems and 142 traumatological diseases) to 96 (all traumatological patients, 52 out of them admitted to our hospital before 13<sup>rd</sup> March, and 39 to “Casa di Cura Piacenza”). Since 14<sup>th</sup> March 2020 we have had only 5 emergencies in CoVID-19 patients, all treated in the local hospital. Overall, we have treated

96 fractures in March 2020, down to 23.2% compared to March 2019 (125). In particular as regard fractures in older people (15,16,17,18,19), we have observed 41 fractures of the femur (down to 16.33%, 49 in March 2019) (Figure 5), 2 humeral head breaks (down to 75%, 8 in March 2019) (Figure 6), and 3 wrist fractures (down to 50%, 6 in March 2020) (Figure 7).

In the out-patient clinic we have drastically reduced the number of visits: from 100 until 21<sup>st</sup> February, to 30 since 13<sup>rd</sup> March, and we decided to extend the time between two successive visits to avoid the spread of CoVID-19 due to potential asymptomatic carriers.

From 7<sup>th</sup> to 21<sup>st</sup> April 2020, 2730/3720 (73.4%) hospital employees have been tested with immunochromatography for n-CoV19. Among them, 2152 (78.8%) were negative for IgG, and 2145 (78.5%) for IgM. Rapid test (chromatography) resulted positive in 578 cases; 453 (78.3%) out of them were confirmed positive for IgG (serum) too. One hundred and twenty-eight cases resulted positive both for IgM and IgG at the rapid Kit: 125 (97.6%) out of them have been confirmed IgG positive, and 107 (83.5%) IgM positive (positive threshold value  $\geq 10$  AU/mL).

In our Department only the seven CoVID-19 orthopedics have been found immunized.

On 9<sup>th</sup> April 2020, the General Director of our hospital called a "skype" meeting to discuss together with all the heads of the Departments, the general situation and plan a new strategy in the so-called phase 2 of the CoVID-19 epidemic.

We think that the significative reduction of the number of CoVID-19 patients admitted to the ED and particularly, those with acute respiratory failure, observed in the last two weeks, can be the result of several factors, such as: the Italian lockdown and the activation of a local healthcare system thanks to the great intuition by Dr. Luigi Cavanna.

Based on the observation that the ED has been overcrowded with CoVID-19 infected people already in serious condition and all these patient had a story of days or weeks spent at this home with flu-like symptoms and exertional dyspnea at first, then dyspnea at rest with urgent hospitalization for acute respiratory failure, dr Cavanna designed a plan to dramatically reduce admission to ED. Since the treatment of patients

admitted to the Piacenza hospital was based on hydroxychloroquine tablets 400 mg daily plus darunavir and cobicistat 800/150 daily for seven days, dr Cavanna and his medical staff choose to treat early at home CoVID-19 patients at the onset of symptoms to avoid a rapid progressive worsening of the infection (20).

## Discussion and Conclusion

The clinical spectrum of CoVID-19 infection can vary from asymptomatic forms to flu-like symptoms and interstitial pneumonia with different lung damage and the development of ARDS. Some patients can complain of anosmia and dysgeusia (21). ARDS is the main cause of death (22).

Piacenza is a small city with many inhabitants of advanced age, surrounded by four valleys al Nure, Val d'Arda, Val Tidone, Val Trebbia - for a total of 287172 inhabitants at 2019. Piacenza has quickly become one of the epicenters of the Italian epidemic for its proximity to Codogno, where the first case of CoVID-19 has been identified. The "Guglielmo da Saliceto" Hospital has struggled to deliver regular services, but in a few days, it changed its perspectives to avoid the complete collapse of its health system. A plan against CoVID-19 epidemic has been designed thank to the collaboration of all the Departments. The great flexibility and cooperation of all the medical and nursing staff of our hospital is the real key of the success of our strategy.

Based on this evidence and the overcrowding of our ED and ICU, we decided to stop all the planned orthopedic surgery and to move to another building in Piacenza, "Casa di Cura Piacenza". This choice has allowed to create a new dedicated CoVID-19 ward in our hospital. Surely, the national quarantine since March 10<sup>th</sup> has contributed to reduce the incidence of traumatological diseases. Surprisingly, we observed a reduction of typical bone fractures in old people, who generally occurred at home. We believe that a gradual resumption of all the activities is necessary but with a tailored strategy for every Department. A long-term plan is necessary to keep the system operational and to be ready for a possible second wave of the "tsunami". For this reason, the Orthopedics and Traumatological

Department will be split into two units until the complete resolution of the Italian pandemic: the traumatological surgery and the emergency room in the “Guglielmo da Saliceto” Hospital, the out-patient clinic and the orthopedic surgery in “Casa di Cura Piacenza” (25 beds). In addition, we will create specific routes designed to be prepared for a future pandemic and based on this dramatic experience. At time of writing, we are living the so-called phase 2 of CoVID-19 pandemic and we have just rearranged our organization, confirming the common idea that CoVID-19 is a real challenge for all the EDs (Table 2).

We strongly believe that we have to learn a clear lesson from what happened in the world and in Italy particularly, just one month ago. We need to be prepared for a possible “second wave” of this “tsunami”, but certainly, we need to have a long-term plan for the next pandemic based on the evidence that we live in a globalized world with globalized diseases.

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