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Commentary

Suggestions from Cremona, Italy: 2 months into the pandemic at the frontline of COVID-19 in Europe

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The COVID-19 pandemic is hitting hard even the most advanced healthcare systems [1]. We have had to care for large numbers of severely ill patients with limited resources (ventilators and specialists in respiratory failure management), often with a lack of healthcare workers (HCWs)—a terrible situation. The hospital of Cremona, Italy, is a 500-bed facility and was the second hospital in Europe to be hit, on February 21st, with this tsunami-like disease. Rapidly the number of patients with COVID-19-induced pneumonia reached 540. During the first 8 weeks of the pandemic the

emergency room evaluated 1706 patients, with 1542 admissions; 242 patients were intubated, 419 underwent non-invasive ventilation (NIV), and 342 died. Home care was activated in 58 cases. At 2 months into the pandemic and in the phase of descent, we are offering advice—useful tips derived from real-life experience—to our colleagues facing this disease. Indications regarding preparedness are available, but a view from the ‘battlefield’ may help in everyday practice (Table 1) [2,3].

The indications here described should be managed by a group of clinicians and management experts in charge of the organization of the hospital in this war-like setting, this being point zero.

Education first

It is difficult to organize continuing HCW education in an emergency setting, but it is necessary to implement courses on infection control and prevention (ICP) and on COVID-19 management. Three main points need to be addressed [4–7].

- (a) Correct use of personal protective equipment (PPE). Many HCWs will be displaced from their routine work to a new task, the treatment of a transmissible infection. HCWs need to be rapidly updated on the necessary competencies required to manage highly infectious patients with respiratory failure. Rapid and thorough courses on the correct use of PPE is the first thing that should be done to protect both HCWs and patients. Doffing procedures are critical, due to a high risk of contamination [4,8]. While HCWs are often placing stress on the use of face masks, meticulous hand hygiene (HH) is probably the most important prevention strategy, and adherence to this is instrumental [8,9].

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Table 1
Our ten practical tips to help manage the COVID-19 pandemic

	Problem found	Solution
1. Education	Limited knowledge of IPC No information on COVID therapy	'Fast and dirty' courses
2. Home care	GPs are not familiar with the disease	Webinars on clinical picture, diagnosis, treatment, IPC
3. Emergency room	High flow of patients	Organize different priority lines Organize patient reallocation to other hospitals
4. Patients' wards	High number of admissions	Programme when, where, and who will open a new COVID-19 ward
5. Patients' ventilation	Extremely high need for ventilatory support: ventilatory support (intubation/NIV)	Identify all ventilators in the facility Open new ICU in sub-intensive units and in the operating theatre
6. Laboratory and radiology	High request for PCR for SARS-CoV-2 High need for pulmonary CT	Select a high-throughput instrument for SARS-CoV-2 PCR Organize a COVID-19 CT service
7. COVID-19 therapy	Right therapy at the right time Drugs may go out of stock	Find time to study or let somebody update you Pharmacy has to check for critical drugs
8. Sick HCWs	HCWs may be infected when pandemic starts or may get infected	Have an emergency HCW shortage programme to reorganize ward staff
9. Limited supplies	Increased consumption of oxygen, blood gas syringes, surgical masks and FFP2/FFP3	Check the oxygen system and supply Verify supply of syringes, and PPE
10. Check patients and HCW needs	Stress is common in patients and HCWs	Evaluate psychological needs of the patients Organize a psychological service for HCWs

NIV, non-invasive ventilation; FFP, filtering facepiece; GP, general practitioner; HCW, healthcare worker; HRCT, high-resolution computed tomography; ICU, Intensive Care Unit; IPC, infection prevention and control; PCR, polymerase chain reaction; PPE, personal protective equipment.

- (b) Proper nasopharyngeal swab-taking is fundamental to obtain the best sensitivity/specificity of testing.
- (c) COVID-19 management: 'fast and dirty' courses should be organized on the general principles of respiratory insufficiency, blood gas analysis, oxygen therapy, venous thromboembolism prevention, antivirals and anti-inflammatory drugs use [7]. Intensive care patient management retraining for HCWs should be performed. Since indications evolve rapidly, courses should be repeated regularly.

Implement home care

Collaborating with GPs to correctly manage patients at home—limiting access to the hospital only for patients with possible pneumonia—is of paramount importance. Webinars on COVID-19 ICP strategies and management should be implemented: 1-hour courses on one-two items are much appreciated.

Reorganize the emergency room (ER)

We saw up to 70 COVID-19 patients per day. A reorganization of the ER will be necessary. Consider: how and where to perform

triage, and to receive patients into the ER; clean and COVID-19 triage areas may be necessary. You may rapidly be struggling for beds and even for oxygen therapy points, since most COVID-19 patients have respiratory failure.

Open new COVID-19 wards

We had to admit over 60 patients with COVID-19 every day, forcing us to quickly reorganize the hospital. Anticipatory planning on when and where to open new COVID-19 units is of paramount importance. Activation should be triggered by objective indicators (i.e. number of patients in the ER awaiting hospitalization); staff dedicated to opening new care units should be pre-alerted, to ensure work/rest shifts and to avoid HCW burnout.

Extend intensive care unit and ventilation capacity

We had to increase our intubation capacity from ten to 52 beds in 3 weeks. Early intubation is recommended to manage COVID-19 patients [7] and you may very rapidly run out of ventilators. Since ventilation weaning often takes over 2 weeks, a rapid saturation of the ICU is easily foreseeable, and early intubation may become a difficult problem to solve. You should programme in advance when to convert areas with ventilators (i.e. operating theatres) to COVID-19 intensive and semi-intensive care units. Consider to prone patients to improve respiratory function. A reorganization of the staff is also fundamental since high-level skills are needed to manage these patients.

Re-organize diagnostic services

Organize high-throughput nasopharyngeal SARS-CoV-2 swabs and define which exams have to be performed to manage these patients, including D-dimer, ferritin, and IL-6 determination. The need for high-resolution computed tomography (HRCT), the best diagnostic exam for interstitial pneumonia, will grow rapidly [10,11]. We performed over 2400 pulmonary HRCT in March, as compared to a standard of 200. A dedicated CT service has to be organized.

Optimize anti-COVID-19 therapy

Antithrombotic prophylaxis due to an increased risk of venous thromboembolism should not be overlooked. To improve knowledge, all efforts should be made to treat all patients within randomized controlled trials. Patients are so numerous that almost any drug utilized will rapidly go out of stock.

Programme work with a shortage of HCWs

It is likely that a certain number of HCWs will already be infected at the beginning of the epidemic, thus others will become infected. An emergency plan on how to reorganize services and how to reallocate HCWs to continue to offer a high level of services is of primary importance. Infected HCWs should be visited through dedicated internal services and treated following standard procedures.

Check facility needs

Ensure that all you need for patients with respiratory failure is in place. Oxygen consumption will rapidly increase and oxygen may become insufficient: in our hospital oxygen use skyrocketed from 3 m³/day to >80 m³/day. Drug use will increase similarly: norepinephrine and midazolam passed from 2500 and 800 vials/month to

21 000 and 7000, respectively. Blood gas analysis syringe use will increase: in our hospital consumption passed from 1900 in January 2020 to 12 900 in March. PPE use will be critical: mask use—i.e. surgical masks and FFP2/FFP3 respirators—increased from 5000 to 41 000/week, impermeable gowns from 1300 to 11 700/week, goggles/face shields from 30 to 1200/week. Adequate supplies have to be organized.

Take into account the needs and stress of patients and HCWs

Patients are scared of the disease, and visits, at least in our country, are forbidden. Time individually spent with patients is not enough, and the whole team—doctors, nurses, nurses' aids—should try to stay as close to them as possible. In our experience this is exactly what every HCW is willing to do, limiting the sense of anxiety and fear that is common during COVID-19. On the side of the HCWs, working with COVID-19 patients is an incredibly stressful duty since it is a highly transmittable disease. Furthermore, the level of uncertainty in management is high, the mortality is dreadful, and patients' social lives within the hospital are extremely difficult. Additionally, bringing home the stresses from work and worrying about the risk of transmitting SARS-CoV-2 infection to family members is a source of anxiety to the extent that normal marital relationship may be altered. Psychological support from the very beginning of the outbreak would be very useful for both patients and HCWs.

The latin motto *estote parati*—be prepared—is what we learnt from this terrible pandemic; while waiting for possible new waves, we are working on education on PPE, HH, and ventilation, and programming how to dedicate general wards and ICUs to manage new COVID-19 patients.

Finally, once the tsunami has passed, you will need to have rehabilitation services to manage patients discharged after long ICU stays: be prepared [12]. To conclude, we have proposed what we think could be of help to our colleagues facing the COVID-19 pandemic (see Table 1). This experience has so far taught us that even in these extremely difficult situations you have to struggle for collaboration and discussion. We think that aid to coordinate such a strenuous situation could be sourced from experts in catastrophe medicine or war medicine; the needs of the hospital, its patients and HCWs undergo a rapid and dramatical change over only a few days, similar to what is observed during war.

Author contributions

All authors made substantial contributions to the conception of the work, literature search and analysis, and discussion and interpretation of data. AP, AZ and ST drafted the work. All authors revised it critically for important intellectual content. All authors gave final approval of the version to be published. All authors

agreed to be accountable for all aspects of the work. All authors ensured that all questions related to the accuracy or integrity of any part of the work have been appropriately investigated and resolved.

Transparency declaration

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