



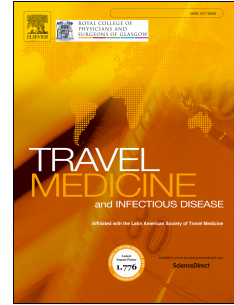
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After the COVID 19 outbreak in Italy: what have we learnt?

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Main Text

Dear Editor,

On February 20, 2020 a 38-year-old man was admitted with acute respiratory insufficiency to the intensive care unit (ICU) of the Codogno Hospital, marking the beginning of the SARS-CoV2 epidemic in Italy. Codogno is a small town in Lombardy, the Italian region most affected by SARS-CoV2, with currently the 37.1% of nationwide cases¹. The sudden massive inflow of patients overwhelmed existing protocols in place to handle rapidly evolving emergency situations.

In order to adequately respond to the wide-spreading of the SARS-CoV2 infection, hospitals needed new strategic organizational planning.

Here we summarize the experience of ASST Fatebenefratelli-Sacco, a tertiary center for infectious disease in Milan (Lombardy). This dynamic situation, indeed, required unprecedented modifications of both logistics and organizational hospital structure: the first week of April 2020 (maximum opening time) 477 out of 894 beds of the Hospital were dedicated to COVID patient.

We also present what are, in our opinion, the main priorities and issues that any hospital advisory board must consider to effectively deal with this kind of emergency.

First and foremost, it is essential to establish an Internal Crisis Unit for emergency management focused on the analysis of epidemiologic data and related information. The Unit receives information from other institutions (regional, national, and international) and where appropriate, applies this data to their own organization and infrastructure.

This Unit will be the top of the chain of command and should enlist: representatives from the hospital advisory board, infectious diseases and microbiology units, emergency medicine, intensive care units (ICU), occupational medicine. The chosen profiles guarantee the necessary epidemiological skills. It may also be appropriate to involve non-medical staff including administrative personnel.

Policy updates should be readily available and distributed to the hospital staff. Additionally, short documents enlisting clear and critical operational instructions may be drafted and spread internally through corporate communication channels.

The current emergency requires a great deal of flexibility for facilities usage/purpose and staff allocation.

The increasing need for ICU beds and non-invasive ventilation devices used outside ICU² may require a thorough overhaul of the hospital floorplan. It is important to accurately estimate the number of ICU and inpatients ward units with non-invasive ventilation devices that can be realistically created after a proper reorganization of the infrastructure.

To minimize virus transmission, it is crucial to avoid cross contaminations between COVID and non-COVID areas; consequently it should be considered to dedicate an entire building to COVID cases.

The presence of proper filter areas is important for creation of routes specifically assigned to the passage of either infected or contaminated (dirty) or non-infected (clean) materials and patients. The routes should be separated to avoid cross contamination not only within the inpatient units, the radiology, laboratory, and emergency room department, but also for the food, laundry, environmental services, and morgue units.

The frontline departments in this disease are the ICU, the intermediate care unit, the infectious disease units, and the pulmonary units. Those should be the first to be expanded from either the existent space or re-purposing of other areas.

Next, staff utilization undergoes profound changes by organizing novel teams of experts with different priorities/tasks. The two main kinds of team should be: one dedicated to care for positive COVID patients and the other providing conventional assistance (non COVID). For all staff members proper training must be developed and continuously delivered on the use of the personal protective equipment (PPE); in particular the correct dressing and undressing manoeuvres³. Teams should include experienced providers to pass on critical knowledge to *in-training* staff members.

The physical and emotional workload to which care providers and non-medical healthcare operators experience cannot be ignored; therefore, psychological support services should be available from the early stages of the emergency⁴.

Although all elective care activities will be suspended⁵ to increase resources and decrease risk of infection, it is necessary to foresee the occurrence of medical and surgical emergencies, together with non-deferrable health care services. The genesis of a collaborative network between local and regional hospitals based on their expertise and space/staff availabilities is an effective strategy for the efficient use of limited resources.

An eventual lack of proper PPE has negative repercussions on the ability to assist patients because of increased occupational exposure and infection. A centralized stocking and distribution of PPE should be established to avoid waste or misuse.

Another area where limited supply affects quality of care is the lack of devices for assisted ventilation. A close collaboration between hospital management and distribution centers is essential for drafting a practical supply plan to ensure availability of those materials/devices.

Moreover, a computerized, user friendly, Health Information System for the management of beds is essential to guarantee the availability of real-time, thorough and complete data.

Admission to the hospital for new patients and outpatient activities should be limited as much as possible. Emergency departments and COVID units should prohibit any visitors from entering or accompanying the

patients. In order to respect hospital restrictions, a video call system should be instituted to facilitate the communication of medical staff with patients and patients' family members.

In summary, based on our experience, key points for any given hospital to properly manage the on-going SARS-CoV-2 pandemic are: a) early establishment of the Internal Crisis Unit; b) careful evaluation of hospital infrastructure and potential re-purpose of areas to create new care units; c) training staff in the use of PPE; e) providing psychological support to the staff; f) providing proper communication between care providers, patients, and their families.

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Authors' contributions

GDF and FA conceived the study. LC wrote the manuscript. All authors collaborated on content development, revised the manuscript and, approved the final version of the manuscript.

Conflict of Interests

The authors of this manuscript declare no relationships with any companies, whose products or services may be related to the subject matter of this manuscript.

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References

- ¹ISS. Epidemia COVID-19 - Aggiornamento nazionale. ISS; Rome, 7th may 2020.
- ² Grasselli G, Pesenti A, Cecconi M. Critical Care Utilization for the COVID-19 Outbreak in Lombardy, Italy. Early Experience and Forecast During an Emergency Response. *JAMA* 2020; Mar 13. DOI: 10.1001/jama.2020.4031
- ³ Wong J, Goh QY, Tan Z, Lie et al. Preparing for a COVID-19 pandemic: a review of operating room outbreak response measures in a large tertiary hospital in Singapore. *Can J Anaesth* 2020; Mar 11. DOI: 10.1007/s12630-020-01620-9
- ⁴ Wang H, Wang S, Yu K. COVID-19 infection epidemic: the medical management strategies in Heilongjiang Province, China. *Crit Care* 2020;24(1):107.
- ⁵ Cao Y, Li Q, Chen J, et al. Hospital emergency management plan during the COVID-19 Epidemic. *Acad Emerg Med* 2020; Mar 2. DOI: 10.1111/acem.13951