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A 10-step guide to convert a surgical unit into a COVID-19 unit during the COVID-19 pandemic



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The novel coronavirus diffused rapidly in Europe and especially in Northern Italy in the second half of February 2020 after the Chinese outbreak in the beginning of December 2019 [1–3]. Shortly after, it was characterized as a pandemic by the World Health Organization. Many hospitals had to face a shortage of hospital beds as ordinary care and intensive care units became dedicated to patients affected by COVID-19 [4]. This issue became immediately evident and a massive re-organization of the hospital units took place [5].

As elective operations were cancelled, surgeons are currently performing only emergency or undeferrable oncologic surgery. The increased need for Intensive Care Unit (ICU) beds led to the conversion of operating rooms and recovery areas into critical care units as well as the relocation of the surgical staff to ICU and COVID-19 units. Surgical units were consequently reshuffled in order to admit a totally different kind of patients. This quick transformation of a surgical unit into a COVID-19 unit requires a various number of technical precautions and practical steps.

At a time when guidelines and recommendation were not yet available, our team had to face this emergency situation taking sharp decisions in order to re-organize the surgical units and staff.

We present a 10-step guide meant to implement a COVID-19 unit starting from a General Surgery Division, as reported from our experience from a medium volume hospital in Northern Italy during the COVID-19 outbreak.

1. All the devices for personal protection must be present in the unit. Everyone who has to enter a COVID-19 unit must know how to properly protect themselves. Entrances in the COVID-19 unit must be planned in order to have only the essential personnel exposed to the virus. Protection devices must be administrated by the dedicated staff not to waste any material.
2. Approximately 90% of COVID-19 patients requires oxygen therapy [6]. A careful analysis of the oxygen flows that can be delivered in a single unit has to be performed. Some unit may experience an increase in daily oxygen need of about 400% (in our experience the usual oxygen flow was about 800 lit/die per unit, increasing up to 3500 lit/die during COVID-19 patients' hospitalization). In fact, in a hospital unit of approximately 30 beds, oxygen flow level must be kept above 400 lit/min within a 4 bar pressure in order to simultaneously run continuous positive airways pressure (C-PAP) hoods, Venturi masks and high flow nasal cannula. The

dedicated technical staff must establish how many C-PAP hoods and high-flow bags can operate simultaneously in that unit. It is essential to develop a hospital control panel for the overall oxygen consumption in order to distribute the patients in C-PAP hood without overloading the single units. A sudden decrease of oxygen pressures inside the C-PAP hoods can in fact bring to a rapid respiratory failure due to the increase in carbon dioxide pressures.

3. COVID-19 patients need continuous nursing assistance. The nursing staff must be empowered to meet this need. The surgical nurses should stay employed to guarantee the routine care of patients. However, a nurse coming from a unit where non-invasive ventilation is routinely performed must be included in every nursing guard shift.
4. Part of the surgical personnel will inevitable face a relocation. The surgical team must be then divided in two sub-teams: a dedicated COVID-19 team working in the COVID-19 units, and a surgical “clean” team dedicated to the surgical procedures working in COVID-19 free surgical units [7]. A tailored reorganization of the surgical staff according to the hospital size must be performed to ensure that emergency surgical capabilities are maintained.
5. The COVID-19 team needs constant training throughout the whole emergency. Surgeons and surgical nurses have to be rapidly trained to the invasive and non-invasive ventilation. Dedicated blood gas analysis machine has to be placed in the unit.
6. To ensure the connection with the nursing staff, a surgeon must always be present in medical shifts, together with an internal doctor, expert in the field of respiratory diseases and ventilation.
7. Dedicated technical staff had to create a clean-dirty path for medical and nursing staff and for the COVID-19 patients within the unit.
8. A dedicated clean path must be guaranteed for food, drugs and devices supply as well.
9. A 24-h direct connection with an anesthesiologist and an intensivist dedicated to the COVID-19 unit has to be instituted.
10. A daily service connecting isolated patients to their close ones has to be implemented. Especially for patients utilizing a C-PAP hood, the communications with their relatives are extremely difficult. Doctors or dedicated nurses must closely keep in touch with the relatives in order to update them about the clinical conditions of their beloved ones.

This outbreak not only provokes us to go back to the origin of our job, taking care of patients, but also forces us to completely change

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what we were doing and the way we were doing it. We are facing something that, for the moment, remains out of our control. The treatment we provide for these patients is substantially supportive and its outcome largely depends on the condition of each patient. Every single medical practitioner is involved.

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Author contribution

Please specify the contribution of each author to the paper, e.g. study design, data collections, data analysis, writing. Others, who have contributed in other ways should be listed as contributors.

Giulio M Mari, Franco Casciaro and Dario Maggioni conceived the study.

Giulio M Mari and Jacopo Crippa wrote the paper.

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