First COVID-19 sub-intensive respiratory unit in Europe: the Italian experience

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European SARS-CoV-2 pandemic epicenter was detected in Northern Italy, in a little Italian town of Lodi province, the Lodi Hospital was therefore rapidly saturated, and in particularly the departments of respiratory diseases and Intensive Care Unit had been largely involved. In this paper, we describe how the first Sub-intensive Respiratory Unit in Europe completely dedicated to COVID-19 patients was organized and managed in our hospital. From February 25th to April 30th 2020, 156 patients were admitted to our Respiratory Sub-intensive Unit. Among them, 100 were discharged, 28 dead and 28 transferred to ICU for intubation.

Key words: COVID-19, severe pneumonia, sub-intensive respiratory unit, department organization, ARDS, ventilation.

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Dear Editor,

SARS-CoV2 spread firstly in China and then worldwide, becoming pandemic on March 2020 [1]. First European case of infection was detected on February in Lodi province. In the following weeks, the pandemic spread in Northern Italy. SARS-CoV-2 related disease, COVID-19, presents a wide spectrum of clinical manifestations, from flu-like symptoms to severe pneumonia and acute respiratory distress syndrome (ARDS) [2].

In this emergency setting, the hospitals and particularly the departments of respiratory diseases and Intensive Care Units (ICUs) were rapidly saturated and the need to enlarge their capacity became mandatory.

We describe how the first Sub-intensive Respiratory Unit (UTISIR) in Europe completely dedicated to COVID-19 patients was organized and managed within one month in Lodi Hospital, a public Institute with 440 beds, 1 respiratory Unit with 18 beds, 4 of them dedicated to respiratory sub-intensive care.

Firstly, a filter zone was created, with personal protective equipment (PPE), a sanitary area and spaces dedicated to warehouses. The number of sub-intensive-care beds was implemented up to 24, to meet the growing needs of inpatients. Each bedside was equipped with monitoring system and the department was provided with 20 high performance ventilators, 24 Continuous Positive Airway Pressure systems (CPAP), 20 Hight Flow Nasal Canulæ (HFNC), 3 Ultrasound Machines and single use bronchoscopes. A multidisciplinary team with pneumologists, cardiologists and anesthesiologists was created. The nursing stuff was implemented, to assure one to four nurses to each patient. To reduce the isolation of patients from relatives, due to the high contagion risk, a system of day-to-day telephone calls to the families for medical updates and video calling was organized.

The Emergency department (ED) in Lodi became the epicenter of the European SARS-CoV-2 pandemic “wave”, with high flux access. The careful observation of patients permitted to stratify them into five prevalent categories, with different needs for medical assistance and a new triage model was created [3] (Table 1).

In UTISIR were admitted patients testing positive to SARS-CoV-2 throat swab with phenotype 3, 4, 5; ICU patients weaned from intubation, with tracheostomy and transferred from other low-intensity care departments of the hospital, when appropriated.

Assessment of patients included: invasive monitoring of blood pressure, body temperature every eight hours, continuous monitoring of cardiac and respiratory frequency, oxygen saturation, continuous electrocardiographic recording, monitoring of urine amount. Arterial blood gas test (ABG) was repeatedly assessed. Blood tests at the admission included: routine complete blood count, C-reactive protein, procalcitonin, renal and liver function, coagulation, troponin, Legionella and Pneumococcal urinary antigens.

According to the 2019 ESPEN guidelines on clinical nutrition in acute respiratory distress syndrome (ARDS) [2].

Physiotherapy had a crucial role in assistance of COVID-19 critical patients. In UTISIR, two physiotherapists worked each shift to maximize the yield of NIV by allowing postural changes, mobilization, prone positioning, and during the weaning from invasive mechanical ventilator support in tracheostomized. Passive and active mobilization of the patients improved function outcomes, cognitive and respiratory conditions, above all in patients coming from ICU [9].

The literature reported alterations of coagulation tests, with increase in D-Dimer levels associated with adverse outcomes in COVID-19 patients. High risk for venous thromboembolism has been highlighted, with high prevalence of symptomatic acute pulmonary embolism and deep vein thrombosis in ICU patients. Therefore, low molecular weight heparin (LMWH) has become part of the therapy of COVID-19 [10,11]. As evidences about the right dose are still lacking, we administered 100U/kg/day. Lung Ultrasound Score (LUS) and compression ultrasound (CUS) of the pleura were organized and managed within one month in Lodi Hospital, a public Institute with 440 beds, 1 respiratory Unit with 18 beds, 4 of them dedicated to respiratory sub-intensive care.

Table 1. The five main phenotypes of COVID-19 symptom presentations to Lodi Emergency Department.

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<tbody>
<tr>
<td>1. Fever without respiratory failure (normal ABG and 6-minute walking test) and normal Chest X-Ray</td>
<td>→ patient can be discharged with indication to quarantine.</td>
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<tr>
<td>2. Fever with chest X-Ray and ABG suggestive for interstitial pneumonia and/or mild respiratory failure (PO2 &gt;60 mmHg without oxygen):</td>
<td>oxygen therapy required → hospitalization in COVID-19 Departments.</td>
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<tr>
<td>3. Fever with moderate/severe respiratory failure (PO2 &lt;60 mmHg without oxygen):</td>
<td>oxygen therapy or CPAP required → hospitalization in COVID-19 Departments or COVID-19 UTISIR.</td>
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<tr>
<td>4. Respiratory failure with suspected ARDS or severe pneumonia:</td>
<td>CPAP or intubation required → hospitalization in COVID-19 ICU or COVID19 UTISIR.</td>
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<tr>
<td>5. ARDS at onset:</td>
<td>CPAP or intubation → hospitalization to COVID-19 ICU or COVID-19 UTISIR.</td>
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ABG, blood gas test; UTISIR, sub-intensive respiratory unit; ICU, intensive care unit.
lower extremity veins were performed to all patients at the admission and repeated during the hospitalization if needed; chest X-Ray or lung CT scan were done in case of clinical worsening, especially if thromboembolism or bleeding was suspected. 

Up to now, no direct treatment has been proven effective against COVID-19. We administered different drugs taking part in ongoing clinical trials. The effectiveness of each treatment is still under study [12-15]. From February 25th to April 30th 2020, 156 patients were admitted to UTISIR: 100 discharged, 28 dead and 28 transferred to ICU for intubation.

**Abbreviations:**

COVID-19: Coronavirus Disease 2019; 
ARDS: Acute respiratory distress syndrome; 
ICU: Intensive care unit; 
UTISIR: Sub-intensive respiratory unit; 
PEE: Personal protective equipment; 
CPAP: Continuous positive airway pressure; 
HFNC: High flow nasal canulae; 
ED: Emergency department; 
NIV: Non-invasive ventilation; 
LMWH: Low molecular weight heparin; 
LUS: Lung ultrasound score; 
IBW: Ideal body weight; 
PEEP: Positive end expiratory pressure; 
CUS: Compression ultrasound.

**References**


