

We fully agree that alveolar overdistention is harmful to our patients. The Alveolar Recruitment Trial showed us that systematically performed recruitment maneuvers, known to cause alveolar overdistention, increased mortality rate in patients with acute respiratory distress syndrome (ARDS) (2). However, the amount of alveolar overdistention or collapse prior to the application of high airway pressures was unknown. Determining alveolar overdistention and collapse is crucial, as PEEP titration approaches are based on the assumption that there is an optimal compromise between alveolar recruitment (i.e., limit the amount of collapse) and minimizing alveolar overdistention.

Numerous bedside PEEP titration approaches have been described, but none have shown to improve patient survival in large randomized controlled trials. In addition, correlation between different approaches is poor. The explanation is that most bedside PEEP titration approaches have at least one of the following three limitations: 1) the approach does not quantify alveolar recruitment; 2) the respiratory system is assessed as a whole, and local lung inhomogeneities remain undetected; and 3) alveolar overdistention is not quantified.

EIT is a functional imaging tool that continuously assesses regional ventilation and lung volume changes at the bedside. As such, EIT is a bedside PEEP titration approach that quantifies both alveolar recruitment and alveolar overdistention and is able to detect local lung inhomogeneities. However, the amount of studies that used EIT to titrate PEEP in critically ill patients with ARDS is limited. In addition, there is no consensus on how to interpret EIT data.

Blankman and colleagues (3) compared several EIT-derived PEEP titration approaches in patients after cardiac surgery and proposed the intratidal gas distribution index to identify alveolar overdistention in the nondependent lung regions and to titrate PEEP. In a case series, Yoshida and colleagues (4) used a ventral-dorsal ventilation distribution of 50–50% to reach homogeneous ventilation and limit alveolar overdistention. In contrast, Francheineau and colleagues (5) aimed to limit the amount of relative collapse to 15% while maintaining the lowest percentage of overdistention in patients with extracorporeal membrane oxygenation. Alternatively, we could have aimed for the greatest amount of ventilated pixels or calculate the global inhomogeneity index. We chose to titrate PEEP at the lowest level of relative alveolar overdistention and collapse, as it is a simple and intuitive approach that has proven to be beneficial in mechanically ventilated patients during surgery (6). This approach resulted in low driving pressures and low transpulmonary pressures in all our patients.

We share the concerns of van den Berg and van der Hoeven that alveolar overdistention is harmful to the lungs. Therefore, we quantified the amount of alveolar overdistention before applying higher PEEP in our patients with coronavirus disease (COVID-19)-related ARDS. The Pleural Pressure Working Group's planned RECRUIT (Recruitment Assessed by Electrical Impedance Tomography: Feasibility, Correlation with Clinical Outcomes and Pilot Data on Personalised PEEP Selection) project (<https://www.plugwgroup.org/>), which aims to compare the results of different bedside methods to titrate PEEP based on EIT, might provide us with some answers on how to titrate PEEP using EIT data. In the meantime, we agree with our colleagues to limit the amount of alveolar overdistention in patients with COVID-19-related ARDS by applying prone positioning and quantifying the amount of alveolar overdistention during a PEEP trial. ■

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## An Expanded COVID-19 Telemedicine Intermediate Care Model Using Repurposed Hotel Rooms

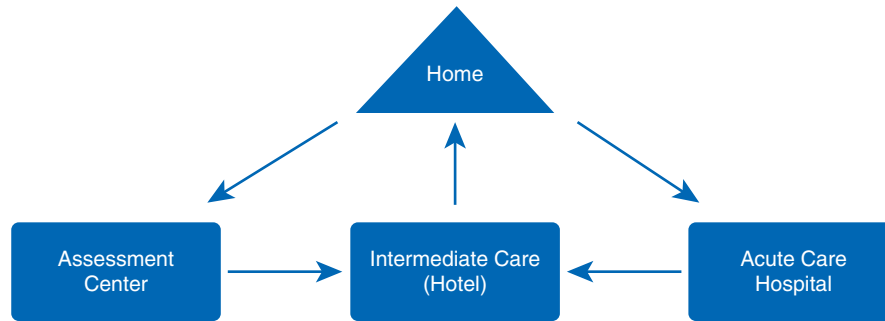
To the Editor:

We read with great interest the recent article from Bruni and colleagues (1) describing a hotel-based cohort

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Author Contributions: All authors were involved in preparation and review of the content. In addition, all authors were involved in the planning of the care model described in the letter.

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**Figure 1.** Saskatchewan Health Authority intermediate care pathway.

model for patients with coronavirus disease (COVID-19) convalescing from a hospital admission. They have shown preliminary evidence that such a model is feasible. Between mid-April and early May, we developed a similar model we have termed COVID-19 Intermediate Care (2) in the Saskatchewan Health Authority, an integrated provincial health system in Saskatchewan, located in Western Canada, serving a population of 1.2 million people spread out over 651,900 km<sup>2</sup>. We have a vast geographic area that is divided into quadrants that are governed centrally. An iterative method involving expertise from infectious disease, respiratory medicine, primary care, information technology, occupational therapy, physiotherapy, homecare services, supply chain, emergency medical services, and operational leadership was used to create a model sensitive to intraprovincial regional needs. Guiding principles for patient-centered, culturally responsive, collaborative, and integrated care were used.

For similar reasons described in the model of Bruni and colleagues (1), we have also decided to use hotels as alternative sites of care. In contrast to their purely convalescent model, ours involves multiple entry points into intermediate care (Figure 1). Not only do patients who are positive for COVID-19 and are convalescing after acute care hospital admission transition there, but appropriate subacute patients identified in dedicated COVID-19 assessment centers and emergency rooms can also enter intermediate care according to established criteria (Table 1). Inherent in our model is the assumption that patients are living independently prior to acquiring COVID-19 and will return to the same setting once they have recovered (*see* Table 2 for a complete list of assumptions).

Bruni and colleagues have built the clinical care model around twice daily assessment of patients by a respiratory physician using remote monitoring (no details of how monitoring is done were included) (1). We have designed our model to include a maximum 50:1 patient-to-physician ratio, with an expectation that primary care

physicians will be the usual providers with backup available from respiratory consultants or others as needed. This is achieved by using a proprietary digital system (Home Health Monitoring; TELUS Health) that creates a dashboard of data collected from all patients being monitored in a given location. Patients are provided with tools and digital media to input their own biophysical data (temperature, heart rate, blood pressure, and oxygen saturation) together with answering a specifically designed COVID-19 digital questionnaire twice daily. Triage of patient care is based on changes/abnormalities in the biophysical data (which is tailored each patient) together with answers to key questions that prompt yellow and red flags under predetermined conditions. The physician can then decide to interact with the patient by video conference through the platform or, if necessary, in person. The frequency and intensity of monitoring is tailored to the clinical status of each patient within the system. For example, the questionnaires are specifically designed to be different between patients entering from an assessment center/emergency room compared with those convalescing from acute care.

In addition to physician staffing, our model includes resources for other allied health professionals, including rehabilitation (physiotherapy and occupational therapy), nutrition services, and nursing. As pointed out by Bruni and colleagues, the physical characteristics of a hotel setting create many efficiencies for staffing of allied health services. An onsite paramedic is also included to provide an immediate response in the event of a respiratory/cardiac emergency that may result in transfer to a nearby hospital. Additionally, we have included onsite security personnel to monitor and enforce public health orders regarding visitation.

**Table 2.** Assumptions Inherent to Intermediate Care Pathway

All patients are COVID-19 swab positive (in exceptional cases/settings, presumptive COVID-19 will be included)
Any patient admitted to this setting is living independently prior to entry and anticipated to return to independent living
Care may be up to 6 wk in duration
No aerosol-generating procedures are anticipated for any patient
Current homecare standards will apply
Care in this setting is voluntary
Entry, exit, and escalation to acute care will be coordinated by the site lead
Staff will be screened in accordance with health authority standards

*Definition of abbreviation:* COVID-19 = coronavirus disease.

**Table 1.** Patient Characteristics of Intermediate Care

Subacute	Postacute
Medically stable but require observation	Require convalescent care or observation following acute care admission
May have hypoxemia	May have persistent hypoxemia
Unable to self-isolate and at risk of infecting others in household	

To date, our jurisdiction has had great success with social distancing, self-isolation, and robust contact tracing in containing COVID-19. At the time of writing this, we have had a total of 962 cases with 15 deaths and enjoy an effective reproductive number of approximately 2.3 (recently increased from <1.0 because of a localized and contained outbreak). Fortunately, to date, our hospitals have not been overwhelmed like some of our Canadian and international peers. As such, we have not yet had to activate this model of care. We highly appreciate the data presented by our Italian colleagues that supports the feasibility of the convalescent part of our model. It remains to be seen how our multientry point model performs relative to theirs.

In summary, we applaud Bruni and colleagues (1) on their work and present a similar but more comprehensive hotel-based model of COVID-19 care. ■

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## Reply to Fenton *et al.*

*From the Authors:*

We really thank Fenton and colleagues for their interest in our article (1) and the pleasing comments regarding our

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telemedicine-supported hotel accommodation model for patients with coronavirus disease (COVID-19).

Our project, which allowed 258 patients with COVID-19 to be discharged from the hospital to the hotel, was performed in the period from April 1 to May 31, 2020, during the Italian COVID-19 epidemic peak, when the number of infections was at its maximum, the need for hospital beds was urgent, and the future perspective of the outbreak was uncertain. The connection between the timing of such a model and the infection peak is a crucial aspect, to guarantee a rapid response to the epidemic and at the same time to contain unnecessary costs. Our timing was very appropriate for the Lazio region peak: the cost-effectiveness analysis of the project is ongoing.

Moreover, a decisive feature of this model is its flexibility: the capacity to modify the offered service, such as personnel, number of active rooms, and provision of other side services, in a fluid way adaptable day by day to contagions and resources guaranteed by different nations with different realities in terms of epidemiology and health systems enables this model to potentially fit to all the countries seriously affected by the pandemic to better cope with the outbreak.

Our model evolved over time: the number of nurses varied according to the number of hotel guests; physiotherapy and psychological counseling services were born following the needs that patients presented during their accommodation; the meal service was adapted to the health and cultural requirements of the patients, such as Easter or Ramadan time. Of course, this model should be adapted to the different sociocultural and epidemiological settings: if this type of management is to be efficient, the few “basic” requirements (e.g., isolation and feasibility of testing) will need to be mixed with other “additional” features (e.g., security and psychological support) to build the best solution, which will be different from country to country and within the same country during different phases of the epidemic.

Medical staff present in the hotel included geriatricians, normally operating in the continuity care service, who managed the in and out flow of patients, the swab timing, and the relationship with the public hygiene office that regulated the isolation conclusion. Patients’ arrival in the facility was subject to compliance with the inclusion criteria mentioned in the paper (1) to guarantee a good quality of accommodation and telemonitoring, despite the limited health resources that a hotel can guarantee compared with a hospital.

Three pulmonologist doctors provided medical availability 24 hours a day and were in charge of remote control of vital signs; a phone, an oximeter, and a thermometer were given to each patient with all the instructions for correctly sending parameters to the central platform. A telephone helpdesk support was made available to minimize the time patients required to familiarize themselves with the telemonitoring tools.

Our model ended up with 254 patients with negative severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) swabs who were discharged home: 4 patients who were still positive were transferred to other health facilities. Currently, the number of infections in Italy has greatly reduced, thus allowing the hotel to be converted back to its original function. The experience provided by such a useful project could enable a rapid reinstatement in case of need for possible COVID-19 second waves. For this reason, healthcare managers should define contractual arrangements with hotel facilities in advance to be ready to activate them quickly if needed.

We are very thankful to Fenton and colleagues for the interest received, delighted to see how our model has been reproduced