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Critical Rounds

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Dear Doctor,

Greetings from Micro Labs limited. We are happy to bring "CRITICONNECT" containing latest information in the field of Critical care medicine.

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Best Regards,
Medical Team, Micro Labs Ltd

Potential Influenza-Related Complications

A recent report illustrates an increased scope of the risk of risks connected with influenza, suggesting that health care professionals will be mindful of a broader variety of possible problems that may arise in patients.

In addition to pneumonia being a serious influenza respiratory complication, the infection can also intensify ongoing chronic respiratory disease. Complications may also have non-respiratory conditions that may end in hospitalization, which is likely to be under recognized.

The research, reported in JAMA Network Accessible, looked at the function of influenza in respiratory and non-respiratory problems in adult hospitalized patients. More than 76,000 people infected with laboratory-confirmed influenza in the United States constituted data utilized by the analysis between 2010 and 2018.

The findings found that 94.9% of patients had respiratory diagnoses and 46.5% had non-respiratory diagnoses, including 5.1% with just non-respiratory diagnosis. According to the report, the most frequent acute diagnosis was pneumonia (36.3 per cent), sepsis (23.3 per cent), and severe kidney damage (20.2 per cent).

However, fewer people with just non-respiratory conditions (81 per cent) obtained influenza antiviral treatment relative to those with respiratory conditions (89 per cent). The authors of the report acknowledged that this result indicates "potential missing opportunities in hospitalized patients to control influenza infections more effectively."

Patients with influenza, sepsis, and serious kidney damage have a high incidence of extreme medical complications, including visits to the intensive care unit (26% to 33%) and in-patient mortality (6% to 8%), the results indicate.

In fact, 43 per cent of patients with at least 1 severe respiratory problem have an existing pulmonary medical disorder, such as asthma or persistent obstructive lung disease.

There was also higher prevalence of the underlying medical disorders, including metabolic (52%), cardiovascular (51%), renal (33%), neurological (30%), immunosuppressive (19%), hepatic (7%), and hematological (6%).

It has been noted that the findings indicate that complete understanding of the disease continuum and the strain associated with influenza would take into account both respiratory and non-respiratory diagnoses

The results underline the value of vaccination against influenza, particularly for people at high risk of serious complications, even those with existing medical conditions.

Multiple patient lung ventilation using one anesthesia workstation or ventilator

The continuing SARS-CoV-2 virus pandemic and its related COVID-19 disease has culminated in severe ventilator shortages and treatment rationing. Significant damage to the global supply chain and quarantine policies prohibit transportation of supplies and the development of medical products**.**

The idea of utilizing an intensive care ventilator for multiple subjects was introduced in 2006 utilizing six Briggs T-tubes and a Puritan-Bennett 840 Series Ventilator to ventilate four human lung simulators, and subsequently evaluated in four adult sheep of human height. Nevertheless, in many places the Briggs T-tube isn't readily accessible.

Using the new 3D printing process of production this question can be solved. 3D printing facilitates bulk manufacturing at the point of need, with digital prototypes delivered through the internet.
They developed and fabricated two components at the Royal Women's Hospital in Melbourne, Australia, utilizing 3D printing: a splitter system and a flow restrictor tool.

Fusion 360 (Autodesk Inc, San Rafael, CA, USA) was used to build the design principles and computer-aided drawings. The splitter apparatus was built to be directly attached to a ventilator at each of the inspiratory and expiratory circuit ports with one unit. The flow restriction system was developed with the purpose of enabling the user to change the tidal volume supplied to one of the patients to gradually limit the flow to one limb of the parallel breathing circuit. It is in theory identical to a single-ventilator, two-lung differential ventilation system mentioned earlier.
Both sections were planned to be compliant with the breathing circuit connectors norm 22 mm ISO 5356–1 (conical anaesthetic and respiratory connectors).

The pieces were manufactured using several cheap fused deposition handheld printing 3D printers.
The overall period of development on a 3D printer desktop (Original Prusa i3 MK3S, Prusa Research a.s., Prague, Czech Republic) was 6 h with one package of two splitters (inspiratory and expiratory limbs) and one inspiratory flow restrictor. Estimated gross raw material prices is £ 1.00.
The device was checked in a typical operating theater, utilizing a Dräger ® Primus anaesthesia workstation (Dräger ®, Lübeck, Germany) to ventilate two artificial lungs (reservoir bags).

In parallel to the anaesthesia workstation, two 22 mm circular ventilation systems were attached through the circuit splitter, with a flow restrictor mounted on the circuit's inspiratory arm.
Under standard operational limits, the overall circuit leak (as calculated by the automated leak test) was < 120 ml. Using a flow restrictor of 2 mm in diameter, an inspiratory pressure of 30 cmH_2O, a positive expiratory pressure of 5 cmH_2O, a respiratory rate of 10 breaths per minute and an inspiratory time of 1.8 s, tidal volumes (measured by the ventilator) with a pressure control ventilation decreased from an average (95 percent CI) of 354 ml (351–357 ml) without a flow restrictor of 167.5 ml (167–168 ml) with a flow restrictor.

This is the first explanation of the usage of 3D printed fluid splitting machines and fluid restrictors for two patients in emergency ventilation. Bench tests showed reasonable efficiency in short-term ventilation environment for emergency use. The great reduction in tidal volume with the restrictor indicates the possibility for combining two sets of lungs of significantly different commitment or goal volume of tidal.

The publishing of such system designs is intended to stimulate debate and enable evaluation of the designs by other researchers. The 3D printing technology is now widespread and inexpensive, so workers with limited preparation will reproduce parts throughout the sector.
Of notice, the circuit configuration, as previously stated in the literature, is not capable of independent calculation of tidal volume or airway pressure.

The usage of a changed circuit for selective regulation of expiratory pressure was considered; however, with the current research approach, it was not possible to determine the impact of the flow restrictor on positive end expiratory pressure. Many variable flow restrictors are undergoing experimental assessment and laboratory research.

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Covid-19: ten critical concerns for intensive care medicine

INTRODUCTION

A major outbreak of newly identified coronavirus (SARS-CoV-2) occurred in Wuhan Area, Hubei Province in December 2019, and it is now called the Covid-19. Infection with SARS-CoV-2 passed rapidly across China and spread to over 90 countries. As of February 26, 2020, 78,064 conditions have been cumulatively reported, and 12,224 cases have been accumulative serious.
On January 29, 2020, along with the Chinese Medical Doctor Association of Critical Care Medicine and the Chinese Pathophysiology Association of Intensive Care Medicine, the Chinese Society of Critical Care Medicine released a joint recommendation to all Chinese Intensive Care Colleagues to combat Covid-19.
As of 26 February 2020, 29 provinces have deployed 32,395 medical personnel to assist Wuhan City, of which 11,638 are intensive care physicians and nurses, according to statistics from the People's Republic of China's National Health Commission.
Subsequently, more Covid-19 patients were handled successfully, and hospital mortality and the percentage of chronically sick patients saw a comparatively diminishing pattern in Wuhan.
In the battle against Covid-19, intensive care physicians and nurses are not only the key power in the frontline, but also, for the first time, compiled and reported important clinical findings that include useful first-hand clinical evidence to deepen the knowledge of Covid-19, which has gained mainly from the rapid growth of Chinese intensive care medicine in the last 20 years.
Most specifically, they should consider challenges with this outbreak, and review observations. We ought to look into the following important problems.

Ten critical issues for intensive care medicine

	Current situations or problems	Suggestions or solutions
1	Severe shortage of critical medical resources including physicians, nurses, and ICU beds in China.	Increase financial and staff investment, value the training of intensive care physicians and intensivists, and increase the ratio of ICU beds to hospital beds nationwide.
2	The levels of intensive care medicine in different provinces are uneven.	Strengthen training to achieve the homogeneity of clinical cognition and management capabilities of intensive care physicians in different provinces.
3	To focus medical resources on rescuing large numbers of Covid-19 patients, many non-Covid-19 patients are unable to receive effective treatment.	Establish a professional agency for the integration and optimization of the allocation of critical medical resources.
4	Medical staffs in Wuhan City from other provinces or cities were unfamiliar with the local conditions and the early phage of rescuing was in unordered states.	Set up standardized operating procedures for ensuring the refined risk stratification and subsequent refined management of critically ill patients.
5	Lack protection awareness and equipment early, many physicians or nurses were infected by SARS-CoV-2.	Strengthen occupational protection training and develop special standardized protection procedures during epidemics.
6	The continuous recognition of Covid-19 by Chinese intensive care physicians is a long and deepening process.	Develop the ability of intensive care physicians to quickly analyze and respond to a new disease.
7	Covid-19 patients usually are complicated with multiple organ failure.	More cooperation between intensive care medicine and other disciplines to deal with the rapid development of Covid-19.
8	The timing, dose, and duration of many therapies or life support for Covid-19 still remain controversial.	More training to improve the research ability of intensive care physicians.
9	The published studies mostly are single-centered and retrospective. It is difficult to integrate clinical, basic and public health data.	Establish a national special disease database, specimen bank and share research data from different medical centers.
10	Critical patients obtain multi-disciplinary expert team consultations through a national video remote consultation platform during Covid-19.	Promote ICU informatization construction. The successful experience should be extensively extended to the cure of other critical patients.

CONCLUSIONS

Throughout the battle toward Covid-19, we should consider and find challenges with the creation of intensive care medicine, recognize crucial concerns that need to be changed and eventually encourage the advancement of intensive care.

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