# NEWSLETTER

**Hong Kong Association of Critical Care Nurses Limited (HKACCN Ltd)**

香港危重病學護士協會有限公司
Hong Kong Association of Critical Care Nurses Ltd.

## Message from the President

Vol. 22, No. 1, Dec 2021

LEUNG Fung Yee
President
HKACCN

Ever since year 2019, a world-wide shockwave as triggered from the COVID-19 pandemic has provoked the healthcare services to transform, innovate, and adapt so as to minimize the damage done to human lives. Unquestionably, impact on the operation of our HKACCN is of no exception. In fact, we have experienced fundamental shifts of the way we so operate.

Amid waves of coronavirus infection, the virus keeps on mutating. We, medical and health care workers, can never remain static and hibernate. The harsher the situation, the more knowledge and skills we need to equip our nurses to safeguard the vulnerable patients. With the strong and persistent support from our Administrative Committee members, we manage to go digital promptly and accurately. By now we conduct our meetings via Zoom, which has enhanced us to make fast group decisions for urgent ad hoc issues. We have developed electronic health declaration forms, evaluation forms, and so on to minimize the use of fomites that may carry infections. This also saves and protects our environment.

At the same time, we have changed swiftly our teaching mode from face-to-face to online through electronic platforms. Happy to tell, these on-line training classes are most welcomed by our colleagues. It does not only reduce the risk of contracting infection but also save time for our learners in travelling. Not until recently, we have resumed our training programmes that need practicing, such as BCLS and ACLS. As the PRCC-ICU courses have resumed, there is a great demand for ECG courses and the ACLS programmes because they are pre-requisites to enrollment. Again, with the great support from our experienced instructors, number of classes are organized from morning to evening, including week days and weekends.

I hereby deeply express my heartfelt appreciations to all our instructors and trainers, as well as our office staff who have concerted their best extra efforts to ensure that our training to nurses is unimpeded, thus our commitments and targets as set can be achieved.

Meanwhile I am very delighted to report that our Association has been re-accredited by the Nursing Council of Hong Kong again as a CNE Provider for another three years (2021-2024). It is a great positive reinforcement and encouragement to us to continue our training, and have quality of care to the critically ill patients be well maintained.

Furthermore, I am glad to share with you good news that one of our council members, Mr. HUI Chi Ming, has been promoted to be Nurse Consultant recently. We congratulate him, and wish him every success in his new post. To better prepare our nurses to be future leaders and be proficient in management, we have started a new Management Course for Frontline Nurses. We are honored to have invited very experienced nurse managers to share their valuable experience and tactics in handling challenges.

At present, the 2019-2021 term of Board of Directors is due to expire and we have successfully elected the new directors to serve our members in the coming two years ahead. Herewith, I would like to take this opportunity to present the new Board of Directors (2021-2023) and together, I would like to offer my sincerest compliments to all our current Board of Directors (2019-2021) for their dedication and contribution in supporting the Association and the nursing profession.

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## How to Maintain Accuracy during Oesophageal Pressure Monitoring

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Introduction

Suffering from acute respiratory distress syndrome (ARDS), patient's lungs were modified to two regions as dependent atelectasis lung region and non-dependent "baby" lung region (Gattinoni et al., 2016). In order to prevent dependent atelectasis, high positive end-expiratory pressure (PEEP) was proposed (Gattinoni et al., 2016). On the other hand, low tidal volume (VT) and limited plateau pre-

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ssure (Pplat) were suggested to protect non-dependent "baby" lung region (Amato et al., 1998; Acute Respiratory Distress Syndrome Network et al., 2000) from ventilator-induced lung injury (VILI) (Gattinoni et al., 2016; Marini & Gattinoni, 2020), and patient self-inflicted lung injury (PSIL) (Brochard, Slutsky & Pesenti, 2017). Recently, Goligher et al. (2021) demonstrated that ARDS patients with high respiratory system elastance benefited from higher driving pressure (ΔP). However, the mechanical ventilation (MV) strategies as mentioned above focus the entire respiratory system but not transpulmonary pressure (Ptp), which is the pressure required to inflate the lung. Thus, over-distention of non-dependent lung region and under-distention of dependent lung region may occur (Grasso et al., 2012; Loring et al., 2010; Talmor et al., 2008; Terragni et al., 2007).

Oesophageal manometry is adopted to estimate pleural pressure (Ppl) so that Ptp could be calculated by subtracting Ppl from airway pressure (Paw) (Akoumianaki et al., 2014). Driving Ptp could be monitored so as to prevent excessive lung stress (Baedorf, Loring & Talmor, 2016). End-expiratory Ptp could also be measured to prevent dependent lung region from atelectrauma (Yoshida et al., 2018). In retrieving appropriate and correct Ptp, critical care nurses should be familiar with the oesophageal balloon placement techniques.

### Oesophageal Balloon Catheter Insertion

Oesophageal balloon catheter is typically introduced into oesophagus transnasally. The catheter is inserted gently to a depth of about 50-60cm to position the balloon inside stomach (Mojoli et al., 2015; Walterspacher et al., 2014). Positive pressure deflection is observed during inspiration once the balloon is located in the stomach. Then the catheter is withdrawn slowly until cardiac oscillation appears on the oesophageal pressure (Pes) waveform. This ensures that the balloon is placed in the lower two thirds of oesophagus. Milic-Emili, Mead, Turner & Glauber (1964) suggested that there was limited pressure artifacts when balloon was located in this position.

### Validation of Pes during Mechanical Ventilation

After insertion and manipulation, the position of oesophageal balloon catheter, validation of balloon position, is needed. Two different validation maneuvers are applied on patients according to their respiratory efforts.

For patients with spontaneous inspiratory effort, the dynamic occlusion test (also called Baydur test) is used to validate Pes waveform by measuring the ratio between changes in Pes and Paw during end-expiratory airway occlusion (Baydur et al., 1982; Milic-Emili et al., 1964). The ratio should be within 0.8-1.2, which implies that the change in Paw and Pes is almost identical, and hence no change in Ptp. If the ratio is out of the above range, the balloon position should be readjusted (Higgs, Behrakis, Bevan, & Milic-Emili, 1983; Milic-Emili et al., 1964).

For patient without spontaneous inspiratory effort, positive pressure occlusion test is to confirm the correct Pes waveform by manually compressing on the rib cage during an expiratory pause (Akoumianaki et al., 2014). If balloon is in correct position, simultaneous positive deflections of Paw and Pes is noted (Akoumianaki et al., 2014).

### Oesophageal Balloon Volume

Accurate Pes reading is not only attributed by correct balloon position, but also adequate volume of air in balloon. Milic-Emili et al. (1964) stated that the balloon with insufficient volume could not measure Pes precisely because Pes could not trasmit to sensor properly. On the other hand, balloon with exaggarated volume could over-estimate Pes as the oesophagus exerts pressure on balloon (Milic-Emili et al, 1964). Although different brands of oesophageal balloon catheters have different recommended filling balloon volume, Walterspacher et al. (2014) found that the actual filling balloon volume was greater than those manufacturer's recommendations, and it relied on surrounding pressure. In order to identify optimal filling balloon volume, clinicians should inflate the balloon progressively within the catheter-specific range of filling volumes. The optimal volume should be the lowest inside the balloon associated with the largest tidal swing of Pes waveform (Mojoli et al, 2015; Mojoli et al., 2016).

### Conclusion

To look for Ptp specifically when treating ARDS, oesophageal balloon catheter is used to find out the Ppl. In order to maintain the accuracy of Pes and even Ptp waveform, critical care nurses should know how to insert the balloon into lower two third of oesophagus, validate the balloon position, and inflate lowest balloon volume to achieve largest tidal swing of Pes waveform.


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# Early Mobilization Programme

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**Background**

Critically ill patients have limited mobility due to their illnesses, and are at risk for immobility related complications in intensive care unit (ICU). Prolonged immobilization increases pressure injury (PI), duration of mechanical ventilation, rate of delirium, length of stay (LOS), loss of function, and decreases quality of life (Harrold et al., 2015).

Early mobilization of critical care patients has been shown as an effective intervention to promote functional status, increase recovery time, improve muscle strength and physical function, reduce rate of delirium, and decreases ICU or hospital length of stay (Drolet et al., 2013).

Literature suggests that critical care nurses play a vital role in promoting early mobilization in ICU to reduce the risk for delirium, ICU-acquired weakness, and functional decline (Stolldorf et al., 2018). Nurses are paramount in their practices to provides mobility support for patients in critical care for their recovery.

Early mobilization (EM) of patients is a caring process that involves initiation of mobilization activities as soon as haemodynamics and respiratory stabilization within 24 hours of admission to ICU. The goal of implementing the performance improvement programme in Yan Chai Hospital ICU is to increase mobilization, and to prevent functional decline and hospital-associated complications of patients. The EM Programme has been introduced and tried since January 2021, and evaluated.

**Objectives**

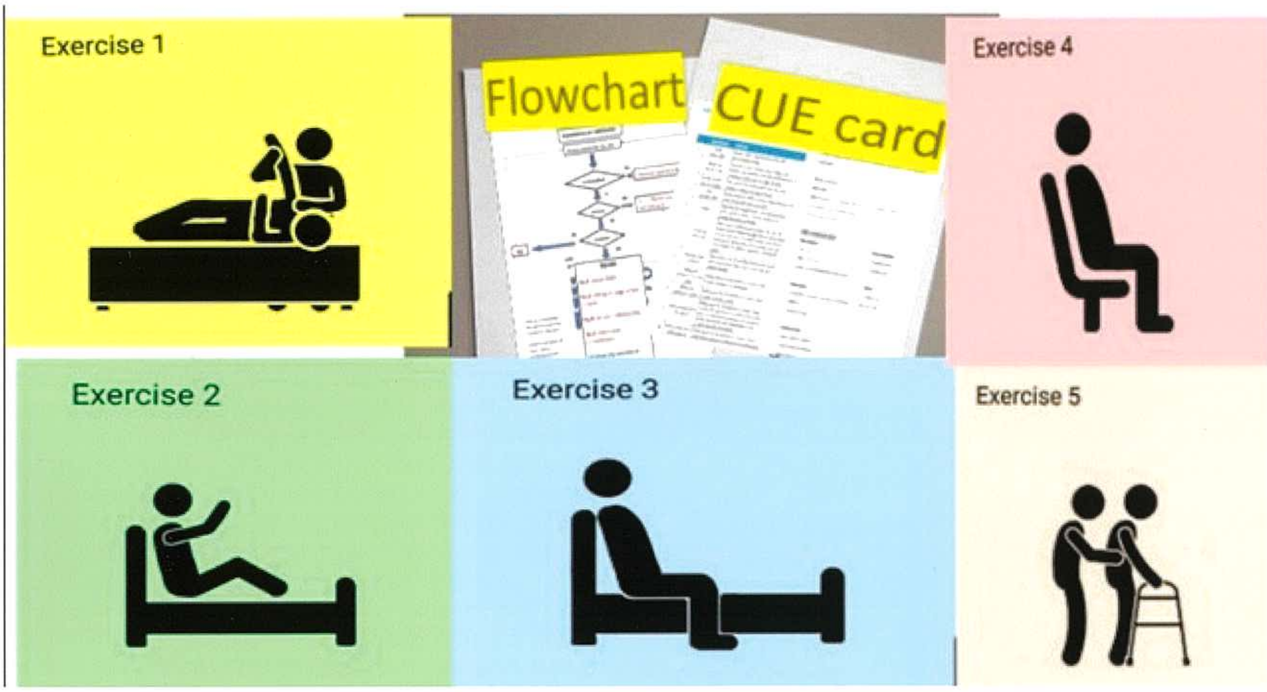
The objectives of this programme are to,

- promote early mobilization of ICU patients;
- prevent ICU-acquired muscle weakness;
- maintain functional status of patients upon discharge; and
- increase patient's satisfaction.

**Workflow and Staff Education**

The assessment of patients and workflow were developed in the formats of flowchart and cue cards (Figure 1). Cue cards and signage for exercise levels were made as Exercise 1 to 5 for easy reference by nurses at the bedside. The cue cards included the Intensive Care Unit Mobility Scale (ICUMS), and signs of intolerance of the patient. The signage indicated patient's current level of exercise (in 5 levels from passive range of

Figure 1 Flowchart and Cue Cards



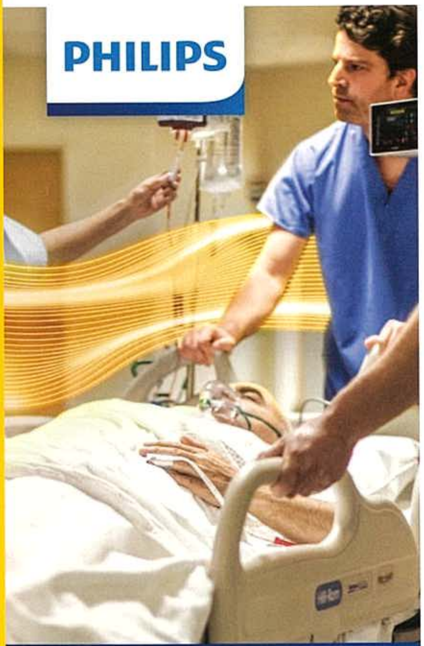

motion / PROM to active range of motion / AROM in bed; to sitting on the edge of bed, or out of bed; and standing stably for one or more minute). A video that explained positioning, therapeutic exercises, transfers, walking, education, and duration of mobility sessions to assist patients was also made available. According to the EM programme, nurses assess the patients every shift according to the flowchart based on the ICUMS, vital signs, and medical conditions like any arrhythmia and/or desaturation in oxygenation. Unless contraindicated, all patients are repositioned every two hours, or sit out of bed to the chair, for twice every day, and rest at night. Nurses also work with physiotherapists, to ambulate the patients and assist them in doing passive and active range of motion exercises.

The EM programme team composes of nine members including Department Operations Manager (DOM) and Ward Manager (WM) who are advisors, and Nursing Officer (NO) and Advanced Practice Nurse (APN) who are responsible for introducing, promoting, and monitoring the EM programme. The programme has been introduced to all nurses through PowerPoint presentation and video; and demonstration of the range of motion exercises to patients before full implementation.

**Full implementation**

In June 2021, the ICU EM programme was implemented to all patients (excluding contraindicated cases) after completion of staff education. The programme's flowchart was placed at each patient's folder. During the morning round,

Figure 2 Demonstration and Practice of the EM Programme in YCH ICU

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nurses would suggest and collaborate with physiotherapists in providing the appropriate level of exercise to ICU patients since their admission (Figure 2). Patients were anticipated to receiving early mobility exercises, which could prevent functional decline and hospital-associated complications.

### Feedback

The satisfaction level of patients reflected their subjective experiences about the care provided. It was assessed by direct verbalization, facial expressions, and degree of participation of the patients.

### Results

From June to October 2021, there was a total of 238 ICU admissions. Eighteen patients were excluded in the programme that more than 90% of the ICU patients over such period were successfully recruited. Patients' participation from exercise level 1 to 5 were analyzed. There were 17% of the patients who performed level 1 (37 of 220), 83% on level 2 (182 of 220), 5% on level 3 (11 of 220), 72% on level 4 (159 of 220), and 0.9% on level 5 (2 of 220). Majority of our patients were tolerating exercise level 2 (83%) and exercise level 4 (72%). This meant that either most of them were too ill and only tolerating sitting up in bed (exercise level 2) or stably ill and able to sit out (exercise level 4). Only 0.9% of the patients could tolerate exercise level 5 due to those who might do at exercise level 4 had already transferred to general ward.

### The Way Forward

Early mobilization is an evidence-based practice to improve health care in ICU. Literature suggests that EM programme could improve muscle strength and physical function, reduce rate of delirium, decrease length of stay, and pressure injury prevalence (Harrold et al., 2015). In promoting and evaluating this programme, it is found from informal feedback a very rewarding practice for ICU patients and staff, in which effective communication, mutual understanding, and cohesive team spirits are the crucial factors to make the programme workable. Feedback and possible outcomes of patients should be systematically collected (e.g. from patient's interviews and comparison with treatment as usual / TAU) for further analysis to evaluate longer term outcomes, that the recovery and quality of life of patients can be enhanced.

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## *Prevention of the Spread of COVID-19 from a Chest Drain System*

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## Introduction

Novel coronavirus 2019 (COVID-19) is the pandemic that hit the world. The safety of frontline healthcare workers raises our concern. To manage COVID-19 patients who require a chest drain system, a few modifications are made to the system as to minimize the potential risk of viral transmission from the system. A prove-of-concept pilot was conducted. The results support the polymerase chain reaction of COVID-19 from the system.

## Methods

The chest drain system applied is a three-bottle system. Three modifications to the system are performed.

1) <u>0.05% aqueous-based chlorhexidine gluconate solution in water seal chamber</u>
   The use of 0.05% aqueous-based chlorhexidine gluconate solution, which is proven to be effective against COVID-19 (Rajeev, 2020), to replace water in the water-seal chamber.

2) <u>Water added in the suction control chamber</u>
   Five millilitres of sterile water are added to the suction chamber for water-sealing so that excessive gas could not escape the system through the suction control port.

3) <u>Bacterial viral filter (BVF) at the suction port</u>
   A BVF is connected to the suction port after disconnecting the suction control stopcock in the system. An adapter from Cook Airway Exchange or a segment of endotracheal tube is used to connect from suction port to BVF.

The modified system was connected to a COVID-19 patient as a pilot study. Several swabs from the system were taken, and tested by polymerase chain reaction (PCR) of COVID-19. The following three parts were swabbed, and a specimen was collected for comparison,

1) the chest drain catheter inner site that connected to patient,
2) pre-filter, the inner tubing before connecting BVF filter,
3) post-filter surface of the BVF, and
4) 1mL of fluid aspirated from the water-seal chamber.

## Results

Result of the SARS-CoV2 RT-PCR gene tests was positive at part 1, but were negative at parts 2 to 4 where the modifications were made.

## Conclusion

Workplace safety is paramount in hospitals. Prevention of the spread of COVID in the environment to healthcare workers is our main consideration. The modification of chest drain system could potentially prevent the spread of COVID-19. Further trial is warranted to establish the reference to other clinical areas for practice in future.


**Reference**

Rajeev, C. (2020). *Chlorhexidine gluconate is effective against the novel coronavirus & other viruses*. doi: 10.13140/RG.2.2.18594.99524



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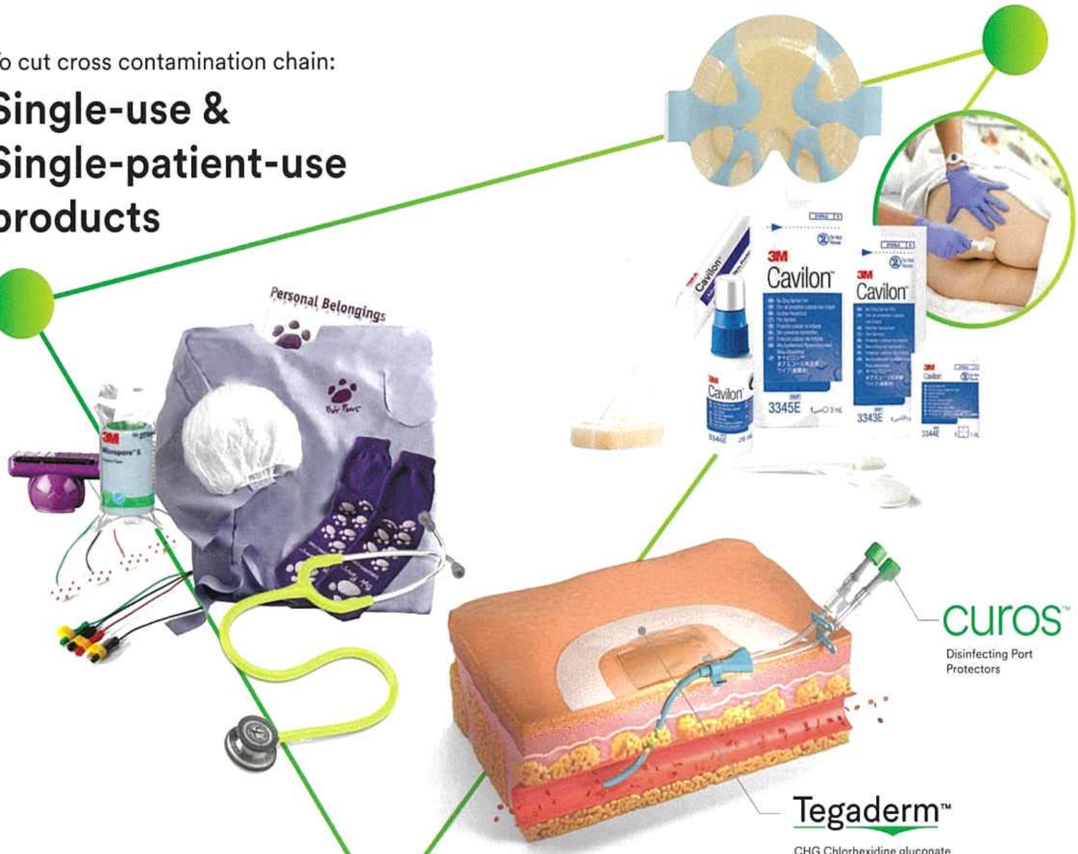


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