Upskilling and training of Critical Care Nurses for Pandemic- A Landscape for future

Derar Gharaibeh, Cornie Saba, Diosdado IV Frasco, Jennifer Dinglasan Marali
Sheikh Khalifa Medical City
UAE

Abstract

This writes up aspire to discourse current challenges encounter during COVID 19 pandemic and envisaging countermeasure to assert future-readiness.

This paper is adopting synthetization of literature review based on current experience through COVID 19 pandemic in outlining a considerably efficient framework for surge critical care training for future-readiness.

This article aimed to aspire to the challenges encountered during the COVID 19 pandemic and envisaging measures to ensure future readiness if a further outbreak of similar pandemics. This paper is adopting the synthetization of literature reviews based on current experience through COVID 19 pandemic in outlining a considerably efficient framework for surge critical care training for future-readiness.

1. INTRODUCTION

Healthcare leaders and human resources have been summoned with unforeseen necessity in provisioning institution readiness to meet demands of the healthcare workforce, namely, staff shortages, healthcare professionals' skills and competencies to meet the surge capacity of acute care setting attributed by the recent COVID 19 pandemic. Strategic workforce planning is crucial from leadership in all healthcare organizations to warrant public and healthcare professional safety while curtailing pandemic related repercussions. Priority has been centred on the reassignment of current staff to acute care and critical care settings and the deployment of non-clinical employees to ensure delivery of care during the precipitous hospitalization of patients with COVID-19. Additionally, the organizations thrive on capitalizing human resources to meet the demand for swift acute care. Compensating for the variable number of clinical staff who need quarantine due to unfortunate acquirement of the virus infection and being vetoed from traveling back from the home country, had imposed additional challenge.

Safeguarding healthcare professional safety and well-being, while provisioning for the workforce readiness during a crisis should prerequisite all the effort and intended approaches of any healthcare organization. Henceforth, an efficient healthcare professional training to forthwith acute care and critical care staffing is paramount to endure current insurgency and future-readiness.

2. METHOD

This paper is adopting synthetization of literature review to discourse current experience and challenges encountered through COVID 19 pandemic in outlining a considerable framework for surge critical care training to assert future-readiness.

3. LITERATURE REVIEW

3.1 COVID 19 discording nursing and critical care continuous education

The outbreak of COVID 19 had overwhelmed the current critical care bed availability and workforce capacity. Given this, the necessity of critical care skills and knowledge for nurses, especially non-critical care trained nurses to augment the workforce availability, has become essential.

As the coronavirus rapidly spreading throughout the world, its detrimental impact on the global population and international health care organization was swift, evolving, and unpredictable. Its effects on nurses are predominantly direct, with rapid cessation of all essential education and training related activities in most organizations. Indeed, the challenge in addressing this problem has become more perplexed; however, to resolute, the setback and curtailing serious ramifications related to patient care, particularly patient safety is imperative (Durham et al., 2008)

3.1.1 Upskilling of healthcare workers for crisis; readiness, safety and proficiency

Goh and colleague 2020, proponents of the article, "Preparing your intensive care unit for the COVID-19 pandemic: practical considerations and strategies," stressed the importance of upskilling healthcare workers as one of the critical elements required to ensure sustainability of the workforce, particularly in term of infection control. They observed, through education and upskilling, logistical and technical challenges with routine or ICU care could be identified and addressed in time. Their approach was ‘just-in-time’ inter-professional and in situ simulation to upkeep the momentum of rapid training and skills retainment. In their simulation training, procedure such as resuscitation and rapid response team training, extracorporeal membrane oxygenation (ECMO), transport of critically ill patients, and procedures like tracheostomy, were performed with full airborne precautions and powered air-purifying respirator (PAPR). During the resuscitation simulation, they found the used of PAPR complicated the process of breath auscultation, whereby, to do so, participant had violated major infection control measure. Hence, in addition to critical care training, infection control has been their focus point in curtailing the unnecessary spread of infection, as well protecting front liners during direct patient encounter. “HCWs should be taught to inspect, disinfect, and dispose of PPE safely, and periodic refresher re-training is required to ensure staff readiness and proficiency” (Goh et al.,2020).

3.1.2 The experiences of health-care providers during the COVID-19 crisis in China: a qualitative study (Liu Q et al., 2020).

This qualitative study presented the predicament faced by Chinese nurses and physicians during the initial of COVID-19 pandemic. At the early phase of the outbreak, the Chinese health-care providers who were assigned to work in the COVID unit and facility were anxious and lacks confidence in caring for patients with this new disease. The risk, transmissibility, pathogenicity, and treatment of the disease were not well

understood, and worries exacerbate as they no longer had the opportunity of educating themselves with the nature of the emerging pandemic. Moreover, some health-care providers had no experience working in an intensive care unit or dealing with critically ill patients requiring mechanical ventilation, and they needed to learn and master new skill and technical procedures in a short period of time. In this empirical study, a semi-structured, in-depth telephonic interview was done. Participants narratives then transcribed verbatim and analysed using "Haase's adaptation of Colaizzi's phenomenological method" (Liu Q et al., 2020). The study findings revealed three main emergence themes; "being fully responsible for patient well-being is my duty", "challenges of working on COVID-19 wards" and "resilience amid challenges" (Liu Q et al., 2020). They summarized, that a comprehensive support and intensive training were necessary to promote preparedness and efficacy in crisis management, safeguarding difficult task/duty and well-being of the health-care providers, while cultivating resiliency with spirit of professional dedication to overcome difficulties despite of the task and allocation in completely new unit/environment.

3.1.3 Experience from Italy (Bambi et al., 2020)

Stefano, a registered nurse in the medical and surgical intensive care unit, Careggi University Hospital, Florence, Italy narrated their experience on how they responded to COVID pandemic. In his commentary article, he cited, Lucchini and colleague (2020), on a recent case series of critically ill patients affected by COVID-19, showing a 33% increase in nursing workload compared with the usual case mix seen with ICU patients. He suggested that surveys about nursing activities and nurse to patient ratios in COVID-19 ICUs could be useful to establish priorities in managing potential staff shortages. In their case and experience, staffing during this pandemic has been resolved by enrolling both nurses with previous ICU experience and recently graduated nurses to manage the surge number of COVID-19 patients. "This solution may have lowered the staff skill mix in these ICUs below the required standards, with potential risks to patients' safety and quality of care" (Bambi et al., 2020), but a great opportunity is available to increase each nurse's experience and competencies and to improve nurses' skills within multidisciplinary teams. He emphasized, broadening competencies and skills on regular basis could have beneficial effects for nurses during pandemic. Consequently, he believes that nurse's regular rotation between specialities will guarantee expanded skills and knowledge acquirement, increasing practical and theoretical knowledge in different specialities, and reducing psychological impact to nurses in case of sudden reassignment to a different clinical setting.

Hence, an upskilling program instituted for non-critical care nurses has become a focal point in the middle of this pandemic to safeguard workforce capacity. The essential of upskilling program is to supports non-critical care nurses, develops essential foundational knowledge in critical care patient management, monitors, and evaluates nursing interventions for critically ill COVID-19 patients.

3.2 The organization compels to recruit alternative in resourcing the insurgency of critical care patient

As the emergency department overwhelmed with patients due to unforeseen widespread pandemic influenza, a guideline to triage patients efficiently to the intensive care unit deemed salient. Notably, the vast number of patients succumbing to the virus infection leads to a scarcity of resources, even in developed

countries. A well-defined strategy in subjugating the surge capacity for huge critical care demand was indispensable.

3.2.1 Surge Capacity and critical care

Surge capacity in this writing context contemplates the ability of an organization to withstand a sudden increase in the number of patients in critical care (Goh et al., 2020) due to the nature of the disease progression. Though, the physical bed capacity of intensive care unit could be substantially increased, it depends on the management system's efficiency, availability of space, supplies, staff, and other pertinence considerations (Phua et al., 2020). New staffing models and strategies for reducing local variability in surge capability are urgently needed (Litton, et al., 2020).

3.2.2 Strategies implored to augment resources in critical care

Globally, there are different strategies exerted to overcome the increasing surge demand. Among those strategies are structuring alternatives practice to ensure that enough healthcare workers are available to provide support for COVID-19 acute clinical care; such strategies include face-to-face triage, promoting telemedicine particularly video consultation (Ohannessian et al., 2020), cancellation of non-urgent outpatient visits, and considering postponing or cancelling elective procedures and surgeries (American College of Surgeons, 2020). There is numerous course of maximizing the services capabilities in terms of mitigating the surge capacity in the critical care areas which include; “1) prepare and implement rapid identification and isolation protocols, and a surge in ICU bed capacity; (2) provide a sustainable workforce with a focus on infection control; (3) ensure adequate supplies to equip ICUs and protect healthcare workers; and (4) maintain quality clinical management, as well as effective communication” (Goh et al., 2020) and (5) training and deployment of nurses from less affected unit to the more saturated areas such as critical care (Raurell-Torredà M, 2020).

3.2.3 Maximizing the availability of containment areas for COVID 19 patient without compromising safety

In the cascade of an extended period of widespread community transmission, the emphasis shifted on supporting essential hospital services, such as critical care and emergency care to mitigate stretch in capacity while maintaining containment efforts. The response will be varied based on the scale and severity of the pandemic (Einav et al., 2014). Given the preparation of the critical care department, consideration of the alternative design of isolation rooms to safeguarding patient placement was instituted. Geographical separation of clinical areas allows the concentration and segregation of equipment and staff, contributing to more effective containment. Ideally, to be effective in the containment effort of the virus, Intensive Care Unit (ICU) should consist of negative pressure airborne prevention rooms or utilization of rooms with high-efficiency particulate air (HEPA) filters in the absence of negative pressure rooms (Phua et al., 2020). Patients are screened at the emergency department and inpatient wards, to expedite identification and isolation of suspected and confirmed cases. As been widely defined, suspected cases ascertainment was based on a combination of travel and contact history and the presence of signs of respiratory illness (Wee et al., 2020).

3.3 COVID 19 destitute critical care

3.3.1 Higher mortality rate due to overwhelming services

The COVID-19 pandemic notably challenging critical care systems worldwide at all levels and optimizing critical care management for acute respiratory failure is a cornerstone in saving patients' lives (Abe, R. et al., 2020). A recent publication in JAMA, through several large-scale observational studies describing the clinical characteristics and outcomes of patients with COVID-19 in a multi-international city. In New York City, 2634 patients were either discharged or died upon succumbed by the virus; 373 (14%) were treated in the ICU, with 320 (12%) received invasive mechanical ventilation (ISARIC, 2020). That is rounding up to 88% of patients who died while receiving mechanical ventilation. A similar finding was retrieved from the United Kingdom national registry; 62% of patients (n=2175/3508) with confirmed COVID-19 died while on advanced respiratory support in the ICU (Grasselli, G. et al., 2020). In Italy, a report from the Lombardy region; among 1591 patients who were acquiring the same virus admitted to ICUs, 26% died, 16% were discharged, and 58% were still in the ICU Griffin, K. M et al., 2020). The high mortality rates could be attributed to overwhelming ICU services owing to exponential surges in the number of acute respiratory distress syndrome cases related to the rampant spread of COVID-19 (Richardson, S. et al., 2020).

3.3.2 Deployment from other specialties come with a cost

High mortality rate is not an exclusive impact of COVID 19. The surge number of a sick patients who are requiring high ventilator support, and hemodynamic support due the nature progression of the infection has outnumbered the existing capacity of trained ICU nurses and intensivists. Deployment of the other specialties to the ICUs, namely anesthetist, in house non-critical care nursing team, with additional deployment of medical and nursing team from outside of the institution had been a prime alternative in aiding the outnumbered workforce (Raurell-Torredà M, 2020). The collateral impact of the deployment, arise from challenges in effective communication among the “intended team” member, risky staff-patient allocation/shift assignment due to unfamiliarity of the shift leader on the staff skill limitation, lack of sense of belonging in the “alien” unit influenced the staff adherence to common critical care patient bundles, and with all these cofounding factors, optimum patient care delivery and outcome will be affected. Therefore, development of a team-based approach for critical care patient management is paramount to minimize the cost (Phua et al., 2020).

3.3.3 Coping with the “tsunami” of COVID 19 update

The rapid spread of the disease and the appetite for updated guideline in understanding the disease and treatment has inspire many health clinicians, policy makers, and health care organization to publish project and research related to COVID 19. Though, generally research and academic writing is highly encouraged in healthcare, particularly when illness is related to complex critical care management, during this pandemic, these endeavors has notably posed a detrimental impact. Many publications at the realm of the pandemic are lack of appropriate peer review, “been sub-optimally designed, with small interventional studies are initiated, therefore statistically underpowered”(Pickkers, P. et al., 2020; Voss, A. et al., 2020)), which lead lack of clinically relevant conclusion. Consequently, the “prematurely publish” study/guideline

will stir anxiety among critical care front-liners, health clinicians, and public alike due to uncertainty of the disseminated info. Therefore, controlling and regulating the influx of info in the healthcare organization during pandemic is substantial (Pickkers, P. et al., 2020). A designated national level body/organization will be valuable in regulating and disseminating appropriate info related to their specific geographical evolution of the disease and resources.

3.3.4 Critical care break the norm of disposing the disposable PPE: The REUSE, do's and don'ts of N95 respirator mask

As COVID 19 primarily transmittable via droplet and aerosolized procedure, N95 respirator mask has been the essential personal protective equipment (PPE) for healthcare providers, in addition to impermeable gown, google, and face shield. However, N95 notably scarcely available in comparison to other PPE during recent pandemic (Livingston et al.,2020). To safeguard the availability of N95 respirator, the Centre of Disease Control (CDC) recommended the limited reuse of N95 as following.

- Do not reuse N95 respirators following use during aerosol generating procedures.
- Do not reuse N95 respirators contaminated with blood, respiratory or nasal secretions, or other bodily fluids from patients.
- Do not reuse respirators following close contact with any patient co-infected with an infectious disease requiring contact precautions.
- Do apply a regular mask on top on N95 respirator to minimize soiling on the outer surface of the mask.
- Hang or store used respirators in a clean, breathable area or container. To minimize potential cross-contamination, respirators must not touch each other, and the name of the respirator owner is clearly identified. Storage containers should be disposed of or cleaned regularly.
- Clean hands with soap and water or an alcohol-based hand sanitizer before and after touching or adjusting the respirator (if necessary, for comfort or to maintain fit).
- Do not touch inside of the respirator. If inadvertent contact is made, respirator to be discarded and perform proper hand hygiene.
- Use a pair of clean (non-sterile) gloves when donning a used N95 respirator and performing a user seal check. Discard gloves after the N95 respirator is donned and any adjustments are made.

4. RECOMMENDED FRAMEWORK AND GUIDELINES FOR NURSE'S PREPAREDNESS TO ADULT CRITICAL CARE DURING PANDEMIC

This framework and guidelines were designed to advance the competence of non-critical care nurses and nurses who worked in less saturated critical care areas within the organization in supporting the critical care workforce managing critically ill COVID 19 adult patients. The program includes a structured theoretical and clinical facet. It aims to equip non-critical care nurses and other intended nurses alike with the needed essential critical care knowledge and skills to perform efficiently in the critical care setting and ensure that the delivery of care is safe and holistic. However, with the advent of COVID 19, the mode of

delivery of this training program has been devised to prevent the spread of the virus and cross-infection of the disease and, at the same time, protecting the personal safety of the nurses.

4.1 Selection criteria of the participants

To warrant timeliness comprehension of knowledge and skill acquirement during pandemic, the participants selection for deployment preparedness training was limited to step down units, post anesthesia care unit (PACU), pediatric ICUs, and neonatal ICUs. Due to lack of availability on conclusive guideline for critical care training participant selection (Raurell-Torredà M, 2020), this criterion was deemed appropriate, presuming that nurses from the intended areas has basic knowledge on critical care concept, care and management.

4.2 Training design and delivery mode

The training encompasses of two-day theoretical interactive lecture using didactic mode, followed by three-day clinical exposure with preceptors (senior ICU nurses). Skill station and case discussion were incorporated between the theoretical session to enhance core skill and learning behavior. To obtain the target number of trained nurses to be ready for clinical deployment, training is to be delivered in weekly basis (one batch/one week).

4.3 Training contents

The program covers an integrated knowledge related on COVID-19, based on the organization's approve adaptation of published evidence-based practice on clinical practice guidelines. Ultimately, the fundamental concept in managing adult patients with ARDS, sepsis, and other related physiological impact of COVID-19 acquirement were extensively discussed and explored by the critical care nurse educators who assigned to facilitate the training. Core concepts such as airway management, assisting with rapid sequence intubation and invasive line insertion, care and safe management of patient on mechanical ventilator and artificial airway, invasive lines monitoring and care, management of hemodynamic and life sustaining drugs, and sedation analgesia with/without paralytic agents were included. Besides, the training inclusive touches base on emergencies responses in a critical care setting, namely basic life support, advanced life support, and mock drills tailored to the recommended guideline for healthcare during recent pandemic. Additionally, imploring return demo by participants on prone positioning patient (simulation) while on mechanical ventilator with multiple lines will warrant safe application of the skill on actual patient.

4.3 Safety guideline on PPEs and different set up of isolation

Safeguarding nurses' safety during clinical deployment is a primary consideration to promote health, well-being, and a sustainable workforce. During skill station, participants were briefed on the safe practice of reusing N95 respirator according to the CDC recommendation, complimented with practice while watching on proper hand washing and donning and doffing procedure of the required PPEs; mask, goggle, face shield, head cover, gown, glove, shoe cover and Hazmat suit.

As to increase the capacity of containment space in critical care, due to limited negative pressure room availability, all single room in the ICU was safely utilized to accommodate patient using high-efficiency particulate air (HEPA) filters. Knowing that these type of room were not build with ante-room (as in

negative pressure room set up) for preferably donning and doffing space, the participants were taught to remove all the donned PPEs except N95 respirator and the outer layer facemask, which to be doffed once they completely closed the exited door. During clinical deployment nurse participants were closely monitored by on duty Charge Nurse and Clinical Nurse Educator on adherence to the infection control endorsed safety guideline.

4.4 Skill checklist to guide and monitor clinical skill obtainment

Skill checklist is design to guide participants clinical exposure, as well to guide the preceptor and Clinical Nurse Educator on the progress of the nurse participants. This approach will encourage learner led learning with timeliness safe supervision.

4.5 Primary Outline of the framework and guidelines

The program's outcome was set based on the needs of the actual participants and the competence of staff required by the unit where they may be assigned; thus, the participant was aided to accomplish these primary outcomes:

Knowledge and Understanding

- Understand COVID 19, pathophysiology and transmission
- Define the significant concepts in the care of patients with COVID 19 in a critical care setting.
- Understanding the concept of mechanical ventilation.
- Understanding Acute Respiratory Distress Syndrome (ARDS) and sepsis.
- Recognize the psychosocial aspects of critically ill patients.
- Define the ethical and legal aspects of patient in the critical care unit.

Cognitive Skills (Thinking and Analysis)

- Utilize current data to tailor a comprehensive nursing care plan for the critically ill patient during surge capacity.
- Analyze the collected data according to priority and formulate appropriate nursing diagnoses related to patients with COVID 19.
- Evaluate the patients' outcomes and connect with the current situation, using the critical thinking process.

Practical and Subject Specific Skills (Transferable Skills)

- Demonstrate nursing care competencies specific to patients with COVID 19 in critical care units (e.g., proning of mechanically ventilated patients).
- Appropriate utilization of personal protective equipment (PPE).
- On the spot, bedside education for cross-trained nurses with their clinical nurse educators.
- Practice role-specific decision-making skills.
- Perform a goal-oriented problem-solving process.

One of the challenges faced in the implementation of the program was to educate a large number of nurses on the soonest possible time, observing social distancing hence ending up with multiple sessions having a maximum of twelve participants per session. This pandemic impacted so much on the execution of the training program. The construct of redesigning a training program where it meets the need to provide the essential skills and knowledge among health care workers is not only beneficial, but, become necessity for an organization that aims to look into staff competence and patient safety amidst pandemic. Therefore, foreseeing the future, training design like this during the crisis would benefit many organizations where the aim is to reach a more significant number of learners effectively and safely with or without a pandemic.

CONCLUSION

Undeniably, the significant predicament of the COVID 19 pandemic is towards the ICU community. As a pre-emptive effort, hospital administrators, policymakers, and critical care practitioners must work on strategies that hasten an organization is bracing itself in the future potentiality of an overwhelming surge of critically ill patients. The cornerstones for future-readiness to coherent collaboration at the local, regional, national, and international levels, focusing on high-quality research, evidence-based practice, sharing data and resources, and ethical integrity in the face of unprecedented challenges likely will be a key to the success of these efforts. Complementing the recommended framework and guidelines with data to evaluate strategy and approach will be valuable.

REFERENCES

1. Durham CF, Alden KR (2008). Enhancing patient safety in nursing education through patient simulation. In Hughes RG (ed.). Patient Safety and Quality: An Evidence-Based Handbook for Nurses. Rockville, MD: Agency for Healthcare Research and Quality; 221-260
2. Goh, K. J., Wong, J., Tien, J. C., Ng, S. Y., Duu Wen, S., Phua, G. C., & Leong, C. K. (2020). Preparing your intensive care unit for the COVID-19 pandemic: practical considerations and strategies. Critical care (London, England), 24(1), 215. https://doi.org/10.1186/s13054-020-02916-4 [cited July 13, 2020]
3. Litton, E.,Bucci, T., Chavan, S. et al. (2020). Surge capacity of intensive care units in case of acute increase in demand caused by COVID -19 in Australia. The Medical Journal of Australia. https://doi.org/10.5694/mja2.50596 [cited 5 Aug 2020]
4. Ohannessian, R., Duong, T. A., & Odone, A. (2020). Global Telemedicine Implementation and Integration Within Health Systems to Fight the COVID-19 Pandemic: A Call to Action. JMIR public health and surveillance, 6(2), e18810. https://doi.org/10.2196/18810 [cited 5 Aug 2020]
5. American College of Surgeons, “Covid 19: Elective Case Triage Guidelines for Surgical Care”, March 2020. https://www.facs.org/covid-19/clinical-guidance/elective-case [cited July 14, 2020]
6. Einav, S., Hick, J. L., Hanfling, D., Erstad, B. L., Toner, E. S., Branson, R. D., Kanter, R. K., Kissoon, N., Dichter, J. R., Devereaux, A. V., Christian, M. D., Task Force for Mass Critical Care, & Task Force for Mass Critical Care (2014). Surge capacity logistics: care of the critically

ill and injured during pandemics and disasters: CHEST consensus statement. Chest, 146(4 Suppl), e17S–43S. https://doi.org/10.1378/chest.14-0734 [cited July 13, 2020]

7. Phua, J., Weng, L., Ling, L., Egi, M., Lim, C. M., Divatia, J. V., Shrestha, B. R., Arabi, Y. M., Ng, J., Gomersall, C. D., Nishimura, M., Koh, Y., Du, B., & Asian Critical Care Clinical Trials Group (2020). Intensive care management of coronavirus disease 2019 (COVID-19): challenges and recommendations. The Lancet. Respiratory medicine, 8(5), 506–517. https://doi.org/10.1016/S2213-2600(20)30161-2 [cited July 6, 2020]
8. Wee, L. E., Fua, T. P., Chua, Y. Y., Ho, A., Sim, X., Conceicao, E. P., Venkatachalam, I., Tan, K. B., & Tan, B. H. (2020). Containing COVID-19 in the Emergency Department: The Role of Improved Case Detection and Segregation of Suspect Cases. *Academic emergency medicine: official journal of the Society for Academic Emergency Medicine*, *27*(5), 379–387. https://doi.org/10.1111/acem.13984 [cited April 12, 2020]
9. Abe, R., Bunya, N., Endo, T. et al. (2020) Save the ICU and save lives during the COVID-19 pandemic. j intensive care 8, 40. https://doi.org/10.1186/s40560-020-00456-1 [cited July 15, 2020]
10. Richardson, S., Hirsch, J. S., Narasimhan, M., Crawford, J. M., McGinn, T., Davidson, K. W., and the Northwell COVID-19 Research Consortium, Barnaby, D. P., Becker, L. B., Chelico, J. D., Cohen, S. L., Cookingham, J., Coppa, K., Diefenbach, M. A., Dominello, A. J., Duer-Hefele, J., Falzon, L., Gitlin, J., Hajizadeh, N., Harvin, T. G., Zanos, T. P. (2020). Presenting Characteristics, Comorbidities, and Outcomes Among 5700 Patients Hospitalized With COVID-19 in the New York City Area. *JAMA*, *323*(20), 2052–2059. Advance online publication. https://doi.org/10.1001/jama.2020.6775 [cited July 15, 2020]
11. ISARIC. International Severe Acute Respiratory and Emerging Infection Consortium: COVID-19 report 2 April 2020. 2020; https://isaric.tghn.org/about/ cited July 15, 2020]
12. Grasselli, G., Zangrillo, A., Zanella, A., Antonelli, M., Cabrini, L., Castelli, A., et al (2020). Baseline characteristics and outcomes of 1591 patients infected with SARS-CoV-2 admitted to ICUs of the Lombardy region, Italy. JAMA - J Am Med Assoc. https://doi.org/10.1001/jama.2020.5394 [cited July 15, 2020]
13. Griffin, K. M., Karas, M. G., Ivascu, N. S., & Lief, L. (2020). Hospital Preparedness for COVID-19: A Practical Guide from a Critical Care Perspective. American journal of respiratory and critical care medicine, 201(11), 1337–1344. https://doi.org/10.1164/rccm.202004-1037CP [cited July 6, 2020]
14. Liu, Q., Luo, D., Haase, J. E., Guo, Q., Wang, X. Q., Liu, S., Xia, L., Liu, Z., Yang, J., & Yang, B. X. (2020). The experiences of health-care providers during the COVID-19 crisis in China: a qualitative study. The Lancet Global Health, 8(6). https://doi.org/10.1016/S2214-109X(20)30204-7 [cited 6 July 2020]
15. Bambi, S., Lozzo, P., Lucchini, A. (2020). New Issues in Nursing Management During the COVID-19 Pandemic in Italy. Am J Crit Care (2020) 29 (4): e92–e93. https://doi.org/10.4037/ajcc2020937 [cited 5July, 2020]

16. Raurell-Torredà M. (2020). Management of ICU nursing teams during the COVID-19 pandemic [Gestión de los equipos de enfermería de UCI durante la pandemia COVID-19]. *Enfermería Intensiva (English ed.)*, *31*(2), 49–51. https://doi.org/10.1016/j.enfie.2020.04.001 [cited 9 Aug 2020]
17. Pickkers, P., van der Hoeven, H. & Citerio, G. (2020). COVID-19: 10 things I wished I'd known some months ago. *Intensive Care Med* **46,** 1449–1452. https://doi.org/10.1007/s00134-020-06098-z [cited 9 Aug 2020]
18. Voss, A., Coombs, G., Unal, S., Saginur, R., & Hsueh, P. R. (2020). Publishing in face of the COVID-19 pandemic. *International journal of antimicrobial agents*, *56*(1), 106081. https://doi.org/10.1016/j.ijantimicag.2020.106081 [cited 10 Aug 2020]
19. Livingston, E., Desai, A., Berkwits, M. (2020) Sourcing Personal Protective Equipment During the COVID-19 Pandemic. *JAMA*;323(19):1912–1914. doi:10.1001/jama.2020.5317
20. CDC (2020). Recommended Guidance for Extended Use and Limited Reuse of N95 Filtering Facepiece Respirators in Healthcare Settings. https://www.cdc.gov/niosh/topics/hcwcontrols/recommendedguidanceextuse.html [cited 10 Aug 2020]