ICU

MANAGEMENT & PRACTICE

INTENSIVE CARE - EMERGENCY MEDICINE - ANAESTHESIOLOGY

VOLUME 20 - ISSUE 2

The Night in the ICU

The Night Falls in the ICU: Changing Realities for Patients, Relatives and the Interdisciplinary Team *C. Similowski, V. Souppart, N. Kentish-Barnes, E. Azoulay*

The Night in the ICU, *A. Meli , S. Coppola, D. Chiumello*

Nine Nurse-Recommended Design Strategies to Improve Alarm Management in the ICU: A Qualitative Study, *E. Özcan, D. Gommers*

Making Decisions During ICU Night Shifts: Challenges and Considerations, *R. Roepke, O. Ranzani*

Sleep Deprivation and Fatigue Management in the Intensive Care Unit, *J. Darbyshire, P. Greig*

Night Service in the Intensive Care Unit of a University Hospital, *K. Schoknecht, I. Meyenburg-Altwarg*

Shadowing the Nightwatch: Nocturnal Activity in the ICU, *J. Poole*

Engaging the Night Shift Nurse With Activities & Educational Opportunities, *T. Sanchez-Sedekum, T. Khairallah*

Is the Severe COVID-19 Over in Europe? *JL Vincent*

Keeping Best Practices in Critical Care During COVID-19, *F. Zampieri*

Is COVID-19 the Black Swan? *A. Ezzat, F. Rubulotta*

Human Factors in Critical Care Medicine, *F. Nacul, V. Della Torre*

Fernando G. Zampieri
Research Institute
HCor-Hospital do Coração
São Paulo, Brazil
Hospital Vila Nova Star
São Paulo, Brazil

fzampieri@hcor.com.br

@f_g_zampieri

Keeping Best Practices in Critical Care During COVID-19

COVID-19 poses several challenges and has made it difficult to measure ICU performance. Sticking to evidence-based interventions can go a long way in improving outcomes and resource utilisation.

How it Started

Taking care of a COVID-19 patient comes with an initial surprise: there is no standard mindset to guide the physician's work before entering a COVID-19 patient's room. After some initial hesitation, most physicians have dubious feelings. It is a mix of both relief ("it is just another sick patient, I have treated people before") and fear ("what should I do next?").

There were few reports early on in the pandemic. Scattered information from "happy hypoxaemic" patients, coupled with suggestions that early intubation was of key importance, the fear of aerosols, the multiple suggestions that anticoagulation should be done due to an abnormally high number of thrombotic events and even other proposed pharmacological treatments (from hydroxychloroquine to tocilizumab, passing by corticosteroids and other drugs) appeared in discussions, forums and some case reports. They were sometimes demanded by patients and families and even politically propelled. This all contributed to shifting the discussion from keeping standards of care to a search of finding a single treatment that would halt the disease.

As soon as COVID-19 blew up in Brazil in May, I was reallocated to what we call a "routine intensivist" (an intensivist that goes almost every working day to the ICU) to a dedicated 10-bed COVID-19 ICU in my former teaching hospital (Hospital das Clínicas from the University of São Paulo). This large teaching hospital, built more than 50 years ago, became a dedicated COVID-19 hospital. Many ICU beds were created, peaking close to 300. I was privileged to work under few resource constraints, but eventual drug shortages and irregular availability of some specific supports (such as continuous renal replacement therapy [RRT] and high-flow nasal catheters [HFNC]) were expected. Concerns were beyond patient care, including staff protection and wellbeing, and resource management.

How is my Unit Doing?

A constant concern of the intensivist is whether they are doing the right thing for their patients. In a scenario where ICU admissions are many and mortality is high, the impeding sense of despair is inevitable. Under normal circumstances, measuring and optimising ICU care is a long-term process, with trends in standardised mortality ratio and standardised resource use being tracked and adjustments being made (Salluh and Soares 2014; Rothen 2017; Zampieri 2020). This is impossible in a pandemic, let alone a pandemic of an unknown disease in a new ICU that has just opened, with a multidisciplinary team that never worked together before.

Traditional markers of performance seemed misleading. Crude mortality is not a useful parameter, specially if you are receiving patients late or only the sickest ones (which are eventually granted an ICU bed). Waiting for standardised mortality ratio and standardised resource use to become available was not feasible, because these measures take time and because they rely on well calibrated illness severity scores (which were unavailable; it was not to be expected that traditional illness severity scores, such as SAPS 3, would perform well for a single disease) (Rewa 2018). Need for readmission is also problematic, because pressure for beds was constant and because you are discharging patients to a ward staff that is as inexperienced with COVID-19 as you. Length of mechanical ventilation is also cumbersome, because few data were available. Although this data should all be measured, they should not (and were not) interpreted as direct performance measurements in this situation.

Rational Implementation

The key to delivering best care was, once again, to develop and implement a routine that guaranteed a minimum evidence-based acceptable care. This is the key point: "minimum." It became clear that while we had few to no evidence on how to manage the COVID-19 disease, we had a good deal of evidence on how to manage patients with multiple organ failure, including respiratory failure. That became our focus in the new unit. Simply do what we know as supported by evidence and rest assured that, on average, we would be doing the best for most patients. We adopted the "zentensivist" approach with open arms (Siuba 2020). What a graceful surprise we had when we realised that we could do a lot by focusing in doing well what we knew and by being more patient and less reactive. Summarising previous evidence as you prepare for an unknown disease can be relieving for the staff and allows one to drift attention away for elusive therapies or magic bullets. A brief summary of what was known before the pandemic, caveats on applying evidence on COVID-19 considering resource

Concern	COVID-19 Imposed Challenges	Approach
Family meetings and definition of directives	Families were unable to visit patient. Interface with staff also compromised.	Daily calls. Video conferences whenever possible. Document all family contacts in charts.
Intubation timing	Concern on aerolisation with NIV and CNAF early in the pandemic. "Early" versus "delayed" intubation.	Use of NIV/CNAF under controlled scenarios (isolated room) (Iwashyna 2020) Intubation guided by ROX Index (Roca 2019) or by respiratory effort (tolerate hypoxaemia if no other organ failure).
Ventilator setting	Low and high elastance profiles expected to occur, with unknown ventilatory management differences at the time.	Mechanical ventilation set as for any other ARDS patient regardless of elastance (plateau pressure below 30 cmH_2O, tidal volume of 4-6 mL/kg), PEEP guided by PEEP table.
Sedation	Expected long duration of mechanical ventilation, with higher incidence of critical illness polineuromiopathy. Occasional shortage of drugs (including fentanyl).	Daily awakening followed by spontaneous breathing trial as soon as possible. Limited use of neuromuscular blockade outside first 48-72 hours.
Ventilator weaning	Unknown "optimal" extubation failure rate. Expected that patients would have difficult weaning. Absence of evidence of when it is safe to release tidal volume in these patients (and ARDS lato senso).	Encouraging spontaneous breathing trials regardless of PO_2/FiO_2 ratio. Allowed extubation even with low (below 120) PO_2/FiO_2 ratio if no delirium and/or instability For patients with delirium and hypoxaemia, discuss tracheostomy.
Pharmacological treatment (not corticosteroids)	Many drugs proposed to be effective, with unknown clinical benefit (lopinavir/ritonavir, nitazoxanide, hydroxychloroquine, azithromycin...).	Use limited to research protocols. Not used as routine care.
Corticosteroids	Concerns on prolonged viral shedding and risk of secondary infections in this population. Evidence on ARDS suggested benefit of dexamethasone for ARDS patients. Older evidence suggested benefit of corticosteroids for prolonged ARDS.	Use of dexamethasone assuming COVID-19 should not be different than other ARDS causes. Adopted RECOVERY dosage as soon as press release available (RECOVERY 2020).
Anticoagulation	Potential benefit suggested as many patients presented with active thrombosis. Unclear net benefit.	Use of prophylactic heparin for all patients if no contraindication. Monitor of deep vein thrombosis with sequential ultrasound. Use of heparin for patients with signs of disseminated intravascular coagulation.

Stress ulcer prophylaxis	Concern of higher risk of bleeding for patients under mechanical ventilation, receiving corticosteroids.	No routine use of proton-pump inhibitors as per SUP-ICU trial (Krag 2018).
Secondary infection management	The expected long ICU stay would pose these patients to higher risk of infection.	Adoption of a wait-and-see strategy (cultures and vigilance) for patients with signs of infection that are not unstable. Short courses of antibiotics. Removal of all unnecessary devices as soon as possible.
Renal replacement therapy	Incidence of acute kidney injury seemed high in critically ill COVID patients. Machine availability to initiate renal replacement therapy could be a limiting factor.	Use of renal replacement therapy only after failure of medical management of AKI (no early dialysis) Family meetings before initiation of RRT whenever possible.
Extracorporeal membrane oxygenation (ECMO)	Unclear if COVID-19 would be a disease that would benefit from ECMO (as apparently happened with H1N1) or not. ECMO may improve ARDS outcomes in some scenarios, but there were concerns on COVID-19, specially regarding circuit patency.	ECMO as a rescue therapy seldom considered. Contact and referral of ECMO team for selected cases.
Tackling adverse events	Expectation that patients would require prolonged ICU stay would pose them to cumulative risk for adverse events, such as device removal, infections from unnecessary devices, airway management complications, etc.	Debriefing after all adverse events to identify bottlenecks and opportunities to avoid future events. Use of fish-bone strategy. Avoid "blaming" culture.
Drug shortage	Due to high demand, it was expected that some shortage of critical drugs (sedation, neuromuscular blockades, antibiotics) could occur.	Discuss with pharmaceutics and establish a priori replacement for some critical drugs, e.g. (drug⟶ replacement): 1. Propofol ⟶ Midazolam 2. Fentanyl ⟶ Morphine 3. Cisatracurium ⟶ Rocuronium ⟶ Pancuronium 4. Ceftriaxone ⟶ Cefuroxime ⟶ Amoxicillin
Staff burnout	Carrying for severely ill patients for a prolonged period, under pressure, afraid of getting sick and underpaid seems the perfect recipe for burnout.	We knew it would occur. We also knew we could do little to nothing about the very roots of burnout.
Data collection and research	Hard to allocate staff for data collection and research in this scenario.	Allocate a data collector regardless of the scenario to avoid flying blind. Use data to encourage staff. Use research as an opportunity to improve care and increase the sense of value inside the unit.

Table 1. Adapting evidence and measuring processes of care during COVID-19.
AKI - acute kidney injury; ARDS - Acute respiratory distress syndrome; CNAF - high-flow nasal cannula; ECMO - Extracorporeal Membrance Oxygenation; NIV - non-invasive ventilation; PEEP - postive end-expiratory pressure; ROX Index - ratio of pulse oximetry/FiO_2

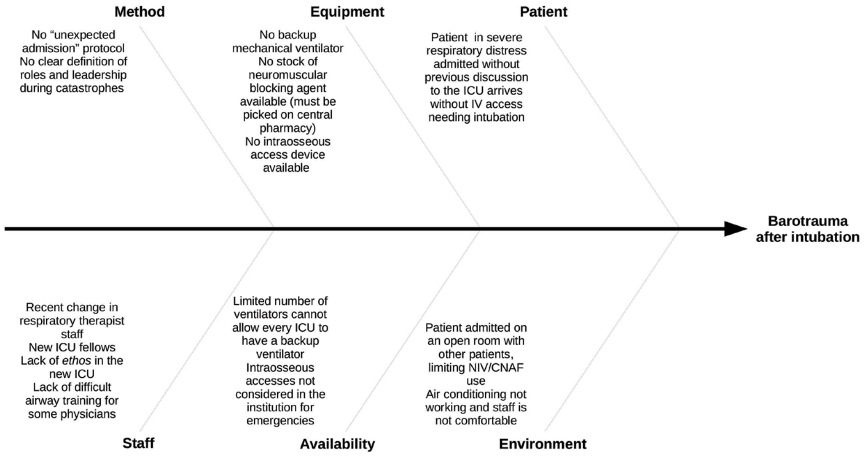

Figure 1. A fish-bone example of a fast-track approach to tackling an adverse event. Many contributors to the event can be approached and improved (such as lack of a clear protocol for unexpected admissions, need for a backup ventilator, among others). Other factors are structural and go beyond ICU walls and, therefore, may not be easily tackled. Some problems also have no immediate solution, such as lack of difficult airway training for all. This can be solved partially be arranging working scale in a way an airway proficient physician is always in-house.

optimisation and the proposed solution are shown in **Table 1**.

Improving patient safety also required us to establish a "tracking" algorithm for unexpected events. Tracing back the roots of a problem following a structured approach (like a fish bone diagram) can be helpful to find opportunities to perform simple interventions and, also equally important, to understand that not all adverse events can be completely solved solely by changing ICU behaviour. You have to accept that you cannot change everything and that some structural problems will prevail despite the best efforts. One example is shown in **Figure 1**, based on a real case experienced during the pandemic. Barotrauma may occur after intubation and it is tempting to attribute it to operator inexperience, improper airway management, poor sedation/blockade, excessive bag-mask ventilation, etc. However, the root cause of the problem may be much more complicated and include a complex chain of events that are not limited to the ICU itself. Tracing these problems can not only help improve immediate aspects of care but also provide feedback to the institution and decrease staff burden or feeling of guilt.

Finally, we also anticipated that some outstanding success cases could be problematic. This seldom discussed aspect of medical care is entangled with the hot hand fallacy. Some interventions performed as an exception attempt to improve a very sick patient's condition would eventually be seen by staff as effective if the patient survived. This could result in widespread intervention use in other scenarios with unknown clinical benefit (generalisation bias). Situations like this would be (and were) inevitable. When "off the grid" interventions seemed successful, one should temper their hardihood and calmly explain to staff that this was an exception, not a rule, and avoid creating new directions of protocol based on previous successful cases. Debriefing successful cases should be done with the same scrutiny as debriefing unsuccessful ones.

Final Remarks

The goal of any ICU remains the same, whether during a pandemic or not: produce survivors with the best quality of life possible at the fastest speed achievable by applying the most current evidence while using the smallest amount of resources. Sticking to evidence-based practices and reducing a hyper-reactive state allows one to remain focused on what is known and beneficial and may be able to improve both outcomes and resource utilisation. ■

Key Points

- COVID-19 has resulted in significant challenges for doctors in intensive care.
- The search for a cure has shifted the discussion from maintaining standards of care to a search of finding a single treatment.
- Under normal circumstances, measuring and optimising ICU care is a long-term process but this becomes impossible during a pandemic.
- While we had few to no evidence on how to manage the COVID-19 disease, we had a good deal of evidence on how to manage patients with multiple organ failure, including respiratory failure.
- Improving patient safety also required us to establish a "tracking" algorithm for unexpected events.

References

Cardoso LT, Grion CM, Matsuo T et al. (2011) Impact of delayed admission to intensive care units on mortality of critically ill patients: a cohort study. Crit Care, 15(1):R28. doi:10.1186/cc9975

Iwashyna TJ, Boehman A, Capelcelatro J et al. (2020) Variation in Aerosol Production Across Oxygen Delivery Devices in Spontaneously Breathing Human Subjects. medRxiv.doi.org/10.1101/2020.04.15.20066688

Krag M, Marker S, Perner A et al. (2018) Pantoprazole in Patients at Risk for Gastrointestinal Bleeding in the ICU. N Engl J Med, 379(23):2199-2208. doi:10.1056/NEJMoa1714919

RECOVERY Collaborative Group, Horby P, Lim WS et al. (2020) Dexamethasone in Hospitalized Patients with Covid-19 - Preliminary Report [published online ahead of print, 2020 Jul 17]. N Engl J Med. doi:10.1056/NEJMoa2021436

Rewa OG, Stelfox HT, Ingolfsson A et al. (2018) Indicators of intensive care unit capacity strain: a systematic review. Crit Care, 22(1):86. doi:10.1186/s13054-018-1975-3

Roca O, Caralt B, Messika J et al. (2019) An Index Combining Respiratory Rate and Oxygenation to Predict Outcome of Nasal High-Flow Therapy. Am J Respir Crit Care Med. 199(11):1368-1376. doi:10.1164/rccm.201803-0589OC

Rothen HU, Stricker K, Einfalt J et al. (2007) Variability in outcome and resource use in intensive care units. Intensive Care Med, 33(8):1329-1336. doi:10.1007/s00134-007-0690-3

Salluh JI, Soares M. (2014) ICU severity of illness scores: APACHE, SAPS and MPM. Curr Opin Crit Care, 20(5):557-565. doi:10.1097/MCC.0000000000000135

Siuba MT, Dugar S, Shekar K (2020) Treading Lightly in a Pandemic: #Zentensivist Reflections on COVID-19 [published online ahead of print, 2020 Apr 21]. Chest. 2020;S0012-3692(20)30745-5. doi:10.1016/j.chest.2020.04.013

Zampieri FG, Soares M, Salluh JIF (2020) How to evaluate intensive care unit performance during the COVID-19 pandemic. Avaliação do desempenho de unidades de terapia intensiva durante a pandemia da COVID-19. Rev Bras Ter Intensiva, 32(2):203-206. doi:10.5935/0103-507x.20200040