COVID -19
Challenges

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A COVID-19 Dashboard: Data Analytics to Aid Resource Allocation in Intensive Care Units

In this article, we focus on clinical and practical application of current available cloud-based data analysis to track and benchmark in real-time suspect and confirmed COVID-19 cases, resource use and availability.

Introduction

The COVID-19 pandemic represents an unprecedented challenge to intensive care units (ICU) due to the surge of severe cases of pneumonia posing great stress to hospitals and healthcare systems (Phua et al. 2020). The fast occupation of ICU beds by these severe cases has exceeded any possibilities of organisation and planning making ICU beds and ventilators a scarce and valuable resource (Phua et al. 2020). The possibility of monitoring case-load, local and regional trends as well as the current use and availability of resources in ICUs has become even more important in the present scenario (Phua et al. 2020; Salluh et al. 2018).

In the present article we describe the characteristics of a COVID-19 dashboard for ICUs and its deployment in 1100 ICUs.

Methods and Results

We used as a base the Epimed Monitor ICU system (epimedsolutions.com), a cloud-based quality improvement (QI) software that allows near-real time monitoring of case-mix, performance metrics and benchmarking for adult, paediatric and neonatal ICUs (Zampieri et al. 2017). The solution is currently

> ◀◀ the Epimed Monitor ICU system cloud-based quality improvement software allows near-real time monitoring of case-mix, performance metrics and benchmarking for adult, paediatric and neonatal ICUs ▶▶

implemented in 1100 ICUs in Belgium, Brazil, Chile, Colombia, France, Portugal and Uruguay. Data from this platform is also publicly available (beyond the scope of QI) in National projects (Belgium-micaproject.be, Brazil- utisbrasileiras.com, Uruguay- ucisuruguayas.com

and the international project LOGIC – icubenchmarking.com). As of February 2020, we incorporated the diagnosis of COVID-19 pneumonia in the diagnostic/coding of Epimed. We subsequently developed an online platform that was seamlessly integrated with the Epimed Monitor database and allowed the near real-time surveillance of suspected and confirmed COVID-19 cases in the ICUs, its occupancy rates, use of mechanical ventilation (MV), outcomes (mortality) as well as the availability of ICU beds and ventilator support resources remaining (ventilators, NIV, ECMO) in the hospital (**Figure 1**). Through the benchmarking all users of Epimed can track the cumulative cases in their hospitals and region, including the outcomes and resource use. Thus, ICU managers can use near real-time data on the availability of the combined local and regional data to better inform the planning on resource allocation and use. In large hospitals with multiple ICUs or in a hospital network, such information would be a part of the routine evalua-

COVID-19 ICU Dashboard
Real-Time covid-19 patients, resource use and availability
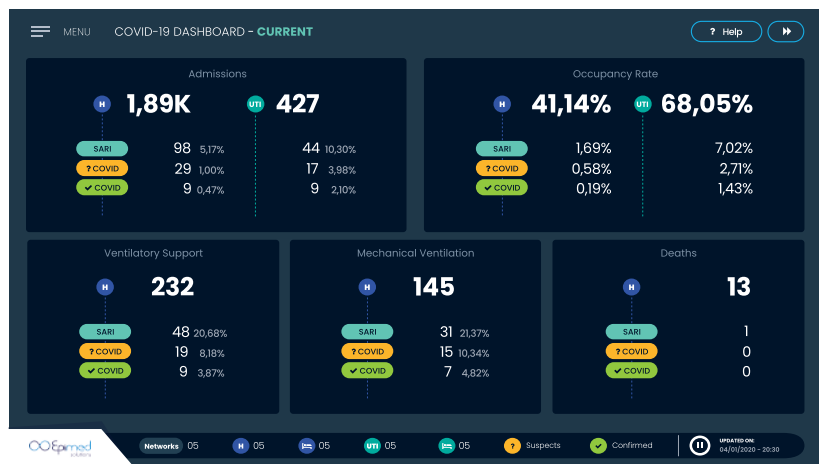
SARI, Suspected and confirmed Covid-19 cases
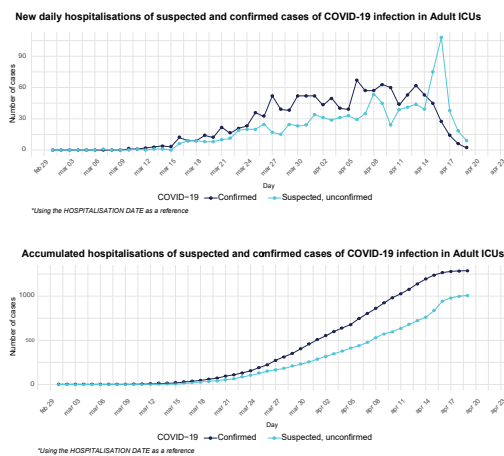
Daily trends and cummulative data

tion of ICU status and therefore would improve the transparency of decision-making process of ICU admission of COVID-19 cases as well as serve as a platform to evaluate where to admit or transfer a patient within an ICU or hospital network.

In addition, the present pandemic represents a unique condition leading to ICU strain. Strain is defined as discordance between available resources and demand to admit more critically ill patients while continuing to provide the highest quality of care (Hussain et al. 2019). During a pandemic or a disaster management, it is fundamental to check the ICU strain. As an ICU manager it

is possible to evaluate the ICU strain integrating all this information cited above and evaluate the contingency risk and eminent crisis in almost real time. Moreover, it is fundamental to develop a framework to triage and adequate resource allocation (Christian et al. 2014) and the availability of reliable and timely data is an important part of it.

Conclusions

The implementation of a specialised COVID-19 dashboard with near real-time information of suspected and confirmed cases as well as resource use and availability is feasible and was delivered in two weeks for 1100 ICUs

in 7 countries. Information technology and clinical data may be used to help improve resource allocation in ICUs for the COVID-19 pandemic.

Data-driven management applied to COVID-19 patients in the ICU allows not only evaluation of ICU performance but may help the planning and resource allocation for these patients.

Conflict of interest

Dr. da Silva Ramos reports no conflicts of interest. Dr. Salluh is co-founder and shareholder at Epimed Solutions®, the provider of a cloud-based healthcare analytics and performance evaluation software. ■

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