Near Real-Time Telemetry of Nation-Wide ICU's Capacity Strain in Argentina

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Abstract. Due to the fast-spreading of COVID-19 during the pandemic, decision-makers turned into innovative digital solutions for data collection in order to make well-informed public health decisions based on reliable data from verified sources. This work describes one of such solutions, implemented in partnership with the Ministry of Health in Argentina.

Keywords. COVID-19, ICU, interoperability, telemetry, digitalization, surveillance, pandemic

1. Introduction

The World Health Organization (WHO) has declared the COVID-19, caused by SARSCoV-2, as a pandemic on Mar 11th, 2020 [1], which approximated initial reproducibility factor (R0) was 2.28 [2]. With a single patient potentially infecting 2.28 people, the spread of the disease becomes exponential. In conjunction with the estimated 5% of patients in need of intensive care [3], the attention turns into having reliable visibility of ICU occupancy and availability, as a way to measure the effect of actions taken as part of pandemic situation handling for spread containment.

The aim of this work is to describe the computational solution created for the Ministry of Health of Argentina, as the instrument to measure ICU capacity and derive public health-related decisions from it.

2. Methods

A decentralized, client-server cloud-based software solution to collect strain information from ICUs was created, to track the use of beds, ventilators, beds with oxygen and supplies needed to keep the unit operating. The solution offers two integration methods:

- B2b status reporting through Application Programming Interface (API) integration. Only 30% used this method, due to the overall immaturity of digitalization across the institutions.

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- B2c status reporting through mobile device or web portal. Most popular integration method. Allows faster integration since there is no need to system integration.

Collected data is visualized in the form of a dashboard, where each reporting institution is plotted in an Argentinian 2-D map, with their corresponding color-coded saturation level (Grey: not reporting, Green: 0 to 0.5, Yellow: 0.5 to 0.8, Red: 0.8 to 0.95, Black: 0.95 to 1), filtered by area as well as reporting date-range.

3. Results

The reporting mechanisms reached a total of 1,659 institutions, covering 96% of the territory in less than 6 months (Table.1). As of January 2021, the solution collected a total of 1.3 million reports by the two integration methods described above.

Table 1. Cumulative adoption of targeted institutions

	April	June	August
Adoption	14.19%	52.63%	96.02%

4. Discussions

One of the key factors to maximize adherence and rapid adoption of digital health solutions is the offering of multiple alternatives for integration. In addition, supporting structural health information interoperability [4] represents a key piece of health information systems aiming to support data-drive decisions.

5. Conclusions

Even though this work offers real-world evidence that the incorporation of digital tools for massive data collection from the health system can be used by policy makers to use reliable and unbiased information to make their decisions, even in critical times like the one from the COVID-19 pandemic, it should be considered as a first step towards a fully feature digitalization of the health system, where technology adoption is part of the decision making in public health matters.

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