Blood Culture Positivity Trend Monitoring in COVID-19 Patients

Parsa Hodjat, MD[1]; S. Wesley Long, MD, PhD[1]; Randall J. Olsen, MD[1]; Paul Christensen, MD[1]

[1] Department of Pathology and Genomic Medicine, Houston Methodist Hospital, Houston, TX

Background

Clinicians reported a perceived increase in blood culture positivity among COVID-19 patients in our 8-hospital system. We questioned 1) is the blood culture positive rate truly increased in COVID-19 compared to non-COVID-19 patients, and 2) if so, what are the causative organisms, and 3) how does this information guide the institutional response? We used a well-established data query infrastructure to answer these key questions bearing on patient care.

Methods

Since the beginning of the COVID-19 pandemic, we have implemented an automated data query system using SQL queries, Python scripting and cron scheduling to create COVID-19 dashboards. We leveraged our direct access to the Laboratory Information System (LIS) relational database to query all blood culture results from March 1, 2020 to December 31, 2020. We stratified blood culture positivity rates by COVID-19 or non-COVID-19 patient categories. Excel Power Query and pivot tools were used for fast and efficient data analysis including table joins, data cleaning and data visualization.

Results

Compared to non-COVID-19 patients, the overall blood culture positivity rate was lower in COVID-19 patients (4.61% compared to 7.36%); however, the absolute number of positive cultures showed an increase from 770 in March 2020 to 962 and 933 in the peak COVID-19 hospitalization months of July 2020 and January 2021, respectively. We discovered that positive cultures in COVID-19 patients were disproportionately caused by contaminants including skin commensal organisms (41.69% compared to 26.62%).

The clinical informatics process took approximately 3 hours to design and run the SQL query and 2 hours to process with Excel Power Query and pivot tools.

Conclusions

Despite an overall lower rate of blood culture positivity in COVID-19 patients, a disproportionate number of positive cultures were caused by commensal skin organisms. We hypothesized that these findings may be due to high rates of immune suppressive therapies such as corticosteroids and cytokine inhibitors, other immune abnormalities, or inadequate isolation procedures and central line maintenance. In response, our institution renewed efforts to emphasize infection control measures. The clinical informatics team's direct access to the LIS database played a pivotal role in data acquisition, data analysis and patient care.
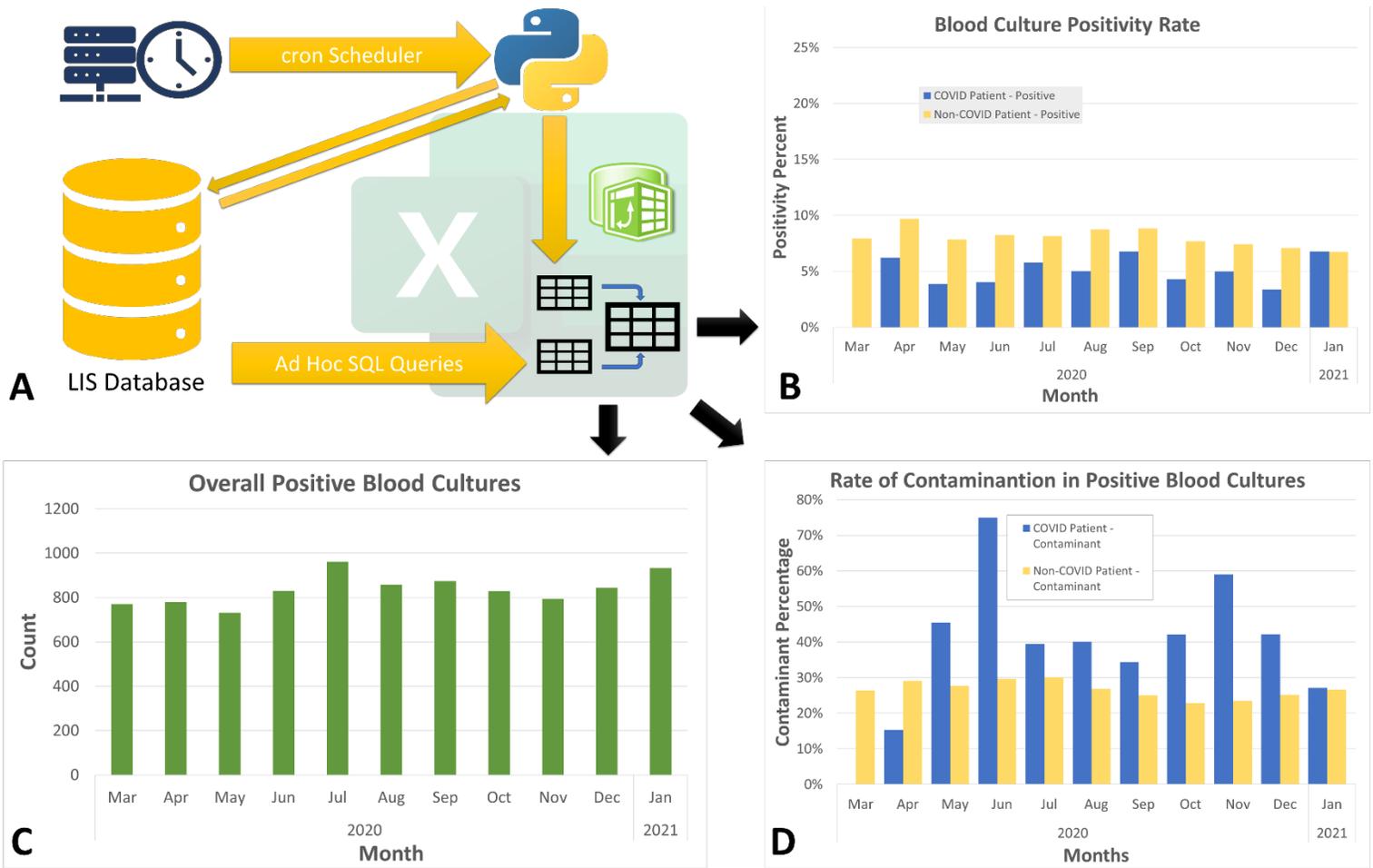
Figure 1. Direct LIS database, and Excel Power Query and pivot tools **(A)** used for a fast and efficient data acquisition and analysis showing **(B)** an overall lower blood culture positivity rate in COVID-19 vs. non-COVID-19 patients, **(C)** increases in the numbers of positive blood cultures in the peak COVID-19 hospitalization months, and **(D)** a higher rate of contaminants in the positive cultures of the COVID-19 group.