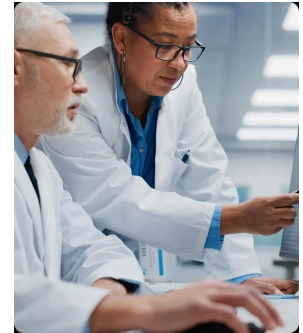


Optimizing sepsis and CRS detection: A data-driven approach to improve patient outcomes



About ActiGraph

ActiGraph is pioneering the digital transformation of clinical research. We empower researchers to unleash the potential of big data and AI with a device-agnostic, decentralized trial platform backed by proven operational, scientific, and regulatory expertise.



The opportunity

- Sepsis and Cytokine Release Syndrome (CRS) are immune-mediated clinical syndromes that require timely intervention to avoid life-threatening complications.
- Risk prediction models offer an option for early recognition of these conditions, paramount to improving the conditions' management and patient outcomes.



The challenge

- Current detection systems may lack prognostic accuracy, particularly for early detection.
- Bias exists in many datasets used to develop and evaluate de-risking products. Certain leading algorithms for early recognition of sepsis, for example, implicitly rely on expert knowledge, making them impractical for use in settings where clinicians do not closely monitor patients.



The approach

- The data types, derived features, and patient populations used to develop and evaluate current sepsis detection systems were systematically examined to illustrate some considerations needed when designing practically useful prediction models.
- The [study](#) explored the influence of (i) feature selection among objective vital measures and laboratory biometrics and expert inputs and (ii) the choice of more homogenous/ heterogenous patient populations on ML algorithm performance for early detection of sepsis.
- The considerations are also relevant to developing CRS risk prediction tools, including uses in various care settings with different data availability and potential for subpopulations among different immunotherapy treatments and cancer types.





The success

- ✓ Through this approach, we learned that the intended use of the algorithm needs to be carefully considered when gathering and incorporating data during development, and the environment in which the algorithm is employed may either (1) rely on data types with different implicit biases across environments or (2) be limited in available data types.
- ✓ We also discovered the metrics used to evaluate the model and process must carefully consider its practical, real-world use. For example, the area under receiver operating characteristic curves can be high in highly imbalanced populations, while the precision of the model may be practically too low for real-world use.
- ✓ By developing a more homogeneous subset of ICU patients with infection and patients at risk for sepsis, we increased model precision by learning more precise sepsis-related features.

“The right data to develop or validate a useful product depends on precisely understanding how it will be used, how it fits in existing clinical workflows, and its benefits to care providers and patients. The DiMe CRS initiative brought together a diverse group of stakeholders to understand these perspectives better, providing invaluable insights about the types of data we need to gather to tackle immunotherapy patient monitoring. We will work closely with our partners and employ digital products to transform clinical research, gathering the right data to empower care providers and patients alike in this space.”

— **Michael Pettinati**

Senior Data Scientist, ActiGraph

