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Sepsis Watch Paper

One of the most life-threatening and evasive conditions for doctors to treat in hospitals is sepsis. It is one of the leading causes of death in a hospital. In fact, every year approximately 1.7 million people will develop sepsis while hospitalized and of those individuals 350,000 of them will die due to complications from sepsis. Most alarmingly, 1 in 3 patients who die in a hospital die from sepsis. Sepsis is the overreaction of the body to infection that can lead to difficulty breathing, elevated heart rate and if left untreated could lead to organ failure and death (CDC, 2022).

While groups such as the elderly or those with compromised immune systems are more susceptible to develop sepsis there have been individuals from many other group who have died of this devastating illness. Celebrities such as Larry King and Muhammed Ali have been reported to have died from sepsis that started as complications from other illnesses. Even former President Bill Clinton developed sepsis at one point during a hospital stay. Sepsis does not discriminate against old or young, rich or poor (Sepsis Alliance, 2022).

The reason sepsis is so insidious is that it is very difficult to diagnose and subsequently very difficult to treat. The reason that sepsis is to difficult to diagnose is that there is no single presentation of symptoms that health care providers can observe that will lead to an ironclad diagnosis. For example, some indications of sepsis could be anything from fever, confusion, clammy skin, shortness of breath etc. (CDC, 2022). Given that the aforementioned symptoms

can be an indication of a plethora of other issues, it is difficult for doctors to suss out a diagnosis of sepsis. Doctors are racing against the clock with an impending sepsis infection. Research over time has indicated that sepsis can be more accurately predicted by comparison to past cases of sepsis. The ideal way to increase prediction of sepsis is to take information from patients and compare their labs and other vitals to thousands of other past patients at many different stages of a hospital stay. This is a task that health care practitioners obviously cannot take on in the limited time that they have, especially while treating a lot of other patients.

Because of all the above factors, clinical diagnosis of sepsis is ripe for an integration of artificial intelligence systems to aid doctors in making these complex decisions given a myriad of data to compare to at their fingertips. At the forefront of this effort are scientists from Duke University. The system inputs constant measurements from a patient such as age, preexisting conditions and current medications. However, the system also needs to take in dynamic information that is changing hour-by-hour such as blood pressure readings, glucose levels and oxygen readings. All these readings are fed into neural networks. These networks were trained before use on patients using thousands of data points from previous patients: those who had sepsis and those who did not. This allowed the system to better learn all the nuances that might lead to individual patient developing sepsis. Overall, the system has decreased deaths due to sepsis by approximately 20%. Doctors and patients were at first very skeptical of a computer program that makes medical decisions. However, one of the advantages is that human intelligence is also valued in this system. Computer systems do not make the final medical decisions. Medical professionals do have an ability to step in and evaluate the course of treatment (Westsman, 2022).

While there appears to be a lot of promise in this field, there are some drawbacks of using programs like Sepsis Watch. For example, because there are a lot of alerts that will pop up on the system and clinicians often are required to respond to these alerts, it has created more administrative work for people who are already pressed for time and often mired in various other paperwork. There is also this idea of "alert fatigue." If doctors are constantly subjected to alerts, it's often hard to determine which alerts should be taken seriously and those that should be ignored at the current moment. The other issue is that researchers have not been able to conduct completely controlled trials which is often considered the gold standard in science. However, researchers believe that in this instance it would be unethical to give some patients access to this tool and not give it to others.

The other issue is that these predictive tools are not regulated by the Food and Drug Administration (FDA) because right now they are not considered medical devices. Furthermore, the companies often have a proprietary model that is hard to validate by outside independent auditors. Last year, for example, an independent study conducted by Michigan Medicine found that the Epic System for sepsis detection performed worse than was reported by the company (Reuter, 2022). There has been more of a call for regulation of these systems as companies are currently working within a black box and it is very hard for the public to determine how accurate these tools are.

There is also the risk of overtreating sepsis if there is a false positive. This could lead to antibiotic resistance and other conditions. This is why, for now at least, researchers strongly suggest coupling the AI tools with human intelligence via doctors and nurses. If gone untreated too long, sepsis can kill patients. There is often a point of no return where a patient can no longer be helped by medical intervention. (Bajaj, 2022) Overall most scientists and doctors

agree that early sepsis detection is critical and are optimistic about the future that programs like Sepsis Watch provide and will continue to do so in the future.

References

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