September Sepsis Awareness Month: Intervention and Analytics

A Spotlight on Intervention and Analytics with Damian Mingle, Chief Data Scientist, WPC Healthcare

On the eve of the Sepsis Alliance's gala, attendees from national healthcare organizations walked the red carpet, posed for celebrity-style photos and partook in festivities at a trendy Times Square club – all to honor sepsis heroes, support survivors and remember those who had succumbed. WPC Healthcare's Chief Data Scientist Damian Mingle received recognition as a finalist for the 2016 Sepsis Alliance Heroes Awards for his work applying data science to detect early warning signs. WPC Healthcare's soon to be released Sepsis Risk Index (an early warning system), built from a hospital facilities patient data and more than 20,000 variables extracted from a vast external data resource, has the potential to be the model of choice among all the current scoring models.

Annually, there are over a million cases of sepsis with a mortality rate of 28% to 50% in the United States. In recent conversations with friends, family and associates, a six degrees of separation phenomenon surfaced. So many of them knew a person who encountered sepsis, who either died or recovered. The fact remains that sepsis mortality can be prevented. The Sepsis Alliance is making this public health crisis heard and acted upon. September is Sepsis Awareness month. Visit the Sepsis Alliance organization, which brings awareness, knowledge, intervention and prevention to all health providers and organizations as well as the public. Read the stories of the survivors and families who lost a loved one and how they are devoting their lives to prevent new tragedies.

Damian Mingle and with him, Ruth Smith, Director Business Development, arrived in from Tennessee, and luckily we had slotted just enough time for a short interview. Here is a transcript of our conversation edited for clarity.

What was the initiative for taking on Sepsis Prevention project? Answer: The need to know more.

Mingle: We were consulting on a project with a prominent healthcare organization [identity soon to be released in upcoming publications] that had a Hospital Engagement Network program, and we were encountering a lot of information around harms events. The president of a major division in a hospital system, who wanted to know more about the sepsis population that he had, called us into a meeting. He felt that a simple report wouldn't be able to answer his questions. This hospital is actually doing really well with sepsis mortality, and are at almost half of national average.

Was there a reason for the hospital's interest in pursuing an analytical solution for Sepsis? Answer: Apply a new data science approach.

Mingle: They have already implemented a lot of statistical process control. They have wonderful protocols in place and did a lot of training and education. Yet, they still wanted to move the needle. We took that as a real compliment. They asked us how we could put a data science approach to this. We had already been thinking along these lines of building an infrastructure or architecture that allowed us to easily ingest data at the right time to make these kind of probabilistic statements about a patient. After five months working on this project, we came out of the data lab and shared with the client a little bit of what we had. It was a compelling presentation for them to say let's go ahead and deploy this at a partner facility.

With respect to the deployment, what kind of advanced, interfacing technology is required in terms of electronic health records and interoperability? Answer: An HL7 feed.

Mingle: When we developed the solution we asked — what was the lowest amount of interaction we could require from a facility? The minimum for us is just an HL7 feed from the data that is already in place. Every hospital in American has it deployed. We ask them to "fork the data" which means instead of sending the data in one direction we can push or pull that data. Our company provides all the processing, all the normalizing and all the storing [not just the algorithm, but cloud-based back end]. Some hospitals are more sophisticated than others, but we want it to be universally approachable for them. Honestly, they turn on the data and we deliver the answer (or the score) back. The technology is text or an email, all encrypted, and they can make a judgement call quickly based on empirical observation.

How does your model compare to the other models that are in place? How would explain the model effectiveness in terms of the improvement score?

Mingle: Quite honestly, the major difference between our solution and other solutions is that we are not incorporating any vital signs or any clinical information. We are not using clinical values so there is no white blood count, respiratory count and heart rate. That is a big difference. The other thing that is kind of interesting, is when we go in to a client meeting, we usually have to educate a little bit on data science in general and what accuracy means.   A lot of people ask about accuracy that doesn't take in to account the imbalance you would see in a positive and not positive population for sepsis (the presence and lack of presence of sepsis). Our model actually identifies patients who do and do not have sepsis. When we talk about area under the curve (the correct identification of sepsis and those without sepsis), which is what really are excited about, it takes an imbalance and right sizes it in a way that we can talk intelligently about prediction. Most of us like the MEWS or TREWScores out of Johns Hopkins that accounts for 70% AUC [area under the curve]. We just did presentation in Nashville yesterday of our new system, where we are at 94% AUC, which is pretty high. As you might imagine, we get a lot of questions about how we can do this with a model that does not include vital signs or any other clinical data.

Where do the models have the most impact on treating sepsis? Answer: Definitely teaching hospitals.

Where we see the most impact at teaching hospitals. Most hospitals, from a sepsis care [event can cost] about $35,000 on up. For a teaching hospital, it's about $168,000 on a per case basis because they are running so much lab work trying to figure out what they need to do. It is a good training set for a teaching hospitals [to use a data science model]. In fact, we did some post analyses, where we looked at a series of [physician] attendings. Those who encountered sepsis more often had a lower mortality rate in their patient population versus those who hadn't encountered sepsis. I think it is because they just hadn't encountered it a lot. Letting someone develop their medical intuition around sepsis while they are protecting the population seems like a really a big win.

Here in New York we instituted Rory's law for prescreen. Illinois has also done the same. What are your thoughts? Answer: To have more non-invasive, more intelligent screening.

I am a fan of screening that is not invasive and in a way that's a little more intelligent. It is hard to imagine, we have this dataset that has been around for forty years. We are using it in a way of an-old –problems, new angles approach. It is a low cost way to not have any selection bias. We run it on everybody that is coming through the emergency department or direct transfer, and process the information back to the clinician. WPC Healthcare reprioritizes the information for the health provider to determine if the patient needs to be seen by a doctor. The result is 3 to 4 hours of time saved. In some cases you are dealing with late stage sepsis, shock or severe sepsis. From a mortality perspective, these people are already half dead. Even if you have a world class protocol in place with a world class doctor at the top of his or her class, chances are not in their favor so —**time** — is the only thing that really matters.

Tom Ahrens,PhD,RN, one of the recipients of a 2016 [Sepsis Alliance Heroes](#) award, has an educational approach to managing sepsis. Do you foresee the blending of forces using both education and analytics? Answer: Both components, education and analytics, are needed. Time is of the essence for sepsis survival.

Smith: Absolutely. There is a clinical component to this that we don't replace. We're just the indicator on the front end. In the hospitals that we are working with, they are using their normal protocols to take out information and work it into their clinical work flow. So what we are really doing is gaining hours from the front end of identifying sepsis that helps then treat the clinical side of it effectively. Both sides of the component are needed and gets us additional lift in terms of saving lives, it is the time component in helping sepsis.

Congratulations Damian Mingle on his breakthrough project. Many thanks to Sepsis Alliance board members and special tribute to all 2016 Sepsis Hero winners. And we can't forget to thank to all nurses on front line defense. Our Sepsis Stars whole-heartedly deserved their night on Broadway!!

Interested in discovering more about Chief Data Scientist Damian Mingle, WPC Healthcare and their analytical solutions please visit their [website](#).

Learn about the [Signs of Sepsis](#) and steps for [steps for prevention and intervention](#). Here are some handy facts from the site:

Sepsis is the body's overwhelming and life-threatening response to infection which can lead to tissue damage, organ failure, and death. Sepsis is a medical emergency that requires early detection and treatment for survival.

Sepsis can be treated but it must be suspected first.

We don't know yet exactly why sepsis occurs. Important to limit your exposure to infections by hand washing, caring and cleaning wounds and getting vaccinations.

If you are worried about sepsis, call 9-1-1. Studies suggest early care in an ambulance can increase survival. Tell health care providers, "**I am concerned about sepsis**."