

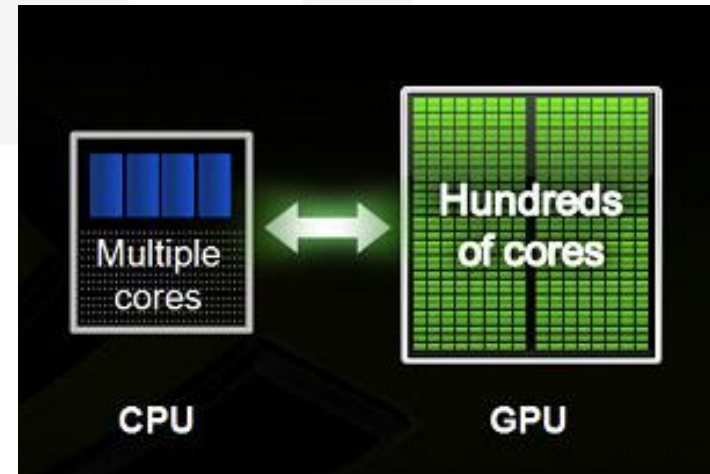
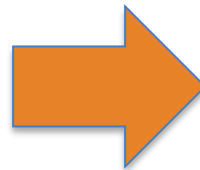
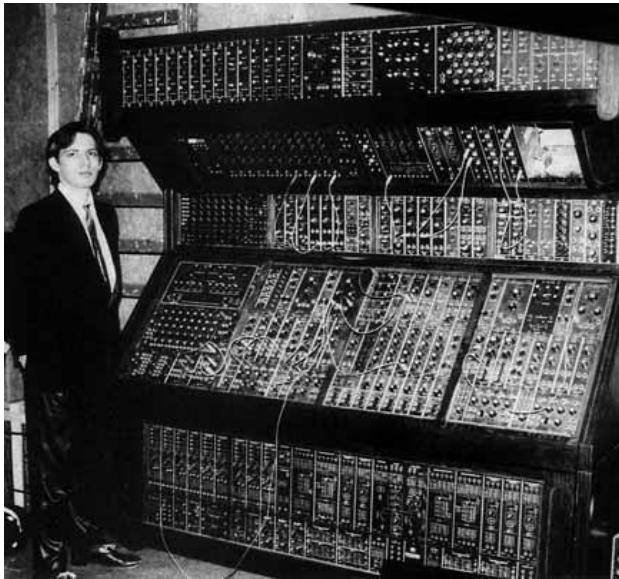
An aerial photograph of a city skyline at dusk. The sky is a mix of blue and orange. In the foreground, a river flows under a large, white, arched steel truss bridge. The city skyline is composed of various skyscrapers, including a prominent gold-colored tower on the left and a blue-tinted tower on the right. The text "SUMMIT OF THE SOUTHEAST 2016" is overlaid in white, sans-serif font across the top half of the image.

# SUMMIT OF THE SOUTHEAST 2016

**Combating Sepsis Proactively:**  
Using non-clinical data to get ahead of the problem  
Damian Mingle  
Chief Data Scientist, WPC Healthcare

# Technology Today Is Powerful

Healthcare will use it to solve its most pressing problems



Storage, bandwidth, and incredible processing speeds are changing how we develop solutions.

# What We Learned About Sepsis

Beyond clinical issues, Sepsis is complex for many reasons.

# Traditional Sepsis Equation

Everybody else is doing it! But should you?

WPC Healthcare  
focuses on this...



*Better Sepsis Outcome = Early Detection + Goal Directed Therapies*



Virtually everyone  
focuses on this...

# Size the Problem

## How important is this problem to my organization?

- Imagine two jumbo jets crash into earth every day for an entire year – (258,000 sepsis deaths per year)
- Sepsis care represents **\$23.7 Billion** each year for healthcare - **#1 condition** for costs
- **\$3 Billion** of that cost is from sepsis readmission which has a bounce back rate of **62%** nationally

### Incidences of posttraumatic stress disorder <sup>9</sup>

#### Rape

55.5 %

#### War

38.8 %

#### Intensive Care Units Survivors\*

22 %

#### Physical violence

11.5 %

#### Fire-/Natural catastrophies

4.5 %

\*Sepsis accounts for 50-60 % of ICU cases

# What's Not In The Stats

Healthcare hasn't quantified sepsis impact fully



**SOURCE:** <http://www.9news.com/news/health/colorado-mom-survives-sepsis-loses-4-limbs/315305819>

# Sepsis...We Got This!

## Focus on sepsis may not be 100%

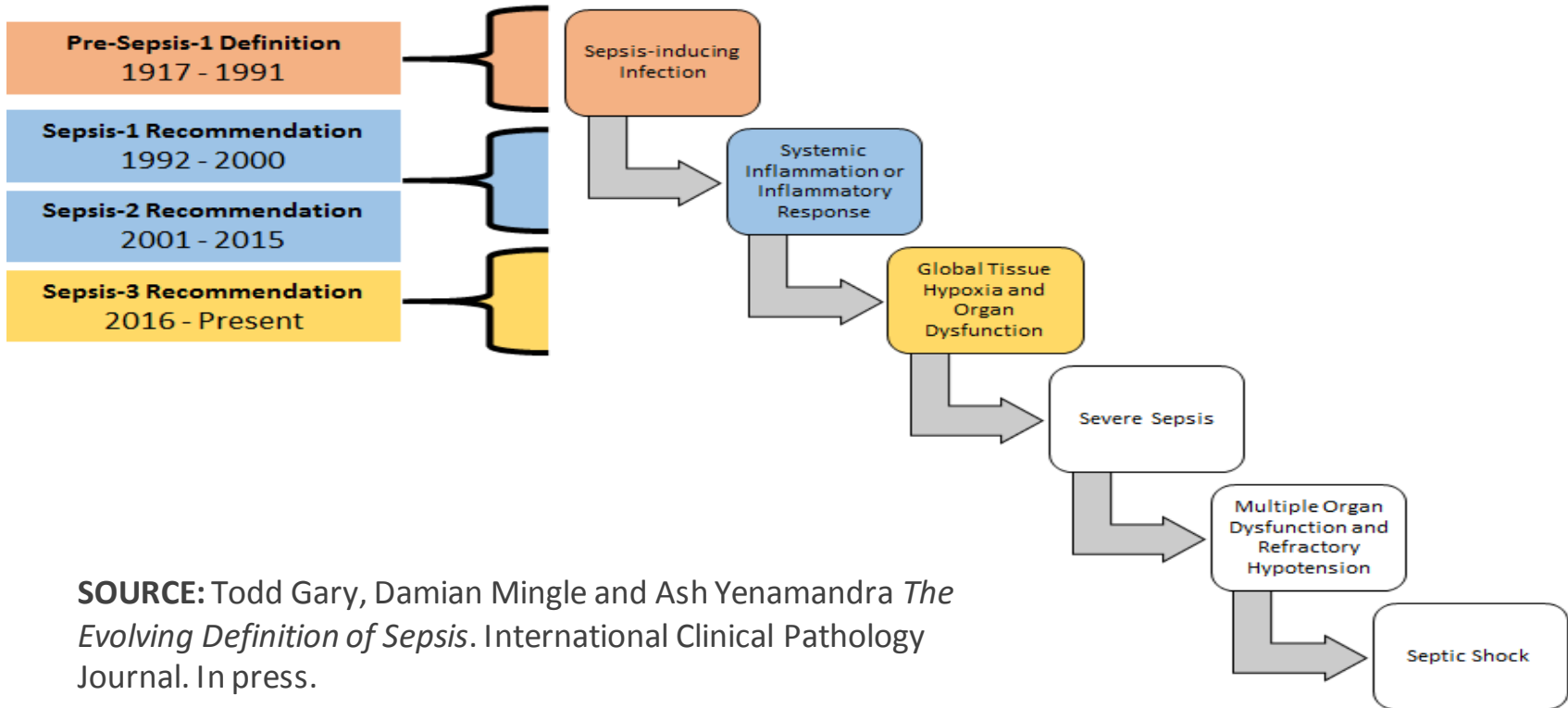
- Spectrum of expertise for sepsis across clinicians
- Staff turnover, new protocols, M&A activities
- Annual sepsis training may not have year-around value
- Human dynamics: lack of respect from clinical team, fight with spouse, school closing due to weather, and staff birthday cake down the hall can contribute to poor outcomes

Sepsis	Mortality In Hospital	Mortality Within 30 Days
Mortality Based Rating on <b>2872</b> cases.		
Actual Mortality	23.29%	27.72%
Sepsis		
Mortality Based Rating on <b>680</b> cases.		
Actual Mortality	35.29%	40.59%

SOURCE: 2016 Centers for Medicare and Medicaid Services for Years 2012 through 2014. Updated 4/5/2016.

# What is Sepsis?

Definition has been redefined 3 times in 24 years



**SOURCE:** Todd Gary, Damian Mingle and Ash Yenamandra *The Evolving Definition of Sepsis*. International Clinical Pathology Journal. In press.



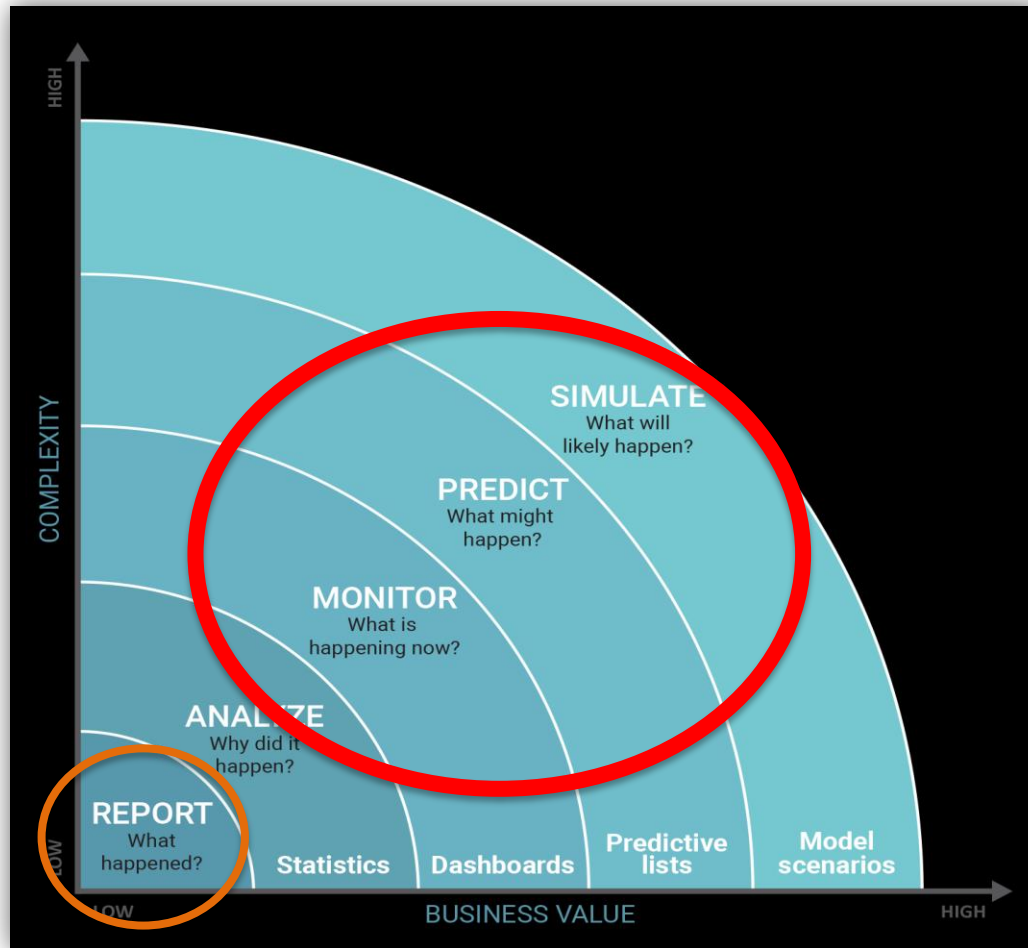
# How We Approached Sepsis

Old Problems, New Angles – A Data Science Approach



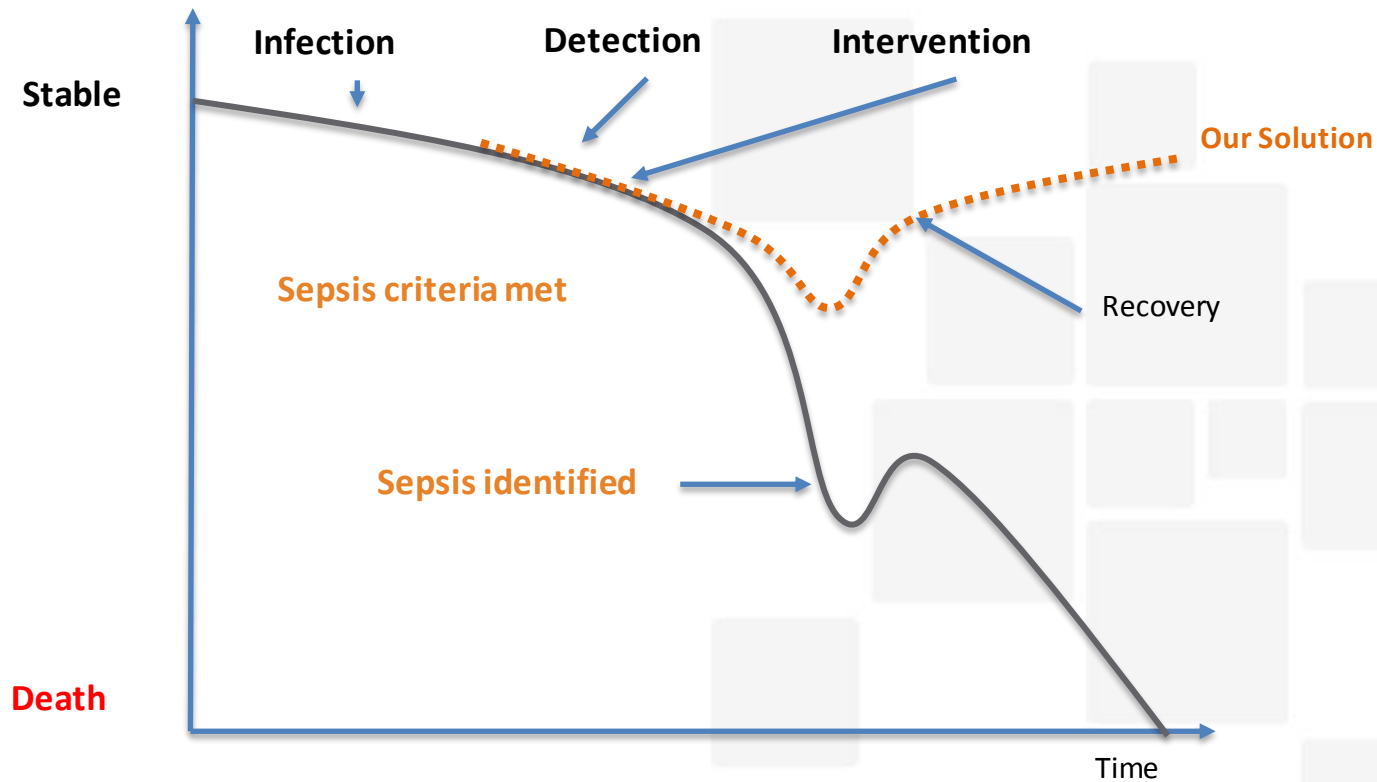
# Our Sepsis Target Is Different

What does your organization value?



# Sepsis Strategy Modified

Differential of standard model and Data Science model



1

Patient enters ED and provides name and date of birth to reception



**1: Pre-admission**

*Average over 2 hours between registration and admission*

2

Patient receives medical screening and physician determines patient should be admitted



*Average almost 1 hour between preadmission and registration*

3

Patient is placed in a bed in the ED and registration clerk visits patient to collect more information



4

Registration clerk updates patient record with address and insurance information



**2: Registration**

5

Physician examines patient and determines admitting diagnoses



6

Registration clerk updates patient record with admitting diagnoses



**3: Admission**

7

Patient is admitted to hospital, transferred to a hospital bed and treatment begins



WPC model can alert at all three major hospital events.



# Results

How we are making a difference today



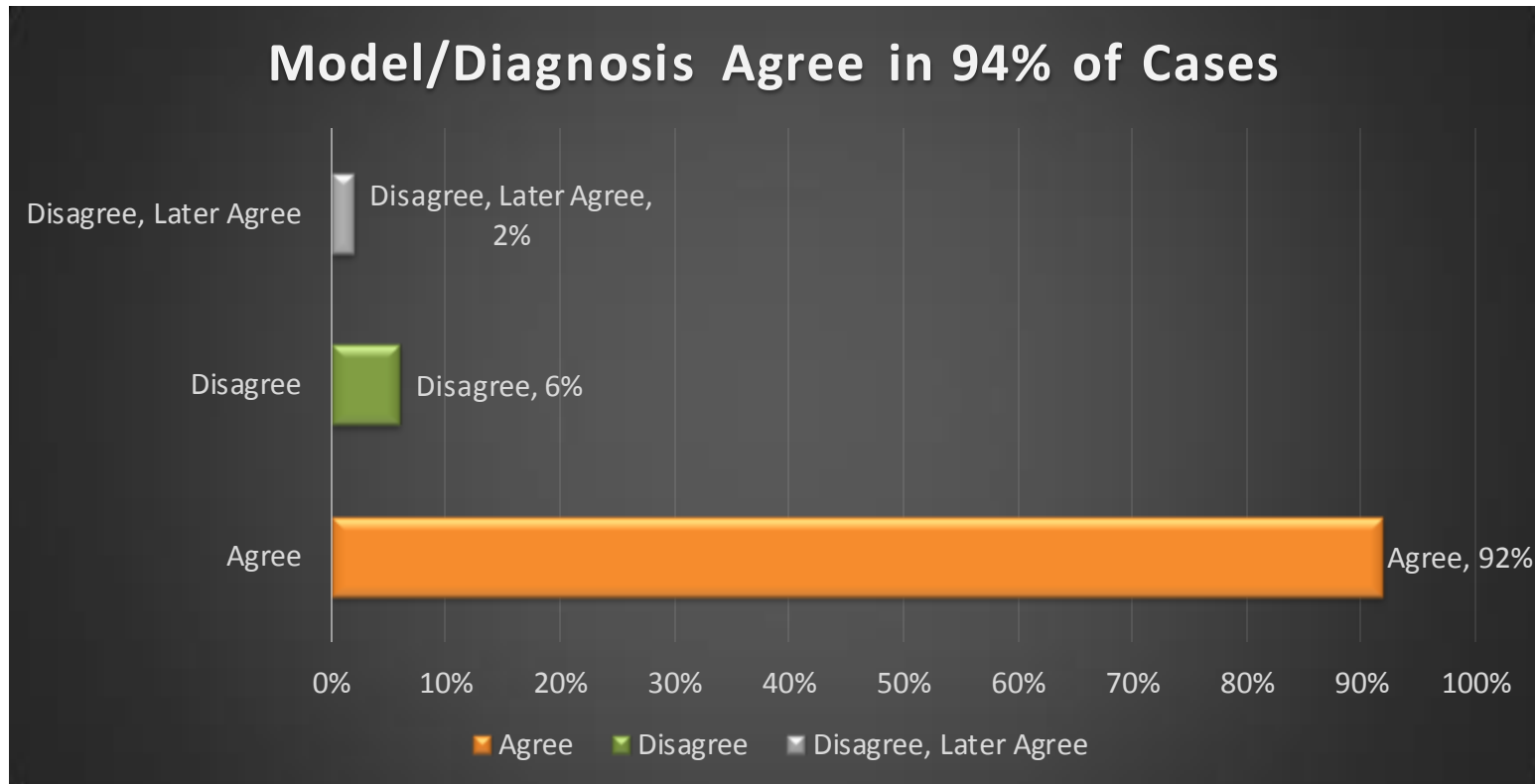
# Things We Did Not Expect

## Creating a dialogue with hospital partners

- **Example Patient #1:**
  - Model triggered a 'suspect sepsis' alert, however patient was treated/discharged for a UTI. Patient readmitted on the 10 days later and 2<sup>nd</sup> alert was sent; patient admitted with severe sepsis.
- **Example Patient #2:**
  - Model triggered a 'suspect sepsis' alert and patient was treated/discharged for urinary and expired 8 days later.

# Do We See The Same Thing?

Sample Size of 800 Admissions



# Data Science Sepsis Results

## Early identification system embedded in workflow

- Assesses all patients, not just those suspected of sepsis
- Identifies sepsis patients up to 4 hours earlier than clinical methods
- Reduces mortality by as much as 30.4% per sepsis patient
- Reduces length of stay by 3-6 days
- Statistically significant reduction of sepsis care costs
- Less than 2% of the emergency room population was possibly septic, but it represented almost 12% of all hospital costs.



# Hospitals May Want to Think Differently About Sepsis:

- How can we make use of technology to produce best-in-class sepsis results?
- How can clinical, financial, and operational team members become more aware of the hospital impact of this small population within the general population?
- How can hospitals modify risk of sepsis readmission by predicting 30-day return at discharge?



Damian Mingle

Chief Data Scientist

[dmingle@wpchealthcare.com](mailto:dmingle@wpchealthcare.com)

615.364.9660