Variable and Metric Development for The Improving Pediatric Sepsis Outcomes (IPSO) Collaborative

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Background

- Improving Pediatric Sepsis Outcomes (IPSO) is a Children's Hospital Association collaborative
- **GOAL**: Reduce mortality from severe sepsis and reduce incidence of hospital onset severe sepsis
- IPSO builds upon work from prior sepsis collaboratives and addresses the entire continuum of care from the ED to the ICU as well as the general care and heme/onc units
- Described here is the methodology used to increase electronic data capture and uniformity across 54 participating sites using standardized metric and variable development

Methods

- Outcome, Process and Balancing Metrics are represented
- "Time to" and "Percent Adherence" Metrics were both chosen if applicable as the former often demonstrates improvement earlier
- Variables and Statistical Process Control (SPC) were mapped to each metric **(Table 1)**
- Preference given to metrics that could be automatically abstracted from the EHR
- **Time zero** was defined both as time of earliest sepsis recognition as determined electronically **(Figure 1)** and a clinically derived time zero that was manually abstracted to identify earliest physiologic onset of sepsis

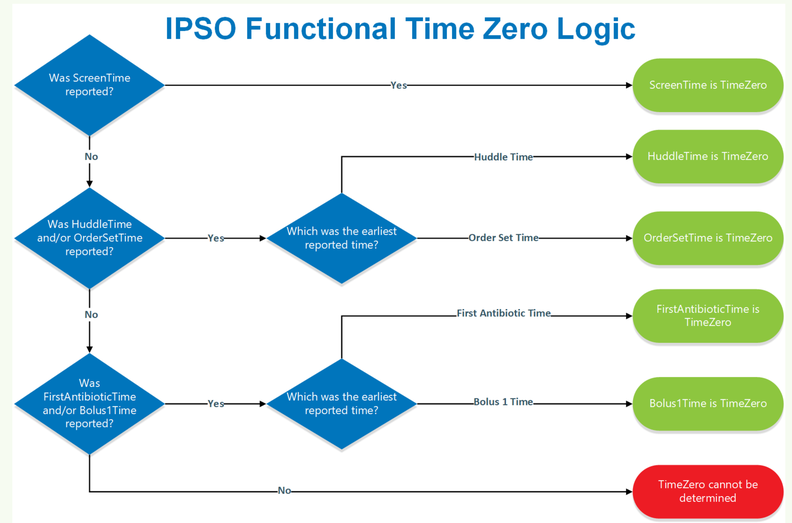

Figure 1. IPSO Functional Time Zero is a variable that can be automatically abstracted from the EHR to identify the earliest point of sepsis recognition. Clinical Time Zero is manually abstracted and augments Functional Time Zero.

Results

IPSO Collaborative – Measures and Related Variables

Outcome Measures

Measure	Chart	Variables Needed
Sepsis Mortality at Day 3	P-Chart	Disposition Disposition Date Functional Time Zero Arrival Time
Sepsis Mortality at Day 30	P-Chart	Disposition
Sepsis Mortalities per 1,000 Hospital Admissions - Day 3	U-Chart	Arrival Time Disposition Date Disposition Hospital Admissions Functional Time Zero
Sepsis Mortalities per 1,000 Hospital Admissions - Day 30	U-Chart	Disposition Hospital Admissions
Incidence of Hospital Onset of Severe Sepsis	P-Chart	Arrival Time Hospital Admissions Functional Time Zero
Hospital Days per Severe Sepsis Episode	X-Bar	Disposition Date Functional Time Zero
Positive-Pressure Free Days	X-Bar	Positive Pressure Vent Days Disposition Patient Chronically Vented
Vasoactive Free Days	X-Bar	Pressor Days Disposition
ICU Free Days	X-Bar	ICU Days Disposition
Organ Dysfunction 3-Day	P-Chart	Organ Dysfunction
Organ Dysfunction 30-Day	P-Chart	Organ Dysfunction

Process Measures

Measure	Chart	Variables Needed
Trigger Activations	P-Chart	Screen Time
Sepsis Huddle Activations	P-Chart	Huddle Time
Utilization of Order Set	P-Chart	Order Set Time
Time to Initiation of Order Set	X-Bar	Order Set Time Functional Time Zero
Time to First Fluid Bolus	X-Bar	Bolus 1 Time Functional Time Zero
Time to Third Fluid Bolus	X-Bar	Bolus 3 Time Functional Time Zero
Time to First IV Antibiotic	X-Bar	First Antibiotic Time Functional Time Zero
Time to First Vasopressor	X-Bar	First Pressor Start Time Functional Time Zero
Time to Surgical Source Control	X-Bar	Time Surgical Source Control Functional Time Zero
Time from Antibiotic Order to Administration	X-Bar	Time Antibiotic Ordered Time Antibiotic Administered

Balancing Measure

Measure	Chart	Variables Needed
Total Intravenous Antibiotic Days	X-Bar	Total IV Antibiotic Days

All measures are calculated monthly at the site and aggregate level, with the exception of mortality which is calculated quarterly at the site level and monthly at the aggregate level.

Table 1. Collaborative metrics with corresponding variables and statistical process control (SPC) charts.

- 44 final variables (40 able to be automated from EHR, including Epic and Cerner)
- 22 metrics
- Most variables mapped to metrics but some were abstracted for population description only, such as lactate, hypotension time and steroid utilization **(Table 1)**
- All metrics mapped to SPC charts (P charts for percentage adherence, X bar charts for time to interventions and U charts for rare outcomes) **(Table 1)**
- Challenging variables to abstract and thus reported in <50% of encounters: clinically derived time zero, high risk conditions, PRISM score and bedside huddle time
- To date 87% of expected data has been submitted **(Figure 2)**

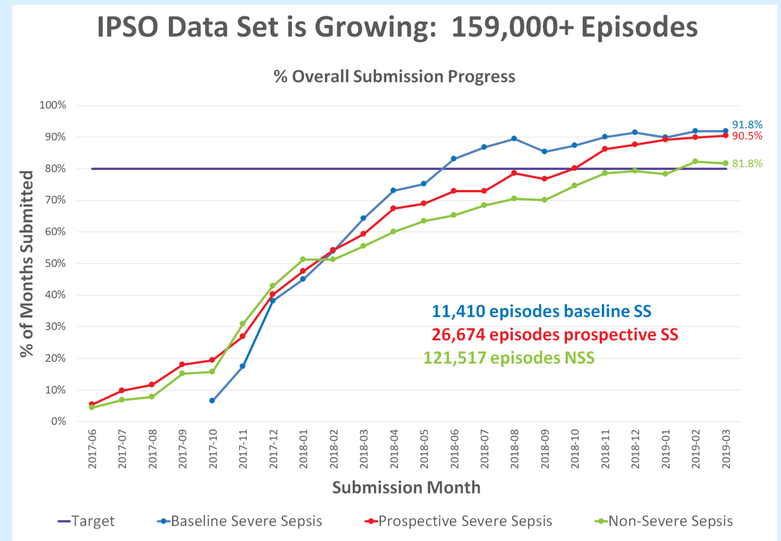

Figure 2. % Overall submission progress across 49 hospitals participating 12 months or more.

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