Background: Prompt reporting of blood culture Gram stains has been associated with decreased patient mortality, yet original findings have not yet been widely replicated. Our aim was to document the positive impact for patients with severe sepsis after improvements in the time to detection (TTD) of positive blood cultures.

Methods: A retrospective matched comparison group study was performed in a quaternary medical care center between Nov 2012 – Nov 2015. Data was extracted from unique cases of severe sepsis, MSIDRGs (870, 871, 872). Our historical blood culture system was the comparator (cohort A), while the BD BACTEC Plus Aerobic and Lytic Anaerobic media (Becton, Dickinson and Company, Sparks, MD) was designated as the intervention (cohort B). The downstream impact was determined using the following outcome variables: a) TTD of positive blood cultures, 2) 30 day all-cause raw mortality, stratified by MSIDRG, 3) hospital readmissions ratios (to expected, C.I.E., Premier, Inc.), and 4) inpatient length of stay rates (C.I.E., Premier, Inc.). Data analysis was performed using JMP 12.1.1 (Cary, NC); data was analyzed by Wilcoxon Rank Sum or Analysis of Means, alpha = 0.05

Results: Unique positive blood cultures were identified (n=216). Cohort demographics were well matched; no statistical differences were observed for age, gender, clinical service, compliance with sepsis bundles, phlebotomy practices, contamination rates, proportion of MSIDRGs, microbial diversity, or sample size. Eleven common bloodstream pathogens represented 87% and 86% of positive results in cohort A and B, respectively. The overall mean TTD was 21.0 ± 15.2 hrs for cohort A and 16.8 ± 12.3 hrs for B. Crude all-cause mortality for ICU patients with MSIDRG 870 was 38% (21.4 ± 12.3% in cohort A and 28% (14.8 ± 12.4%) in cohort B, p = 0.0002)

Usual care during study period, monitored by quality initiatives: • 2 sets of blood cultures via an electronic orders in a sepsis bundle prior to the administration of antibiotics. • Overall positive blood culture rates vary between 9 and 11%. For the study set enriched for sepsis MSIDRGs 870, 871, and 872, a 28% prevalence was observed. • Blood culture contamination rate ranges from 0.6-0.8%. • 16 to 20 mL of blood is commonly obtained from adults. • Blood collection volume metrics are recorded for cohort B via BD Epicenter Data Management System: Blood Volume Monitoring software, and manually for cohort A. • TTD was used to characterize each subject. • Sepsis coding practices remained uniform and no statistical differences to overall sepsis bundle compliance were observed. • Of 760 total severe sepsis cases, no differences in age, gender, hospital service, principal diagnosis, or compliance with sepsis bundles were observed. • The most common services were Hospitalist, Internal Medicine, Critical Care, and Hematology/Oncology, representing 94% of all severe sepsis cases.

Conclusion: Decreases in TTD for bloodstream pathogens were associated with significant improvements in crude all-cause mortality for ICU subjects with MSIDRG 870 and with improved O:E ratios for mortality and LOS. Further assessment of other clinical, laboratory, and economic variables is warranted. Rev. 10/26/2016

Experimental Aim: Assess the downstream impact of newly introduced blood culture system used for patients with sepsis, identified as part of a quality improvement project.

Study Design: A retrospective, observational study was performed with a pre- and post-intervention study design to compare metrics from the intervention period (cohort B) to those from the baseline time period prior to the intervention (cohort A).

The study includes data extracted from in-patient adult and pediatric subjects and follows a quality improvement protocol waived by the Geisinger IRB. The data was assembled by extracting information from the laboratory information system (Sunquest) and the electronic health record (EPIC). JMP ver. 12 and Excel 2013 were used for data validation, statistical analysis, and graphs.

Context: Geisinger Medical Center (GMC) is a 450-bed quaternary care hospital. Tyssol (Bile Drainage, 220 mL for 48 hrs and Inpatient Admissions reach 26,966 yr. GMC implemented the BACTEC FX system and BACTEC Plus Aerobic and Lytic Anaerobic media (Becton, Dickinson and Company, Sparks, MD) in June 2014, and patients were monitored until Nov 2015. Prior to that time, bioMerieux charcoal resin bottles (BacT/Alert FA and FN) were used. The blood culture conversion was further characterized by reviewing Observed to Expected (C.I.E.) ratios for mortality and length of stay calculated via Premier Quality Manager System until Nov 2016.

Usual care during study period, monitored by quality initiatives: • 2 sets of blood cultures via an electronic orders in a sepsis bundle prior to the administration of antibiotics. • Overall positive blood culture rates vary between 9 and 11%. For the study set enriched for sepsis MSIDRGs 870, 871, and 872, a 28% prevalence was observed. • Blood culture contamination rate ranges from 0.6-0.8%. • 16 to 20 mL of blood is commonly obtained from adults. • Blood collection volume metrics are recorded for cohort B via BD Epicenter Data Management System: Blood Volume Monitoring software, and manually for cohort A. • TTD was used to characterize each subject. • Sepsis coding practices remained uniform and no statistical differences to overall sepsis bundle compliance were observed. • Of 760 total severe sepsis cases, no differences in age, gender, hospital service, principal diagnosis, or compliance with sepsis bundles were observed. • The most common services were Hospitalist, Internal Medicine, Critical Care, and Hematology/Oncology, representing 94% of all severe sepsis cases.

Positive Culture Sample Size: Pre-interventionally n = 118. Post intervention n = 98.

Laboratory Method Intervention: BACTEC FX with LEAN laboratory design for blood culture inoculation and Gram stain performance.