

**Executive Summary: Leveraging End Tidal Carbon Dioxide Monitoring to Improve Sepsis
Bundle Compliance**

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Main Points:

- Severe sepsis or septic shock may progress to death if not promptly identified and treated (Lafon et al., 2025)
- The Surviving Sepsis Campaign outlines the recommended diagnostics and treatment to approach suspected or confirmed sepsis (Srzić et al., 2022).
- 1.7 million adults each year are impacted by sepsis (Centers for Disease Control and Prevention [CDC], 2025).
- For sepsis to be identified, there must be a suspicion for infection and at least two of the following:
 - Abnormal body temperature
 - Elevated heart rate
 - Elevated respiratory rate
 - Altered mental status
 - Low blood pressure (Srzić et al., 2022).
- Mortality increases 4 to 9% with every hour of delayed treatment (The Sepsis Alliance, 2025).

Background and Purpose:

- A 35-bed Level III Trauma Center was not achieving the hospital's goal of 86% compliance for arrival to intravenous antibiotic administration within 60 minutes.
- A study by Peng and Manini (2024) determined a correlation between pre-hospital end-tidal carbon dioxide (ETCO₂) and acidosis findings on the patient's labs.
- Hoke et al. (2021) did not have significant findings, but they did find that patients diagnosed with sepsis had pre-hospital ETCO₂ readings between 20 and 29.25.

- A 35-bed Level III Trauma Center in Central North Carolina identified arrival to intravenous antibiotic therapy within 60 minutes as an opportunity for improvement.
- The purpose of the quality improvement project was to determine if sepsis bundle compliance, specifically intravenous antibiotic administration within 60 minutes, could be improved for patients with an ETCO2 reading of 30 or below.

Methodology:

- Education was created and reviewed by the host site emergency department (ED) educator. Communication about the project was shared with the ED providers, nurses, and respiratory therapists.
- The Emergency Medical Services (EMS) report sheet was altered to guide staff to consider sepsis for ETCO2 reports of 30 or less.
- An order for lactic acid point-of-care testing (POCT) was created and added to the nursing standing orders. This order was available for the nurses to use in the event there was any delay in the provider's evaluation of the patient.
- Manual data extraction was accomplished by reviewing EMS report sheets, electronic health record reports were generated to identify the patients, and electronic medical records were reviewed.
- Descriptive statistics were reported for ETCO2 readings, lactic acid results, age, arrival to provider evaluation, and arrival to intravenous antibiotic administration.

Results:

- The quality improvement project started on January 7, 2026, and ended on April 30, 2026.
- 3,481 EMS arrivals occurred from January 7, 2026 to April 30, 2026 and 467 (13.4%) had an ETCO2 reported by EMS.

- 67 (2% of all EMS arrivals, 14% of those with ETCO₂ reported) were found to have an ETCO₂ of 30 or less and 34 (1% of all EMS arrivals, 51% of those with ETCO₂ of 30 or less) were included in the study.
- Lactic acid results ranged from 2.0-18.5 and EMS ETCO₂ ranged from 8-30.
- The median arrival to provider evaluation was 4 minutes indicating that patients were promptly evaluated upon arrival to the Emergency Department (ED).
- The 86% goal of time to IV antibiotic administration was not met.
- 52% (n=15) met the goal of 60 minutes or less for IV antibiotic administration.

Figure 1.

Project Results N=34	
Lactic Acid	2-18.5 mmol/L
ETCO ₂	8-30 mmHg
Age Range	57-98 years
Median Door to Provider	4 minutes
Median Door to Antibiotic Administration	65 minutes
% Meeting Arrival to Antibiotic <60 minutes	52%

Strengths and Limitations:

- Strengths
 - The host site had an interest in improving the arrival to intravenous antibiotic administration. The ED nursing leadership and provider leaders were engaged.
 - The project lead received EMS report sheets regularly to identify patients with reported ETCO₂.
- Limitations

- There was inconsistent use of sepsis order sets, which may represent a barrier to achieving intravenous antibiotic administration.
- The project was conducted at a single-site ED, and the population included EMS arrivals with ETCO₂ of 30 or less.
- There was concern for implementation drift when reviewing the data month to month.

Implications and Conclusions:

- Lactic acid results of 2 or greater were found in patients with ETCO₂ readings of 30 or below.
- ETCO₂ readings are a useful tool, and results of 30 or less correlate with underlying acidosis.
- Prompt provider evaluation was accomplished with a median arrival to provider of 4 minutes.
- Further studies are needed to determine the reason for the antibiotic delay.

References

- Centers for Disease Control and Prevention [CDC}. (2025). *About sepsis*. <https://www.cdc.gov/sepsis/about/index.html>
- Hoke, R., Wells, L., O'Sullivan, J. W., Bloom, I., Kumar, L., Haber, M., Sevransky, J., & Polito, C. (2021). The role of noninvasive, end-tidal capnography in out-of-hospital sepsis identification. *Annals of Emergency Medicine*, 78(4), S143. <https://doi.org/10.1016/j.annemergmed.2021.09.370>
- Lafon, T., Cazalis, M., Hart, K. W., Hennessy, C., Tazarourte, K., Self, W. H., Akhavan, A. R., Laribi, S., Viglino, D., Douplat, M., Ginde, A. A., Tolou, S., Mahler, S. A., Le Borgne, P., Claessens, Y., Yordanov, Y., Le Bastard, Q., Pancher, A., Ducharme, J., . . . Shapiro, N. I. (2025). SEPSIGN: Early identification of sepsis signs in emergency department. *Internal and Emergency Medicine*, 20(5), 1575–1587. <https://doi.org/10.1007/s11739-024-03802-5>
- Peng, P., & Manini, A. F. (2024). Diagnostic utility of capnography in emergency department triage for screening acidemia: A pilot study. *International Journal of Emergency Medicine*, 17(1), 57–58. <https://doi.org/10.1186/s12245-024-00631-3>
- Sepsis Alliance. (2025). *SEP-1: Guiding lifesaving care*. www.sepsis.org. <https://www.sepsis.org/protect-sep-1/>
- Srzić, I., Adam, V. N., & Pejak, D. T. (2022). *Sepsis definition: What's new in the treatment guidelines*. Sestre Milosrdnice University Hospital Center (KBC Sestre milosrdnice). <https://doi.org/10.20471/acc.2022.61.s1.11>