Sepsis is highly correlated with mortality and morbidity. Sepsis is a clinical condition demarcated as the existence of infection and systemic inflammatory response syndrome, SIRS. Confirmation of infection requires a blood culture test, which requires incubation, and thus results take at least 48 h for a syndrome that requires early direct treatment. Since sepsis has a strong inflammatory component, it is hypothesized that metabolic markers affected by inflammation, such as insulin sensitivity, might provide a metric for more rapid, real-time diagnosis. This study uses clinical data from 30 sepsis patients (7624 h in ICU) of whom 60% are male. Median age and median Apache II score are 63 years and 19, respectively. Model-identified insulin sensitivity ($S_I$) profiles were obtained for each patient, and insulin sensitivity and its hourly changes were correlated with modified hourly sepsis scores ($S_{SH1}$). SI profiles and values were similar across the cohort. The sepsis score is highly variable and changes rapidly. The modified hourly sepsis score, $S_{SH1}$, shows a better relation with insulin sensitivity due to less fluctuation in the SIRS element. Median $S_I$ and median $\Delta S_I$ of the cohort is $0.4193 \times 10^{-3}$ and $0.004253 \times 10^{-3}$ L/mU.min, respectively. Additionally, median $S_I$ are $4.392 \times 10^{-4}$ L/mU min ($S_{SH1} = 0$), $4.153 \times 10^{-4}$ L/mU min ($S_{SH1} = 1$), $3.752 \times 10^{-4}$ L/mU min ($S_{SH1} = 2$) and $2.353 \times 10^{-4}$ L/mU min ($S_{SH1} = 3$). Significant relationship between insulin sensitivity across different $S_{SH1}$ groups was observed ($p < 0.05$) even when corrected for multiple comparisons. CDF of $S_I$ indicates that insulin sensitivity is more significant when comparing an hourly sepsis score at a very distinguished level.