The human sequential organ failure assessment (SOFA) scoring system is used worldwide in intensive care units for assessing the extent of organ dysfunction/failure in patients with severe sepsis. An increasing number of septic cases are caused by Gram-positive bacteria as *Staphylococcus aureus*. The aim of the current study was to apply the human SOFA parameters in an awake, porcine model of severe *S. aureus* sepsis. Five pigs were inoculated intravenously with *S. aureus* and two control animals were sham-inoculated. Extensive clinical monitoring and sequential blood sampling was obtained and analysed for SOFA parameters. Dysfunction/failure was observed in the respiratory, haemostatic and hepatic system of all infected animals, together with initial cardiovascular dysfunction. The pulmonary system was the first to fail clinically, which corresponds with similar human findings, whereas the liver was affected earlier in pigs compared to humans. The use of human SOFA parameters was valuable in identifying dysfunctional/failing organs and showed consistency between this porcine model and human severe sepsis. Applying SOFA parameters in this model increased the relevance for comparison to clinical methods of evaluating human severe sepsis. Changes in SOFA parameters may in future porcine studies serve as a target for monitoring the effect of therapeutic intervention.