

Description of Additional supplementary files

Supplementary data 1. MLST, SCCmec , Agr typing and NGS sequence details of NICU isolates.

Supplementary data 2. Colonization surveillance and clinical culture status of NICU isolates.

Supplementary data 3. Minimum inhibitory concentration (MIC) of 17 antibiotics against NICU isolates

Supplementary data 4. agr mutations in NICU subclones

Supplementary data 5. Patients information and clinical culture status of COVID-19 pneumonia patients

Supplementary data 6. 14 Antibiotics susceptibility of COVID19 pneumonia isolates

Supplementary data 7. Number of isolates and percentages by EA-Agr, Agr positive and Agr negative in hospital and skin *S. aureus* isolates

Supplementary data 8. PacBio SMRT sequencing

Supplementary data 9. Relevant modified motifs detected in hospital isolates by PacBio SMRT(Sequel) sequencing

Supplementary data 10. Differential 5mC methylation positions in Agr-positive and EA-Agr as determined by EM-seq

Supplementary data 11. Methylase list and expressions in outbreak subclones by RNA sequencing

Supplementary data 12. Primers used in this study