

**Estimating the effect of Methicillin-resistant Staphylococcus aureus
infection on length of stay in an
intensive care unit using a longitudinal model**

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Healthcare-associated methicillin-resistant Staphylococcus aureus (MRSA) infection may cause increased hospital stay or, sometimes, death. Quantifying this effect is complicated because it is a time-dependent exposure: infection may both prolong hospital stay, and longer stays increase risk of infection. We show how use of a multinomial longitudinal model for estimating the daily probability of death and discharge can overcome these problems. We then extend the basic model to estimate how the effect of MRSA infection varies over time, and to quantify the number of excess ICU days due to infection. We find that infection decreases the relative risk of discharge (relative risk ratio = 0.68, 95% credible interval: 0.54, 0.82), but is only indirectly associated with increased mortality. An infection on the first day of admission resulted in a mean extra stay of 0.3 days (95% CI: 0.1, 0.5) for a patient with an APACHE II score of 10, and 1.2 days (95% CI: 0.5, 2.0) for a patient with an APACHE II score of 30. The decrease in the relative risk of discharge remained fairly constant with day of MRSA infection, but was slightly stronger closer to the start of infection. These results confirm the importance of MRSA infection in increasing ICU stay, but suggest that previous work may have systematically overestimated the effect size.