Methods. Authors reviewed articles and book chapters to identify key methodological principles relative to the design, implementation, and analysis of CRT. We undertook a systematic review of studies conducted between 1997 and 2017 in infection control and hospital epidemiology that used a CRT design, and evaluated each study on those key principles.

Results. Seven epidemiological principles were identified as most critical (Figure 1). Among the 44 studies included in the review, the most commonly used design was a CRT with cross-over ($n = 15, 34\%$), followed by a parallel CRT ($n = 11, 25\%$), and a stratified CRT design ($n = 7, 16\%$). Twenty-two (50\%) offered justification for their choice of CRT. Twenty-five (56\%) accounted for clustering at the design phase when estimating sample size. Only 15 (34\%) reported the intraclass correlation coefficient, coefficient of variation, or design effect. Fifteen studies (34\%) obtained waived consent, 14 (32\%) did not report whether they dealt with consent, 8 (18\%) studies obtained consent from individuals, and 7 (16\%) sought consent at the cluster level. Seventeen studies (39\%) matched or stratified at time of randomization, while 27 (61\%) did not use either of these techniques. Notably, 10 (23\%) studies did not report any efforts to reduce the potential for bias and/or contamination. Twenty-seven (61\%) accounted for clustering in their analyses.

Conclusion. CRT in infection control and hospital epidemiology are common but are still lacking in methodological rigor. It is crucial to continue improving the design and reporting of these studies to better evaluate the effectiveness of interventions.

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2158. Introducing the Population Standardized Infection Ratio (SIR): A Metric that Marries the Device SIR to the Standardized Utilization Ratio (SUR)
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Background. The device standardized infection ratio (SIR) has been used to compare units' performance for different publicly reported infections. Interventions to reduce unnecessary device use may select a higher risk population that is not accounted for in the current risk adjustments, leading to a paradoxical increase in SIR for facilities that may be high performers. The standardized utilization ratio (SUR) adjusts for device use for different units and facilities.

Methods. We calculated the device SIR (calculated based on actual device-days) and population SIR (defined as S observed events/Σ predicted events based on predicted device days) accounting for the facility SUR for both central line-associated bloodstream infections (CLABSI) and catheter-associated urinary tract infections (CAUTI) in 84 hospitals from a single system. The observed and predicted events were compiled at the unit level and aggregated to facility and system-level SIRs for calendar years 2016 and 2017.

Results. The central line SUR was 1.02 for 801,737 central line-days, with the device SIR of 0.78 and the population SIR of 0.80 (+2.6\%, relative increase). On the other hand, the urinary catheter SUR was 0.89 for 758,966 urinary catheter-days, with the device SIR of 0.87 and the population SIR of 0.77 (~11.5\%, relative decrease). The cumulative attributable difference for CAUTI with a SIR of 1 was ~107 for the device SIR compared with ~185 for the population SIR. Facilities with a wider variation in SUR tended to have a greater difference in device vs. population SIRs (Figures 1 and 2).

Conclusion. Population SIR takes into account device utilization, making it an attractive metric to address overall risk of infection or harm to a patient population, and reduces the risk of selection bias that may impact the device SIR with interventions to reduce device use.

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2159. Methodological Threats to the Standardized Infection and Standardized Antimicrobial Administration Ratios
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Background. Standardized ratios, such as the CDC’s Standardized Infection Ratio (SIR) and Standardized Antimicrobial Administration Ratio (SAAR), are used to assess hospital infection control and stewardship programs. While there has been a focus to improve adjustment factors in the prediction models for these ratios, there remain limitations to these methods in assessments of program effects.

Methods. We use a previously published mathematical model of an intensive care unit to simulate transmission of Staphylococcus aureus and the administration of antimicrobials to treat it. This approach allows for the calculation of an MRSA LabID SIR and Anti-MRSA adult ICU SAAR score with perfect adjustment, where the only difference between the simulated ICUs is due to random chance. We then evaluated the interpretations and statistical significance of these ratio measures as gauges of hospital program performance.

Results. Over a single year of 200 simulations, the models produced SIR/SAAR scores ranging from 0.47 to 1.73, with a median of 0.99, representing a considerable spread of scores obtained due to chance. The P-values measuring if these measures were different from 1.0 were significant in 86% of those facilities. Extending the simulation past one year exacerbated this tendency to over-identify scores as significant, and also showed that 53.5% of hospitals had improving (26%) or worsening (27.5%) of scores due to regression to the mean. This scenario could be falsely interpreted as the result of interventions put in place in response to their first year scores.