Letters to the Editor

Statistics and Meaningful Infection Rates

To the Editor:

In recommending adoption of more sophisticated measures to describe the frequency and pattern of adverse events, Gaynes, et al[1] suggest stratified incidence density rates (e.g., infections per thousand device days). Failure to apply tests for statistical significance to descriptive data have been a common weakness in hospital infection surveillance and quality assurance programs.[2] Moving from cumulative incidence rates, to which binomial or Poisson probabilities can be applied,[3] to incidence densities introduces the complications of ratio estimators, censored data, and selecting appropriate expressions for duration of risk. The price of more meaningful rates will be more complex analysis of their meaning.

Some authors have applied catalytic models[4] to express the relationship between incidence density and cumulative incidence.[5-9] However, this assumes a constant hazard function throughout the duration of risk. Further, should the duration of risk be expressed as the total number of device days, the number of days until diagnosis of device-associated infection, or the number of days until diagnosis minus an incubation period?[10] Survival analysis methods that compensate for censored data, such as the Kaplan-Meier product limit method and others, may be more meaningful than simply plotting device-associated device-day infection rates."

These sophisticated measures are valuable and will undoubtedly advance hospital epidemiology beyond present limitation, but they do beg for computer support and advanced levels of analytic expertise. Because less than one-third of infection surveillance programs have such support, it is likely that simple screening methods will be required so that technically demanding methods may be reserved for use when suspicions are aroused. I hope that the authors will be invited to continue their report in order to help us understand the analytic methods most appropriate to the descriptive measures recommended.

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The authors reply.

We are in full agreement with Mr. Bimbaum that moving from cumulative incidence rates to incidence densities introduces complications. In particular, interhospital comparison of device-associated, device-day infection rates in intensive care units or high-risk nurseries, as we recently recommended,' assumes the per-day risk of infection is constant throughout the duration of the device. Several studies have indicated that this may not be the case.[2,3] Therefore, the answer to the question Mr. Birnbaum poses is presently unknown. For practical collection of data, hospitals in the NNIS system use the total number of device days in the intensive care unit or high-risk nursery as a proxy for duration of risk.

A prospective surveillance study is the best mechanism by

https://doi.org/10.1086/646491 Published online by Cambridge University Press