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

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which to answer the questions raised by Mr. Birnbaum. This implies a study collecting a wide variety of very detailed data. However, the surveillance data acquired in the NNIS system, which is voluntary, cannot be as detailed and must remain relatively practical. The Centers for Disease Control's intent is to provide information to hospitals that is more meaningful for interhospital comparison, rather than attempt to define a specific patient's risk. The rates that we now advocate, such as device-associated, device-day rates, are meant only as a guide and indicate areas for further investigation. The Joint Commission on Accreditation of Healthcare Organizations in their agenda for change also has accepted the limitations of "benchmark" rates.[4] Censored data and an inconstant infection risk throughout the duration of a device represent only two areas where improvement in these rates are needed. We will continue to improve the NNIS system and provide mechanisms, often through articles in this journal, to help hospitals understand the most appropriate methods to interpret the rates we have recommended.

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Home Healthcare

To the Editor:

I read with great interest the article "Infection Control for Home Health,"[1] as I work for a national organization that provides home services in Canada.

As the authors mentioned in the article, there are scarce data regarding development and transmission of infections in the home setting. I do believe, as they do, that serious infections probably do occur less frequently in the home setting than in the hospital. However, I am not so sure that the home environment is necessarily a safer setting for individuals when there are many factors in the client's home environment that we never control, such as general hygiene, adequate handwashing facilities, home health professionals with communicable diseases, the use of more multiple invasive devices, or an immunocompromising condition. We assume that the home environment is safer, but we have little evidence for that except for the absence of "full-blown" infection. However, could a low-grade infection be associated with a longer healing period in an incisional wound, for example?

I believe that most infection control guidelines are a result of hospital-based research. Yet we have little research to define infection control parameters for the home setting. To make assumptions about the safety of the home environment in terms of infection control, with little data to support that hypothesis, is almost negligent. It certainly behooves us in the community to more rigorously test various infection control hypotheses.

I did want to question the statement regarding sterile irrigation solutions that can be kept open for 72 hours before discarding. Where are the data to support that particular time frame? I am only familiar with the work of Brown et al,[2] in terms of the length of time sterile solutions are kept open, and did not know that any other data existed. I realize that their work is hospital-based.

Because there is little legislation to protect us in the community, we must abide by research-based practice as much as possible.

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The authors reply.

Yes, good infection control data concerning home health are sparse. However, it is not negligent to make recommendations based on the best information available. It is certainly more irresponsible to make no effort at all. Hopefully, our article will stimulate you "to more rigorously test various infection control hypotheses" as you continue your work in the home. At the very least, home health nurses should be collecting reliable surveillance data patterned after data collected in the hospital. Such a simple step would help us answer the question about whether the home environment is safer than the hospital.

Regarding the 72-hour change interval for urinary tract irrigants, I know of no data to support a particular time frame. However, most patients who have chronic indwelling urinary catheters do not have sterile urine. Patients who use intermittent

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