- Barbut F. Meynard JL, Guiguet M, et al. *Clostridium difficile*-associated diarrhea in HIV-infected patients: epidemiology and risk factors. J AIDS 1997;16:176-181.
- 9. Reeves DS. The effect of quinolone antibacterials on the gastrointestinal flora compared with that of other antibacterials. *J Antimicrob Chemother* 1986;18:89-102.
- Golledge CL, Carson CF, O'Neill GL, Bowman RA, Riley TV. Ciprofloxacin and Clostridium difficile-associated diarrhoea. J Antimicrob Chemother 1992;30:141-147.
- Bates CJ, Wilcox MH, Spencer RC, Harris DM. Ciprofloxacin and *Clostridium difficile* infection. *Lancet* 1990;336:1193.
- Cain DB, O'Connor ME. Pseudomembranous colitis associated with ciprofloxacin. *Lancet* 1990;336:946.
- Golledge CL, O'Neill GL, Carson CF, Bowman RA, Riley TV. Ciprofloxacin and pseudomembranous colitis. *Lancet* 1990;336: 1509-1510.
- McFarland LV, Bauwens JE, Melcher SA, Surawicz CM, Greenberg RN, Elmer GW. Ciprofloxacin-associated *Clostridium difficile* disease. *Lancet* 1995;346:977-978.
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### The authors reply.

We thank Thomas et al. for their interest in our study. We agree that matching only by date of admission and ward would have been a reasonable alternative approach. We disagree with their comments about matching on date of admission. Our decision to use date of admission was based on careful consideration of circumstances in our hospital, particularly staffing shortages. This variable can readily change during a 3-month period, is potentially associated with nosocomial transmission, and, in our setting, is not easily measurable-all arguments for matching. Randomly selecting controls, as suggested by Thomas et al., may have led to a loss of precision compared with matching on length of stay. Regardless, the pertinent point is

that we obtained similar results with relatively large effect sizes using two different sets of controls. In their interpretation of confidence intervals, Thomas et al. ignore the fact that it is the point estimate of the odds ratio that is most likely to reflect the "truth." The point estimates of the odds ratios for the two sets of controls, 5.5 and 6.7, both based on multivariable analysis, obviously do not represent a "lack of effect" as suggested by Thomas et al. Their discussion about sample size and power is misinformed; these are a priori concepts that should not be used interpret completed studies.<sup>1</sup> to Thomas et al. cite epidemiologic studies that in fact support our findings of an association between fluoroquinolone use and Clostridium difficile-associated diarrhea.<sup>2,3</sup> We acknowledge that the generalizability of such studies may be limited. We would suggest that Thomas et al. exert similar caution when making generalizations based on their experience in a single hospital. We agree that continued surveillance of fluoroquinolones and Clostridium difficile-associated diarrhea is justified.

### REFERENCES

- Goodman SN, Berlin JA. The use of predicted confidence intervals when planning experiments and the misuse of power when interpreting results. *Ann Intern Med* 1994;121:200-206.
- Shah S, Lewis A, Leopold D, Dunstan F, Woodhouse K. Gastric acid suppression does not promote clostridial diarrhoea in the elderly. QMJ 2000;93:175-181.
- Nath SK, Salama S, Persaud D, et al. Drug risk factors associated with a sustained outbreak of *Clostridium difficile* diarrhea in a teaching hospital. *Can J Infect Dis* 1994;5:270-275.

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# Transmissions From Infected Healthcare Providers to Patients Are Medical Errors

## To the Editor:

Do no harm. This is a principle all medical personnel live by and should be referred to whenever we discuss interactions between patients and healthcare providers. In the June issue of Infection Control and Hospital Epidemiology, there were two editorials,<sup>1,2</sup> one article,<sup>3</sup> and two letters<sup>4,5</sup> regarding the transmission of hepatitis B virus, hepatitis C virus, and human immunodeficiency virus from surgical personnel to patients. It serves our collective interest to analyze this issue through the principle stated above and its necessary practical companion, reducing medical errors. After all, isn't transmission of disease in our healthcare institutions by definition a medical error?

A critical component of accident prevention is building systems that prevent errors from occurring. What we have learned from other industries. such as the aviation sector, is that rather than focusing on the individual, a successful strategy requires standardizing procedures that everyone in the system must follow. If an individual working inside the system has the choice of whether to follow an aspect of the recommended procedures, doesn't this in effect mean that there is no system? Instead, there is individual compliance or noncompliance. Could you imagine if the same "system" existed in the airline industry? Would we accept a situation in which the pilot could choose whether to conduct inspections before takeoff? Isn't a pilot with individual choice equivalent to a surgeon who can choose whether to be vaccinated or whether to be tested for hepatitis B virus?

#### REFERENCES

- Chiarello LA, Cardo DM. Preventing transmission of hepatitis B virus from surgeons to patients. *Infect Control Hosp Epidemiol* 2002; 23:301-302.
- Paton S, Zou S, Giulivi A. More should be done to protect surgical patients from interoperative hepatitis B infection. *Infect Control Hosp Epidemiol* 2002;23:303-305.
- Spijkerman IJB, van Doorn LJ, Janssen MHW, et al. Transmission of hepatitis B virus from a surgeon to his patients during highrisk and low-risk surgical procedures during 4 years. *Infect Control Hosp Epidemiol* 2002; 23:306-312.
- Fiser WP Jr. Should surgeons be tested for blood-borne pathogens? *Infect Control Hosp Epidemiol* 2002;23:296-297.
- Ball RT Jr. Protecting patients from surgical hepatitis C virus infection. *Infect Control Hosp Epidemiol* 2002;23:297-298.

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