Editorial

HIV Transmission from Surgeons and Dentists to Patients: Can Models Predict the Risk?

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In this issue, Schulman et al have presented their model suggesting the risk of human immunodeficiency virus (HIV) transmission from surgeons to patients is extremely low.' Will such a model, with its reassuring conclusions, succeed in allaying the concerns of a populace frightened by the prospect of acquiring HIV infection in the operating room or the dentist's chair? Analysis of related data and public sentiment suggest this model will provide limited reassurance; however, it cannot explain a critical event: the clustering of HIV transmission from a Florida dentist to six patients.

Since the early days of the acquired immunodeficiency syndrome (AIDS) era, this disease has engendered intense anxiety (some have described it as near-hysteria) in the general population. As more was learned about HIV and its transmission, the general public came to understand that, with the exception of infants born to infected mothers, individuals became infected with HIV only by sexual intercourse with an infected person, intravenous drug use, or transfusion of contaminated blood products. Gradually, it became accepted that acquisition of infection did not occur through casual contact with infected persons[2]; the public was reassured that sharing an office, a taxi, a classroom, or a dormitory room with an HIV-infected person did not pose a risk. Even the chance of acquiring HIV infection from transfused blood products became increasingly remote as blood donor sources were limited to low-risk populations, routine screening of blood for HIV antibodies became standard, and opportunities for directed donations became more widely available. Thus, as information about routes of HIV transmission was disseminated to the public, a more calm and rational approach to AIDS emerged.[2]

In 1990, the Centers for Disease Control announced that a dentist with AIDS had transmitted HIV to one of his patients; subsequently, five additional patients also were found to have been infected by this dentist.[3] Despite an exhaustive investigation, no breaches of infection control practices could be identified that would explain these transmissions.[4] This event set off a firestorm of renewed public anxiety, as well as the introduction of some unwise legislative proposals (eg, that all surgeons be tested regularly for HIV infection). Thus, just at a time when physicians and the public had come to believe they understood all the known routes of HIV transmission, the transmission of HIV from the Florida dentist flew in the face of this understanding.

As a response to widespread concern and to better assess the risk of HIV transmission to patients, "lookback" investigations of patients operated on by HIV-infected surgeons and dentists were done. To date, these investigations have failed to identify other

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cases of healthcare worker-to-patient transmission of HIV.[3] Although health authorities reassured the public and their political leaders that the risk to patients was quite small, anxieties remained high. The widespread educational campaigns had been successful; people believed they understood how HIV was acquired and, therefore, how to prevent their exposure to HIV infection. The public had learned that AIDS was a disease confined largely to persons who practiced certain behaviors and that individuals could exert substantial control over their exposure to these risks. When contemplating the necessity for medical care, it was recognized that the principal hazard lay in receiving HIV-contaminated blood. Although blood transfusions could not be made absolutely safe, the risks could be estimated reasonably[5] so that the potential hazards could be weighed against potential benefits. Most important, these estimates accurately predicted reality so that patients and their physicians could make decisions based on reliable information. Many patients accepted this tiny risk. Some chose to minimize even the very small chance of transfusion-associated HIV transmission by obtaining directed donations from family members or by preoperative autologous deposits.[6]

The utility of any model in estimating the risk of healthcare worker-to-patient transmission of HIV is that it quantifies a risk that otherwise looms frightening because of its uncertainty. In the model described by Schulman et al,[1] the estimated risk of HIV transmission from an infected surgeon to patients is less than one per one million procedures, which they appropriately categorize as extremely low. They further estimate that a mandatory HIV antibody screening program for surgeons could reduce the risk to less than one per 10 million procedures, but at considerable cost.

Although models such as these are useful because they place the risk of transmission into a statistical perspective, their persuasiveness is limited by their inability to explain how one dentist could suddenly and inexplicably infect so many patients. This single event, which triggered public anxieties and legislative proposals, likely stimulated the creation of the model. Yet the model does not account for this singular event. What is the impact of models that may not accurately predict reality?

Modelers have been attracted previously to the arena of HIV transmission in the hospital. Numerous published models have estimated the risk of HIV transmission from infected patients to surgeons. Many care providers for HIV-positive patients have encountered surgeons who are reluctant to operate on these patients. If the models that estimated patient-to-surgeon HIV transmission predicted reality accurately, finding surgeons willing to operate might be nearly impossible. Several models of HIV transmission to surgeons have calculated this lifetime risk at 1% to 10%.[7] If these estimates were accurate, then many hundreds of surgeons would have become infected by now. Yet in serosurveys of surgeons, no HIV infections were found among those who did not possess other, nonoccupational risk factors.[8] It seems that most surgeons' behavior has been affected little by statistical models that may have inflated the risk; instead, they appear to be influenced more by the objective reality of a genuinely low risk of patient-to-surgeon transmission of HIV In contrast, a small group of surgeons, desiring to reduce further their risk of occupational acquisition of HIV infection, decline to operate on HIV antibody-positive persons.

Schulman et al acknowledge that their model is unable to account for the cluster of transmissions from the Florida dentist. It is likely that an assumption of their model, that all HIV-infected surgeons have a uniform chance of transmitting that infection to patients, is flawed. Notably, hepatitis B acquisition from infected surgeons also does not occur uniformly; rather, transmission characteristically produces clusters of infections.[9,10] Again, like the Florida dentist with AIDS, investigations of these hepatitis B-infected surgeons usually do not identify breaches of infection control practices. Indeed, an orthopedic surgeon who knew he was infected transmitted HBV to two patients recently, despite meticulous attention to infection control practices, including the surgeon's use of double gloves.[11] As with HIV-infected healthcare workers, the vast majority of HBV-infected surgeons and dentists do not transmit infection to their patients. However, on those infrequent occasions when transmission to patients has occurred, it was detected only because a number of patients became infected over a brief time-again, a feature shared with the Florida episode. Unfortunately, the mechanism of intraoperative transmission of bloodborne pathogens remains murky. This persistent enigma virtually ensures that anxiety and uncertainty surrounding this issue will not be alleviated. Furthermore, if surgeon- and dentist-to-patient transmission of hepatitis B is a model for HIV then future clusters of HIV infection are likely to occur as a consequence of an infected surgeon or dentist who has inexplicably become an efficient transmitter of HIV.[12]

Many medical and public health organizations favor voluntary restrictions on performance of invasive procedures by HIV-infected surgeons and dentists. None currently advocate routine and regular screening of surgeons or dentists. To date, the available data, including the model described by Schulman et al, are supportive of these positions. At some future

time, we may understand why rare dentists and surgeons become efficient transmitters of hepatitis B infection to their patients; that information will help us finally understand why a Florida dentist who employed standard infection control practices nonetheless infected six patients with HIV.

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