Tetanus Prophylaxis in the Emergency Department

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See related article, p. 305.

Tetanus is now so rare in the United States that few physicians encounter a case in the course of their careers. The 96% reduction in the incidence of reported tetanus cases and elimination of neonatal tetanus since the late 1940s can be attributed to the effectiveness of widespread vaccination with tetanus toxoid–containing vaccines, as well as improved wound care and delivery practices. Despite its rarity, tetanus continues to be of concern because of the clinical severity, high mortality, and associated high costs of the disease. In 1991 to 2000, the median hospital stay for tetanus cases reported to the US Centers for Disease Control and Prevention (CDC) was 16 days, with more than half of cases requiring mechanical ventilation. The overall case fatality rate was 19% (Centers for Disease Control and Prevention, unpublished data, 2003). The vast majority of reported cases and nearly all deaths occur in individuals who are unvaccinated or inadequately vaccinated and thus were potentially preventable. In this issue of Annals, Talan et al report the results of a study measuring the prevalence of protective antitetanus antibody levels in approximately 2,000 adults presenting for wound care in 5 academic emergency departments (EDs) and the frequency with which they received appropriate tetanus prophylaxis. Histories and physical examinations were performed on participants at the time of presentation. A standardized data collection form was used to record information about the immune status and wound characteristics of enrolled patients but not their history of prior tetanus toxoid immunization in order to disguise the purpose of the study from the treating physicians. Serum was obtained for determination of tetanus antitoxin levels; wound care was performed as clinically indicated. A systematic history of tetanus immunization was subsequently obtained by research associates when patients returned for follow-up care 5 to 7 days after presentation. At that time, a second serum sample for tetanus antitoxin determination was collected from those who received tetanus toxoid and not tetanus immunoglobulin at their initial visit. Patient charts from the initial ED visit were reviewed for documentation of tetanus vaccination histories. Appropriate tetanus prophylaxis was defined as that given in accordance with the recommendations of the Advisory Committee on Immunization Practices.

The most striking finding of this study was that only 57% of patients presenting with wounds were provided appropriate tetanus prophylaxis; 35% failed to receive indicated tetanus vaccination, or vaccination and tetanus immunoglobulin, and 8% received unnecessary measures. Ironically, none of the 504 (26%) patients most in need of prophylaxis (ie, those without a history of primary immunization who presented with tetanus-prone wounds) were treated correctly. The lack of appreciation of the importance of a primary tetanus immunization series when assessing and managing tetanus risk was also suggested by the absence of recorded information about primary vaccination in 80% of medical records. Since the study by Talan et al was conducted in teaching hospitals, the apparent lack of familiarity and compliance with recommendations that have been in place for more than a decade and endorsed by most medical societies, including the American College of Emergency Physicians, is noteworthy. It is also likely that attention to tetanus prophylaxis was at least modestly enhanced during the course of the study, because 12% of participating attending physicians who were surveyed suspected that tetanus prophylaxis was a possible focus of the study and an additional 48% may have had some suspicion. Had the study been conducted in a representative sample of institutions providing emergency care, adherence to tetanus prophylactic guide-
lines might have been found to be even lower. These results are consistent with tetanus surveillance data showing that among reported tetanus cases who sought medical attention for their antecedent wounds, fewer than 60% received indicated tetanus toxoid.6

On a more positive note, 90% of patients tested had antitetanus antibody levels above the cut-off value of 0.15 IU/mL used to define protection. Lower prevalences of protection were found in the elderly, those with lower levels of education, immigrants whose countries of origin were outside North America and Western Europe, and those with a history of unknown or inadequate vaccination.4 The groups less likely to have protective tetanus antitoxin levels were the same as those identified in the Third National Health and Nutrition Examination Survey, a study of a representative sample of the US population aged 6 years or older.7,8 However, the proportion of protection in each subgroup in the study by Talan et al4 was higher than that found in the National Health and Nutrition Examination Survey III, perhaps reflecting differences in care-seeking and treatment practices in the populations served by the study sites compared with the United States as a whole.

Only one third of patients with initial nonprotective tetanus antitoxin titers developed protective levels by the time of follow-up at 5 to 7 days after presentation.4 This is not surprising because an increase in antibody titers after tetanus toxoid boosting typically is not seen for 4 days and does not peak until 2 weeks after toxoid administration. The response tends to be slower as the interval between tetanus booster doses increases and may be particularly delayed in the elderly.9 There is, however, experimental evidence that protection after tetanus toxoid administration begins before an increase in antibodies can be measured. In the absence of primary immunization, little antibody response to a first dose of toxoid is observed, necessitating the use of tetanus immunoglobulin in unimmunized patients.9 Thus, a careful history of prior tetanus vaccination with attention to receipt of a primary series is essential for determining correct tetanus wound prophylaxis. Improved immunization record keeping, including adult vaccination registries, may assist medical providers in accurately assessing patient tetanus prophylaxis needs in the future.

Given the present low incidence of tetanus in the United States and the relatively high prevalence of protective tetanus antitoxin in individuals who are not members of defined risk groups, the authors raise the issue of the appropriateness of the Advisory Committee on Immunization Practices guidelines for tetanus prophylaxis in wound care.4 The current recommendations should be maintained for several reasons. As reviewed by Wassilak et al9 and Galazka,10 individual antibody response and duration of immunity after tetanus immunization varies widely. Tetanus occurs when the amount of toxin produced by wounds contaminated with Clostridium tetani overwhelms available antitoxin. Periodic reports of tetanus cases occurring in the face of “protective” tetanus antitoxin levels support the concept that no single value can define minimum protection for all patients. Antitetanus antibody cut-off levels used to define population immunity do not guarantee individual protection.9,10 The proportion of individuals in Talan et al’s4 study whose tetanus antitoxin levels were at the lower end of the protective range is unknown. Furthermore, the degree of protection for any given patient within a low-risk group cannot be accurately predicted solely by history. The Advisory Committee on Immunization Practices wound prophylaxis guidelines are designed to afford protection well above minimum levels to ensure that the greatest possible number of tetanus cases are averted.

Tetanus boosters provided in EDs not only afford protection against tetanus associated with wounds prompting visits for immediate care, but also provide protection for future wounds and other conditions that could result in tetanus. Many of the tetanus cases reported to the CDC involve wounds judged too trivial to merit professional wound care or are related to surgical procedures and nontraumatic conditions not traditionally thought to be associated with tetanus.1-3 Because compliance with the Advisory Committee on Immunization Practices recommendation that regular tetanus boosters be given every 10 years is poor,11 EDs play an important role in maintaining immunity in the US population and preventing tetanus in individuals at risk who do not seek medical attention.

A final aspect of the Advisory Committee on Immunization Practices wound prophylaxis guidelines not addressed in the study by Talan et al4 merits comment. The Advisory Committee on Immunization Practices strongly recommends that combined tetanus and diphtheria toxoid formulated for use in older children and adults always be used in those 7 years and older to maintain individual and population immunity to diphtheria as well as tetanus, unless a clear contraindication to diphtheria toxoid exists.5 Although diphtheria in the United States is now even rarer than tetanus, endemic
diphtheria transmission still exists in at least one area in the United States and diphtheria is present in many countries in the developing world. A recently reported case of an unimmunized older American adult who developed fatal diphtheria after return from a visit to a Caribbean country is a clear reminder of the risk of diphtheria when immunity is inadequate. The National Health and Nutrition Examination Survey serosurvey demonstrated that the prevalence of protection against diphtheria in the US population is even lower than that against tetanus, especially among older adults. This difference in seroprotection is probably due in part to the use of single antigen tetanus toxoid boosters instead of combined tetanus and diphtheria toxoid. The large diphtheria outbreak in the former Soviet Union in the early- to mid-1990s provided a dramatic example of the risk of epidemic diphtheria when population immunity declines. Combined tetanus and diphtheria toxoid should be used routinely in ED wound care rather than single antigen tetanus toxoid boosters.

Tetanus-diphtheria toxoid vaccine is one of the safest, cheapest, and most effective vaccines available. Careful histories of tetanus and diphtheria vaccination should be taken as part of routine ED wound care, and Advisory Committee on Immunization Practices guidelines for the administration of combined tetanus and diphtheria toxoid and tetanus immunoglobulin should continue to be followed.

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