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Point-of-care tetanus immunoassay: An audit of unscheduled tetanus prophylaxis

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Abstract Tetanus is a life threatening non-communicable infection caused by the anaerobic bacillus tetanus clostridium which enters the body through a wound. The World Health Organisation (2006) aim to eradicate tetanus incidence globally is supported by the implementation of national vaccination programmes. The United Kingdom population received tetanus prophylaxis through a robust vaccination infrastructure and unscheduled tetanus prophylaxis when patients present to emergency departments following penetrating injury. However, individual patient recall of tetanus immune status is problematic. The decision to prescribe tetanus prophylaxis is dependent on accurate assessment of a tetanus-prone wound and current tetanus immunity status. One solution is the use of tetanus immunoassay. This paper presents an analysis of expenditure on unscheduled tetanus prophylaxis in two emergency departments at one NHS Foundation Trust in the North of England. Consideration is given to potential benefits of single step point-of-care tetanus immunoassay using one drop of the patient's blood. Cost-savings were limited. Critical to the discussion is the impact of tetanus immunoassay on patient choice. Any prospective change to an A&E departments' tetanus prophylaxis practise must guarantee no less a level of seroprotection than necessary and preferably should enhance individual patients' safety, comfort and choice.

Editor's comments
Tetanus vaccination is an important aspect of trauma care, particularly when traumatic injury involves an open wound. It is essential that the trauma practitioner is aware of the issues surrounding this aspect of practice whether or not they are involved in the administration of the vaccine. This paper acts as an update on the contemporary issues.

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Introduction

Tetanus is a life threatening infection caused when the organism '*Clostridium tetani*' enters the body via a wound. The organism thrives in anaerobic conditions such as deep penetrating wounds where low levels of oxygen, moisture and warmth exist. Causative factors involve for example, animal or human bites, road traffic incidents or domestic, industrial and horticultural trauma. The incubation period varies, according to the literature, which is generally considered to be 4—21 days post-injury range (LaForce et al., 1969; Department of Health, 2006) though exceptions exist i.e. 2—50 days (Steimle et al., 2002), 3—21 days (Atkinson et al., 2007). The aetiology of tetanus infection concerns two toxins; tetanospasmin and tetanolysin. Tetanospasmin prevents the release of [gamma]-aminobutyric acid (GABA) at the junction of the inhibitory nervous impulses, causing clinical signs of tetanus. The exact function of tetanolysin is less known (Rhee et al., 2005).

The first symptom of tetanus is lockjaw which leads to neck rigidity then generalised spasm and paralysis. As the patient is conscious throughout the episode it is likely that they experience intense pain which may be exacerbated with sudden noises affecting the neurological system. The risus sardonicus is a characteristic facial grimace usually seen in infected infants and the opisthotonos is an intense muscular arching of the back. Immediate life-saving treatment involves sedation, airway and respiratory support, active and passive immunization and neutralising of the tetanus toxin in the body with intravenous antibiotics.

Literature

An electronic literature, policy and guidelines search was conducted in September 2010 for the period 2000—2010 for articles relating to tetanus prophylaxis and the use of immunoassay in the emergency department (ED). Search terms were 'accident and emergency', 'emergency department', 'tetanus prophylaxis', and 'tetanus immunoassay' led to a combined total of 87 articles. De-duplication and review for relevance led to selection of the following articles.

Cooke (2009) questioned whether tetanus prophylaxis procedures for wound management were optimal, providing a literature review of 110 articles and data highlighting the clinical problem of accurate identification and prescribing of tetanus prophylaxis for patients presenting with tetanus-prone wounds who are not fully immunized. It is noted that patients do not accurately recall their tetanus immune status (Fishbein et al., 2006; Stubbe et al., 2007a,b; Cooke, 2009) so point-of-care tetanus immunoassay, an immediate single analysis using one drop of the patient's blood whilst in the ED, could provide a cost-benefit mechanism for swift and accurate calculation of tetanus serum antibody levels. Cavenaille and Duchateau (2005) declared a 40% reduction in ED tetanus boosters and 80% reduction in Human Anti-tetanus Immunoglobulin (HTIG) administration using immunoassay. Building on an earlier study which declared that approximately 90% of patients could not recall their anti-tetanus status accurately (Elkharrat et al., 1999) a prospective concordance study of 1018 ED adults was conducted to validate the bedside use of Tetanus Quick Stick (TQS) against the enzyme-linked immunosorbent assay (ELISA) method concluding ''TQS is the most useful tool in diagnosing individual protection at the bedside and may be performed at ER triages'' (Elkharrat et al., 2010, p. 42).

Stubbe et al. (2007a,b) noted the unreliable tetanus prophylaxis history from patients with wounds and evaluated the contribution and cost-effectiveness of TQS and its place in a modified emergency algorithm. TQS tests were obtained from 611 patients enrolled in a double-blind multicentre study, 498 were valid and 113 either refused to participate or incomplete study records invalidated participants. A physician took a history and determined tetanus prophylaxis requirements in accordance with the established algorithm. It was concluded that TQS was a cost-effective tool for patients presenting with a tetanus-prone wound coupled with no seroprotection. Of significance, there was a reported 56.9% improvement in the management of patients by avoiding unnecessary treatments with an associated mean cost saving of 10.58 euros with TQS compared to 11.34 euros without TQS. Talan et al. (2004) conducted a prospective observational study of 1988 adult patients attending five EDs with wounds. Serum antitoxin titres were measured using enzyme immunoassay at the level of >0.15 IU/mL. Overall tetanus seroprotection was generally high (90.2%) however, tetanus risk was higher in older people, immigrants, and people who did not experience education beyond compulsory education. Underimmunization was also noted in 504 patients who gave a history of inadequate primary immunization yet who also had inadequate titres and who were not prescribed tetanus immunoglobulin. This practice called for the investigation of barriers to physician compliance, education and standardized management protocols.