ORIGINAL ARTICLE

Audit of tetanus prevention knowledge and practices in accident and emergency departments in England

Emma J Savage, Stephen Nash, Anne McGuinness, Natasha S Crowcroft

Emerg Med J 2007;24:417–421. doi: 10.1136/emj.2007.047399

See end of article for authors' affiliations

Correspondence to:
Dr E J Savage, Immunisation
Department, Centre for
Infections, Health Protection
Agency, 61 Colindale
Avenue, London NW9 5EQ,
UK; emma.savage@
hpa.org.uk

Accepted 20 March 2007

Objectives: To assess the knowledge and current tetanus prevention practices of various staff members in accident and emergency (A&E) departments.

Design, setting and participants: A structured questionnaire containing 16 questions on tetanus guidance, anti-tetanus practice, vaccination preparations and information on the population served by the department was sent to medical and nursing staff in A&E departments across England.

Results: 366 completed questionnaires from 67 hospitals were returned. 48.9% of the questionnaires were completed by the medical staff and 39.9% by the nursing staff at various grades. 75% of respondents said that their department had a local tetanus guideline, but only 29% stated that the tetanus guidelines were always followed. 31.4% of respondents said that injecting drug users were managed as a high-risk group in their department. Many respondents did not follow the national policy; they tended to err on the side of caution when it came to defining and treating tetanus-prone wounds, with 22.1% stating that they would consider any wound tetanus prone. Contrary to current Department of Health guidelines, 46.2% of respondents said that they would give a booster dose if the fifth dose had been given >10 years ago.

Conclusions: There are clear differences between the recommended guidelines for tetanus prevention and current practice in A&E departments. The changes announced in 2002 do not seem to have been widely implemented. As a result, the apparent success of the national tetanus vaccination programme may be the result of more cautious clinical practice than would be expected from the UK policy. If national recommendations for tetanus are implemented in clinical practice, then the impact on control of the disease should be monitored closely.

Tetanus is an acute, life-threatening disease caused by toxins produced by the bacterium *Clostridium tetani*. Tetanus spores are widespread in the environment and transmission occurs when spores are introduced into the body, usually through a puncture-type wound, but also through seemingly trivial wounds such as scratches. Injecting drug use is an increasingly common route of transmission in the UK.¹

In the UK, tetanus immunisation became part of the national routine childhood programme in 1961. Since then, the incidence of tetanus has decreased significantly and tetanus is now a rare disease, with only 221 cases reported in England and Wales between 1984 and 2004.^{2–3} Accident and emergency (A&E) departments deal daily with tetanus prevention as part of wound care but owing to the rarity of this disease acute tetanus is unlikely to be seen. For more than a decade, guidelines have stated that five doses of vaccine are sufficient to give satisfactory immunity, and that routine boosters every 10 years are no longer necessary.⁴ However, a survey conducted in one region of England found that only 17 of 40 people working in A&E departments were aware of these recommendations.⁵ In new guidelines, the Department of Health reduced the indications for booster vaccinations even further; boosters are no longer recommended following a tetanus-prone wound for those who have ever received five doses of vaccine, even if the last dose was >10 years before, unless the wound is classified as high risk.⁶ Wounds are classified as high risk if there is heavy contamination with material likely to contain tetanus spores, but a significant proportion of cases of tetanus occurs when there is no wound or a low-risk wound. A recent review recommended that an audit of current practice for tetanus vaccination in A&E departments should be conducted to determine how closely current policy is being followed.⁷ We designed a survey to assess the knowledge and current tetanus

prevention practices of a range of staff members in A&E departments in England.

METHODS

A questionnaire was designed in consultation with the British Association of Emergency Medicine to assess knowledge on current guidelines.^{4–6} The questionnaire contained 16 questions ascertaining information on the following: tetanus guidance, anti-tetanus practice, vaccination preparations and information on the population served by the department. The questionnaires were sent to 204 hospitals in England with an A&E department, during November 2004. The list of hospitals was obtained from the British Association of Emergency Medicine and The Medical Directory 2001. Eleven copies of the questionnaire were included with the cover letter, which was addressed by name to the consultant in charge. The consultant was asked to distribute the survey to five of the medical staff (senior house officers and staff grades) and five of the nursing staff (D and E grades) and to the hospital pharmacist. All questionnaires were treated as confidential.

For the analysis, hospitals were categorised as either small or large based on the official attendance figures during 2004 obtained from the Healthcare Commission. A hospital with an annual attendance figure smaller than the mean annual number of attendees per A&E department ($n = 61\,596$) was classified as small. A large hospital had an attendance figure >61 596 patients per year. Attendance data were available for all but two of the A&E departments that returned the questionnaires. Data were entered into a Microsoft Access

Abbreviations: A&E, accident and emergency; HTIG, human tetanus immunoglobulin

database and statistical analysis was conducted using SPSS V.13.0 and Stata software.

RESULTS

Of the 204 hospitals that were sent the questionnaires, 185 still had an active A&E department, as some had either merged with other hospitals or closed. In all, 21 hospitals with an A&E department were omitted from the audit because of out-of-date information. A total of 366 questionnaires from 67 hospitals were returned, a hospital response rate of 36.2%. The mean (range) number of questionnaires returned from each hospital was 5.5 (1–11). At least one hospital in each Strategic Health Authority in England responded (fig 1). Of the hospitals that responded to the audit, 32 were classified as large and 35 as small. Questionnaires were returned from 146 nurses (grade D to matron level), 179 medics (up to consultant level) and 21 pharmacists. The position of 20 respondents in the hospital was unclear.

A total of 75.4% ($n = 267$) of respondents said that their A&E department had a local tetanus guideline in addition to or based on the green book,⁴ 2.3% said that their department

did not have a policy and 22.3% did not know. Also, 29% ($n = 76$) of the respondents said that the policy was always followed in their department and a further 31.3% ($n = 82$) thought it was followed 75% of the time, whereas 2.3% ($n = 6$) of the respondents indicated that the policy was never followed.

In all, 31.3% ($n = 55$) of medics and 66.4% ($n = 91$) of nurses said that their induction programme did not include any teaching on tetanus. However, 13.9% ($n = 19$) of nurses said that teaching on tetanus was included in their induction compared with 36.9% ($n = 65$) of medics. A greater number of both medics and nurses (73.8% and 63.2%, respectively) who worked in smaller hospitals reported receiving specific teaching on tetanus.

Although 31.4% of respondents said that their department managed injecting drug users as a high-risk group for tetanus, with 15.3% saying that they were not, 53.3% said that they did not know. Also, 72.1% of responders ($n = 111$) who treated injecting drug users as a high risk group worked in smaller hospitals.

The average length of time the respondents had worked in A&E departments was 6.2 years, ranging from <1 year to 39 years. Most respondents (86.6%) had never seen a case of clinical tetanus. In all, 25 people had seen 1 case and 9 had seen between 2 and 10 cases during their career, although many said that these were "overseas".

A total of 98% of respondents classified contaminated wounds as tetanus-prone wounds and >91% considered wounds received outdoors as tetanus-prone wounds (table 1). A high proportion, 77.5%, also believed that a wound >12 h old was a tetanus-prone wound; 22.1% stated that they would consider any wound to be tetanus prone.

Respondents were questioned on their course of action when patients with varying vaccination histories presented with a tetanus-prone wound. Table 2 shows these results. In all, 68.9% of the respondents said that they would "never" give human tetanus immunoglobulin (HTIG) if the patient had received five doses of vaccine 10 years. This fell to 34.6% if the last dose was received >10 years ago. Also, 40.2% of respondents said that they would always give HTIG if the wound was contaminated, with 54.7% saying "sometimes". There was a similar decrease (from 80.4% to 26.9%) in the number of respondents "never" giving a booster dose depending on whether the last dose had been given <10 years before; 46.2% stated that they would always give another booster dose if the fifth dose had been given >10 years ago.

Opposing results were found regarding the course of action when the patient was immunocompromised, with 29.8% stating that they would "always" give immunoglobulin and 22.1% saying "never". There were similar discrepant results about giving a dose of vaccine to patients who were immunocompromised, with 24.8% answering "always" and 26.4% "never".

Tetanus vaccines in differing combinations have been available since the introduction of single-antigen vaccines in the 1950s. Respondents were asked which vaccine preparations their department used for anti-tetanus prophylaxis. Over 12% said that their department still issued single-tetanus vaccine (which are no longer available) for adults, with 8% saying that it was used for children (table 3); 51.3% stated that their department, was giving the paediatric preparation of tetanus and high-dose diphtheria vaccine for adults, which should not be given. Over 40% of respondents did not know whether certain vaccine preparations were being given to children <10 years in the department with many responding that children were referred to their general practitioner for vaccinations.

Figure 1 Map showing participating accident and emergency departments and the Strategic Health Authorities.

Table 1 Percentage of respondents who considered a particular wound type to be tetanus prone

Wound type	Yes	No	Don't know	Classification as tetanus-prone wound*
Deep wound (n=337)	65.0 (219)	30.0 (101)	5.0 (17)	No
Contaminated wound (n=357)	98.0 (350)	1.1 (4)	0.8 (3)	Yes
Wound >12 h old (n=342)	77.5 (265)	14.0 (48)	8.5 (29)	No, only if it requires surgical intervention
Any wound (n=335)	22.1 (74)	74.6 (250)	3.3 (11)	No
Diabetic wound or ulcers (n=334)	25.8 (86)	63.2 (211)	11.1 (37)	No
Infection at the injection site (n=337)	66.2 (223)	24.3 (82)	9.5 (32)	Yes, if in an IDU
Any wound received outdoors (n=356)	91.6 (326)	6.7 (24)	1.7 (6)	No
Burn (n=327)	60.6 (198)	31.2 (102)	8.3 (27)	Yes

IDU, injecting drug user.

Values are % (n).

*Tetanus-prone wounds also include compound fractures, wounds/burns in patients with systemic sepsis, wounds needing surgical intervention and wounds with devitalised tissue.

Of 21 participating pharmacists, 12 reported the median (range) annual number of doses of tetanus-containing vaccines used by their department as 1848 (226–3600) and 7 reported the median (range) number of doses of HTIG as 46 (19–90).

DISCUSSION

The results of this survey undertaken in A&E departments are interesting, but also give cause for concern. A response rate of 36.2% is relatively modest with only 67 hospitals taking part in the survey, but the overall number of individual questionnaires returned (n=366) was sufficient to reach conclusions about the current level of knowledge of A&E staff in England. Those who respond to surveys may be more compliant with guidance and therefore our findings probably represent the best-case scenario.⁸ This study also has added value as questionnaires were returned from a wide variety of both medical and nursing staff of different grades and with differing levels of experience. One possible reason for the poor response rate was that the questionnaires were sent to individual consultants and therefore, if they had moved, the questionnaire was not completed by any other member of staff. A small number of questionnaires was returned to the sender, increasing the overall response rate slightly.

It was difficult to assess and compare results at the hospital level owing to the design of the survey, with several staff members in each hospital being asked for their opinion. There was no independent verification of, for example, whether a

department did provide training or of the vaccine preparations used in the hospital. The local policies returned by some departments were quite variable and some differed significantly from the national policy.

It is clear from this survey that there is a significant difference between the recommended guidelines and what is practised on the ground. In general, respondents seemed to err on the side of caution when it came to considering which wounds are tetanus-prone, with almost a quarter of people considering any wound to be tetanus prone and 65% saying that deep wounds should be considered tetanus prone. A large proportion of respondents also considered all wounds >12 h old to be tetanus prone when only wounds requiring surgical intervention delayed for >6 h are tetanus prone. Although guidance is not being followed, such patients are not at risk—apart from receiving possibly unnecessary additional boosters. By contrast, a sizeable proportion did not consider either burns or infections at the injection site to be tetanus prone, putting patients at risk of developing tetanus.

Current UK guidelines state that five doses of a vaccine containing tetanus toxoid provide lifelong immunity, irrespective of the interval that has passed since the person received the fifth dose. Respondents either did not know the appropriate course of action or ignored the current guidelines, as almost half said that they would always give a further dose of vaccine even if the patient was fully vaccinated—that is, had taken the recommended five doses. This may indicate their clinical

Table 2 Percentage of respondents who would administer immunoglobulin or a booster dose of tetanus vaccine to a patient with a tetanus-prone wound depending on the immunisation status of the patient

Immunisation status	HTIG, % (n)				Vaccine booster, % (n)			
	Always	Never	Sometimes	Guidelines	Always	Never	Sometimes	Guidelines
Fully vaccinated <10 years ago	0.9 (3)	68.9 (242)	30.2 (106)	Only if high risk	2.0 (7)	80.4 (279)	17.6 (61)	None required
Fully vaccinated >10 years ago	17.4 (61)	34.6 (121)	48.0 (168)	Only if high risk	46.2 (160)	26.9 (93)	26.9 (93)	None required
Primary immunisations complete	38.5 (135)	15.4 (54)	46.2 (162)	Only if high risk	84.3 (290)	3.2 (11)	12.5 (43)	If due soon, and if convenient, a reinforcing dose can be given
Primary immunisations complete, 1 booster	14.8 (51)	29.0 (100)	56.2 (194)	Only if high risk	33.9 (115)	28.6 (97)	37.5 (127)	If due soon, and if convenient, a reinforcing dose can be given
Single dose	56.1 (189)	5.6 (19)	38.3 (129)	Yes	82.4 (271)	4.0 (13)	13.7 (45)	A reinforcing dose and further doses to complete schedule
Status not known	49.6 (175)	4.0 (14)	46.5 (164)	Yes	77.9 (271)	2.9 (10)	19.3 (67)	A reinforcing dose and further doses to complete schedule
Immunocompromised	29.8 (101)	22.1 (75)	48.1 (163)	Yes	24.8 (82)	26.4 (87)	48.8 (161)	A reinforcing dose and further doses to complete schedule

HTIG, human tetanus immunoglobulin.

Table 3 Knowledge of vaccine preparations used in accident and emergency departments

Vaccine preparation	Adults and children > 10 years			Children < 10 years			No, n (%)	Not known, n (%)	n	Yes, n (%)	No, n (%)	Not known, n (%)	Age group	Available
	n	Yes, n (%)	No, n (%)	n	Yes, n (%)	No, n (%)								
Single tetanus	260	33 (12.7)	181 (69.6)	275	22 (8.0)	46 (17.7)	137 (49.8)	116 (42.2)					All ages	1950–2002
Tetanus and high dose diphtheria	300	154 (51.3)	104 (34.7)	290	81 (27.9)	42 (14.0)	93 (32.1)	116 (40.0)					Children < 10 years	1961–2004
Tetanus and low dose diphtheria	283	156 (55.1)	66 (23.3)	294	82 (27.9)	61 (21.6)	84 (28.6)	128 (43.5)					Booster for all, aged ≥ 10 years	1994–2004
Diphtheria/tetanus/whole cell pertussis	250	1 (0.4)	178 (71.2)	270	6 (2.2)	71 (28.4)	135 (50.0)	129 (47.8)					Infant vaccination	1961–2004
Diphtheria/tetanus/acellular pertussis	250	5 (2.0)	176 (70.4)	271	8 (29.5)	69 (27.6)	135 (49.8)	128 (47.2)					Preschool booster	Vaccine available since 1991. Given routinely for preschool booster since 2001, and with IPV since 2005
Diphtheria/tetanus/inactivated polio	259	28 (10.8)	163 (62.9)	275	22 (8.0)	68 (26.3)	133 (48.3)	120 (43.6)					Booster for all aged, ≥ 10 years	Since 2005
Diphtheria/tetanus/acellular pertussis/inactivated polio	249	3 (1.2)	178 (71.4)	270	12 (4.4)	68 (27.3)	133 (49.3)	120 (43.6)					Preschool booster	Since 2005

IPV, inactivated polio vaccine.

experience of how difficult it is to establish an accurate vaccination history in adults. On the contrary, not all respondents were giving a dose of vaccine for patients whose immunisation status was not up to date or uncertain, which is recommended. Guidelines on the treatment of tetanus-prone wounds with HTIG say that if a tetanus-prone wound is high risk—that is, heavily contaminated—HTIG should be given, irrespective of the immunisation history of the patient. However, only 40% of respondents said that they would always give HTIG if a tetanus-prone wound was contaminated.

It is encouraging that three-quarters of those questioned said that their department provided tetanus guidelines, but less than one-third said that the guideline was always followed. Hospitals could do more to raise both the awareness of the existence of guidelines and adherence to them by staff. Incorporating training on tetanus into staff-induction courses is one way in which hospitals could improve knowledge and best practice of tetanus among staff. The survey showed that many nursing staff did not receive any teaching on tetanus during their induction. It is also possible that doctors simply prescribe a tetanus booster and leave the details of the preparation in current use to the nurses who administer it and to the pharmacists who provide it.

An increased risk of tetanus has been associated with injecting drug use.⁹ In 2003, the US reported that 15% of their cases between 1998 and 2000 were among injecting drug users.¹⁰ An increasing number of cases associated with injecting drug use have also been seen in the UK.¹ Despite injecting drug users being a recognised high-risk group for tetanus, less than one-third of respondents managed them as a high-risk group. Lack of training and the year of qualification of the staff may be possible explanations for this finding, as the increased incidence of tetanus among injecting drug users in Britain only started in 2003. Before this, elderly people were the most common at-risk group for tetanus and may be more likely to be recognised as such by A&E staff.

The gaps in knowledge shown in this survey are doubtless exacerbated by healthcare workers having no experience of the disease, so giving less priority to its prevention. Although rare, with only 46 cases reported in the UK between 2001–4,³ tetanus is a potentially fatal infection, and A&E departments should take steps to ensure that UK recommendations are followed at all times so that patients will be confident of receiving the most appropriate treatment from the staff treating them.

Evidence indicates that the change in the tetanus prevention policy, announced in a letter from the Chief Medical Officer in 2002, and more recently in the new green book, does not seem to have been implemented.^{6–11} Policy makers need to consider more closely whether and how their guidance will be implemented in the current National Health Service. The policy change was not based on evidence of a failure of previous recommendations. We have observed that practice is erring on the side of caution in giving boosters where current policy would not recommend them. As the incubation period of tetanus can be long enough for boosters to prevent the disease, cases of tetanus may have been prevented by current practice, which would not have been prevented by following the current policy. The approach of clinicians, while out of step with national guidance, may nonetheless be sensible. Although current UK guidance states that five doses of vaccine is sufficient for lifelong immunity, World Health Organization guidance goes further in recommending six doses.¹² Similarly, the routine vaccination schedules in Canada and in the US recommend at least six doses of tetanus-containing vaccine, with seven routine doses scheduled in New Zealand.^{13–15} The UK tetanus vaccination programme in its current and historical form has been overwhelmingly successful, and in that context,

the recent change to a less conservative policy may have been ill advised. If current policy is implemented in clinical practice, its impact on cases of tetanus should be closely monitored.

ACKNOWLEDGEMENTS

We thank Joanne White, Robin Smith, the British Association of Emergency Medicine and Bill Alexander at the Health Care Commission.

Authors' affiliations

Emma J Savage, Natasha S Crowcroft, Immunisation Department, Centre for Infections, Health Protection Agency, London, UK

Stephen Nash, A&E Department, Princess Royal University Hospital, Kent, UK

Anne McGuinness, UCLH NHS Trust, London, UK

Competing interests: None.

REFERENCES

- 1 Hahne S, White JM, Crowcroft NS, *et al*. Tetanus in injecting drug users, United Kingdom. *Emerg Infect Dis* 2006;**12**:709–10.
- 2 Rushdy AA, White JM, Ramsay ME, *et al*. Tetanus in England and Wales, 1984–2000. *Epidemiol Infect* 2003;**130**:71–7.
- 3 Health Protection Agency. Tetanus in England and Wales: 2001 to 2004. *CDR Weekly* 2005;**15**.
- 4 Department of Health, Scottish Executive Health Department, Welsh Assembly Government, DHSSPS (Northern Ireland). Tetanus. In: Salisbury DM, Begg NT, eds. *Immunisation against infectious disease*. London: HMSO, 1996.
- 5 Adeboye KA, Sangowawa O. Tetanus prophylaxis in the A&E department. *J R Soc Med* 2002;**95**:113.
- 6 Chief Medical Officer, Chief Nursing Officer, and Chief Pharmaceutical Officer. *Update on immunisation issues* [cited 10 January 2007]. London: Department of Health, 2002, <http://www.dh.gov.uk/assetRoot/04/01/34/08/04013408.pdf> (accessed 30 Mar 2007).
- 7 Bracebridge S, Crowcroft N, White J. Tetanus immunisation policy in England and Wales—an overview of the literature. *Commun Dis Public Health* 2004;**7**:283–6.
- 8 Armstrong D, Ashworth M. When questionnaire response rates do matter: a survey of general practitioners and their views of NHS changes. *Br J Gen Pract* 2000;**50**:479–80.
- 9 Rezza G, Pizzuti R, De Campora E, *et al*. Tetanus and injections drug use: rediscovery of a neglected problem? *Eur J Epidemiol* 1996;**12**:655–6.
- 10 Pascual FB, McGinley EL, Zanardi LR, *et al*. Tetanus surveillance—United States, 1998–2000. *MMWR Surveill Summ* 2003;**52**:1–8.
- 11 Department of Health, Scottish Executive Health Department, Welsh Assembly Government, DHSSPS (Northern Ireland). Tetanus. In: Salisbury DM, Ramsay ME, Noakes K, eds. *Immunisation against infectious disease—“The green book”*. London: TSO, 2006:367–84.
- 12 WHO. Tetanus vaccine. *Wkly Epidemiol Rec* 2006;**20**:197–208.
- 13 Centres for Disease Control and Prevention. Recommended immunization schedules for persons aged 0–18 years—United States, 2007. *Morb Mortal Wkly Rep* 2006;**55**:Q1–4.
- 14 Ministry of Health. Tetanus toxoid. *Canada immunization guide*. Ottawa, ON: Canada Medical Association, 2002:208–13.
- 15 Ministry of Health. *Tetanus, Immunisation handbook*. Wellington: Ministry of Health, 2006.

Access the latest content chosen by our Editors

BMJ Journals editors select an article from each issue to be made free online immediately on publication. Other material is free after 12 months to non-subscribers. Access the Editor's Choice from the home page—or expand your horizons and see what the other BMJ Journals editors have chosen by following the links on any BMJ Journal home page.