Hepatitis B vaccination in United Kingdom accident and emergency departments

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SUMMARY

Hepatitis B vaccination is not widespread amongst staff in accident and emergency departments in the United Kingdom. The results of a survey of departments training senior registrars reveal that unfounded fears concerning the safety of the vaccine are responsible for the low uptake. The need for vaccination, cost, medicolegal aspects and future developments are discussed.

INTRODUCTION

The risks of front line health workers contracting disease from patient contact have received much media attention in recent months. Initial concern centred on the possibility of transmitting the Human Immunodeficiency Virus (HIV), with justification in the light of recent reports from the United States (MMWR, 1987). The British Dental Association, The Royal College of Nursing and, latterly, the British Medical Association have highlighted the problem of Hepatitis B, with calls for the Department of Health to extend the number of groups for whom vaccination is recommended.

Although few would question the virulence of the disease and the potential for producing chronic liver disease or even death, the attitude to vaccination appears, at best, to be ambivalent. Plasma-derived Hepatitis B vaccine has been available in the United Kingdom since 1982; however, it does not appear to be in widespread use in accident and emergency (A&E) departments. Overall, since 1982 only 75 000 vaccinations have been given in the United Kingdom compared with one million in the United States. This seems paradoxical; an apparently safe, effective, relatively inexpensive prophylactic measure against a threat with potentially devastating consequences on the health and career of the victim.

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In 1986, a member of staff in the author's department contracted Hepatitis B. As is usually the case, she had no recall of the infecting incident. Now fully recovered, her misfortune prompted a reappraisal of Hepatitis B prevalence and prevention in accident and emergency practice.

SURVEY METHOD AND RESULTS

A survey was undertaken of A&E departments in the United Kingdom responsible for senior registrar training to assess the prevalence of vaccination and the reasons for at-risk groups not being vaccinated.

Forty-five replies were received, representing 75% of those departments training senior registrars. Only 22% of senior registrars have been vaccinated. The most frequently quoted reasons for not being vaccinated were: (1) concern that the vaccine may not be safe (50%); and (2) lack of advice or recommendation to be vaccinated from either the consultant in charge or the hospital occupational health department (39%). Only one senior registrar was concerned that being identified as a carrier may adversely affect his career and another solitary trainee did not believe himself at risk.

In 30% of departments, some members of the nursing staff have been vaccinated and in 13% some porters also.

Twenty-six per cent of consultants in this group of trainers are known to have been vaccinated. However, the remaining 74%, in addition to not having been vaccinated themselves, have no policy for the other staff in their department and only 18% of all consultants actively encourage vaccination. Fifty-seven per cent of hospital occupational health departments stock the vaccine but only 39% encourage at risk groups to be vaccinated. One department will vaccinate anyone who is willing to pay for it themselves.

In 13% of departments, there is a facility for arranging vaccination of other non-hospital at risk groups, for example police, fire and ambulance personnel either via their own general practitioner or the hospital occupational health department.

Only three departments reported cases of members of staff contracting Hepatitis B in the last 10 years. One doctor and three nurses were affected, all of whom recovered uneventfully.

Unless the patient is an obvious intravenous drug abuser or jaundiced, only 39% take any routine precautions when exposed to blood and then gloves only. Sixty-one per cent take no routine precautions whatsoever.

DISCUSSION

Although the sample in this survey is confined to training centres, there is no reason to assume that the trends revealed do not apply nationwide, with the true prevalence of vaccination in A&E departments being far lower than these figures would suggest.

Attitudes to vaccination seem to be dominated by two main factors: the safety and the need for vaccination.

(1) Is the vaccine safe?

The vaccine was first licensed in the United States in 1981 and marketed in the United Kingdom in 1982. The present plasma-derived vaccine is obtained from the excess surface antigen protein coat of the virus in the plasma of asymptomatic carriers. Concern arose because the source of this starting plasma was asymptomatic Hepatitis B carriers, including homosexuals, and the theoretical risk, therefore, of contamination by and transmission of HIV. Zuckerman (1984) describes this concern as absurd. Each of the three chemical inactivation procedures using pepsin, urea and formaldehyde inactivate HIV. The prolonged purification stages over a period of 65 weeks during manufacture of the vaccine destroy, not only the infectivity of the Hepatitis B virus, but inactivate all representatives of living organisms known to infect man. The safety of the vaccine is now established. The earliest papers from Stevens in New York in 1983 demonstrated no cases of AIDS occurring after Hepatitis B vaccination and they have been repeatedly vindicated. There is no risk of transmitting HIV or any other blood-borne virus. The Hepatitis B immunoglobulin, frequently administered after needlestick injuries to those who may not have been vaccinated because of unfounded safety fears, is prepared from the same pooled plasma and not subjected to the same inactivation procedures as the vaccine. Nonetheless, it has World Health Organisation approval as being risk free and is popularly regarded as such.

The survey findings reflect those of Triger (1984) who found an overall acceptance rate of only 56% amongst medical and paramedical personnel offered the vaccine. The uptake rate amongst staff in the two local teaching hospital A&E departments was 40/72 overall, but varied from 75% in one to 26% in the other. Triger observed that, despite the well-recognized hazards of Hepatitis B, hospital staff have a marked reluctance to avail themselves of adequate protection. Anxiety about adverse reaction arises because of the small amount of data on adverse effects, presumably a product of their rarity. Staff are unconvinced by the lack of serious complications reported to date since the length of time to follow up is still comparatively short. Shanson (1986) at St Stephen's Hospital, London, England, with a high local population of both Hepatitis B and HIV carriers, reported that only 10 hospital staff were vaccinated between 1983 and 1985. Once again, the fear of transmission of HIV dominated the reasons for declining vaccination, but acceptance rates increased with greater publicity and availability of information. Despite authoritative reassurance to the contrary, the spectre of AIDS lingers and no one wants to be that first reported case.

There appears to be a failure to accept that A&E department staff are at risk, possibly as a result of the low number of reported cases from these units. High vaccination acceptance rates and interest correlate with recent episodes of acute Hepatitis B among members of the Unit staff. The hazards of immunization seem to be relative and can be outweighed by personal experiences of the consequences of the disease.

The safety of the vaccine is no longer seriously questioned although opponents of mass vaccination maintain that no vaccine is completely safe and there is always the risk of anaphylaxis. A vague association with neurological complications has been quoted, although no causal relationship has been established and they occur no more than could be expected by chance. The question of the risks of widespread immunization outweighing the risk of infection remains academic. Some three million doses of vaccine have been given worldwide and, in general, it is well tolerated with few untoward side effects, limited mostly to minor reactions at the injection site in 5%.

Table 1 Hepatitis B infection sequelae

Resolution (90%)
Acute fulminant Hepatitis
Chronic carrier state
Chronic active Hepatitis
Chronic persistent Hepatitis
Cirrhosis
Primary hepatocellular carcinoma

(2) Is the vaccine necessary?

The scale of the problem should not be underestimated. The life time risk of Hepatitis B infection amongst health care workers who have frequent contact with blood is 15–30% representing five to ten times the risk in the general population.

The potential sequelae of infection are listed in Table 1 and how outcome is influenced by vaccination or administration of immunoglobulin in Tables 2 and 3. 60% of cases are subclinical. There are estimated to be some 200 million carriers worldwide with large geographical variation (Table 4). In the UK, 4–6% of the population have surface antibodies and another 2–4% core antibodies. At least 0.1% remain carriers (Zuckerman, 1987). The prevalence of carriers in the United Kingdom is variously estimated between 0.06% (Vickers *et al.*, 1987), 0.33% (Boxall & Flewett, 1987), and 0.8–2% (Alexander & Williams, 1986), with the higher rates in urban population, due to the relative proportions of immigrants from areas with high carriage rates. The method of carrier detection also affects these results, with series using the more sensitive radioimmunoassay technique revealing the larger prevalence.

Table 2 Acute outcomes of HBV infection (%)

	Subclinical Hepatitis	Anicteric Hepatitis	Icteric Hepatitis	Fulminant Hepatitis
No vaccination or HBIG	50	30	19.9	0.1
Vaccination	75	13	12	0.01
HBIG	83	8.5	8.4	0.1

Table 3 Chronic outcome of HBV infection (%)

	Resolution	Carrier state	Persistent Hepatitis	Active Hepatitis
No vaccination or HBIG	90	5	3.5	1.5
Vaccination	99	0.5	0.35	0.15
HBIG	90	5	3.5	1.5

Table 4 Chronic HB_sA_e Carriers(%)

USA	0.1-1
South America	1-3
USSR	3-6
Southern Europe	3-6
South East Asia	15-30
Southern Africa	15-30

The average UK A&E department seeing 30 000-40 000 new patients per annum will, therefore, be exposed to 30-250 carriers annually, many of whom will be asymptomatic, unknown carriers presenting with an injury or illness involving blood spillage.

Annually, the total number of cases of acute Hepatitis B ranged between 1000 and 1200 from 1975 to 1983 (Polakoff, 1987). A rise to 2000, with 30 deaths, in 1984 was followed by a fall to 1300 in 1986. Drug abusers constitute the largest single group and changes in their numbers have been responsible for the previous fluctuations in the annual total. In 1984, 600 cases of hepatitis B had a history of drug abuse, falling to 300 in 1986, possibly as a result of publicity given to the risks of acquiring HIV limiting the use of the intravenous route for drug abuse or the sharing of syringes.

The incidence of Hepatitis B in United Kingdom adults aged between 15 and 64 years is 2:100 000 females and 6:100 000 males (Polakoff, 1986). Intravenous drug abusers constitute the largest single group, with Health Service staff comprising 5.4% of the total (Table 5). In the period 1980-1984, this represented a total of 361 cases, a 25% increase over the previous 5-year period. This apparently alarming increase was, however, largely due to Hepatitis B contracted whilst working abroad.

The changing pattern of Hepatitis B infection in Health Service staff over the same two periods 1975-1979 and 1980-1984 is further illustrated in Table 6. The incidence

Table 5 Incidence of Hepatitis B in the UK (%)*

Drug Abuse	23.9
Male homosexual	7.8
Travel abroad	9.6
Health service staff	5.4

*Polakoff (1986)

Table 6 Acute Hepatitis B in Health Service staff*

	1975-1979 (no.)	Annual rate per 100 000	1980-1984 (no.)	Annual rate per 100 000
Surgeons	6	12	14	25
Physicians	27	12	26	11
Nursing staff	131	7	95	4
Dentists	12	17	13	17

*Polakoff (1986).

Table 7 Annual incidence of infection/100 000*

Laboratory staff	37
Surgeons	25
Physicians	11
Nurses	4

*Polakoff (1986).

among surgeons has doubled although the total number of cases remains low at 14 in 5 years. In terms of exposure to blood and potential for needlestick injuries, this group must be the most comparable to those in A&E for whom no figures are available. Laboratory staff have the highest annual incidence with rates of 37 : 100 000 (Table 7).

More detailed figures are required for the risks of exposure to UK A&E department staff. Symington (1986) assessed serological markers of Hepatitis B infection in 145 A&E staff in Glasgow and found a prevalence of 2.5% compared with 1.5% amongst blood donors. Although little higher than the prevalence in the general population, frequent contact with blood and the unpredictability of patients led to the designation of A&E staff as a priority group for vaccination.

In addition, three health care workers in the United States exposed to blood from HIV seropositive patients, including one failed arterial catheterization in the emergency room, but not via inoculation injury, have developed HIV antibodies. The Centre for Disease Control conclude that exposure of intact skin or mucous membranes to contaminated blood may rarely result in the transmission of HIV (MMWR, 1987). Similarly, Callender *et al.* (1982) found that, of 51 clinical workers contracting Hepatitis B, only three could recall a specific inoculation injury. This may not, therefore, be the usual mode of infection in medical staff and Hepatitis B may be acquired by contact with infected blood without specific inoculation injury. The wearing of gloves should be a routine precaution whenever exposed to blood.

Precautions

Before the introduction of the vaccine, prevention depended on the wearing of gloves when dealing with contaminated blood and the immunoglobulin (HBIG) given after exposure. This was a suboptimal practice due to the short supply and cost of HBIG (£140), and the infrequency of the victim being aware of the infecting incident. In one series (Anonymous, 1980), only 2/52 could recall exposure. This obviously reduces the efficacy of a control policy based on treatment after exposure. However, it would seem from the present survey that most A&E departments still adopt such a policy and remain vulnerable to the unknown carrier attending hospital because of some unrelated complaint.

Some precautions can be taken to limit transmission. Infection may occur via needlestick injuries, contact with contaminated blood on minor skin wounds or the conjunctiva. Inoculation injuries are the usual mode of infection in medical staff and only a few of the patients who are carriers will be detected by screening high-risk patients. The overall risk of infection can, therefore, only be reduced by stricter

precautions in the handling of *any* patients blood and by vaccination for clinical staff at high risk. Geddes (1986) has recommended carefully avoiding needlestick injuries and the wearing of gloves and, possibly, goggles to avoid contamination of skin or conjunctiva with patients blood in *all* patients who are bleeding. The individual carrier who is not known to be positive is potentially far more hazardous than the known carrier. Recommendations to encourage safe working practices and advice including 'good techniques protect against all microbiological hazards' (Gatley, 1987) are, of course, entirely laudable and appropriate to the relative calm and order of the laboratory. Such conditions may well not obtain in the mêlée of the multiply injured patient and contamination becomes a real possibility, even with experienced, aware staff practicing an established routine.

The apparent concentration of carriers in urban areas, in particular, Edinburgh and London, may lead staff in the more rural departments to believe themselves not vulnerable. This is specious. The general population as a whole is highly mobile and it may well be in the course of such mobility that the unknown asymptomatic carrier will arrive exsanguinating or, even more dangerously, with a minor, apparently innocent, laceration in the 'low risk' department employing no routine precautions against Hepatitis B transmission. There is no room for complacency even in our rural departments.

The argument against widespread vaccination

There remain those, however, who dispute a policy of widespread vaccination suggesting that most UK carriers have low infectivity and, therefore, present such a low risk to health staff that vaccination need not be considered (Anonymous, 1982). The relatively low prevalence of Hepatitis B may allow a vaccine to appear effective when it is not. Vandervelde & Mortimer (1985) screened 1000 hospital staff and found high antibody prevalence in only 6%, amongst staff thought to be at special risk. This absence of widespread infection was thought to be too low to justify routine antibody screening before vaccination and argued against the liberal use of vaccine amongst United Kingdom hospital staff. They quoted a low risk of exposure, only 71% good response rate with high antibody titres and a 10% no-response rate as a reason to critically examine each request for vaccine.

Gatley (1987) believes that local statistics of the risk of exposure are required to enable the group who really are at risk to be offered vaccination rather than the 'overkill' recommended at present, maintaining this would be cheaper, safer and more sensible.

Cost

Estimated costs assume 100% uptake amongst staff, which would almost certainly not apply. Initial acceptance rates are uniformly low at 15–25% (Triger, 1984; Symington, 1986; Samaranayake, 1986). This only increases to 50–70% after using tutorials or discussion groups to inform and educate the groups at risk, and to actively offer the vaccine. In the United States, where the new recombinant vaccine has been available since January 1987, and is routinely offered to medical students and residents, uptake has increased but has not approached 100%.

The major argument against widespread vaccination is cost. Attempts to reduce the cost where extensive immunization is needed have included use of the intradermal route of injection. This reduces the dose of vaccine required and may accelerate the immune response in persons suddenly at high risk of infection but the efficacy and duration of protection are unknown, and vaccines are, at present, not licensed for use intradermally.

Cost/benefit analysis by Mulley *et al.* in the United States (1982) suggest that: (1) prior serological screening is not necessary in groups with a large proportion of persons susceptible to infection with a high annual risk of infection and (2) the net cost of each prevented case of Hepatitis B is proportional to the estimated attack rate in the population with net cost benefits emerging when attack rate exceeds 5–6% per annum, as occurs in American surgical residents.

The 500 000 population of National Health Service staff that the British Medical Association (1987) identifies as being at risk would have cost £35–40 million to vaccinate, using plasma derived vaccine costing £63.50 per course. The new recombinant vaccine will cost half this figure. This estimate excludes the cost of follow-up testing in order to define, at 1–3 months, the level of antibody response, surveillance of the 5–10% young and healthy subjects and the 40% of those over 40 years who are poor or non-responders, and booster injections as required. To vaccinate all A&E staff may cost £1 million, and this is a rotating and constantly changing population requiring, therefore, continued vaccination and expenditure. Whilst expense alone is insufficient reason to refuse wider immunization, the financial implications cannot be ignored. The DHSS has provided no extra funding to Health Authorities for Hepatitis B vaccination and is unlikely to do so in the present financial climate.

The cost of Hepatitis B in medical staff in the United Kingdom has not been calculated but, after weeks in hospital, loss of skill to the National Health Service and treatment of carriers with interferon, this will be huge. Zuckerman estimated that the cost of treating chronic hepatitis in the United States could fund the National Health Service.

Future developments

The development of new better and safer vaccines allows procrastination both by the policy makers and potential vaccinees to continue. The next generation vaccine is the recombinant DNA vaccine derived from yeast cells. This should eliminate many of the safety concerns associated with the plasma-derived vaccine, particularly the unfounded fear of transmitting HIV. Availability will no longer be limited by the supply of plasma, although low uptake of vaccine means this is not a problem at present. The new vaccine promises to be highly effective and well tolerated, although multiple doses are still required. Unfortunately, these genetically produced vaccines are no better than the plasma-derived vaccines in reducing the numbers of poor or non-responders. This problem may be solved by micellar vaccines, from the two major polypeptide components of HBsAg presently undergoing clinical trials in the United States, which have produced high antibody titres even in previous non-responders. Chemically synthesized polypeptide and hybrid virus vaccines using the vaccinia or adenovirus as a vector are promising areas of research.

Medicolegal aspects

Present vaccination policy may have medicolegal consequences. Acute Hepatitis B is recognized in the United Kingdom as an occupational disease amongst health workers with consequent implications for Health Authorities who are liable for compensation for ill health or death. The position of claims arising from an employee who develops Hepatitis B after not having been offered vaccination is always difficult to prove given the infrequency with which the infecting incident can be identified. Any infected NHS employee could argue in the courts that the occupationally contracted Hepatitis B was, in part, due to the failure of the employing authority to provide the necessary vaccine.

CONCLUSION

The present situation is clearly unsatisfactory with a diversity of views and practices. Safety fears and cost have limited uptake and discouraged health authorities to actively encourage vaccination. The impact of the new, cheaper yeast-derived recombinant vaccine is awaited.

More specific information concerning the risks of exposure to Hepatitis B amongst A&E staff and evidence of past subclinical infection would be valuable. Finch (1987) identified A&E staff as a group who should actively be offered protection, and the British Medical Association (1987) strongly recommend immunization for all health care staff working in the specialty.

New guidelines are required from the Department of Health to allow and fund each Health Authority to formulate and implement a vaccination policy through hospital occupational health departments and consultants in charge of departments at risk including A&E. All staff in A&E departments should be made aware of these guidelines and have access to Hepatitis B vaccine if so desired. Information must be provided so that each individual can reach an informed decision.

For those who decline vaccination, meticulous precautions when dealing with *any* contact with blood, no matter how trivial the spillage, is essential to keep the Hepatitis B virus at bay.

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